# Evaluation of the effectiveness and safety of acupuncture in the management of shoulder pain in adults

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# DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and, any editorial work, paid or unpaid, carried out by a third party is acknowledged.

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# ABBREVIATIONS

| | |
|---|---|
| AC | Acromioclavicular |
| ADL | Activities of daily living |
| CAM | Complementary and alternative medicine |
| CHM | Chinese herbal medicine |
| CMS | Constant Murley score |
| CI | Confidence interval |
| CT | Computed tomography |
| EA | Electroacupuncture |
| FMA | Fugl-Meyer assessment |
| GP | General practitioner |
| ITT | Intention-to-treat |
| MAS | Motor assessment scale |
| MD | Mean difference |
| MMT | Manual muscle testing |
| MRA | Magnetic resonance arthrography |
| MRI | Magnetic resonance imaging |
| Non-RCT | Non-randomised controlled trial |
| NSAIDs | Non-steroidal anti-inflammatory drugs |
| RCT | Randomised controlled trial |
| ROM | Range of motion |
| RR | Risk ratio |
| SMD | Standardised mean difference |
| SP | Shoulder pain |
| SPADI | Shoulder pain and disability index |
| TENS | Transcutaneous electrical nerve stimulation |
| VAS | Visual analogue scale |

# PUBLICATION

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# SUMMARY


## Background

Shoulder pain (SP) is one of the most common musculoskeletal pains in the community. It affects 6.9-26% of the population globally. SP is characterised by pain in or around the shoulder joint, accompanied by weakness, stiffness, numbness, swelling, tearing, or bony changes, limitation of shoulder movement, and/or noises upon arm movements. The Western medicine management for SP is not satisfactory and patients seek complementary and alternative medicine, including acupuncture, for solution. However, the effectiveness and safety of acupuncture for SP have not been assessed systematically.

## Objectives

1) To review the fundamental knowledge of SP from both Western medicine and Chinese medicine perspectives; and
2) To evaluate the effectiveness and safety of acupuncture in the management of SP in adults by systematically reviewing the currently available randomised and non-randomised controlled trials.

## Methods

A total of 13 English electronic databases and three Chinese databases were searched from their respective inceptions to the 18th September 2012. Conference proceedings and the reference list were hand searched. Both randomised and non-randomised controlled trials that compared acupuncture with sham acupuncture, Western medicine or other therapy (such as physical therapy) as treatment for adult patients with SP were included. The studies involving the same co-intervention in

both comparison arms were considered. Two reviewers independently selected the studies, extracted the data for analysis and assessed the risk of bias of the included studies. Meta-analysis was performed using RevMan 5.1. The continuous data was analysed by mean difference (MD) or standardised mean difference (SMD), and the dichotomous data was analysed by risk ratio (RR); both with 95% confidence interval (CI).

**Results**

A total of 6,609 studies were identified following search strategies. Thirty-eight randomised controlled trials (RCTs) and six non-randomised controlled trials (non-RCTs) met the inclusion criteria and were included in this review.

Among the 38 RCTs, 4,115 participants were randomised. There was a high risk of performance bias and an unclear risk of bias of selection, detection, attrition, reporting and other bias across most RCTs. Seven RCTs compared acupuncture with sham acupuncture. The pooled data showed that acupuncture was more effective to relieve pain than sham acupuncture at the end of treatment (SMD -0.58, 95% CI -0.99 to -0.16; two trials, n = 399) and at the end of follow-up (SMD -0.57, 95% CI -0.77 to -0.37; two trials, n = 399). Real acupuncture was superior to sham acupuncture for improving abduction degree of the shoulder at the end of six-week treatment (MD 12.00, 95% CI 3.89 to 20.11; one trial, n = 289) and at the end of three-month follow-up (MD 11.00, 95% CI 3.05 to 18.95; one trial, n = 289). Six RCTs made comparison of acupuncture and Western medication. The pooled data showed that there was no significant difference in alleviating pain between two groups at the end of treatment period (MD -0.91, 95% CI -2.14 to 0.32; two trials, n = 487). However, nerve block (Xylocaine) was more effective in improving shoulder

movement in all directions than acupuncture after one-session treatment. Two RCTs compared acupuncture with other therapy (such as Trager psychophysical integration and conventional orthopaedic therapy). Acupuncture was more effective to reduce pain than conventional orthopaedic therapy after three-month treatment (MD -15.00, 95% CI -20.89 to -9.11; one trial, n = 289), as well as at the end of three-month follow-up (MD -14.00, 95% CI -19.80 to -8.20; one trial, n = 289). The pooled data showed that acupuncture was more effective to improve abduction degree than other therapy at the end of treatment (MD 12.83, 95% CI 1.41 to 24.24; two trials, n = 302). Three studies compared acupuncture plus Western medication with Western medication alone. There was no significant difference between acupuncture plus oral Naproxen Sodium and oral Naproxen Sodium alone for pain relief at the end of 12-session treatment (MD 0.02, 95% CI -0.16 to 0.20; one trial, n = 257). The pooled data showed there was no significant difference in improving abduction degree between acupuncture plus Western medication and Western medication alone (MD -1.34, 95% CI -16.80 to 14.12; two trials, n = 190). Eighteen studies compared acupuncture plus other therapy with other therapy alone. The pooled data indicated that acupuncture was more effective for pain relief as an adjunct treatment to Tuina at the end of treatment (MD -1.32, 95% CI -1.56 to -1.07; two trials, n = 132). However, there was no significant difference between acupuncture plus Tuina group and Tuina alone group for abduction degree after the last treatment (MD 9.70, 95% CI -17.70 to 37.11; two trials, n = 120). Two studies comparing acupuncture plus other therapy with Western medication plus other therapy did not examine the effects on pain intensity or ROM. With Tuina or exercise as co-intervention, two studies compared acupuncture with other therapy. There was no significant difference between electroacupuncture plus exercise and interferential electrotherapy plus

exercise for alleviating pain at the end of one-month treatment (MD 0.10, 95% CI -0.96 to 1.16; one trial, n = 47).

Six non-RCTs involved 570 participants with SP. All of them had a high a risk of selection bias (random sequence generation) and performance bias (blinding of participants). Majority had an unclear risk of selection bias (allocation concealment), detection, attrition, reporting and other bias. Although all the investigators claimed that the treatment group was more effective than the control group, due to lack of data for primary and secondary outcome measures, meta-analysis was not performed.

No severe adverse events were observed in either RCTs or non-RCTs.

**Conclusions**

This systematic review included both randomised and non-randomised controlled trials of acupuncture for the treatment of SP adult sufferers. Acupuncture is potentially beneficial and safe for relieving pain and improving abduction movement of the shoulder joint. However, due to the various confounders and high risk of bias, the findings need to be interpreted with caution. A large scaled, rigorously designed RCT is warranted to confirm the current results.

# CHAPTER ONE

# GENERAL INTRODUCTION

This chapter describes the general background, aims and objectives of the study. It also outlines the organisation of this thesis.

## 1.1 Background

Shoulder pain (SP) is one of the most common musculoskeletal complaints in the primary care (Mitchell, Adebajo, Hay, & Carr, 2005). It affects 6.9-26% of the global population. The pain is presented in or around the shoulder joint. The accompanied symptoms are characterised by weakness, stiffness, numbness, swelling, colour changes, or limitation of shoulder movement (Martin & Gabica, 2009). Approximately 60% SP sufferers' symptoms last for more than one year and the recurrence rate is estimated around 25% (Cadogan, Laslett, Hing, McNair, & Coates, 2011). Untreated SP can have significant impact on a person's ability to carry out daily activities (such as working, eating, dressing, personal hygiene) and subjective quality of life (such as poor sleep, difficulty concentration and mood swings) which lead to substantial economic burden to the society (Gutierrez, Thompson, Kemp, & Mulroy, 2007; Mitchell et al., 2005). In 2000, the direct costs for the treatment of shoulder dysfunction in the United States reached $7 billion (Meislin, Sperling, & Stitik, 2005). In Australia, rotator cuff syndrome, with SP as the key symptom, is ranked the fourth among the top ten surgical procedures performed on people with musculoskeletal conditions. About 14,000 surgeries were performed in 2003-2004 (ABS, 2006).

Current treatment options for SP include pharmacotherapy (oral analgesics, non-steroidal anti-inflammatory drugs [NSAIDs], steroid; and glucocorticoid injection),

surgery, physiotherapy and exercise (Mitchell et al., 2005; Stevenson, 2004). Analgesics do not treat the disease, but have some effects on motivating patients and encouraging rehabilitation (Mitchell et al., 2005). NSAIDs induce peptic ulcers and allergic reaction (Stevenson, 2004). Steroids and physiotherapy have a marginal short-term effect on pain and their effectiveness is relatively week (Mitchell et al., 2005). Steroid injection has a number of side effects, such as endocrine disturbances, liver and cardiac problem and testicular atrophy (G. C. Lin & Erinoff, 1996). The surgical treatment takes likelihood of risks (Abrams & Bell, 2008). There is still no evidence to support the benefit of physiotherapy for SP (Green, Buchbinder, & Hetrick, 2003). Therefore, more and more SP sufferers seek complementary and alternative medicine including acupuncture for solution of SP.

Acupuncture, as one of the Chinese medicine modalities, has been practiced for thousands of years in China and surrounding Asian countries. It treats patients by inserting and manipulating sterile needles in specific acupoints on the body according to Chinese medicine theories. The World Health Organization (WHO) has reported that acupuncture is an effective treatment for therapeutic purposes, particularly for pain relief (X. Zhang, 2003), which is supported by numerous laboratory experiments and clinical trials (Ambrosio, Bloor, & MacPherson, 2012; Hopton, Thomas, & MacPherson, 2013). Thus, acupuncture is used as a treatment method by 90% of pain management clinics in the United Kingdom and 70% in Germany (Daniela, 2004). According to medical science theory, the mechanism for using acupuncture to reduce pain is that acupuncture can promote the release of endogenous opiates (Han, 2003) and stimulate the serotoninergic descending pain inhibitory pathway (Chang, Tsai, Yu, Yi, & Lin, 2004). Chinese medicine therapy believes that needling at the acupoints can remove the obstruction of Qi and blood, and alleviate pain (J. G.

Lin & Chen, 2009). Acupuncture is safe with few adverse effects when administered by well-trained acupuncturists (Goddard, 2004). There is a number of published randomised controlled trials (RCTs) which have indicated the beneficial effects of acupuncture for pain conditions, such as lateral elbow pain (Green et al., 2002), low back pain (Furlan et al., 2005), neck disorders (Trinh et al., 2006), tension-type headache (Linde et al., 2009b), migraine prophylaxis (Linde et al., 2009a) and SP (Green, Buchbinder, & Hetrick, 2005; Molsberger, Schneider, Gotthardt, & Drabik, 2010), However, recent systematic reviews of RCTs using acupuncture for pain relief state that acupuncture is effective for some but not all types of pain (M. S. Lee & Ernst, 2011). Acupuncture has been used to treat SP; however, there is no sufficient evidence to support its effectiveness (Green et al., 2005; W. Peng, Wang, Liu, Liu, & Mao, 2007).

Clinical researchers favour RCTs instead of non-randomised studies, as RCTs are considered to be high-level evidence for assessing the effects of a medical intervention (Deeks et al., 2003). However, such a study design is inappropriate when applied to complementary and alternative medicine, particularly for a physical intervention such as acupuncture (White, Filshie, & Cummings, 2001). Ignoring findings from non-randomised studies may hinder the complementary and alternative medicine development as a form of evidence-based healthcare. Therefore, it is critical to include both randomised and non-randomised studies when reviewing the effectiveness of an intervention for clinical conditions. However, very few currently published systematic reviews of acupuncture include non-randomised studies.

## 1.2 Aims and objectives of the study

The aims of the study are to investigate (1) whether acupuncture may provide symptomatic relief for SP and (2) whether acupuncture is safe in the management of SP in adults by conducting a systematic review of RCTs and non-randomised controlled trials (non-RCTs).

The objectives of the present project are to:

a) review the fundamental knowledge of SP from both Western medicine and Chinese medicine perspectives;
b) evaluate whether acupuncture is effective for the management of SP according to the currently available RCTs and non-RCTs; and
c) assess whether acupuncture is safe for the management of SP according to the currently available RCTs and non-RCTs.

## 1.3 Location of the study

This study was primarily conducted at the Chinese Medicine Research Laboratory, Level 4, Building 202, Bundoora West Campus, RMIT University, Australia.

## 1.4 Organisation of the thesis

The thesis consists of eight chapters. Chapter One provides a general introduction to the background, aims and objectives of the study, and the organisation of the thesis. Chapter Two reviews the definition, epidemiology, mechanism, diagnosis and management of SP from Western medicine perspectives. Chapter Three describes SP from Chinese medicine perspectives, including aetiology, pathogenesis, differentiation of syndrome, and Chinese herbal medicine and acupuncture treatment for SP. Chapter Four outlines the detailed methods used for the systematic review.

Chapters Five and Six reports the findings of the review of RCTs and non-RCTs, respectively. Chapter Seven discusses the results of the previous two chapters. Chapter Eight, the final chapter, draws the general conclusions.

# CHAPTER TWO

# LITERATURE REVIEW ON SHOULDER PAIN FROM WESTERN MEDICINE PERSPECTIVES

This chapter provides a descriptive review of SP from Western medicine perspectives, including definition, epidemiology, impact, mechanism, diagnosis and management of SP and assessment of effects.

## 2.1 Definition of SP

SP refers to the pain presented in or around the shoulder joint including scapular areas and low cervical spine (M. Pribicevic, H. Pollard, R. Bonello, & K. de Luca, 2010). The accompanied symptoms of SP are characterised by weakness, stiffness, numbness, swelling, inflammation, tearing, or bony changes in the shoulder joint, limitation of shoulder movement, and/or noises when arms are moving (Ogiela & Zieve, 2009; Williiams & Robert, 2011). These conditions are often persistent and chronic (Burbank, Stevenson, Czarnecki, & Dorfman, 2008; Meislin et al., 2005). In addition, patients with SP may be accompanied by referred pain to the back, neck or arms, fatigue or fever (Williiams & Robert, 2011).

SP is one of the key symptoms of numerous shoulder joint diseases, such as rotator cuff tendinopathy, rotator cuff tears, adhesive capsulitis, glenohumeral arthritis, acromioclavicular (AC) diseases, scapulohumeral periarthritis, subacromial and subdeltoid bursitis, shoulder impingement syndrome, osteoarthritis, infraspinatus tendinitis, supraspinatus tendinitis, biceps tendinitis, and myotenositis of long head of biceps brachii.

Apart from shoulder joint disorders, a number of internal medicine diseases can cause SP. For example, heart pain from cardiovascular diseases may radiate to the shoulder region (Topol & Califf, 2007). Pain from cholecystitis (inflammation of the gallbladder) can radiate between or over the scapulae (L. Williams & Wilkins, 2008).

## 2.2 Epidemiology of SP

### 2.2.1 Global prevalence of SP

SP is one of most common musculoskeletal pain in the community (Mitchell et al., 2005). Its prevalence differs from 6.9% to 26% in the global population (Luime, Koes, et al., 2004). The lifetime prevalence is up to 70% (Luime, Koes, et al., 2004). The results of recent prevalence studies in different countries are summarised in Table 1.

**Table 1: Prevalence of shoulder pain in different countries**

| Country | Prevalence of SP | Reference | Country | Prevalence of SP | Reference |
|---|---|---|---|---|---|
| Australia | 25% | (C. L. Hill, T. K. Gill, E. M. Shanahan, & A. W. Taylor, 2010) | Netherlands | 17% | (Bot et al., 2005) |
| China (Jining) | 10.9% | (Hongtu, Jishou, & Yanhua, 2011) | Norway | 15.7-20.2% | (Sven, Knut, & John-Anker, 2006) |
| Cuba | 10.1% | (Reyes Llerena et al., 2000) | United Kingdom | 16%-26% | (Urwin et al., 1998) |
| Finland | 20.1% | (Kaila-Kangas, 2007) | United States | 6.7% | (Cunningham & Kelsey, 1984) |

### 2.2.2 Prevalence of SP in Australia

A community survey in North Queensland indicated that 8.9% of population were having SP and it was the third pain condition ranked after lower back pain and knee pain (Minaur, Sawyers, Parker, & Darmawan, 2004). Another survey from North West Adelaide reported that 22.3% of participants had aching, pain and stiffness on their shoulder (Catherine L. Hill, Tiffany K. Gill, E. M. Shanahan, & Anne W. Taylor, 2010).

An Australian survey conducted in 2013 showed that among patients treated by GPs in a week, the average number of patients with SP was three, while rheumatologists treat an average of five patients with SP each week. The percentage of weekly patients with SP reported by the chiropractors in New South Wales was 12% among total patients. The most common diagnosis of SP was impingement syndrome with rotator cuff tendinitis (44%) and shoulder subluxation (12%) (Mario Pribicevic, Henry Pollard, Rod Bonello, & Katie de Luca, 2010). The prevalence of SP was also investigated in certain occupations. It has been found that about 23% keyboard operators (Hall & Morrow, 1988) and 46.5 % medical students (Smith, 2007) complained about SP.

### 2.2.3 Prevalence of different shoulder diseases

The shoulder diseases involving SP have different prevalence. For instance, the incidence of rotator cuff tears is approximately 20.7-22.1% (Minagawa et al., 2013; Yamamoto et al., 2010); AC joint diseases is about 10% (Vecchio, Kavanagh, Hazleman, & King, 1995); and glenohumeral osteoarthritis is around 3% (Urwin et al., 1998).

### 2.2.4 Factors impacting on prevalence of SP

The factors relating to variation in prevalence of SP consist of age, gender, occupation, diabetes, educational level and others.

Firstly, age is one of main factors related to the development and prognosis of SP, especially in patients over 40 years old (Codsi, 2007). In addition, patients over 40 are more likely to experience severe symptoms (Burbank et al., 2008; C. L. Hill et al., 2010). The prevalence of rotator cuff tears was 0% between 20s and 40s, 10.7% in

the 50s, 15.2% in the 60s, 26.5% in the 70s, and 36.6% in the 80s (Minagawa et al., 2013). Magnetic resonance imaging (MRI) found that 93% of the population older than 30 years old have asymptomatic AC joint arthritis (Stein, Wiater, Pfaff, Bigliani, & Levine, 2001).

Secondly, among those patients with SP, females present more severe pain and worse disability of the shoulder than males (C. L. Hill et al., 2010). Somatic and psychiatric disorders and co-morbidity for patients with pain conditions were more commonly seen in females than males. Psychological disorders tend to affect for women more than men. The additional factors, such as part-time work, economical problems and marriage, may be a contributing factor to the complications in female patients with pain condition (Bingefors & Isacson, 2004).

Thirdly, occupations involving heavy lifting, one-sided and repetitive movements, uncomfortable working posture, or intensive vibration or shaking can increase the risk of developing chronic SP (Miranda, Punnett, Viikari-Juntura, Heliovaara, & Knekt, 2008). For example, construction workers, hairdressers (Mitchell et al., 2005), computer workers (Cote et al., 2009) and nurses (Smedley et al., 2003) are associated with high risk of shoulder disorders. SP also frequently occurs in athletes. Nearly 66% of competitive swimmers, 57% of pitchers, 52% of badminton players, 44% of collegiate volleyball players, and 29% of collegiate javelin throwers and 22% hand ball players suffered SP (Fahlstrom, Yeap, Alfredson, & Soderman, 2006; Pink & Tibone, 2000).

Fourthly, diabetes mellitus is associated with the impairment of tendons in shoulder joints (Luime, Kuiper, et al., 2004). Among diabetic patients, the incidence of

adhesive capsulitis has reached 10-36%; whilst the prevalence for the patients without a history of diabetes is 2-10%. Compared to non-diabetic patients, the SP-related symptoms of diabetic patients are more severe and conservative treatment for SP is less effective (Kabbabe, Ramkumar, & Richardson, 2010). However, the mechanism for the diabetes-related shoulder complaint still remains unclear.

Fifthly, the prevalence of SP is also related with education level. There is substantially low SP occurrence in the highly educated groups (C. L. Hill et al., 2010). In Australia, the prevalence of SP in people who received a Bachelor degree is about 14.2%; whereas the prevalence in population whose highest level of education is secondary education is as high as 23.9% (C. L. Hill et al., 2010).

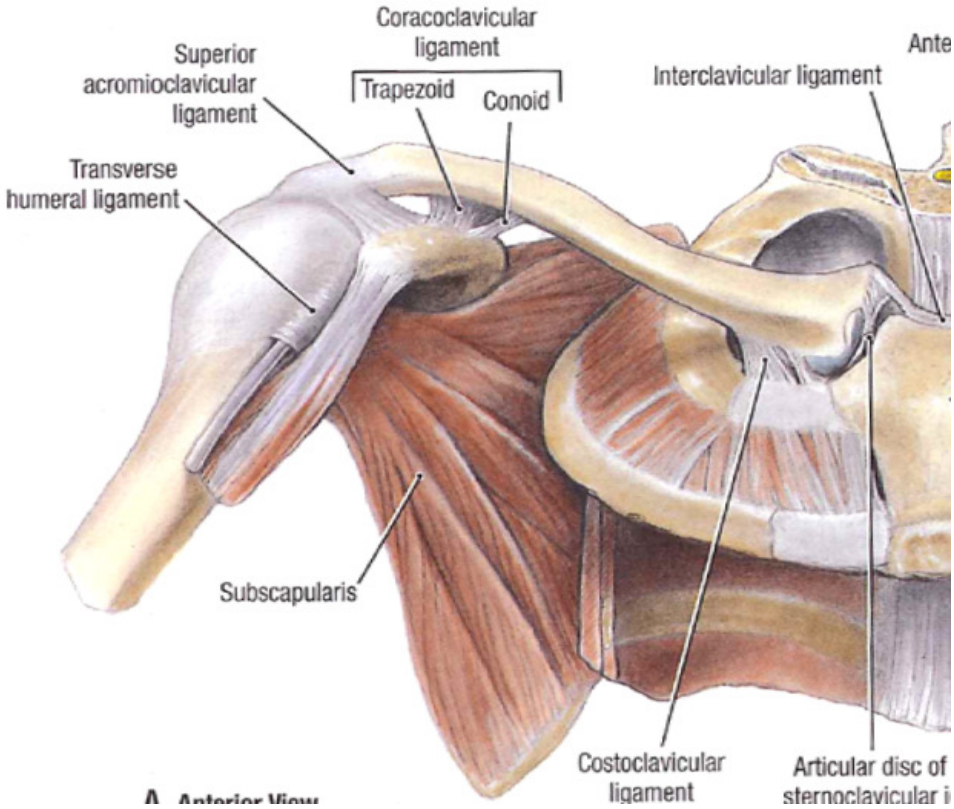
Finally, there are other factors that relate to SP prevalence such as psychological and smoking factors. Populations with serious depression have triple risk of SP than the normal people (Miranda, Viikari-Juntura, Heistaro, Heliovaara, & Riihimaki, 2005). An Australian study indicated that 24.1% of current smokers have SP symptoms, compared with only 21% in non-smokers and ex-smokers (C. L. Hill et al., 2010).

## 2.3 Mechanisms of SP

Some sufferers present SP suddenly whilst others develop gradually. Although the pain presents in the shoulder region, the mechanisms are different. Pain may be caused by the local structures within or around the shoulder or may be referred from other sources. It is worth reviewing the structure of the shoulder first.

### 2.3.1 Anatomy of shoulder

The shoulder of human has a complex structure, consisting of three joints: glenohumeral joint, AC joint and sternoclavicular joint. They are formed by three bones, the humerus (upper arm bone), scapula (shoulder blade) and clavicle (collar bone) and muscles and ligaments attached to them. Major muscles include serratus anterior, subclavius, pectoralis minor, sternocleidomastoid, levator scapulae, rhomboid major, rhomboid minor, trapezius and deltoid (Wyss & Patel, 2012). The structure of the shoulder is illustrated in Figure 1.



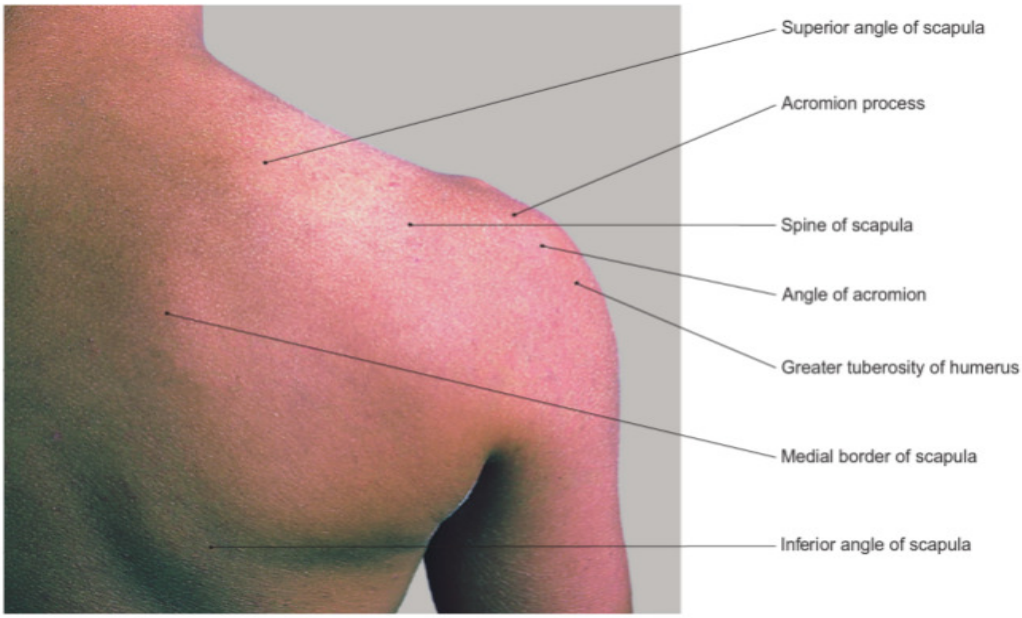



**Figure 1: Anatomy of the shoulder** [adapted from (Agur, Dalley, & Grant, 2012; Field & Hutchinson, 2012)]

The glenohumeral joint makes the movement of upper limbs more flexible; however, its stability largely relies on the surrounding soft tissues (Kaback, Green, & Blaine, 2012). AC joint is located on the tips of shoulder. It is easier to get injured (DeBerardino, Pensak, Ferreira, & Mazzocca, 2010). Sternoclavicular joint is the most unconstrained joint in the human body and its stability primarily depends on its attaching ligaments (van Tongel, MacDonald, Leiter, Pouliart, & Peeler, 2012; G. R. Williams, Ramsey, & Wiesel, 2011). The characteristics of the shoulder structure result in the clinical features of the shoulder problems.

### 2.3.2 Causes of SP

There are four major categories of causes for most SP, including tendon inflammation (bursitis of tendinitis) or tendon tear, instability, arthritis, and fracture. Less common causes of SP are tumours, infections and nerve-related problems (Kishan, Syed, Fiorito-Torres, & Thakore-James, 2012; Nee, Vicenzino, Jull, Cleland, & Coppieters, 2012).

The sudden onset of SP is normally a result of the movement of lifting, pushing, pulling or elevation of arms. This is often the cause of a torn muscle or tendon in a rotator cuff tear. Other commonly seen injuries include dislocated shoulder, referred pain, labral tear of the shoulder, AC joint sprain and clavicle fracture. Less commonly seen injuries consist of biceps rupture, pectoral strain, scapula fracture and humeral fracture (van der Windt et al., 2000).

With repetitive movement, lifting, pushing, pulling or prolonged arm elevation, gradual onset of SP will develop. Rotator cuff tendonitis is a typical disease with gradual degeneration and inflammation of the rotator cuff tendons. Other commonly seen injuries which can cause gradual onset of SP are rotator cuff tears, internal impingement, and superior labrum anterior-posterior lesion (Wilk et al., 2009).

### 2.3.3 Mechanisms of SP

The literature has described that the build-up of mucopolysaccharide in fibrous tendon causes myxoid degeneration. This condition repeats itself, leading to globular degeneration and causes pain (Jones et al., 2006). Kannus 1991 has found that degeneration was identified in 97% of clinical cases of rotator cuff tendinitis or tears (Kannus & Jozsa, 1991). The main features of SP include mucoid degeneration, hypoxic degenerative tendinopathy, calcifying tendinopathy and tendo-lipomatosis. An important aspect of degeneration is hypoperfusion of the tendon. Nirschl 1989 described the changes in degeneration of the rotator cuff as infiltration of vascular and fibroblasts, fragmentation and disorganisation of collagen architecture (Nirschl, 1989). In case of shoulder impingement, degeneration leads to the narrowing of space behind the coracoacromial ligament and below the acromion, compressing the

tissues between the acromion and the head of humerus (Kromer, Tautenhahn, de Bie, Staal, & Bastiaenen, 2009). Degeneration of the intra-articular meniscus, commonly observed inpatients over the age of 50 years, begins as early as the second decade of life and is thought to contribute to osteoarthritis (Mall et al., 2013). Degeneration and/or inflammation of bone, ligament, tendon or other soft tissues is cause mechanical abrasion between the tendons of the rotator cuff muscles, the long head of biceps and subacromial bursa against the underside of the acromium.

Mechanical trauma under the acromion can lead to shoulder impingement (Wyss & Patel, 2012). Repetitive trauma in the rotator cuff can lead to oedema and haemorrhage in the rotator cuff and cause hypertrophy of the synovium and subsynovial fat of the sub-acromial bursa (Brossmann, Stabler, Preidler, Trudell, & Resnick, 1996). Trauma can directly lead to structure change and instability of the glenohumeral joint. The majority of primary dislocation is associated with trauma, and the dislocation has a high incident to recurrence (Wyss & Patel, 2012).

The initial proposed factor of rotator cuff tendinopathy is an inflammatory response which can develop into tendinitis. Repetitive inflammation can lead to the acute tears, degeneration as well as tendon thickening (Wyss & Patel, 2012). Growth cytokines can promote wound healing. Its sustained production can also lead to tissue fibrosis, such as factor-β (TGF-β) (Border & Noble, 1994). Basic fibroblast growth factor (bFGF), platelet-derived growth factor (PDGF), hepatocyte growth factor, tumour necrosis factor-α (TNF-α) and interleukin-lp (IL-lp) may be related to the initiation and development of capsular fibrosis of adhesive capsulitis (Allen et al., 1990; Wahl, Allen, Wong, Dougherty, & Ellingsworth, 1990). Cytokines such as platelet-derived growth factor and transforming growth factor-β may be related with inflammation.

Matrix-bound transforming growth factor-β may act as a constant stimulus (Rodeo, Hannafin, Tom, Warren, & Wickiewicz, 1997). Some cytokines such as insulin-like growth factor (IGF-1) and nitric oxide synthase (NOS) can directly lead to pain conditions (Wyss & Patel, 2012).

Hyperplasia is as the form of the fibroblasts and vascular granulation tissue. It leads to the increased vascularity and macrostructural thickening and the disorganisation of shoulder fibres (Wyss & Patel, 2012). Hyperplasia can cause disruption of the tendon collagen matrix which can result in tendon compromise (Jones et al., 2006).

One of the factors causing secondary impingement is the impairment of dynamic stabilisers (weakness of rotator cuff muscles), static stabilisers (capsular ligament, labrum) and scapular stabilizers (Wyss & Patel, 2012). Repetitive impairment of the primary dynamic stabiliser in the glenohumeral joint can lead to rotator cuff tendinopathy. The impairment of static and/or dynamic stabilisers (rotator cuff muscles and biceps tendon, latissimus dorsi and pectoralis minor) in the glenohumeral joint can lead to glenohumeral osteoarthritis and instability (Wyss & Patel, 2012).

Recurring strain in the rotator cuff can lead to instability of the glenohumeral joint, and is the main cause of rotator cuff tendinopathy (Wyss & Patel, 2012). Impingement syndrome arises from excessive or repetitive contraction of the rotator tendons with other shoulder structures. This can lead to pain and disability (Wyss & Patel, 2012).

## 2.4 Impacts of SP

SP has significant impact on patients' quality of life (C. L. Hill et al., 2010) as well as social and economic activities.

### 2.4.1 Impacts on quality of life

SP not only results in the symptoms of stiffness, weakness, limitation of range of movement, reduction of strength of the shoulder and arms (Mitchell et al., 2005), but is also associated with impairments in patients' performance in daily life. It has been reported that SP may cause significant disability, limit daily basic activities (such as dining, dressing and washing), reduce work productivity, and cause absence from work or school (Green et al., 2005; Luime, Koes, et al., 2004). In Australia, 20% of patients with rotator cuff tendinopathy, 16% for acute rotator cuff tear and 22% for adhesive capsulitis have permanent difficulties with activities (Rachelle Buchbinder, Margaret P. Staples, E. Michael Shanahan, & Roos, 2013). In addition, persistent SP is associated with substantial impairment of sleep, mood swings and poor concentration (Badcock, Lewis, Hay, McCarney, & Croft, 2002; Green et al., 2005). Chronic SP and disability may lead to high risks of psychological problems, such as depression (Badcock et al., 2002; C. L. Hill et al., 2010). Australian GPs prescribe Benzodiazepines as low dose anti-depressants for 5% of patients with rotator cuff tendinopathy, 34% with acute rotator cuff tear, and 15% with adhesive capsulitis (Rachelle Buchbinder et al., 2013). Frequent treatments can cause absence from work or school (Ostor, Richards, Prevost, Hazleman, & Speed, 2004). In Sweden, the mean sick leave time for SP sufferers in six months was nearly nine days and its mean indirect costs accounted for almost 84% of total costs (Virta, Joranger, Brox, & Eriksson, 2012). In the Netherlands, the costs associated with absence from work due to SP in half a year was nearly half of total costs (Kuijpers, van Tulder, van der Heijden, Bouter, & van der Windt, 2006).

### 2.4.2 Economic impact

SP is associated with high financial burden for patients and is a heavy economic burden for society (Meislin et al., 2005). SP has multiple underlying pathological changes and is difficult to be cured by primary health practitioners and simple treatments. Patients often turn to specialists and use multi-treatments which lead to considerable expenses. In 2000, the total costs to treat shoulder problems reached nearly USD $7 billion in United States (Meislin et al., 2005). In Sweden, the mean total cost (including sick leave costs) for each patient with SP in six months was €2,069 in 2009 (Virta et al., 2012). In the Netherlands, the mean total cost for SP patients in half a year was €689 between 2001 and 2003 (Kuijpers et al., 2006). Surgery for rotator cuff syndrome, of which SP is the key symptom, ranks fourth among the top ten surgical procedures performed on people with musculoskeletal conditions in Australia in 2003-2004 and costs around AU$14,000 per person (ABS, 2006). Furthermore, SP is a long standing complaint and about 41% patients do not recover completely after one year of regular treatment. The recurrence rate is estimated around 22% (Croft, Pope, & Silman, 1996; van der Windt et al., 1996). Therefore, long-term treatment for SP can cause substantial economic burden in patients and society.

## 2.5 Diagnosis of SP

SP, either acute or chronic, is a common complaint. There are many causes of this problem. It is essential to develop an accurate diagnosis of the cause of SP so that appropriate treatment can be provided according to its cause. The diagnosis of the cause of SP is based on thorough examination of symptoms and signs as well as imaging studies.

### 2.5.1 Symptoms and signs

The commonly seen symptoms and signs of SP include: pain, stiffness, weakness, numbness, temperature changes, colour changes, swelling, clicking or noises when moving the shoulder, inflammation associated symptoms, and deformity (Martin & Gabica, 2009; Saccomanni, 2009).

The nature of pain can be described as sharp, dull, burning, cramp, shock-like or stabbing. In patients with impingement syndromes and rotator cuff tears, SP can occur during the night. Most of the pain of frozen shoulder occurs when moving the arms over the face level (Louis, 2010). The pain may radiate to the adjacent areas such as the neck, back and arms (Williiams & Robert, 2011). In some severe cases, the pain may extend to the chest, abdomen, jaw, teeth and throat (Louis, 2010). Severe pain can also cause restriction of shoulder joints and limitation of ROM which leads to stiffness (Martin & Gabica, 2009; Mitchell et al., 2005). Fracture or other shoulder joint disorders such as osteoarthritis may cause stiffness as well (Hand, Athanasou, Matthews, & Carr, 2007).

When injuries damage the nerves which dominate the muscles, patients can experience lack of strength in the shoulder (Louis, 2010). Patients with shoulder impingement, tendonitis or tendonitis can present with weakness of rotator cuff muscle (Wyss & Patel, 2012). Patients with tendinitis have weakness of the infraspinatus and supraspinatus (Wilk et al., 2009).

Numbness and tingling sensations may appear in arthritis, fracture, sprain, blow, or dislocation of the shoulder (Staff, Blahd, & Messenger, 2011). A feeling of coolness

in the hands or arms may occur, due to lack of blood in the veins or arteries. As a consequence, the skin colour may change to blue or white (Martin & Gabica, 2009). If the shoulder joints are infected, inflamed or bruised, the colour of the shoulder skin will change to red. Dislocation or fracture of the shoulder due to an injury can lead to deformity of the local joint and swelling of the local affected area or the whole arms and shoulder (Martin & Gabica, 2009).

### 2.5.2 Physical examination

Physical examination can help to confirm or rule out the diagnosis of shoulder diseases. Information from the examinations can be very useful for doctors to decide between surgical and conservative management (Wyss & Patel, 2012). It is the affordable method to confirm the diagnosis compared with other costly methods (Hegedus et al., 2008). The physical examination for shoulder impingement syndrome includes palpation ROM test, neurovascular examination, strength assessment and clearance of the cervical spine; the key physical examinations for rotator cuff tendinopathy are shoulder girdle examination with ROM and provocative maneuver test. In patients with glenohumeral osteoarthritis, aside from previously mentioned examinations, the most accurate test for patients with impingement is the painful arc sign, which has sensitivity rate of 71% (Wyss & Patel, 2012). The infraspinatus strength test was the most sensitive test for shoulder impingement combined with rotator cuff tears, with an accuracy of 70%. A synthesisation of multi positive tests can enhance the possibility of drawing a correct diagnosis. For example, when the painful arc test, Hawkin-Kennedy impingement test and infraspinatus muscle strength test are all positive, the probability to confirm impingement is over 95% (Wyss & Patel, 2012).

### 2.5.3 Imaging studies

Imaging studies such as X-rays, ultrasounds, magnetic resonance imaging (MRI), computed tomography (CT) scans or nerve conduction studies are often required to confirm SP diagnosis and rule out other injuries.

#### 2.5.3.1 X-ray

X-ray is obtained to identify arthritic changes, traumatic injuries, tendon or bursal calcifications, or humeral head subluxation. It is sensitive and specific for rotator cuff tears. It can help to assess the shape of the acromion and distinguish glenohumeral osteoarthritis from adhesive capsulitis. X-rays can also help to confirm fractures and position of dislocation (Wyss & Patel, 2012). It may be useful for the diagnosis of chronic tears (Iannotti et al., 1991). About 64% of SP sufferers were reported as “normal” when examined with X-ray. Both glenohumeral joint disorders and AC joint disorders were identified in 17% patients with SP under X-ray. Rotator cuff calcifications and fractures were identified in 13% and 6% of SP patients respectively (Cadogan et al., 2011). Forty-two percent of SP patients were examined as supraspinatus and 31% as subacromial bursa (Wyss & Patel, 2012). In Australia, 69% of GPs requested for X-ray tests to determine rotator cuff tendinopathy, 27% for acute rotator cuff tear, and 73% for adhesive capsulitis (Rachelle Buchbinder et al., 2013). A sample of shoulder joints under X-ray is illustrated in Figure 2.

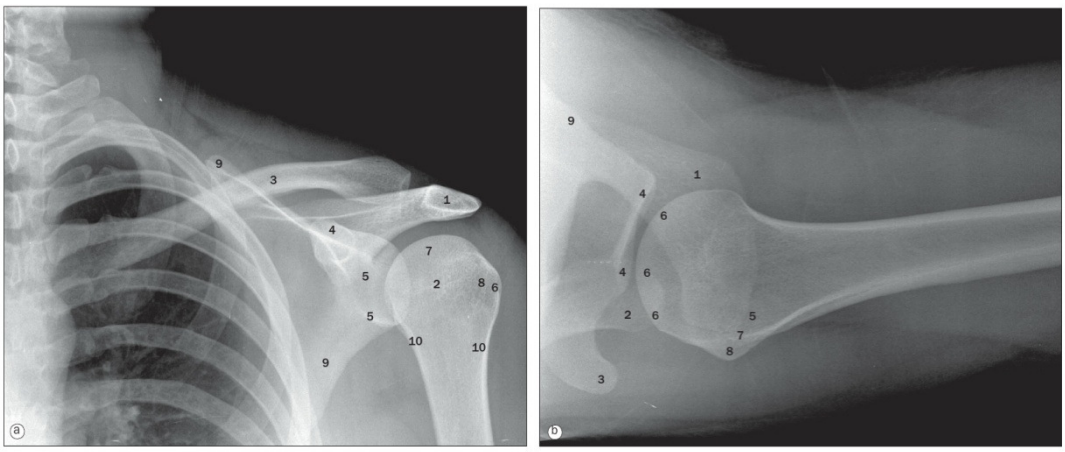


**Figure 2: Sample of shoulder joints under X-ray** [adapted from (Weir, Abrahams, Spratt, & Salkowski, 2010)]

### 2.5.3.2 Ultrasound scan

The ultrasound is an accurate imaging test to evaluate tendinopathy, especially when comparing with the healthy side and assessing the extra-articular soft-tissues (Nirschl, 1989). The accuracy of musculoskeletal ultrasound is related to the experience of the examiner (Wyss & Patel, 2012). Rotator cuff pathology was the most common pathology identified by ultrasound (50%). The ultrasound is the most accurate test to detect full-thickness tears (Dinnes, Loveman, McIntyre, & Waugh, 2003). The accurate rate of long head of biceps tendon (LHB) pathology is 17%. Normal condition was 15%. Subscapularis pathology was 14% (Cadogan et al., 2011). In Australia, 82% of GPs requested for ultrasound scans to identify rotator cuff tendinopathy; 94% used ultrasound for acute rotator cuff tear; and 74% for adhesive capsulitis (Rachelle Buchbinder et al., 2013). A sample of shoulder joints under ultrasound is shown in Figure 3.

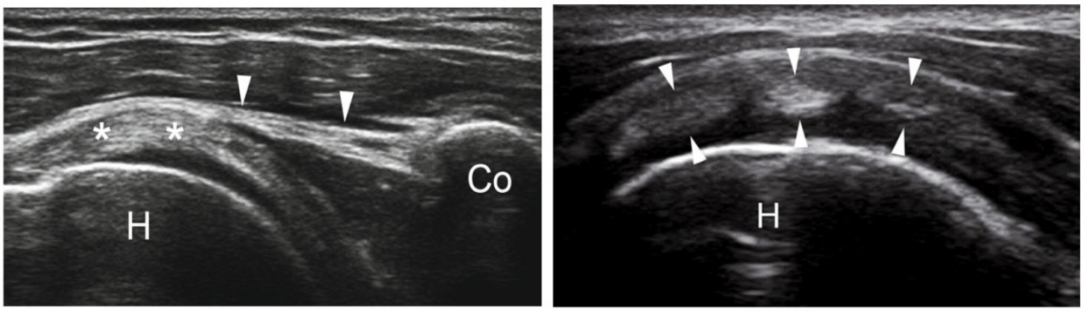



**Figure 3: Sample of shoulder joints under ultrasound** [adapted from (Silvestri, Muda, & Sconfienza, 2012)]

#### 2.5.3.3 CT scan, MRI and MRA

In majority of shoulder conditions, advanced imaging such as CT scan, MRI and magnetic resonance arthrography (MRA) are not required to determine the diagnosis, unless there is difficulty in distinguishing between diagnosis or surgery is required (Kaback et al., 2012). MRI was the best way to view shoulder impingment syndrome (Brossmann, Preidler, et al., 1996). MRI was the gold standard for evaluation of calcification and muscular tears in the shoulder and in rotator cuff compromise. It is also accurate to detect the full thickness of the rotator cuff (Wyss & Patel, 2012). A sample of shoulder joints under MRI is illustrated in Figure 4.

CT scans are used to assess the structure of the glenoid and erosion of bone. It is usually performed before shoulder joint replacement surgery (Nyffeler, Jost, Pfirrmann, & Gerber, 2003). In Australia, 6% GPs ordered CT scans for determining acute rotator cuff tear, 6% for adhesive capsulitis, and less than 1% for patients with rotator cuff tendinopathy. Similarly, 1% GPs ordered MRI for diagnosing rotator cuff tendinopathy, 16% for acute rotator cuff tear, and 5% for adhesive capsulitis (Rachelle Buchbinder et al., 2013). MRA is very accurate to detect full-thickness rotator cuff tendinopathy. However, its performance is poor for partial-thickness tears. Although some studies suggested that MRA's performance is better than MRI or

ultrasound, potential discomfort and invasiveness limit its wide application in clinical practice (Dinnes et al., 2003).

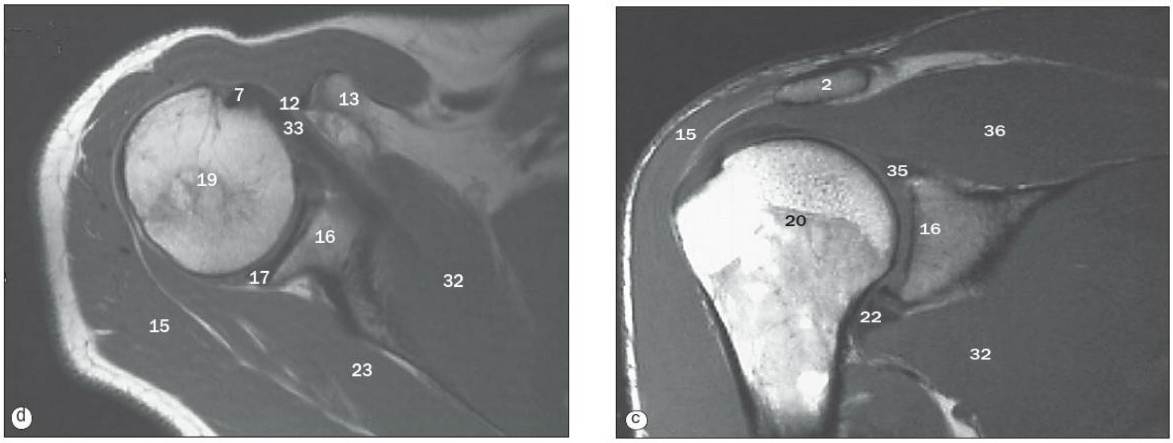



**Figure 4: Sample of shoulder joints under magnetic resonance imaging**
[adapted from (Weir et al., 2010)]

## 2.6 Current management of SP

Many SP sufferers do not consult health practitioners and use over-the-counter drugs. Some patients seek self-treatment for symptomatic relief. Hence their symptoms are not always well managed. It is critical to understand the cause of SP so that an appropriate treatment plan can be tailored to individual needs in clinical practice. The current management options of SP include rest, pharmacotherapy (oral or injection), surgery, physiotherapy and exercise (Mitchell et al., 2005).

### 2.6.1 Rest

The first management for SP is to rest the joint and allow the acute inflammation to subside. It is a self-administered treatment. Relative rest has short-term effects for rotator cuff disorders. Patients can modify work and normal activities as soon as the pain threshold and limitation of ability occurs. AC disorders commonly cope with rest and other simple treatments. However, prolonged immobilisation of the joint may cause frozen shoulder (Mitchell et al., 2005).

### 2.6.2 Pharmacotherapy

Depending on the severity of SP and its causes, pharmaceutical treatments for SP can be obtained over-the-counter (such as aspirin) or with a doctor's prescription. Medications consist of NSAIDs, oral steroid, and glucocorticoid injection.

#### 2.6.2.1 NSAIDs

NSAIDs are frequently used in primary health care (van der Windt, van der Heijden, Scholten, Koes, & Bouter, 1995). NSAIDs are anti-inflammatory medications, commonly used for patients with SP caused by arthritis, bursitis and tendonitis. It can inhibit prostaglandin synthesis. This leads to pain relief and suppression of inflammation in the articular or peri-articular structures (Todd & Clissold, 1991). It can provide short-term pain relief for SP. However, there is no evidence for long-term effectiveness. In Australia, 32% of GPs suggested the use of NSAIDs for patients with rotator cuff tendinopathy; 54% of GPs recommended NSAIDs for patients with acute rotator cuff tear; and 62% of GPs advised NSAIDs for patients with adhesive capsulitis (Rachelle Buchbinder et al., 2013). They may cause side effects such as gastrointestinal symptoms, gastrointestinal bleeding, hepatitis, renal insufficiency and bronchospasm (van der Windt et al., 1995).

#### 2.6.2.2 Oral steroid

Evidence indicates that oral steroids can reduce the symptom of inflammation in joint diseases especially in the early stages (Gotzsche & Johansen, 1998). The short-term effectiveness is significant for adhesive capsulitis, but the effects are not maintained for over 6 months. The common oral steroids for SP include prednisolone, cortisone, hydrocortisone and triamcinolone (Buchbinder, Green, Youd, & Johnston, 2006). In

Australia, 3% of GPs prescribed a short course of oral steroid for rotator cuff tendinopathy, 2% for acute rotator cuff tear and 6% for adhesive capsulitis (Rachelle Buchbinder et al., 2013). The widely used steroids are cortisone acetate and prednisolone. Corticosteroid can be offered orally for short-term pain relief as its long-term effects are very few. Long-term application of steroid may cause several adverse events such as systemic side effects (Neviaser & Hannafin, 2010).

#### 2.6.2.3 Steroid injection

Steroid injection to the shoulder joint is used to alleviate pain at the early stages (Neviaser & Hannafin, 2010). It can treat shoulder pain regardless of the underlying aetiology. However, its long-term effects for pain relief are limited. There is no evidence to support its effectiveness (Buchbinder, Green, & Youd, 2003). In Australia, 28% and 24% of GPs suggested general glucocorticoid injection and image-guided glucocorticoid injection respectively for patients with rotator cuff tendinopathy; 61% and 1% of GPs recommended glucocorticoid injection and image-guided glucocorticoid injection for patients with acute rotator cuff tear; 66% and 14% GPs advised general glucocorticoid injection and image-guided glucocorticoid injection for patients with adhesive capsulitis (Rachelle Buchbinder et al., 2013). The widely used drugs for steroid injection are methylprednisolone, hydrocortisone acetate and triamcinolone acetonide. Steroid has a number of side effects, such as endocrine disturbances, liver and cardiac problem and testicular atrophy. These side effects also exist in the oral steroid (G. C. Lin & Erinoff, 1996).

### 2.6.3 Nerve blocks

Nerve blocks are usually used for post-operative shoulder pain(Price, 2007). Suprascapular nerve blocks are also considered an effective, simple and practical

treatment for normal SP (Carette et al., 2003; Cheville & Tchou, 2007; Ozkan et al., 2012). Nerve blocks can temporarily relieve pain in the shoulder and its therapeutic effects can be observed immediately (Ozkan et al., 2012). However, its exact mechanism is still unclear (Neviaser & Hannafin, 2010). An Australian survey indicated that less than 1% of GPs suggested the use of nerve blocks for rotator cuff tendinopathy and 1% for adhesive capsulitis; however, no GPs advised it use for acute rotator cuff tear (Rachelle Buchbinder et al., 2013). The common drugs for nerve blocks are bupivacaine hydrochloride lidocaine mixed with steroid. These drugs may cause side effects such as nausea, sedation, and dizziness (Checcucci et al., 2008).

### 2.6.4 Surgery

The shoulder, after knee and hip joint, is the third most common joint to receive surgical treatment (Kim, Wise, Zhang, & Szabo, 2011). When non-operative treatment fails to improve symptoms, surgical options can be considered. The common surgeries for the shoulder are humeral head replacement and total shoulder arthroplasty (Kaback et al., 2012). An appropriate early surgery can maximise the effectiveness of healing and repairability. The surgical treatment may have reasonable expectation of benefit, but at the same time it involves the likelihood of risks (Abrams & Bell, 2008). However, the recovery time is long which will cause patients long absence from work. Furthermore, it is an expensive treatment. Its cost-effectiveness rate is low. In Australia, 6% of GPs recommended surgery to patients with rotator cuff tendinopathy, 58% for acute rotator cuff tear, and 10% for adhesive capsulitis (Rachelle Buchbinder et al., 2013). Due to the fast development of surgical techniques, more and more patients with severe shoulder disorders have chosen this

treatment. In United States, the number of patients receiving shoulder arthroplasties has increased from 19,000 in 1998 to 47,000 in 2008 (Kim et al., 2011).

### 2.6.5 Arthroscopy

Arthroscopy is normally applied to young patients or patients with mild shoulder problems which are not suitable for major invasive surgeries (Weinstein, Bucchieri, Pollock, Flatow, & Bigliani, 2000). It has a combination of diagnosis and management functions (Snyder, 2003). It is a form of surgical through small incisions of the body (Abrams & Bell, 2008). Arthroscopy is used to strengthen shoulder joints and release capsular contraction. It is a favourite approach to treat shoulder capsulitis and rotator cuff disorders (Abrams & Bell, 2008; Neviaser & Hannafin, 2010). Synovectomy and debridement of loose flaps of cartilage can also be conducted under arthroscopy. Patients' symptoms may be relieved; however, the effects gradually dissipate. When applying arthroscopy, surgeons can identify the underlying causes of symptoms. Sometimes arthroscopy and surgery (such as therapeutic synovectomy) can be performed at the same time (Neviaser & Hannafin, 2010). Although it is generally safe form of management, there are still risks of severe adverse effects, such as post-arthroscopic glenohumeral chondrolysis, nerve damage, deep infection, deep venous thrombosis and pulmonary embolus (Geoffrey S. Marecek & Matthew D. Saltzman, 2010).

### 2.6.6 Physiotherapy

Physiotherapy is a conservative treatment and is usually recommended as standard treatment. Physiotherapy includes manual physical therapy, stretching of the soft tissue, passive joint mobilisation, and supervised and prescribed exercises. It also includes electrical modalities, such as ultrasound, laser, transcutaneous

electromagnetic stimulation, interferential current and pulsed electromagnetic field therapy. It may elevate pain threshold, improve blood flow and increase tissue metabolism and capillary permeability. However, there is still no evidence to support these benefits (Green et al., 2003). In Australia, 74% of GPs suggested it for patients with rotator cuff tendinopathy; 61% for patients with acute rotator cuff tear; and 66% for patients with adhesive capsulitis (Rachelle Buchbinder et al., 2013). It is believed that physiotherapy not only improves ROM of shoulder in severe cases but also prevents the condition from developing to severe stages. Invasive treatment options (such as suprascapulation nerve blocks, hydrodilation and open release) are only offered to patients who fail with physiotherapy. However, there is limited high-level evidence to prove the therapeutic benefit of physiotherapy (Neviaser & Hannafin, 2010).

### 2.6.7 Exercise

There is increasing evidence supporting the effectiveness of exercise therapy for SP. It can be the foundation of management by physiotherapists (Brox, Staff, Ljunggren, & Brevik, 1993; Ginn, Herbert, Khouw, & Lee, 1997). Exercise can help to correct joint instability and incoordination, improve muscle weakness and soft tissues tightness, and recover the impairment of the scapulohumeral rhythm. Exercise is a part of the rehabilitation therapy. The content of home exercise should include stretching, rotator cuff strength, ROM, postural training and scapular stabilisation (Wyss & Patel, 2012). In Australia, 60% of GPs suggested patients with rotator cuff tendinopathy to do active home exercise; 30% of GPs recommended it for patients with acute rotator cuff tear; 42% of GPs advised it for patients with adhesive capsulitis (Rachelle Buchbinder et al., 2013).

### 2.6.8 Alternative therapies for SP

Complementary and alternative medicine (CAM) has been widely used in Australia. SP is one of the clinical conditions for which patients seek CAM therapies, including acupuncture and Chinese herbal medicine (CHM) (Mitchell et al., 2005). In Australia, 7% of GPs would refer their patients with rotator cuff tendinopathy for acupuncture treatment, 2% for patients with acute rotator cuff tear and 4% for patients with adhesive capsulitis. Acupuncture is one of the five widely used CAM therapies for SP, the others being physiotherapy, chiropractic, orthopaedic surgery and rheumatology (Rachelle Buchbinder et al., 2013).

More details of acupuncture and CHM for the management of SP are provided in the reviews in Chapter 3.

## 2.7 Assessment of treatment effects

A number of instruments have been used to assess the key symptoms of SP (such as pain intensity and shoulder functions) before and after treatment in the clinical management and clinical research of SP. The main instruments are detailed as below.

### 2.7.1 Visual analogue scale

The intensity of pain is usually assessed before and after treatment by using scoring systems to determine the treatment effects. The commonly used instrument is the visual analogue scale (VAS). VAS is a one-dimensional measurement with a line of 100 mm (10 cm) in length (McCormack, Horne, & Sheather, 1988). There are two descriptors at the two ends of the scale, “0” indicating “no pain” and “100” representing “extreme pain” (Hawker, Mian, Kendzerska, & French, 2011). A number

of clinical trials have adopted VAS as a patient self-administered instrument to assess the severity of pain. The patient is required to mark a point on the VAS to indicate pain intensity (Huskisson, 1974; Joyce, Zutshi, Hrubes, & Mason, 1975; Scott & Huskisson, 1976). The evaluator uses a ruler to measure the length between 0 and the marked point of respondent and obtains a score of pain between 0 and 100 (Jensen, Karoly, & Braver, 1986). The range of scores can be interpreted into four categories: 0-4 mm (no pain), 5-44 mm (mild pain), 45-74 mm (moderate pain), and 75-100 mm (severe pain) (Jensen, Chen, & Brugger, 2003). This instrument is well accepted by patients as it is easy to use (Huskisson, 1974; Joyce et al., 1975) and is very sensitive to detect changes in patients with chronic degenerative or inflammatory joint pain (Joyce et al., 1975). However, VAS is not suitable for older patients due to their cognitive impairment (Scott & Huskisson, 1976).

### 2.7.2 Shoulder Pain and Disability Index

The shoulder Pain and Disability Index (SPADI) is a validated instrument to assess the severity of pain and functions of the shoulder joint (Breckenridge & McAuley, 2011). It is normally used by patients themselves. It is an 11-point scale and includes pain scale (five items) and disability scale (eight items). The pain index is the subtotal score of five items to indicate the severity of pain. The disability index is a summed score to represent the shoulder function. The total scores of pain index and disability index generate the global index which indirectly demonstrates the general health or disease of the shoulder (F. Angst et al., 2007). The 13-item questions are easy to understand and well responded by patients. They are also less emotionally sensitive (F. Angst et al., 2007; Felix Angst, Schwyzer, Aeschlimann, Simmen, & Goldhahn, 2011). The sample SPADI is listed in Figure 5.

## Pain scale

How severe is your pain?
Circle the number that best describes your pain where: 0 = no pain and 10 = the worst pain imaginable.

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| At its worst | | | | | | | | | | | |
| When lying on the involved side? | | | | | | | | | | | |
| Reaching for something on a high shelf? | | | | | | | | | | | |
| Touching the back of your neck? | | | | | | | | | | | |
| Pushing with the involved arm? | | | | | | | | | | | |

## Disability scale

How much difficulty do you have?
Circle the number that best describes your experience where: 0 = no difficulty and 100 = so difficult it requires help.

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Washing your hair? | | | | | | | | | | | |
| Washing your back? | | | | | | | | | | | |
| Putting on an undershirt or jumper? | | | | | | | | | | | |
| Putting on a shirt that buttons down the front? | | | | | | | | | | | |
| Putting on your pants? | | | | | | | | | | | |
| Placing an object on a high shelf? | | | | | | | | | | | |
| Carrying a heavy object of 10 pounds (4.5 kilograms) | | | | | | | | | | | |
| Removing something from your back pocket? | | | | | | | | | | | |

**Figure 5: Sample of shoulder pain and disability index** [adapted from (Roach, Budiman-Mak, Songsiridej, & Lertratanakul, 1991)]

### 2.7.3 Constant Murley score (CMS)

The CMS is used to evaluate shoulder functions (Constant et al., 2008). It comprises of four domains: pain (one item), activities of daily living (ADL) (four items including work, other activity of daily living, sleep and positioning during daily living), range of motion (four items: flexion, abduction, pronation and supination), and power (two items for strength). The items of pain, work, other activity of daily living and sleep are assessed by patients themselves, and the remaining items are examined by evaluators (Felix Angst et al., 2011). Each item has a score range of 0 to 100, with 0 indicating the worst shoulder functions and 100 representing the best. The scores of each item are added up for a total score. The scores for each domain can be

calculated separately. The summed score of all domains becomes the general index which demonstrates the general function of shoulder (Hirschmann, Wind, Amsler, & Gross, 2010). The CMS is easy to be understood and not emotionally sensitive (Felix Angst et al., 2011).

### 2.7.4 Range of motion

The measurement of ROM is presented as the degree of angularity between the movable arm and body examined by universal goniometer. There are six directions which are usually tested for the shoulder's ROM, that is, flexion, extension, abduction, adduction, pronation (internal rotation) and supination (external rotation).

# CHAPTER THREE

# LITERATURE REVIEW ON SHOULDER PAIN FROM CHINESE MEDICINE PERSPECTIVES

This chapter briefly introduces the definition, diagnosis, aetiology, pathogenesis and management of SP according to Chinese medicine theories. It also reviews the currently available clinical research on CHM and acupuncture for treating SP.

## 3.1 Definition and diagnosis of SP

SP is classified as painful obstruction syndrome in Chinese medicine, the symptom appears in a number of clinical conditions in the Chinese medicine classic literature as "*Bi* syndrome" (*Bi Zheng* 痹证), "Leakage shoulder Wind" (*Lou Jian Feng* 漏肩风), and "Frozen shoulder" (*Dong Jie Jian* 冻结肩). The Chinese medicine diagnosis of SP is based on its clinical manifestations, including the nature of the pain in the shoulder region and its accompanied symptoms and signs.

The earliest description of *Bi* Syndrome was seen in the chapter of *Bi* in the Plain Questions (*Su Wen • Bi Lun Pian* 素问•痹论篇) (1 Century BC) which discussed its aetiology, pathogenesis and syndrome differentiation. It indicated that *Bi* syndrome was due to the invasion of pathogenic Wind, Cold and Dampness. The Chapter of Stroke and Joint Diseases in the Synopsis of Prescriptions of the Golden Chamber (*Jin Gui Yao Lue • Zhong Feng Li Jie Bing* 金匮要略•中风历节病) (early 3 Century AD) provided two herbal prescriptions, which are the Cassia Twig, Peony and Anemarrhena Decoction (Gui Zhi Shao Yao Zhi Mu Tang) and the Aconite Decoction (Wu Tou Tang), to treat *Bi* syndrome. The Chapter of Wind *Bi* Symptoms in the General Treatise on the Causes and Symptoms of Diseases (*Zhu Bing Yuan Hou*

*Lun • Feng Bi Hou* 诸病源候论•风痹候) (610 AD) explained *Bi* syndrome as well, stating: “The combination of Wind, Cold and Dampness evils causes *Bi* syndrome. It presents with muscle stiffness, or pain. It is due to low immunity, opened sweat pores and the contraction of Wind evil”. The A-B Classic of Acupuncture and Moxibustion (*Zhen Jiu Jia Yi Jing* 针灸甲乙经) (259 AD) recorded the treatment for SP. It said: “*Bi* syndrome around the shoulder region……use Quyuan (SI 13) to treat; for SP which affects the motion of flexion, and radiates to the supraclavicular fossa, use Yunmen (LU 2) to treat”. The Classic of Nourishing Life with Acupuncture and Moxibustion (*Zhen Jiu Zi Sheng Jing* 针灸资生经) (1220 AD) indicated to use “Tianjing (TE 10) to treat SP with numbness and limitation of flexion and extension of the shoulder joint”.

The name “Leakage shoulder Wind” (*Lou Jian Feng* 漏肩风) appeared in the Ming and Qing dynasties. It refers to a disease with SP and limitation of movements as key symptoms and signs. The Ancient and Modern Medical Guide (*Gu Jin Yi Jian* 古今医鉴) (1576 AD) also recorded the causes and symptoms of SP. It said: “if the arms are left uncovered by blankets when one falls asleep, they will be invaded by pathogenic Cold which will lead to pain of the shoulders and arms……When women feed their babies during lactation period, pathogenic Wind and Cold factors attack which may cause shoulder and arm pain”.

### 3.2 Aetiology and pathogenesis of SP

For thousands of years, Chinese medicine has been practiced heavily based on Yin and Yang theory. CHM and acupuncture are the main modalities of Chinese medicine. According to Chinese medicine theories, the concept of Qi refers to the “root of humans” (The Classic Difficulties) and further expands to Essence (Jing),

Defensive Qi (Wei), Nutritive Qi (Ying), Original Qi (Yuan), Blood and Body fluids (Figure 6).

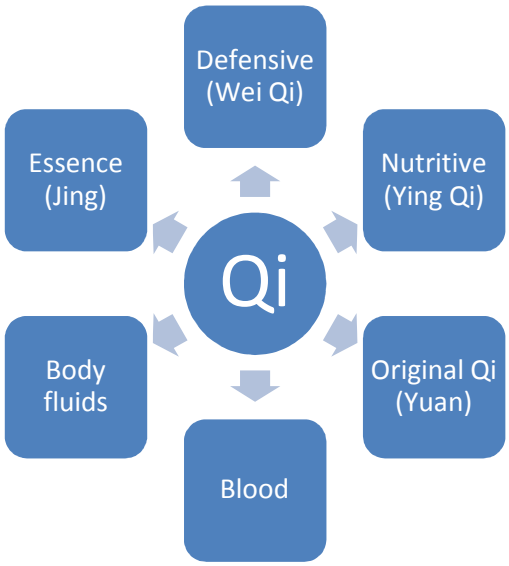



**Figure 6: The concept of Qi** [adapted from (Maciocia, 2005)]

The causes of diseases are divided into two main categories: Interior and exterior causes. The main pathogenic factors in which the classic literature referred as “Evils” are Wind, Cold, summer-Heat, Dampness, dryness and fire (Maciocia, 2005). From a Chinese medicine point of view, the occurrence of SP is due to the weakness of Wei Qi leading to the invasion of pathogenic Wind, Cold, Dampness or Heat.

When a person resides in a Damp place for a long period, wades through water, or is caught in the rain and/or abnormal weather changes, pathogenic Wind, Cold and/or Dampness may invade the muscles, joints and/or meridians and obstruct Qi and blood in a local area, leading to Wind-Cold-Dampness *Bi* syndrome. When invaded by Wind-Dampness-Heat, or Heat is accumulated from excess Yang Qi or deficient Yin and hyperactive Yang, or Wind-Cold-Dampness turns into Heat, the Heat spreads along the meridians to the joints and causes a number of Heat signs,

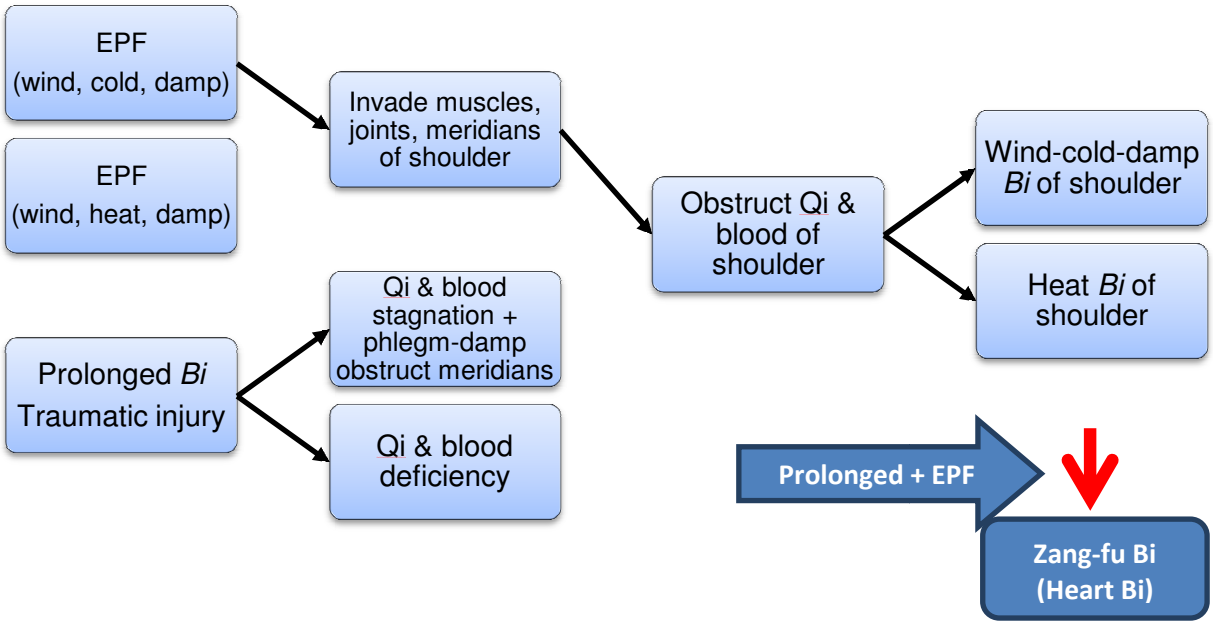
resulting to what is known as Heat type of *Bi* syndrome. When the evils attack the shoulder region, pain in the shoulder appears (Aung & Chen, 2007; Marcus, 1998).

With long-term development of *Bi* syndrome, the following three pathogenic changes may occur:

1) Obstruction of meridians by blood stasis and turbid-phlegm; or
2) Deficiency of Qi and blood; or
3) Zang-fu *Bi*

The invasion of external pathogenic factors, deficiency of Qi and blood, and traumatic injury are also the causes of Lou Jian Feng.

The aetiology and pathogeneses of SP are shown in Figure 7.




Note: EPF: external pathogenic factors

**Figure 7: Aetiology and pathogeneses of shoulder pain**

### 3.3 Differentiation of syndrome of SP

*Bi* syndrome can be classified into two types according to the pathogeneses, Wind-Cold-Dampness type (caused by Wind-Cold-Dampness evils) and Heat type (caused by Wind-Dampness-Heat). Their common symptoms are arthralgia and inflexibility of limbs and joints. When Wind is predominant, the syndrome is called Wandering *Bi* (Xing *Bi*). When Cold is pronounced, the syndrome is known as Painful *Bi* (Tong *Bi*), when Dampness is the predominant factor, the syndrome is regarded as Dampness *Bi* (Zhuo *Bi*). The classifications of *Bi* syndrome are summarised in Figure 8.

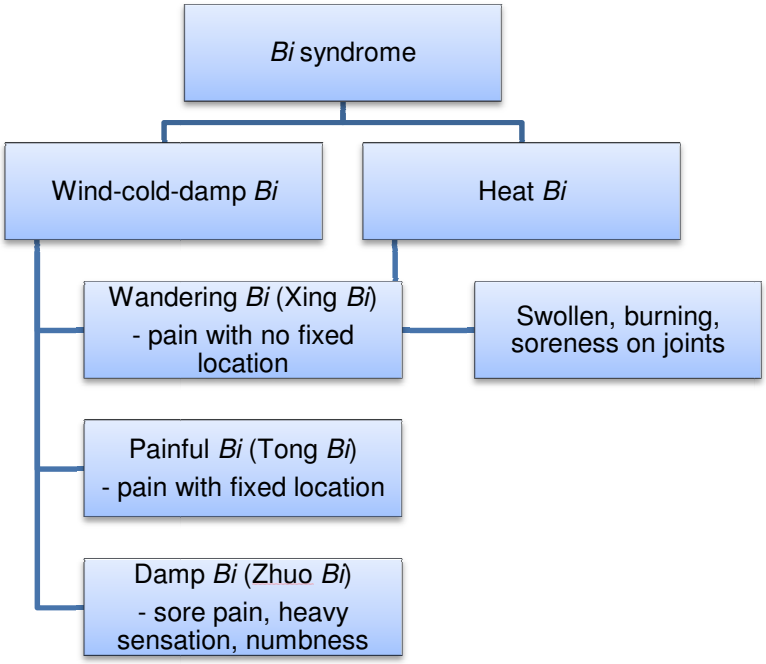



**Figure 8: Classifications of *Bi* syndrome**

### 3.4 Management for SP

Chinese medicine has been used for the treatment of *Bi* syndromes for years based on their Chinese medicine aetiology, pathogeneses and diagnosis. CHM and acupuncture are the most commonly used modalities of Chinese medicine. CHMs are derived from medicinal plants, minerals and animal parts which are combined to a formula to treat the clinical conditions based on Chinese medicine theory.

Acupuncture, in a board sense, encompasses numerous substyles such as traditional Chinese acupuncture, laser acupuncture, microsystem acupuncture (such as scalp acupuncture and auricular acupuncture) (X. Zhang, 2003), warm acupuncture, fire acupuncture, hydro acupuncture, small needle-knife (Liu & Huang, 2008), Japanese acupuncture, transcutaneous electrical nerve stimulation (TENS) and dry needling (Bao, 2013). The current review has adopted the narrow sense of acupuncture which is to use sterile needles to puncture into certain points and stimulate needles, either manually or electrically, to achieve needle sensation and promote Qi flow along the meridian and thus treat diseases (Dung, Clogston, & Dunn, 2004). The basic treatment principles for SP are to eliminate pathogenic factors (expel Wind, disperse Cold, eliminate Dampness or clear Heat), invigorate blood and relieve pain.

### 3.4.1 Wandering *Bi* syndrome (Xing Bi)

1) Clinical manifestations

   Wandering pain in the joints; limited flexibility; aversion to Wind; fever; thin white tongue coating; and superficial pulse

2) Treatment principles

   Expel Wind, remove obstruction, disperse Cold-Dampness and relieve pain

3) CHM treatment

   Fang Feng Tang (防风汤) (*Fang Feng* (Radix Saposhnikoviae), *Dang Gui* (Radix Angelicae Sinensis), *Fu Ling* (Poria), *Xing Ren* (Semen Armeniacae Amarum), *Huang Qin* (Radix Scutellariae), *Qin Jiao* (Gentianae Macrophyllae), *Ge Gen* (Radix Puerariae), *Ma Huang* (Herba Ephedrae), *Rou Gui* (Cortex Cinnamomi), *Sheng Jiang* (Rhizoma

Zingiberis Recens), *Gan Cao* (Radix Glycyrrhizae), *Da Zao* (Fructus Jujubae))

4) Acupuncture treatment

Fengchi (GB 20), Geshu (BL 17), Xuehai (SP 10), Dazhui (GV 14)

### 3.4.2 Painful *Bi* syndrome (Tong Bi)

1) Clinical manifestations

Severe arthralgia in a fixed location and is aggravated by Cold and alleviated by warmth; the affected joints are inflexible; the skin is not reddened/erythematous or hot to touch; thin white tongue coating, and taut tense pulse.

2) Treatment principles

Disperse Cold, eliminate Wind-Dampness and relieve pain

3) CHM treatment

Wu Tou Tang (乌头汤) (*Chuan Wu* (Radix Aconiti), *Ma Huang* (Herba Ephedrae), *Shao Yao* (Dioscorea opposita), *Huang Qi* (Radix Astragali seu Hedysari), *Gan Cao* (Radix Glycyrrhizae))

4) Acupuncture treatment

Shenshu (BL 23), Guanyuan (CV 4), Dazhui (GV 14), Fengmen (BL 12)

### 3.4.3 Dampness *Bi* syndrome (Zhuo Bi)

1) Clinical manifestations

Arthralgia is accompanied by heaviness or swelling of the joints with fixed pain; heavy sensation in the hands and feet; limited mobility; numbness of the muscles and skin; white and greasy tongue coating; and soft and slow pulse.

2) Treatment principles

Eliminate Dampness, remove obstructions from the meridians and dispel Wind-Cold

3) CHM treatment

Yi Yi Ren Tang (薏苡仁汤) (*Yi Yi Ren* (Semen Coicis), *Chuan Xiong* (Rhizoma Ligustici Chuanxiong), *Dang Gui* (Radix Angelicae Sinensis), *Ma Huang* (Herba Ephedrae), *Gui Zhi* (Ramulus Cinnamomi), *Qiang Huo* (Rhizoma et Radix Notopterygii), *Du Huo* (Radix Angelicae Pubescentis), *Fang Feng* (Radix Saposhnikoviae), *Chuan Wu* (Radix Aconiti), *Cang Zhu* (Rhizoma Atractylodis), *Sheng Jiang* (Rhizoma Zingiberis Recens), *Gan Cao* (Radix Glycyrrhizae))

4) Acupuncture treatment

Dazhui (GV 14), Geshu (BL 17), Pishu (BL 20), Zusanli (ST 36), Yinlingquan (SP 9)

### 3.4.4 Wind-Dampness-Heat *Bi* syndrome (Re Bi)

1) Clinical manifestations

Acute onset; joint pain; reddened/erythematous and hot to touch; swelling; aggravated by pressure and alleviated by Cold; fever; aversion to Wind; thirst; restlessness; dry yellow tongue coating; and slippery and rapid pulse

2) Treatment principles

Clear Heat, remove obstructions from the meridians and eliminate Wind-Dampness

3) CHM treatment

Bai Hu Gui Zhi Tang (白虎桂枝汤) (*Zhi Mu* (Rhizoma Anemarrhenae), *Shi Gao* (Gypsum Fibrosum), *Gan Cao* (Radix Glycyrrhizae), *Jing Mi* (Semen Oryzae Sativae), *Gui Zhi* (Ramulus Cinnamomi))

4) Acupuncture treatment

Dazhui (GV 14), Quchi (LI 11), Hegu (LI 4), Yangbai (GB 14)

For pain in the shoulder region, Rhizoma et Radix Notopterygii, Ramulus Cinnamomi and Rhizoma Curcumae Longae can be added to the CHM formulae. A number of acupoints such as Jianyu (LI 15), Naoshu (SI 10), Jianliao (TE 14) and Jianqian (Extra) can be added to the acupuncture prescriptions according to the location of SP.

The above-mentioned knowledge has been accumulated throughout centuries of clinical practice. With the development of evidence-based Chinese medicine, more scientific evidence is required to support the claim of clinical effects. Therefore, a critical review of the literature on RCTs for CHM and acupuncture was conducted to obtain a clearer picture on the current state of the clinical research in the area of CHM and acupuncture and their roles in the clinical management of SP.

## 3.5 Existing reviews of CHM and acupuncture for SP

The number of RCTs on CHM and acupuncture for clinical conditions has increased dramatically in recent decades (Cai, Shen, Zhong, Li, & Wu, 2012). To evaluate the effects and safety of CHM and acupuncture for SP, several systematic reviews and overviews have been carried out (Green et al., 2005; J. A. Lee et al., 2012; W. M. Peng, Mao, Liu, Liu, & Wang, 2007). This section summarises all the RCTs included in the existing systematic reviews and overviews to determine the effects and safety of CHM and acupuncture for SP.

A literature search was performed in the following databases: Pubmed, Embase, Cochrane Library and China National Knowledge Infrastructure (CNKI) from their respective inceptions to the 18th September 2012. Search terms included shoulder pain, Chinese herbal medicine, acupuncture, systematic review, overview, meta-analysis and their synonyms. Systematic reviews (with or without meta-analysis) or overviews of RCTs and/or non-RCTs of CHM and acupuncture for SP were considered and their included studies published in English and Chinese were extracted. As a result of the search, three systematic reviews of RCTs on acupuncture for SP were retrieved (Green et al., 2005; J. A. Lee et al., 2012; W. M. Peng et al., 2007); however, no reviews of non-RCTs on acupuncture for SP were identified. In addition, no reviews of RCTs and/or non-RCTs on CHM for SP were found. Therefore, only RCTs included in the three acupuncture systematic reviews are summarised in this section.

The three systematic reviews and 20 non-duplicated RCTs of acupuncture for SP included in these reviews are summarised in Tables 2 and 3.

## Table 2: Summary of existing systematic reviews of acupuncture for shoulder pain

| Review | Review focus and included studies (n=) | RCTs of acupuncture for SP extracted from included reviews | Reviewer's comments | | |
|---|---|---|---|---|---|
| | | | Effects | Adverse events | Overall quality |
| Green 2005 | Systematic review on acupuncture for SP (n=9) | Berry 1980<br>Ceccherelli 2001<br>Dyson-Hudson 2001<br>Kleihenz 1999<br>Lin 1994<br>Moore 1976<br>Romoli 2000<br>Sun 2001<br>Yuan 1995 | There is little evidence to support that acupuncture can benefit for the SP. But authors consider there may have short-term effects on pain relief or improvement of functions. | Little evidence to show acupuncture can cause severe adverse effects. | The methodological quality was diverse. The number of included trials was small. |
| Lee 2012 | Acupuncture for SP after stroke: a systematic review (n=7) | Shang 2008<br>Xiong 2001<br>Zhang 2001<br>Zhang 2008<br>Zhao 2004<br>Zhou 2002<br>Zhu 2007 | Acupuncture is effective for treating SP after stroke. | No discussion. | Further trials concerning this topic should be conducted following high methodological standards. |
| Peng 2007 | Review of acupuncture for frozen shoulder (n=6) | Cao 2006<br>Guerra 2004<br>Guo 2006<br>Kleihenz 1999<br>Nebeta 2002<br>Sun 2001 | There is little evidence to support that acupuncture can improve pain and functions, ROM, CMS and QoL of patients with frozen shoulder. | Acupuncture is safe to treat frozen shoulder. | The quality of included trials is low. |

A total of 20 RCTs on acupuncture for SP were extracted from the three systematic reviews (Green et al., 2005; J. A. Lee et al., 2012; W. M. Peng et al., 2007). They were conducted in China (Cao & Du, 2006; Guo et al., 2006; Shang, Ma, Cai, Wang, & Kong, 2008; X. Xiong & Lin, 2001; Yuan, 1995; G. Zhang, 2001; H. Zhang, 2008; C. Zhao, He, Li, & Sheng, 2004; Zhou, 2002; Zhu, Gao, & Yang, 2007), Italy (Ceccheerelli, Bordin, Gagliardi, & Caravello, 2001; Romoli et al., 2000), United States (Dyson-Hudson, Shiflett, Kirshblum, Bowen, & Druin, 2001; Moore & Berk, 1976), England (Berry, Fernandes, Bloom, Clark, & Hamilton, 1980), Germany (Kleinhenz et al., 1999), Hong Kong (K. O. Sun, Chan, Lo, & Fong, 2001), Japan (Nabeta & Kawakita, 2002), Spain (Guerra de Hoyos et al., 2004) and Taiwan (M. L. Lin, Huang, Lin, & Tsai, 1994). The sample sizes of the trials ranged from 18 to 160. Conditions treated in these studies involved SP, frozen shoulder, shoulder cuff lesion, scaplulohumeral periarthritis, rotator cuff tendinitis, shoulder's myofascial pain, neck-shoulder pain, hemiplegic patients with SP, shoulder-hand syndrome after stroke, and shoulder subluxiation, shoulder joint half-dislocation caused by apoplexy and hemiplegy.

Among the 20 studies, without a co-intervention, five of them compared acupuncture to sham acupuncture (Ceccheerelli et al., 2001; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Moore & Berk, 1976; Nabeta & Kawakita, 2002). Other comparisons included acupuncture plus moxibustion versus Western medicine (Berry et al., 1980), acupuncture versus Trager psychophysical integration (Dyson-Hudson et al., 2001), traditional manual acupuncture versus biological holographic acupuncture plus exercise (Yuan, 1995), acupuncture versus TENS (H. Zhang, 2008). With co-interventions, five studies compared acupuncture plus rehabilitation to rehabilitation alone (Shang et al., 2008; X. Xiong & Lin, 2001; C. Zhao et al., 2004;

Zhou, 2002; Zhu et al., 2007). Other comparisons consisted of acupuncture plus Western medicine and exercise versus Western medicine and exercise (Guo et al., 2006), acupuncture plus Western medicine versus Western medicine alone (M. L. Lin et al., 1994), acupuncture plus physiotherapy and exercise versus physiotherapy and exercise (K. O. Sun et al., 2001), acupuncture plus mobilisation therapy versus mobilisation therapy alone (Romoli et al., 2000; X. Xiong & Lin, 2001), acupuncture plus exercise versus exercise alone (G. Zhang, 2001). Electroacupuncture (EA) was employed as the intervention in four studies (Guerra de Hoyos et al., 2004; Guo et al., 2006; M. L. Lin et al., 1994; H. Zhang, 2008).

## Table 3: Characteristics of 20 included RCTs of acupuncture for shoulder pain

| Comparisons | Author, Year | Country | Condition | Analysed Sample Size (Group T/C) | Treatment duration | Intervention | Control | Outcome measures | Results |
|---|---|---|---|---|---|---|---|---|---|
| **Without co-interventions** | | | | | | | | | |
| Acupuncture vs sham acupuncture | Ceccherelli 2001 | Italy | shoulder's myofascial pain | 44 (22/22) | 5 weeks with 3-month follow-up | Acupuncture | Sham acupuncture | MGPQ | T>C<br>$p<0.05$ |
| | Guerra 2004 | Spain | SP | 130 (65/65) | 8 weeks (4 weeks, 16 weeks follow-up) | EA | Sham EA | VAS, Lattinen Index, ROM, SPADI, credibility, quality of life score, number of pills consumed, adverse events | T>C<br>$p<0.01$<br>Adverse events T=C |
| | Kleihenz 1999 | Germany | Rotator cuff tendinitis | 52 (25/27) | 4 weeks with 3- month follow-up | Acupuncture | Sham acupuncture | MCMS; subjective ratings, QoL, adverse events | MCMS:T>C<br>$p=0.014$<br>Subjective rating and QoL: T=C<br>Adverse events: T=C |
| | Moore 1976 | United States | SP | 42 (22/20) | 3 weeks with 1-week follow-up | Acupuncture | Sham acupuncture | ROM (pronation, supination, extension and abduction); shoulder discomfort 11-point scale; Hypnotic susceptibility 5-point scale, self-administered questionnaire | T=C |
| | Nebeta 2002 | Japan | Neck and shoulder pain | 34 (17/17) | 3 weeks with 9-day follow-up | Acupuncture | Sham acupuncture | VAS | Immediate after 1st treatment<br>T>C<br>$p<0.01$;<br>9 days follow-up after 3 sessions treatment<br>T=C |

| Comparisons | Author, Year | Country | Condition | Analysed Sample Size (Group T/C) | Treatment duration | Intervention | Control | Outcome measures | Results |
|---|---|---|---|---|---|---|---|---|---|
| acupuncture plus moxibustion versus Western medicine | Berry 1980 | England | Shoulder cuff lesions | 60 (12/12/12/12/12) | 4 weeks | Acupuncture plus moxibustion | C1: NSAID<br>C2: lignocaine plus tolmetin sodium<br>C3: placebo NSAID plus placebo ultrasound<br>C4: ultrasound | VAS; 4-point scale for none, mild, moderate and severe pain; ROM (abduction degree); MGPQ; Comparative assessment by patient and assessor; Success or failure of treatment; adverse events | T=C |
| acupuncture vs Trager psychophysical integration | Dyson-Hudson 2001 | United States | SP | 18 (9/9) | 5 weeks with 5-week follow-up | Acupuncture | Trager psychophysical integration | WUSPI; NRS, VRS, ROM | T=C |
| bioholographic acupuncture plus exercise vs traditional manual acupuncture | Yuan 1995 | China | Scapulohumeral periarthritis | 98 (49/49) | Unclear duration, and no assessment point | Bioholographic acupuncture plus exercise | Traditional manual acupuncture (with moxibustion depends on the syndrome differentiation) | Effective rate (no criteria), the relationship between treatment sessions and effective rate | T>C, $p<0.05$ |
| Acupuncture vs TENS | Zhang 2008 | China | Shoulder joint half-dislocation caused by apoplexy and hemiplegy | 60 (30/30) | 32 days | EA | TENS | VAS, Degree of shoulder joint half dislocation | T>C<br>$p<0.05$ |
| **With co-interventions** | | | | | | | | | |
| Acupuncture + rehabilitation vs | Shang 2008 | China | Poststroke shoulder-hand syndrome | 120 (40/40/40) | 30 days | Acupuncture plus rehabilitation exercises | C1: acupuncture<br>C2: rehabilitation | FMA, VAS, ROM | T>C<br>$p<0.01$ |

| Comparisons | Author, Year | Country | Condition | Analysed Sample Size (Group T/C) | Treatment duration | Intervention | Control | Outcome measures | Results |
|---|---|---|---|---|---|---|---|---|---|
| rehabilitation alone | Xiong 2001 | China | Hemiplegic patients with SP | 68 (36/32) | 10 days | Acupuncture plus rehabilitation exercises | Rehabilitation exercises | ROM | T>C<br>*p*<0.05 |
| | Zhao 2004 | China | Shoulder-hand syndrome after stroke | 54 (30/24) | 23 days | Acupuncture plus rehabilitation exercises | Rehabilitation exercises | FMA | T>C |
| | Zhou 2002 | China | Hemiplegic patients with SP | 100 (50/50) | 4 weeks | Acupuncture plus rehabilitation training | Rehabilitation training | VAS, Brunnstorm's classification of upper limbs | T>C<br>*p*<0.05 |
| | Zhu 2007 | China | Shoulder subluxiation | 60 (30/30) | 1 month | Acupuncture plus rehabilitation exercises | Rehabilitation | VAS, ROM, Clinical score of neural lesion | T>C<br>*p*<0.05 |
| wrist-ankle acupuncture + Tuina vs Tuina alone | Cao 2006 | China | Scapulohumeral periarthritis | 160 (80/80) | 20d/course 2-4 courses | Wrist-ankle acupuncture plus Tuina | Tuina | Effective rate (Disease diagnosis of TCM curative effect standard) | T>C,<br>*p*<0.05 |
| acupuncture + WM + exercise vs WM + exercise | Guo 2006 | China | Scapulohumeral periarthritis | 257 (124/133) | 15 days | EA plus Western medicine plus exercise | Western medicine plus exercise | VAS; Melle score; Effective rate (Clinical pain therapy) | T>C<br>*p*<0.01 |
| acupuncture plus WM vs WM alone | Lin 1994 | Taiwan | Frozen shoulder | 150 (50/50/50) | 1 session | EA plus nerve block | C1: EA<br>C2: nerve block | ROM; Bromage pain score | T>C<br>*p*<0.05 |

| Comparisons | Author, Year | Country | Condition | Analysed Sample Size (Group T/C) | Treatment duration | Intervention | Control | Outcome measures | Results |
|---|---|---|---|---|---|---|---|---|---|
| Wrist-ankle acupuncture plus mobiliation vs mobilisation alone | Romoli 2000 | Italy | SP | 24 (unclear) | 5 weeks with 6-month follow-up | Acupuncture plus mobilisation | C1: ear acupuncture plus mobilisation C2: mobilisation | Pain on VAS; ROM; MGPQ; general perceived benefit, total amount of pain medication taken, severity of main complaint. | No results provided, it is a protocol. |
| acupuncture plus physiotherapy + exercise vs physiotherapy + exercise | Sun 2001 | Hong Kong | Frozen shoulder | 35 (13/22) | 6 weeks with 14-week follow-up | Acupuncture plus physiotherapy plus exercise | physiotherapy plus exercise | CMS | T>C $p<0.05$ |
| acupuncture plus exercise vs exercise alone | Zhang 2001 | China | Omalgia for post-stroke patients | 40 (20/20) | 15 days | Acupuncture plus exercise | Exercise | VAS, FMA, MAS, MMT, ADL, Brunnstorm's classification of upper limbs | T>C $p<0.05$ |

Notes: MGPQ: McGill Pain Questionnaire; MCMS: modified Constant Murley Score; VAS: Visual Analogue Scale; ROM: Range of Motion; QoL: quality of life; WUSPI: Wheelchair Users Shoulder Pain Index; NRS: Numeric Rating Scale; VAS: Verbal Rating Scale; FMA: Fugl-Meyer Assessment; MAS: Motor Assessment Scale; MMT: Manual Muscle Testing; ADL: Activities of Daily Living; T: treatment group; C: control group.

When comparing acupuncture to sham acupuncture, four studies concluded that acupuncture was more effective than sham acupuncture for relieving SP (Ceccheerelli et al., 2001; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Nabeta & Kawakita, 2002). However, one study did not observe any significant difference between acupuncture and sham acupuncture groups at the end of a 3-week treatment period (Moore & Berk, 1976). The Kleinhenz 1999 study reported that acupuncture was superior to sham acupuncture for improving CMS when treating rotator cuff tendinitis. However, there were no significant differences between the two groups on subjective rating, quality of life and adverse events (Kleinhenz et al., 1999). One trial reported that the acupuncture was more effective than sham acupuncture for treating neck and shoulder pain on VAS (Nabeta & Kawakita, 2002). The Guerra' trial reported that EA was superior to sham EA on VAS, Lattinen Index, ROM, SPADI, credibility, and quality of life scores. There was no difference between real and sham acupuncture groups on adverse events (Guerra de Hoyos et al., 2004).

Berry 1980 did not find any significant difference between acupuncture plus moxibustion group and Western medicine group when treating patients with shoulder cuff lesions. Similarly, Dyson-Hudson 2001 indicated that there was no significant difference between acupuncture and Trager psychophysical integration on WUSPI, NRS, VRS and ROM. Yuan 1995 reported that biological holographic acupuncture plus exercise was superior to traditional manual acupuncture for pain relief when evaluated according to the effective rate. Zhang 2008 stated that acupuncture was more effective than TENS for reducing pain when evaluated by VAS and ROM of shoulder joint partial dislocation.

When acupuncture plus rehabilitation was compared to rehabilitation alone, all five studies indicated that the combined treatment was more effective than the single treatment either for pain relief (Shang et al., 2008; Zhou, 2002; Zhu et al., 2007) or for improving ROM (Shang et al., 2008; X. Xiong & Lin, 2001; Zhu et al., 2007). Zhao 2004 reported that acupuncture plus rehabilitation was more effective than rehabilitation alone on motor recovery using Fugl-Meyer Assessment (FMA).

For other comparisons with co-interventions, the majority of included trials were more optimistic with the combined treatment group (that is, acupuncture combined with other therapies) than the control group (that is, other therapy only). Guo 2006 indicated that acupuncture plus Western medicine and exercise was more effective to relieve pain than Western medicine and exercise when using VAS, Melle score and effective rate as outcome measures. Lin 1994 indicated that acupuncture plus Western medicine was more effective than Western medicine alone on improving ROM and Bromage pain score after a once-off acupuncture treatment. Sun 2001 stated that acupuncture plus physiotherapy and exercise was more effective than physiotherapy and exercise on improving CMS. Zhang 2001 reported that acupuncture plus exercise was superior to exercise alone on VAS, FMA and MAS. However, there was no significant difference between the two groups on MMT, ADL, Brunnstorm's classification of upper limbs. Romoli 2000 did not report of their results.

Ten studies used pain on VAS to assess the intensity of pain (Berry et al., 1980; Guerra de Hoyos et al., 2004; Guo et al., 2006; Nabeta & Kawakita, 2002; Romoli et al., 2000; Shang et al., 2008; G. Zhang, 2001; H. Zhang, 2008; Zhou, 2002; Zhu et al., 2007). ROM was assessed in eight trials (Berry et al., 1980; Dyson-Hudson et al., 2001; M. L. Lin et al., 1994; Moore & Berk, 1976; Romoli et al., 2000; Shang et al.,

2008; X. Xiong & Lin, 2001; Zhu et al., 2007). CMS was evaluated in two trials (Kleinhenz et al., 1999; K. O. Sun et al., 2001), while the McGill pain questionnaire was used in three studies (Berry et al., 1980; Ceccheerelli et al., 2001; Romoli et al., 2000).

Adverse events were only reported in three trials (Berry et al., 1980; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999). The majority of adverse events were on pain, dizziness, bruising, numbness, or fatigue. No severe adverse events were observed, and no dropouts were due to adverse events of acupuncture treatment.

## 3.6 Discussion

In summary, based on the included RCTs in these three systematic reviews, acupuncture, with or without co-interventions, seems effective for relieving SP. However, this finding needs to be interpreted with great caution due to the reasons provided below.

Firstly, patients with SP due to different diseases were considered in the published reviews, such as musculoskeletal diseases (Green et al., 2005; W. M. Peng et al., 2007) and cerebrovascular diseases (J. A. Lee et al., 2012). Lee 2012 concluded that acupuncture was effective for alleviating pain for patients with SP after stroke. However, Green 2005 and Peng 2007 reviews could not draw a firm conclusion for using acupuncture to treat SP or frozen shoulder due to the low quality of studies and the small number of included trials. It would be better to focus on SP due to musculoskeletal problems in the future research.

Secondly, the published reviews did not search the Chinese databases. Chinese RCTs occupied 70% of global RCTs for acupuncture (Cai et al., 2012). However, little information is available in the major bibliographic databases such as Medline, BioMed and Embase, which are popularly used in the Western world. In addition, researchers in Western countries may have difficulties in accessing the Chinese literature due to language barrier (Cai et al., 2012). The omission of Chinese databases for these reviews may have resulted in the exclusion of many relevant Chinese studies in the field.

Thirdly, the literature searches in Green 2005‘s and Peng 2007’s reviews were performed in December 2003 and 2006 respectively (W. M. Peng et al., 2007). Both of them concluded that little evidence is available to support that acupuncture may be beneficial for relieving SP. However, the number of publications of RCTs for acupuncture has rapidly increased since 2005 (Cai et al., 2012; Green et al., 2005). The review needs to be updated to incorporate the latest knowledge.

Fourthly, some of the included studies were inappropriate to answer the research question of the review. For instance, Berry’s trial compared acupuncture plus moxibustion with Western medicine which means the effects of acupuncture were mixed up with those from moxibustion (Berry et al., 1980). In Nebeta’s study, the effects of acupuncture for SP could not be determined as patients with both SP and neck pain were recruited and no separate data were available (Nabeta & Kawakita, 2002). Including right trials is the prerequisite to reach a reliable conclusion. The findings from the current reviews are in doubt due to the improper selection of included studies.

Fifthly, the published reviews have not included any non-randomised studies which should not be ignored when the quality of included RCTs in a review is low (Cai et al., 2012). Currently the majority of existing clinical evidence on Chinese medicine is from non-randomised studies (Drew et al., 2002). It is critical to involve non-randomised studies into the systematic review and compare the results from data syntheses of randomised and non-randomised studies.

Therefore it is essential to conduct a comprehensive systematic review following rigorous methods to update the current knowledge of acupuncture for SP by addressing the weaknesses of the existing reviews. This is to ensure the correct information can be disseminated. The future project may develop a systematic review of CHM for treating SP.

# CHAPTER FOUR

# METHODS

This Chapter describes the methodology used in the systematic review of randomised and non-randomised trials of acupuncture for the treatment of SP.

This review was developed following the methods specified in the Cochrane Handbook for Systematic Reviews of Interventions 5.1 (Higgins & Green, 2011).

## 4.1 Search strategies

### 4.1.1 Electronic searches

The following English and Chinese electronic databases (Table 4) were searched from their respective inceptions to the 18th September 2012 to identify relevant randomised and non-randomised studies to be included in the review.

**Table 4: Databases searched for the clinical trials on acupuncture for shoulder pain**

| English databases | Chinese databases |
|---|---|
| • Cochrane Central Register of Controlled Trials<br>• PubMed<br>• EMBASE<br>• CINAHL<br>• Informit<br>• Science Direct<br>• LILACS (Latin American and Caribbean Health Sciences)<br>• ProQuest<br>• Blackwell Synergy<br>• KoreaMed<br>• INDMED<br>• Ingenta<br>• Web of knowledge | • VIP Information (www.cqvip.com)<br>• China National Knowledge Infrastructure (www.cnki.net)<br>• Wanfangdata (www.wanfangdata.com.cn) |

The search strategy was intentionally of low specificity to enable the maximum extent of relevant studies to be identified and included. The sample strategies used for the searching in PubMed are listed as below:

| | |
|---|---|
| #1 | acupuncture[Title/Abstract] |
| #2 | acupuncture[MeSH Terms] |
| #3 | needle[Title/Abstract] |
| #4 | needle[MeSH Terms] |
| #5 | electroacupuncture[Title/Abstract] |
| #6 | electroacupuncture[MeSH Terms] |
| #7 | "electro acupuncture"[Title/Abstract] |
| #8 | "electro acupuncture"[MeSH Terms] |
| #9 | #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 |
| #10 | Shoulder[Title/Abstract] |
| #11 | Shoulder[MeSH Terms] |
| #12 | "rotator cuff"[Title/Abstract] |
| #13 | "rotator cuff"[MeSH Terms] |
| #14 | “Acromioclavicular joint”[Title/Abstract] |
| #15 | “Acromioclavicular joint”[MeSH Terms] |
| #16 | “Glenohumeral joint”[Title/Abstract] |
| #17 | “Glenohumeral joint”[MeSH Terms] |
| #18 | #10 OR #11 OR #12 OR #13 OR#14 OR #15 OR #16 OR #17 |
| #19 | Pain[Title/Abstract] |
| #20 | Pain[MeSH Terms] |
| #21 | complaint[Title/Abstract] |
| #22 | complaint[MeSH Terms] |
| #23 | arthritis[Title/Abstract] |
| #24 | arthritis[MeSH Terms] |
| #25 | Bursitis[Title/Abstract] |
| #26 | Bursitis[MeSH Terms] |
| #27 | Tendinitis[Title/Abstract] |
| #28 | Tendinitis[MeSH Terms] |
| #29 | Tendonitis[Title/Abstract] |
| #30 | Tendonitis[MeSH Terms] |
| #31 | Tears[Title/Abstract] |
| #32 | Tears[MeSH Terms] |
| #33 | #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 |
| #34 | “Shoulder pain”[Title/Abstract] |
| #35 | “Shoulder pain”[MeSH Terms] |
| #36 | “adhesive capsulitis”[Title/Abstract] |
| #37 | “adhesive capsulitis”[MeSH Terms] |
| #38 | "humeroscapularperiarthritis"[Title/Abstract] |
| #39 | "humeroscapularperiarthritis"[MeSH Terms] |
| #40 | “frozen shoulder”[Title/Abstract] |
| #41 | “frozen shoulder”[MeSH Terms] |
| #42 | “shoulder impingement syndrome”[Title/Abstract] |
| #43 | “shoulder impingement syndrome”[MeSH Terms] |
| #44 | #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 |
| #45 | #9 AND #18 AND #33 |
| #46 | #9 AND #44 |
| #47 | #45 OR #46 |

Similar search strategies were applied to other databases. The details of search strategies used for each database are provided in Appendix 1.

### 4.1.2 Hand searches

Conference proceedings of the World Congress of Chinese Medicine held in 2003, 2006, 2008, 2009 and 2011 were hand searched. The reference lists of identified publications were also hand searched for additional trials.

## 4.2 Study selection

Two reviewers (YH and WY) independently screened the titles and abstracts of all identified potential studies according to the inclusion and exclusion criteria. When there was insufficient information available for decision-making, the full text of the studies were retrieved for further information. Any discrepancy between the two reviewers was discussed with a third party (GL).

## 4.3 Inclusion and exclusion criteria

### 4.3.1 Types of studies

Both RCTs and non-RCTs, with or without blinding, published in English or Chinese were included in this review, irrespective of publication type. For cross-over trials, only data from the first treatment phase were included.

### 4.3.2 Types of participants

All adult patients (aged 18 years or over) with SP were considered regardless of gender and ethnic group. The studies which did not provide the range of age of participants were considered to be included if the mean value of the age was over 18 years old.

Either acute or chronic pain in the shoulder, irrespective of diagnostic label, was considered. The region of pain could be localised to the clavicle, humerus, and scapula with surrounding ligament, tendons and muscles. The diagnosis for patients with SP might include adhesive capsulitis, humeroscapular periarthritis, shoulder impingement syndrome, shoulder arthritis, rotator cuff disease, osteoarthritis, biceps tendonitis, subacromial bursitis, infraspinatus tendonitis, myotenositis of long head of biceps brachii, AC joint or glenohumeral joint diseases or shoulder tears. Studies which did not provide a specific diagnosis, were classified under humeroscapular periarthritis or adhesive capsulitis.

Studies involving participants with SP due to traumatic injury, fracture, primary fibromyalgia, chronic systemic diseases rheumatoid arthritis, tumour, cancer, mental diseases, cognitive impairment or surgery were excluded. Studies were also excluded if pain at other location (such as neck pain, spine pain, or arm pain) was combined with SP.

### 4.3.3 Types of interventions

Acupuncture (either traditional Chinese acupuncture or EA) compared to the following control interventions was considered: sham acupuncture/EA, no treatment, Western medication, or other therapies (such as physiotherapy, or exercise). Acupuncture combined with other treatments, such as CHM, was also included. Co-interventions were allowed as long as all trial arms received the same co-intervention.

Any other types of acupuncture, such as warm acupuncture, fire acupuncture, hydro acupuncture, auricular acupuncture and small needle-knife, were excluded. The

studies comparing acupuncture with any form of CHM, another type of acupuncture or massage, with or without co-interventions, were excluded from the current review.

### 4.3.4 Types of outcome measures

No studies were excluded due to lack of primary and/or secondary outcome measures. RCTs or non-RCTs were included for meta-analysis if sufficient data for at least one of the primary or secondary outcomes measures listed below were reported. If none of the following primary and/or secondary outcomes were measured, the studies would be included for qualitative synthesis only.

#### 4.3.4.1 Primary outcomes

- Pain intensity using pain scores or scales such as visual analogue scale (VAS)

#### 4.3.4.2 Secondary outcomes

- Range of motion (ROM): including the change of abduction, adduction, flexion, extension, supination and pronation degrees.
- Constant Murley score (CMS)
- Adverse events

## 4.4 Data extraction

Data were extracted using a pre-defined data extraction form (Appendix 2). The extracted data from each included study consisted of the characteristics of study design, participants, interventions and outcome measures. Characteristics of study design included the country of origin, study setting and risk of bias. Characteristics of participants were age, inclusion and exclusion criteria, sample size, and the number

and reasons for dropouts and/or withdrawals. Characteristics of interventions consisted of treatment and control modalities, needling techniques, and duration of treatment and follow-up. Characteristics of outcome measures included primary and/or secondary outcomes where applicable.

Two reviewers (YH and WY) independently extracted the data using the data extraction form. Any disagreement between the two reviewers was discussed with a third party (GL).

## 4.5 Assessment of risk of bias in included studies

The following domains of risk of bias were assessed:

1) Random sequence generation: Low risk (computer generated random numbers, or random number table, or similar), Unclear risk (not reported), or High risk (other methods).
2) Allocation concealment: Low risk (central allocation, or serially numbered, opaque, sealed envelopes, or similar), Unclear risk (not reported), or High risk (open allocation or similar).
3) Blinding of participants: Low risk (sham acupuncture or similar), Unclear risk (not performed), or High risk (acupuncture versus tablets or similar).
4) Blinding of outcome assessors: Low risk (blinding performed, or similar), Unclear risk (not performed), or High risk (no blinding performed, or blinding unlikely performed, or similar).
5) Incomplete outcome data: Low risk (incomplete outcome adequately addressed), Unclear risk (difficult to determine), or High risk (incomplete outcome not adequately addressed).

6) Selective reporting: Low risk (the trial protocol available and outcome not selectively reported), Unclear risk (difficult to determine), or High risk (outcomes selectively reported).
7) Other bias: Low risk (baseline imbalance not existed, selection criteria valid and feasible), Unclear risk (difficult to determine), or High risk (baseline imbalance existed, selection criteria not valid or feasible).

Two reviewers (YH and WY) assessed the risk of bias of included studies independently. Any discrepancy between them was resolved through discussion with a third party (GL).

## 4.6 Data analysis

Meta-analyses were processed by the Cochrane software RevMan 5.1 (RevMan 2011).

### 4.6.1 Data synthesis

The data synthesis was conducted quantitatively and qualitatively. The dichotomous data was presented as risk ratio (RR) and continuous data was presented as mean difference (MD) with 95% confidence intervals (CI) using inverse variance with random effects methods due to the diversity of the interventions. When the same outcome measure was assessed by different scales, standardised mean difference (SMD) was used to replace MD. The intention-to-treat analysis (ITT) was applied to this review where possible. The "worst-case scenario" method was used to address missing data. Both traditional Chinese manual acupuncture and EA were same at the pre-stimulation stage, including diagnosis and selection of acupoints and needles. The only difference between these two techniques is the stimulation method: the

former stimulates needles manually whilst the latter applies the instruments to the needles for electric stimulation. Thus, these two types of acupuncture were included in the same meta-analysis. Their heterogeneity was assessed when applicable.

### 4.6.2 Assessment of heterogeneity

The heterogeneity was estimated by $I^2$. This review considered $I^2$ from 0 to 30% (exclusive) as low heterogeneity; 30% to 50% (exclusive) as moderate heterogeneity; and 50% to 100% as substantial heterogeneity. When substantial heterogeneity existed, further investigation was conducted to identify the potential sources by performing subgroup analysis if possible.

### 4.6.3 Assessment of reporting bias

Potential publication bias was planned to be assessed by using a funnel plot, if the number of trials were sufficient.

# CHAPTER FIVE

# RESULTS I – SYSTEMATIC REVIEW OF RCTS

This chapter reports the results of the systematic review of RCTs using acupuncture for the treatment of SP.

## 5.1 Results of the search

Following the established search strategies, there were a total of 6,609 references (4,280 from Chinese databases and 2,329 from English databases) retrieved from electronic databases and no reference through hand searching until 18$^{th}$ September 2012. Initially, 1,557 duplicated publications were excluded. The remaining 5,052 studies were screened by their titles and abstracts. Among them, 4,864 papers were excluded due to the following reasons: not for assessing effects of acupuncture (n = 1,269), not for assessing effects of SP (n = 1,358), non-human studies (n = 24), non-adult (n = 1), non-musculoskeletal SP (n = 32), non-English or Chinese (n = 23), non-controlled trials (n = 1,692), inappropriate comparators (n = 465). The full texts for 188 studies remained and were retrieved for further screening. A total of 144 studies were excluded with reasons as follows: duplicated publications (n = 42), not for assessing effects of acupuncture (n = 5), not for assessing effects of SP (n = 3), non-musculoskeletal SP (n = 13), non-controlled trials (n = 42), inappropriate comparators (n = 25), and no assessment point (n = 14). As a result, 38 RCTs and six non-RCTs were included in the current review. The study selection process is illustrated in Figure 9.

This Chapter reports the results from 38 RCTs. The findings from six non-RCTs will be reported in the next Chapter.

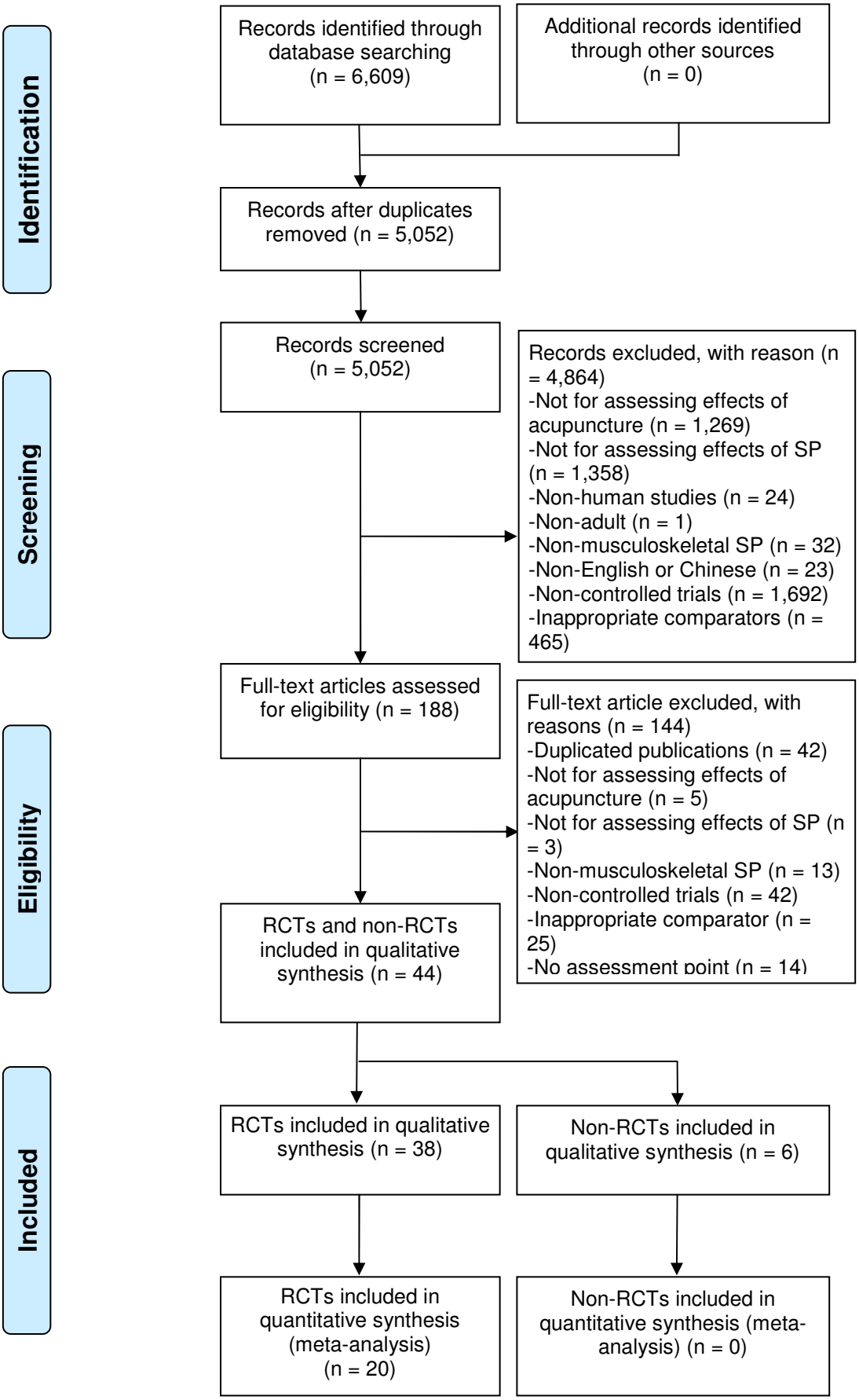



**Figure 9: Flow chart of study selection process of RCTs and non-RCTs of acupuncture for shoulder pain**

## 5.2 Description of studies

Among the 38 included RCTs, 11 trials were published in English (Ceccheerelli et al., 2001; Che, Qiu, Xin, Shao, & Han, 2005; Cheing, So, & Chao, 2008; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia, Jung, & Chen, 2006; Molsberger et al., 2010; Moore & Berk, 1976; K. O. Sun et al., 2001). The rest of the 27 studies were published in Chinese. Detailed information of each included RCTs is listed in the table of characteristics of included studies (Appendix 3). The characteristics of the included RCTs including design, sample sizes, participants, interventions and outcomes are summarised as below.

### 5.2.1 Design of studies

Twenty-seven studies used the design of two arms (Ceccheerelli et al., 2001; Che et al., 2005; Deng & Liu, 2012; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; Guerra de Hoyos et al., 2004; Guo et al., 2006; He & Zhang, 2011; Jiang, 2011; Ke, Ye, Xiao, & Han, 2012; Kleinhenz et al., 1999; S. Li et al., 2010; Z. Li, 2011; Moore & Berk, 1976; Shao et al., 2006; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; X. Wang & Cheng, 2012; H. Xiong & Wei, 2009; Xu, Fang, Zhang, & Wang, 2006; Xuan, Zhang, Gao, & Zhu, 2008; J. Yang, Jiang, Xiong, Luo, & Zhang, 2012; W. Yang, 2009; Y. Zhang, 2011), 10 studies employed three arms (Cheing et al., 2008; Ding, 2011; Huang, Ma, & Zhen, 2009; Lathia et al., 2006; M. L. Lin et al., 1994; Molsberger et al., 2010; Wan, 2002; P. Wang, Yang, Mu, & Zhang, 2007; Xie, 2010; J. Zhang, Wang, Yang, & Liu, 2012), and one study employed four arms (S. Zhao, 2008). There were no cross-over trials among these studies. In the multi-arm

studies only the groups which met the inclusion criteria were included for data analysis in this review.

Twenty-three studies were single-centre trials (Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; Guerra de Hoyos et al., 2004; He & Zhang, 2011; Huang et al., 2009; Ke et al., 2012; Kleinhenz et al., 1999; S. Li et al., 2010; Z. Li, 2011; Moore & Berk, 1976; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; X. Wang & Cheng, 2012; H. Xiong & Wei, 2009; J. Yang et al., 2012; W. Yang, 2009; J. Zhang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008); six were multi-centre trials (Guo et al., 2006; Lathia et al., 2006; Molsberger et al., 2010; Shao et al., 2006; Xu et al., 2006; Xuan et al., 2008); and nine trials did not provide relevant information (Ceccheerelli et al., 2001; Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Jiang, 2011; M. L. Lin et al., 1994; Wan, 2002; P. Wang et al., 2007; Xie, 2010).

### 5.2.2 Sample sizes

The sample sizes of the included studies varied from 17 to 424, with average of 110. Five trials had sample sizes below 40 (Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Lathia et al., 2006; K. O. Sun et al., 2001; W. Yang, 2009). The sample sizes of 18 trials were between 40 and 99 (Ceccheerelli et al., 2001; Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Jiang, 2011; Ke et al., 2012; Kleinhenz et al., 1999; Z. Li, 2011; Moore & Berk, 1976; Y. Sun, 2012; P. Wang et al., 2007; X. Wang & Cheng, 2012; H. Xiong & Wei, 2009; J. Yang et al., 2012; J. Zhang et al., 2012; Y. Zhang, 2011). Ten trials had sample sizes between 100 and 199 (Gao, 2009; Guerra de Hoyos et al., 2004; He & Zhang, 2011; Huang et al., 2009; S. Li et al., 2010; M. L. Lin et al., 1994; Tan & Yuan, 2003; Wan, 2002; Xie, 2010; S. Zhao,

2008). The rest five studies had sample sizes of 200 or more (Guo et al., 2006; Molsberger et al., 2010; Shao et al., 2006; Xu et al., 2006; Xuan et al., 2008).

### 5.2.3 Setting

In the 38 included trials, 24 trials were conducted in mainland China (Che et al., 2005; Deng & Liu, 2012; Gao, 2009; Guo et al., 2006; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; S. Li et al., 2010; Z. Li, 2011; Shao et al., 2006; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; X. Wang & Cheng, 2012; Xie, 2010; H. Xiong & Wei, 2009; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; W. Yang, 2009; J. Zhang et al., 2012; Y. Zhang, 2011) and 14 trials were performed outside mainland China, including four in the United States (Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Lathia et al., 2006; Moore & Berk, 1976), four in Hong Kong (Cheing et al., 2008; Ding, 2011; Z. Li, 2011; K. O. Sun et al., 2001), two in Germany (Kleinhenz et al., 1999; Molsberger et al., 2010), two in Taiwan (M. L. Lin et al., 1994; S. Zhao, 2008), one in Italy (Ceccheerelli et al., 2001) and one in Spain (Guerra de Hoyos et al., 2004).

Twenty-three trials clearly stated that only out-patients recruited in the studies (Cheing et al., 2008; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; Guerra de Hoyos et al., 2004; Guo et al., 2006; He & Zhang, 2011; Kleinhenz et al., 1999; Lathia et al., 2006; S. Li et al., 2010; Molsberger et al., 2010; Moore & Berk, 1976; Shao et al., 2006; K. O. Sun et al., 2001; Y. Sun, 2012; Wan, 2002; Xie, 2010; Xu et al., 2006; Xuan et al., 2008; J. Zhang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008). Three trials stated that only in-patients participated in the studies (Z. Li, 2011; H. Xiong & Wei, 2009; J. Yang et al., 2012). One trial indicated that both in-patients and out-patients were included in the study (Tan & Yuan, 2003).

Eleven trials did not mention whether participants were in- patients or out-patients (Ceccheerelli et al., 2001; Che et al., 2005; Deng & Liu, 2012; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; Z. Li, 2011; M. L. Lin et al., 1994; P. Wang et al., 2007; X. Wang & Cheng, 2012; W. Yang, 2009).

Twenty-three trials were conducted in hospitals (Deng & Liu, 2012; Gao, 2009; Guo et al., 2006; He & Zhang, 2011; Huang et al., 2009; Ke et al., 2012; Lathia et al., 2006; S. Li et al., 2010; Z. Li, 2011; M. L. Lin et al., 1994; Shao et al., 2006; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; X. Wang & Cheng, 2012; H. Xiong & Wei, 2009; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; W. Yang, 2009; J. Zhang et al., 2012), and eight trials were performed in clinics (Ding, 2011; Dyson-Hudson et al., 2007; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Molsberger et al., 2010; Moore & Berk, 1976; Y. Zhang, 2011; S. Zhao, 2008). The remaining seven studies did not provide any information on the setting of the study (Ceccheerelli et al., 2001; Che et al., 2005; Cheing et al., 2008; Dyson-Hudson et al., 2001; Jiang, 2011; Z. Li, 2011; Xie, 2010).

### 5.2.4 Types of participants

The included studies randomised a total of 4,115 participants. Their ages ranged from 20 to 90 years old. Fifteen studies clearly reported the range and mean of participants' ages (Ceccheerelli et al., 2001; Deng & Liu, 2012; Ding, 2011; Dyson-Hudson et al., 2001; Gao, 2009; Guo et al., 2006; Z. Li, 2011; Molsberger et al., 2010; K. O. Sun et al., 2001; Tan & Yuan, 2003; X. Wang & Cheng, 2012; Xie, 2010; W. Yang, 2009; J. Zhang et al., 2012; Y. Zhang, 2011). Twelve studies did not report the range of ages but only indicated the mean of participants' ages (Che et al., 2005; Dyson-Hudson et al., 2007; Guerra de Hoyos et al., 2004; Ke et al., 2012; Kleinhenz

et al., 1999; Lathia et al., 2006; S. Li et al., 2010; Z. Li, 2011; P. Wang et al., 2007; H. Xiong & Wei, 2009; Xu et al., 2006; S. Zhao, 2008). Eight studies only indicated the range of ages without reporting the mean value of ages (Cheing et al., 2008; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Shao et al., 2006; Y. Sun, 2012; Wan, 2002; Xuan et al., 2008). The other three studies did not report either the range or their mean value (M. L. Lin et al., 1994; Moore & Berk, 1976; J. Yang et al., 2012). Among the studies which provided the range and mean value of the age, 10 trails reported the range of ages for all participants without detailed information for each group (Cheing et al., 2008; Dyson-Hudson et al., 2001; Gao, 2009; He & Zhang, 2011; Huang et al., 2009; Molsberger et al., 2010; Wan, 2002; X. Wang & Cheng, 2012; Xie, 2010; Y. Zhang, 2011). Four studies only stated the mean without providing the standard deviation (Che et al., 2005; Guo et al., 2006; X. Wang & Cheng, 2012; Xie, 2010). Two studies only listed the total mean of ages, but did not specify the mean of ages in the different groups (X. Wang & Cheng, 2012; Xie, 2010).

Four studies did not indicate the gender of the participants (M. L. Lin et al., 1994; Moore & Berk, 1976; Shao et al., 2006; J. Yang et al., 2012). The remaining 34 studies involved 2,036 females and 1,537 males.

All participants involved in the included studies were with SP. However, only one study indicated participants were with acute SP (Ceccheerelli et al., 2001) and patients in another two studies had chronic SP (Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001). The remaining 35 studies did not state whether acute or chronic SP was included.

Majority of the included RCTs (33 out of 38) provided diagnostic labels to SP. Twenty-nine of them gave a broad diagnosis to the participants recruited as scapulohumeral periarthritis (also known as frozen shoulder) (Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Gao, 2009; Guo et al., 2006; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; S. Li et al., 2010; Z. Li, 2011; M. L. Lin et al., 1994; Shao et al., 2006; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; X. Wang & Cheng, 2012; Xie, 2010; H. Xiong & Wei, 2009; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; W. Yang, 2009; J. Zhang et al., 2012; S. Zhao, 2008). Detailed diagnosis was provided in four studies (Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Moore & Berk, 1976). The Guerra 2004 trial involved participants with cuff tendonitis, capsulitis, bicipital tendonitis or bursitis. The Kleinhenz 1999 trial only recruited participants with rotator cuff tendinitis. The patients in the Lathia 2006 study had adhesive capsulitis, rotator cuff syndromes, rotator cuff tear, osteoarthritis, biceps tendonitis or subacromial bursitis. The conditions in the Moore 1976 study included tendonitis, bursitis, or osteoarthritis. The remaining five trials did not provide details.

More than half of the studies (22 out of 38) provided clear diagnostic criteria for SP, Eighteen studies used the Diagnostic and Therapeutic Criteria of Chinese Medicine Diseases and Syndromes (Che et al., 2005; Deng & Liu, 2012; Ding, 2011; Gao, 2009; He & Zhang, 2011; Ke et al., 2012; S. Li et al., 2010; Z. Li, 2011; Shao et al., 2006; Y. Sun, 2012; P. Wang et al., 2007; Xie, 2010; Xu et al., 2006; Xuan et al., 2008; J. Zhang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008); and four studies used the guidelines set in the Second Chinese National Conference on Scapulohumeral periarthritis (Guo et al., 2006; Tan & Yuan, 2003; H. Xiong & Wei, 2009; J. Yang et

al., 2012). Thirteen studies developed their own criteria according to the history and examination (Ceccheerelli et al., 2001; Cheing et al., 2008; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Huang et al., 2009; Jiang, 2011; Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010; Moore & Berk, 1976; K. O. Sun et al., 2001; W. Yang, 2009). The other three studies did not provide any diagnostic criteria (M. L. Lin et al., 1994; Wan, 2002; X. Wang & Cheng, 2012).

### 5.2.5 Types of interventions

Among the 38 RCTs, the forms of acupuncture were traditional Chinese acupuncture and EA. Twenty-six studies used traditional Chinese acupuncture (Ceccheerelli et al., 2001; Deng & Liu, 2012; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; He & Zhang, 2011; Jiang, 2011; Kleinhenz et al., 1999; Lathia et al., 2006; Z. Li, 2011; Molsberger et al., 2010; Moore & Berk, 1976; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; Xie, 2010; H. Xiong & Wei, 2009; Xu et al., 2006; W. Yang, 2009; J. Zhang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008), while twelve studies used EA (Che et al., 2005; Cheing et al., 2008; Guerra de Hoyos et al., 2004; Guo et al., 2006; Huang et al., 2009; Ke et al., 2012; S. Li et al., 2010; M. L. Lin et al., 1994; Shao et al., 2006; X. Wang & Cheng, 2012; Xuan et al., 2008; J. Yang et al., 2012).

Nine studies used a single acupoint (Che et al., 2005; Guo et al., 2006; Z. Li, 2011; Shao et al., 2006; K. O. Sun et al., 2001; Y. Sun, 2012; Xu et al., 2006; Xuan et al., 2008; W. Yang, 2009), including Tiaokou (ST 38) (Guo et al., 2006; Shao et al., 2006; Xuan et al., 2008; W. Yang, 2009), Jianyu (LI 15) (Che et al., 2005; Xu et al., 2006), Yinlingquan (SP 9) (Z. Li, 2011; Y. Sun, 2012), and Zhongping (Extra) (K. O. Sun et

al., 2001). Twenty-nine studies used multiple-points (Ceccheerelli et al., 2001; Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; Guerra de Hoyos et al., 2004; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; Kleinhenz et al., 1999; Lathia et al., 2006; S. Li et al., 2010; Z. Li, 2011; M. L. Lin et al., 1994; Molsberger et al., 2010; Moore & Berk, 1976; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; X. Wang & Cheng, 2012; Xie, 2010; H. Xiong & Wei, 2009; J. Yang et al., 2012; J. Zhang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008). All the studies with multi-points used different Chinese acupuncture formulas. Two studies employed multiple-formulae for different syndromes (S. Li et al., 2010; J. Yang et al., 2012). The top 10 most frequently used acupuncture points were Jianyu (LI 15) (26 studies), Jianzhen (SI 9) (17 studies), Quchi (LI 11) (15 studies), Jianliao (TE14) (14 studies), Jianqian (extra) (14 studies), Ashi (13 studies), Hegu (LI 4) (11 studies), Binao (LI 14) (9 studies), Tiaokou (ST 38) (8 studies), and Waiguan (TE 5) (8 studies).

Three studies indicated that they performed acupuncture on both the affected and healthy sides (H. Xiong & Wei, 2009; Xuan et al., 2008; W. Yang, 2009). Six studies inserted the needles in the affected side only (Dyson-Hudson et al., 2001; Y. Sun, 2012; Wan, 2002; Xie, 2010; Xu et al., 2006; S. Zhao, 2008). Three studies applied acupuncture to the healthy side (Che et al., 2005; Shao et al., 2006; K. O. Sun et al., 2001). The other 26 studies did not clearly indicate whether affected or healthy side of the body was needled.

Half of included RCTs (19 out of 38) reported the depth of insertion (Ceccheerelli et al., 2001; Cheing et al., 2008; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Guo et al., 2006; He & Zhang, 2011;

Lathia et al., 2006; Molsberger et al., 2010; Moore & Berk, 1976; Shao et al., 2006; K. O. Sun et al., 2001; Tan & Yuan, 2003; P. Wang et al., 2007; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; W. Yang, 2009). The other 19 studies did not provide the relevant information.

The treatment periods in the included studies varied from one day to eight weeks.

The duration of seven studies was less than two weeks (exclusive) (Huang et al., 2009; Z. Li, 2011; M. L. Lin et al., 1994; Shao et al., 2006; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012). The duration of 20 studies was from two weeks (inclusive) to one month (30 days) (exclusive) (Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Gao, 2009; Guo et al., 2006; Ke et al., 2012; Kleinhenz et al., 1999; S. Li et al., 2010; Z. Li, 2011; Moore & Berk, 1976; Y. Sun, 2012; Tan & Yuan, 2003; P. Wang et al., 2007; X. Wang & Cheng, 2012; Xie, 2010; H. Xiong & Wei, 2009; W. Yang, 2009; J. Zhang et al., 2012; S. Zhao, 2008). Eleven studies treated patients from one month (30 days) (inclusive) to two months (60 days) (exclusive) (Ceccheerelli et al., 2001; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; He & Zhang, 2011; Jiang, 2011; Lathia et al., 2006; K. O. Sun et al., 2001; Wan, 2002; Y. Zhang, 2011). Only one study treated patients at three months (Molsberger et al., 2010).

Eleven RCTs provided follow-up after the last treatment. Follow-up periods ranged from one week to six months. The Moore 1976 study only followed up for one week (Moore & Berk, 1976). Another trial had a follow-up period of 15 days (Che et al., 2005). The Xuan's study followed up the participants for one month (Xuan et al., 2008). Another two trials had five-week follow-up periods (Dyson-Hudson et al., 2007;

Dyson-Hudson et al., 2001). Three studies followed up the treatment effects for three months (Ceccheerelli et al., 2001; Kleinhenz et al., 1999; Molsberger et al., 2010). The Sun's trial followed up for 14 weeks (K. O. Sun et al., 2001). The Guerra's study had a 19-week follow-up period (Guerra de Hoyos et al., 2004). The Cheing 2008 trial only followed up the treatment group for six months and did not follow up the control group. The rest of 27 studies did not provide any information on follow-up.

Treatment sessions were various across all the studies. Two studies provided treatment with less than five sessions (M. L. Lin et al., 1994; Moore & Berk, 1976). Thirteen studies conducted five (inclusive) to ten (exclusive) sessions of treatment (Ceccheerelli et al., 2001; Cheing et al., 2008; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Huang et al., 2009; Kleinhenz et al., 1999; Shao et al., 2006; H. Xiong & Wei, 2009; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012). Treatment sessions of another 14 studies were between 10 sessions (inclusive) and 20 sessions (exclusive) (Che et al., 2005; Deng & Liu, 2012; Gao, 2009; Guo et al., 2006; Lathia et al., 2006; Z. Li, 2011; Molsberger et al., 2010; K. O. Sun et al., 2001; Y. Sun, 2012; P. Wang et al., 2007; W. Yang, 2009; J. Zhang et al., 2012; S. Zhao, 2008). Nine studies delivered 20-30 sessions of treatment (He & Zhang, 2011; Jiang, 2011; Ke et al., 2012; S. Li et al., 2010; Tan & Yuan, 2003; Wan, 2002; X. Wang & Cheng, 2012; Xie, 2010; Y. Zhang, 2011).

Most of studies (35 out of 38) indicated the frequency of treatment. Twenty-two studies provided acupuncture treatment once a day (Che et al., 2005; Deng & Liu, 2012; Ding, 2011; Gao, 2009; Guo et al., 2006; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; Z. Li, 2011; Shao et al., 2006; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; X. Wang & Cheng, 2012; Xie, 2010;

Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; J. Zhang et al., 2012). Three studies had treatment once every other day (H. Xiong & Wei, 2009; W. Yang, 2009; Y. Zhang, 2011). One study had treatment once a day followed by once every other day (S. Zhao, 2008). Two studies treated patients once a week (Guerra de Hoyos et al., 2004; Moore & Berk, 1976). One study had one to three times of treatment per week (Molsberger et al., 2010). Five studies had treatment twice a week (Ceccheerelli et al., 2001; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Lathia et al., 2006; K. O. Sun et al., 2001). One study offered the treatment two or three times per week (Cheing et al., 2008). Three studies did not provide information on it (Kleinhenz et al., 1999; S. Li et al., 2010; M. L. Lin et al., 1994).

Twenty-three studies indicated that *De Qi* sensation was obtained during the acupuncture treatment (Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; Guerra de Hoyos et al., 2004; Guo et al., 2006; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; Lathia et al., 2006; Z. Li, 2011; Molsberger et al., 2010; K. O. Sun et al., 2001; Tan & Yuan, 2003; X. Wang & Cheng, 2012; Xu et al., 2006; J. Yang et al., 2012; W. Yang, 2009; Y. Zhang, 2011). The other 15 studies did not describe whether *De Qi* sensation was achieved.

Thirty-six studies indicated the retention time of needling during the acupuncture treatment. Two studies retained the needles for 15 minutes (Guerra de Hoyos et al., 2004; Tan & Yuan, 2003). The Moore's trial had a 17-minute retention time (Moore & Berk, 1976). Majority of RCTs needled the points for 20 minutes (in 19 studies: (Ceccheerelli et al., 2001; Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guo et al., 2006; Ke et al.,

2012; Kleinhenz et al., 1999; S. Li et al., 2010; Z. Li, 2011; Molsberger et al., 2010; Shao et al., 2006; K. O. Sun et al., 2001; Y. Sun, 2012; Wan, 2002; W. Yang, 2009; J. Zhang et al., 2012; S. Zhao, 2008)) or 30 minutes [in 13 trials: (Ding, 2011; Gao, 2009; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Lathia et al., 2006; Z. Li, 2011; M. L. Lin et al., 1994; X. Wang & Cheng, 2012; Xie, 2010; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012)]. The Xiong 2009 study inserted needles for 20 to 40 minutes (H. Xiong & Wei, 2009). The rest two studies did not provide any information on retention time (P. Wang et al., 2007; Y. Zhang, 2011).

The intervention in the control group consisted of sham acupuncture (seven trials), Western medication (11 trials), $O_3$ injection (one trial), ultrasound (one trial), TDP irradiation (two trials), physiotherapy (three trials), Tuina or joint mobilisation (15 trials), exercise (six trials), and electric treatment (one trial). In terms of the application of Western medications, there were three administration routes used, including oral (seven studies), external (two studies) and injection (two studies). The types of Western medications consisted of NSAID and nerve bock. The most commonly used analgesic drugs were Diclofenac Sodium, Ibruprofen and Xylocaine.

When co-intervention was not involved in the trials, with acupuncture in the active intervention group, seven studies compared acupuncture with sham acupuncture (Ceccheerelli et al., 2001; Dyson-Hudson et al., 2007; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010; Moore & Berk, 1976); four studies used Western medication taken orally in the control groups (Che et al., 2005; Shao et al., 2006; Xu et al., 2006; Xuan et al., 2008); one study used injection application of Western medications in the control group (M. L. Lin et al., 1994); one study used Western medication externally in the control group (J. Zhang

et al., 2012); one study used both oral Western medication and physiotherapy in the control group (Molsberger et al., 2010); and two used other therapies, including Trager psychophysical integration (Dyson-Hudson et al., 2001) and conservative orthopaedic treatment (Molsberger et al., 2010).

Co-intervention with acupuncture was applied in 25 studies. Two studies compared acupuncture plus other therapy1 with other therapy2 plus other therapy1 (Cheing et al., 2008; S. Li et al., 2010). Two studies compared acupuncture plus other therapy with Western medication plus other therapy (Z. Li, 2011; P. Wang et al., 2007). Three studies compared acupuncture plus Western medication with Western medication alone (Guo et al., 2006; M. L. Lin et al., 1994; H. Xiong & Wei, 2009). Eighteen studies compared acupuncture plus other therapy with other therapy alone (Deng & Liu, 2012; Ding, 2011; Gao, 2009; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; Z. Li, 2011; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; X. Wang & Cheng, 2012; Xie, 2010; J. Yang et al., 2012; W. Yang, 2009; Y. Zhang, 2011; S. Zhao, 2008).

### 5.2.6 Types of outcome measures

#### 5.2.6.1 Visual Analogue Scale

Eight studies assessed acupuncture effects on pain intensity using VAS (Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Guerra de Hoyos et al., 2004; Guo et al., 2006; Molsberger et al., 2010; Xu et al., 2006; Xuan et al., 2008). Two of them also compared the changes of VAS from the baseline to the end of treatment between two groups (Ding, 2011; Guo et al., 2006).

Eight studies assessed the VAS at the end of treatment period (Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Guerra de Hoyos et al., 2004; Guo et al., 2006; Molsberger et al., 2010; Xu et al., 2006; Xuan et al., 2008). Five studies assessed the VAS at the end of follow-up period (Cheing et al., 2008; Ding, 2011; Guerra de Hoyos et al., 2004; Molsberger et al., 2010; Xuan et al., 2008).

#### 5.2.6.2 Constant Murley Assessment Scale

Six studies assessed acupuncture effects on the shoulder function using CMS (Cheing et al., 2008; Kleinhenz et al., 1999; Z. Li, 2011; K. O. Sun et al., 2001; Y. Zhang, 2011; S. Zhao, 2008). Among them, the Kleinhenz's study revised "work" to "training" and modified figure of lift weight to suit the needs from its participants, athletes (Kleinhenz et al., 1999).

#### 5.2.6.3 Range of motion (ROM)

Twelve studies assessed the acupuncture effects on ROM (Ding, 2011; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Guo et al., 2006; Z. Li, 2011; M. L. Lin et al., 1994; Molsberger et al., 2010; H. Xiong & Wei, 2009; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; J. Zhang et al., 2012). Seven of them assessed the improvement of shoulder ROM, but the directions of ROM tested were various (Ding, 2011; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Z. Li, 2011; M. L. Lin et al., 1994; Molsberger et al., 2010; H. Xiong & Wei, 2009). The Lin 1994 studies tested six directions of ROM: flexion, extension, abduction, adduction, pronation and supination. The Dyson-Hudson 2001 trial examined four directions of ROM: flexion, abduction, pronation and supination. The Xiong 2009 trial assessed: flexion, extension, abduction and supination degrees. The Li 2011b trial evaluated three directions: abduction, pronation and supination. The Ding 2011study measured two

direction of ROM: flexion and abduction. The Molsberger 2010 and Guerra 2004 trials observed: abduction degree. Three RCTs (Guo et al., 2006; Xu et al., 2006; Xuan et al., 2008) calculated the total scores to assess the improvement of shoulder movement. The Yang 2012 and Zhang 2013 studies assessed the shoulder ROM but did not report the detailed data.

#### 5.2.6.4 Shoulder Pain and Disability Index (SPADI)

Two studies assessed acupuncture effects on pain and the function of the shoulder by the SPADI (Guerra de Hoyos et al., 2004; Lathia et al., 2006).

#### 5.2.6.5 Adverse events

Six out of 38 studies provided information on adverse events (Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Shao et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; J. Zhang et al., 2012). Three studies found adverse events in both treatment and control groups (Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Shao et al., 2006). Three trials reported that no adverse events were observed during the treatment period (Xuan et al., 2008; J. Yang et al., 2012; J. Zhang et al., 2012). The Shao 2006 study did not report the details of adverse events.

## 5.3 Excluded studies

As shown in Figure 9, a total of 144 studies were excluded after screening the full text due to duplicated publications (n = 42), not for assessing effects of acupuncture (n = 5), not for assessing effects of SP (n = 3), non-musculoskeletal SP (n = 13), non-controlled trials (n = 42), inappropriate comparators (n = 25), and no assessment point (n= 14). The details of excluded studies are described in the “List and characteristics of excluded studies” (Appendix 4).

## 5.4 Risk of bias in included studies

The graph and summary of “Risk of bias” assessment are provided in Figures 10 and 11. The risk of bias of each included RCT was assessed according to the criteria listed in the methods chapter. The assessment of individual included RCTs is provided in Appendix 5. Each aspect of the assessment of risk of bias is described as below.

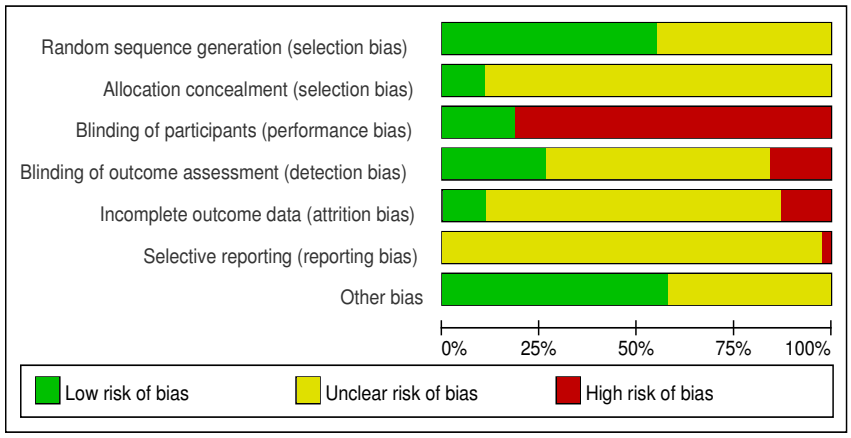



**Figure 10: Risk of bias graph of included RCTs**

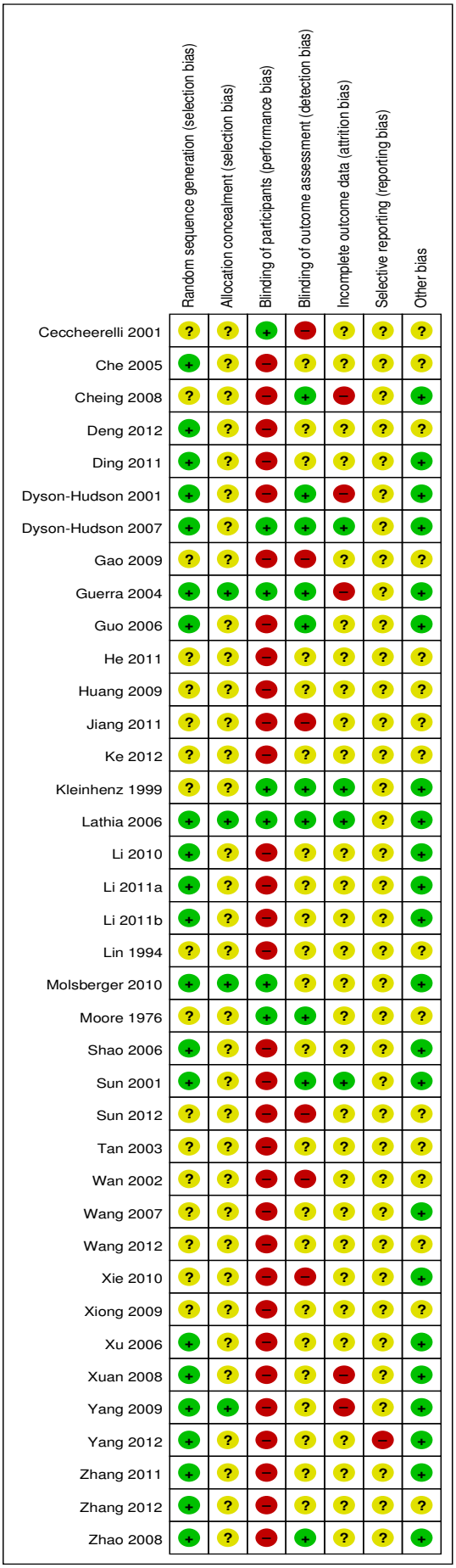



**Figure 11: Risk of bias summary of included RCTs**

### 5.4.1 Random sequence generation (selection bias)

All included trials stated that participants were randomly assigned into treatment and control groups. More than half of included trials (21 out of 38) provided the methods used for randomisation, including random number tables in 13 studies (Che et al., 2005; Deng & Liu, 2012; Ding, 2011; Guo et al., 2006; Lathia et al., 2006; S. Li et al., 2010; Z. Li, 2011; Shao et al., 2006; K. O. Sun et al., 2001; Xu et al., 2006; J. Yang et al., 2012; W. Yang, 2009; J. Zhang et al., 2012), computer-generated random table in four studies (Guerra de Hoyos et al., 2004; Molsberger et al., 2010; Xuan et al., 2008; S. Zhao, 2008), randomisation block in three studies (Dyson-Hudson et al., 2007; Y. Zhang, 2011; S. Zhao, 2008), and coin toss in one study (Dyson-Hudson et al., 2001). The other 17 trials did not describe the methods used for randomisation.

### 5.4.2 Allocation concealment (selection bias)

Among 38 included studies, only four trials reported the methods for allocation of randomisation. Two studies used sealed opaque envelopes to allocate random numbers to participants (Lathia et al., 2006; W. Yang, 2009). Two studies used telephone calls via a centralised office to allocate random numbers to participants (Guerra de Hoyos et al., 2004; Molsberger et al., 2010). The rest 34 studies did not describe the methods used for allocation concealment.

### 5.4.3 Blinding (performance bias and detection bias)

As it is impossible to blind an acupuncturist to perform treatment, double-blinding was defined as blinding of both participants and outcome assessors. Five studies employed double-blinding (Dyson-Hudson et al., 2007; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Moore & Berk, 1976). Seven trials employed single-blinding of participants (Ceccheerelli et al., 2001; Cheing et al.,

2008; Dyson-Hudson et al., 2001; Guo et al., 2006; Molsberger et al., 2010; K. O. Sun et al., 2001; S. Zhao, 2008).

#### 5.4.3.1 Blinding of participants

Seven studies employed sham acupuncture as control interventions to blind participants (Ceccheerelli et al., 2001; Dyson-Hudson et al., 2007; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010; Moore & Berk, 1976). The other 31 trials used different forms of treatments in two groups which made the blinding of participants unlikely.

#### 5.4.3.2 Blinding of outcome assessors

Ten trials blinded outcome assessors (Cheing et al., 2008; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Guo et al., 2006; Kleinhenz et al., 1999; Lathia et al., 2006; Moore & Berk, 1976; K. O. Sun et al., 2001; S. Zhao, 2008). Another six trials were of high risk for blinding of assessor (Ceccheerelli et al., 2001; Gao, 2009; Jiang, 2011; Y. Sun, 2012; Wan, 2002; Xie, 2010). The remaining 22 studies did not provide sufficient information on it.

### 5.4.4 Incomplete outcome data (attrition bias)

The attrition bias was only assessed for the immediate effects. More than two thirds of included studies (28 out of 38) had the identical number of participants randomised and reported in the results for the outcomes (Ceccheerelli et al., 2001; Che et al., 2005; Deng & Liu, 2012; Ding, 2011; Dyson-Hudson et al., 2007; Gao, 2009; Guo et al., 2006; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; S. Li et al., 2010; Z. Li, 2011; M. L. Lin et al., 1994; Moore & Berk, 1976; Shao et al., 2006; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; P. Wang et al., 2007; X. Wang & Cheng,

2012; Xie, 2010; H. Xiong & Wei, 2009; Xu et al., 2006; J. Yang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008). Among them, only one study clearly stated that all participants completed the trials which implied that no withdrawals/dropouts at the end of treatment period (Dyson-Hudson et al., 2007). Ten studies reported a total of 115 withdrawals/dropouts (Cheing et al., 2008; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010; K. O. Sun et al., 2001; Xuan et al., 2008; W. Yang, 2009; J. Zhang et al., 2012). Six of them provided reasons, including no improvement received, unrelated medical conditions, time restriction, worsened symptom, fainting, fear of needle pain, far from hospital, and intolerance of treatment (Cheing et al., 2008; Dyson-Hudson et al., 2001; Kleinhenz et al., 1999; Lathia et al., 2006; K. O. Sun et al., 2001; W. Yang, 2009). Only four studies (Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010; K. O. Sun et al., 2001) applied the ITT method to their data analysis. The other six RCTs (Cheing et al., 2008; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Xuan et al., 2008; W. Yang, 2009; J. Zhang et al., 2012) did not address the missing data in the statistical analysis.

### 5.4.5 Selective reporting (reporting bias)

As none of the included studies reported their protocol prior to publishing, it is unclear whether these studies reported their results selectively. When compared to the outcome measures listed in the methods described in the published papers, one study did not report results for all the outcome measures (J. Yang et al., 2012).

### 5.4.6 Other bias

Among 38 RCTs, 31 of them reported that the demographic data at the baseline were comparable (Che et al., 2005; Cheing et al., 2008; Deng & Liu, 2012; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Gao, 2009; Guerra de Hoyos et al., 2004; Guo et al., 2006; Jiang, 2011; Ke et al., 2012; Kleinhenz et al., 1999; Lathia et al., 2006; S. Li et al., 2010; Z. Li, 2011; Molsberger et al., 2010; Shao et al., 2006; K. O. Sun et al., 2001; Tan & Yuan, 2003; P. Wang et al., 2007; X. Wang & Cheng, 2012; Xie, 2010; H. Xiong & Wei, 2009; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; W. Yang, 2009; J. Zhang et al., 2012; Y. Zhang, 2011; S. Zhao, 2008). The other seven trials did not provide any information on baseline.

Twenty-three studies described valid and feasible inclusion and exclusion criteria which can be implemented into practice (Ceccheerelli et al., 2001; Cheing et al., 2008; Ding, 2011; Dyson-Hudson et al., 2007; Dyson-Hudson et al., 2001; Guerra de Hoyos et al., 2004; Guo et al., 2006; Kleinhenz et al., 1999; Lathia et al., 2006; S. Li et al., 2010; Z. Li, 2011; Molsberger et al., 2010; Shao et al., 2006; K. O. Sun et al., 2001; P. Wang et al., 2007; Xie, 2010; Xu et al., 2006; Xuan et al., 2008; J. Yang et al., 2012; W. Yang, 2009; Y. Zhang, 2011; S. Zhao, 2008). One trial only presented inclusion criteria (Jiang, 2011) whilst another study only stated exclusion criteria (Che et al., 2005). The rest 13 trials did not provide any selection criteria.

## 5.5 Effects of interventions

The effects of acupuncture compared to sham acupuncture, Western medication and other therapy, with or without co-intervention, are reported as below.

### 5.5.1 Acupuncture versus sham acupuncture

Seven studies compared acupuncture with sham acupuncture (Ceccheerelli et al., 2001; Dyson-Hudson et al., 2007; Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010; Moore & Berk, 1976). Four trials reported the results from primary or secondary outcomes and they are included in the meta-analysis (Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999; Lathia et al., 2006; Molsberger et al., 2010).

#### 5.5.1.1 Pain on VAS

Among the seven trials, two studies evaluated pain on VAS at the end of treatment and follow-up periods (Guerra de Hoyos et al., 2004; Molsberger et al., 2010). The pooled data at the end of treatment showed that acupuncture was more effective than sham acupuncture (SMD -0.58, 95% CI -0.99 to -0.16). The heterogeneity was substantial ($I^2$ = 71%) (Figure 12). However, no subgroup analysis could be conducted to investigate the contributing factors to the substantial heterogeneity as only two studies were involved. There were some different characteristics existed in these two trials. The sample size of the Molsberger 2010 study (n = 424) was much larger than that in Guerra 2004 trial (n = 130). The Molsberger 2010 study used EA whilst Guerra 2004 used manual acupuncture. Molsberger 2010 used an average of eight acupoints, and Guerra 2004 only used four acupoints. The number of treatment sessions in Molsberger 2010 was 15, but only eight sessions in Guerra 2004. The Molsberger 2010 trial used the ITT analysis whilst Guerra did not. These differences may be the sources for the substantial heterogeneity.

The pooled data at the end of follow-up indicated that acupuncture was more effective to relieve pain than sham acupuncture (SMD -0.57, 95% CI -0.77 to -0.37). There was no heterogeneity ($I^2$ = 0%) (Figure 12).

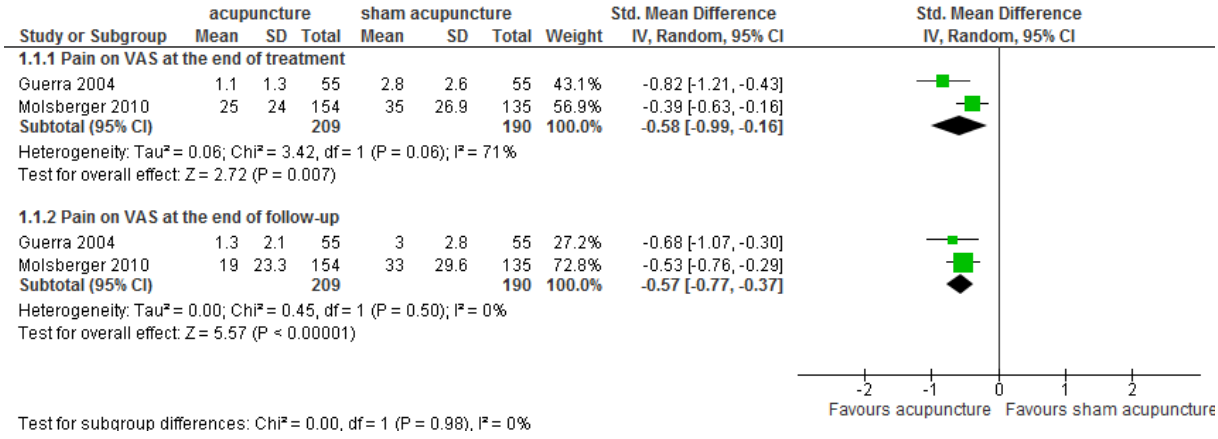



**Figure 12: Comparison of real and sham acupuncture for relief using VAS.**

### 5.5.1.2 Constant Murley Score (CMS)

Among the seven trials, one study evaluated the pain and shoulder functions using CMS (Kleinhenz et al., 1999). It indicated that acupuncture was more effective than sham acupuncture to improve the total index (MD 17.30, 95% CI 7.79 to 26.81) and pain index (MD 3.53, 95% CI 1.23 to 5.83) on CMS respectively at the end of four weeks treatment period. However, three months after the treatment, there was no significant difference in pain index between real and sham acupuncture (MD -0.52, 95% CI -3.41 to 2.37) (Figure 13). For the change of total index on CMS between baseline and the end of treatment, the Kleinhenz 1999 study also illustrated that acupuncture was more effective than sham acupuncture after four weeks treatment period (MD 10.80, 95% CI 2.42 to 19.18).

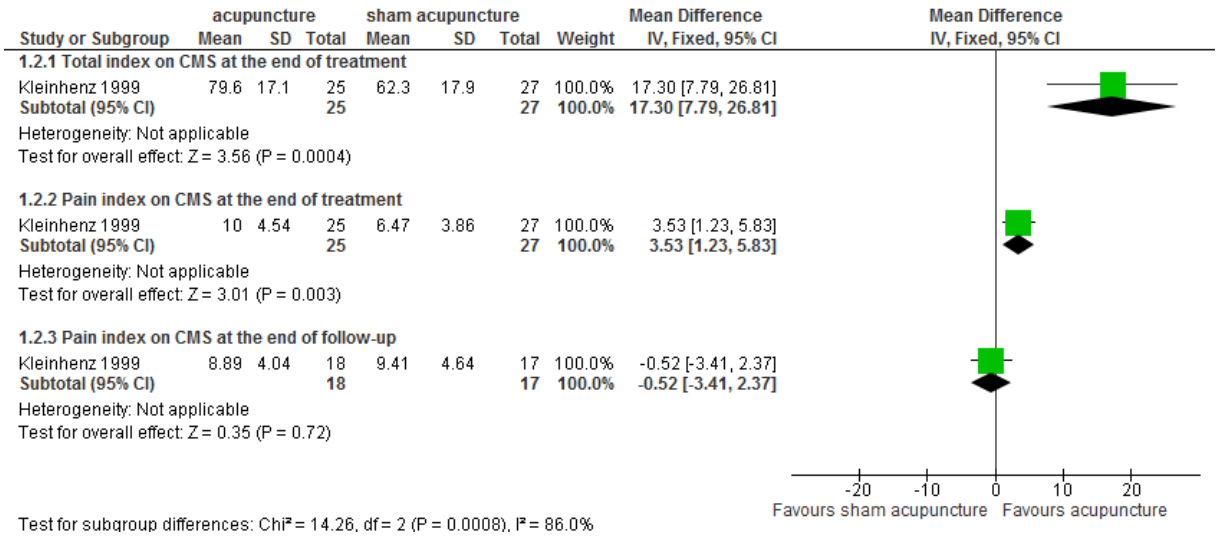



**Figure 13: Comparison of real and sham acupuncture for Constant Murley score**

### 5.5.1.3 Range of Motion (ROM)

In seven trials, two studies evaluated the ROM (Guerra de Hoyos et al., 2004; Molsberger et al., 2010). The Molsberger 2010 trial showed that acupuncture was more effective than sham acupuncture for abduction degree at the end of three months treatment (MD 12.00, 95% CI 3.89 to 20.11), and three months follow-up (MD 11.00, 95% CI 3.05 to 18.95) respectively (Figure 14).

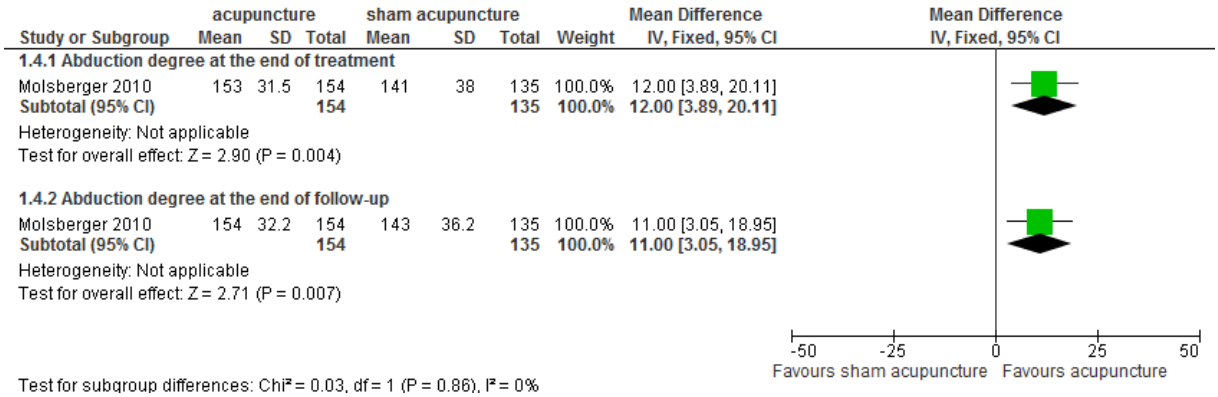



**Figure 14: Comparison of real and sham acupuncture for range of motion**

For the change of abduction degree compared to baseline and at the end of seven weeks treatment, the Guerra 2004 study illustrated that real acupuncture was superior to sham acupuncture at end of seven-week treatment (MD 24.80, 95% CI 14.08 to 35.52), as well as five weeks after the last treatment (MD 31.40, 95% CI 19.26 to 43.54) (Figure 15).

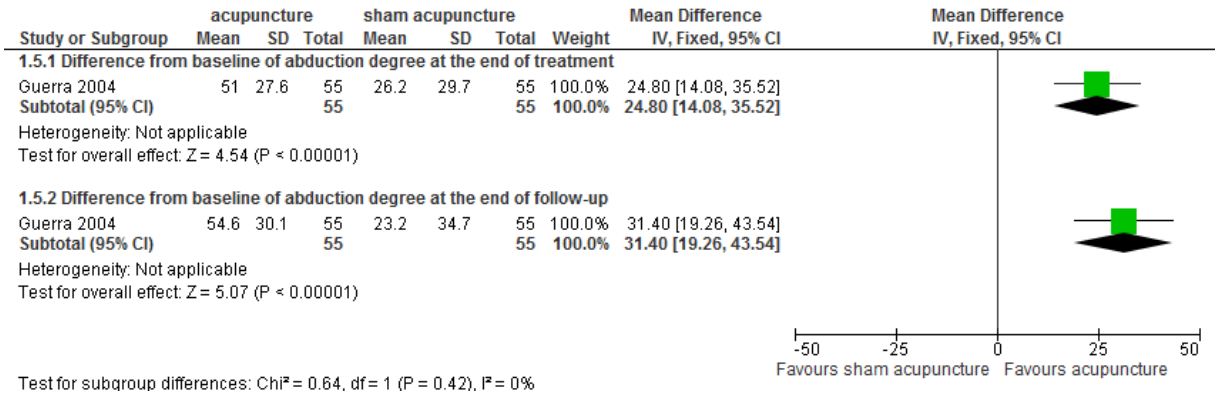



**Figure 15: Comparison of real and sham acupuncture for the change of range of motion from baseline**

### 5.5.1.4 Adverse events

Among the seven trials, two studies reported adverse events (Guerra de Hoyos et al., 2004; Kleinhenz et al., 1999). The Guerra 2004 trial reported 12 cases (two cases of fainting, three cases of dizziness, one case of dyspepsia, one case of anxiety and five cases of bursitis) in real acupuncture group, and six cases (four cases of dyspepsia and two cases of anxiety) in the sham acupuncture group. The Kleinhenz 1999 study reported seven cases (three cases of headache, two cases of dizziness and two cases of loss of strength in the legs) in real acupuncture group, and six cases (two cases of faint, two cases of headache, one case of headache and one case for increased muscle tension) in the sham acupuncture group. The pooled data did not show a significant difference in adverse events between two groups (RR 1.60, 95% CI 0.83 to 3.08). No heterogeneity existed ($I^2$ = 0%) (Figure 16).

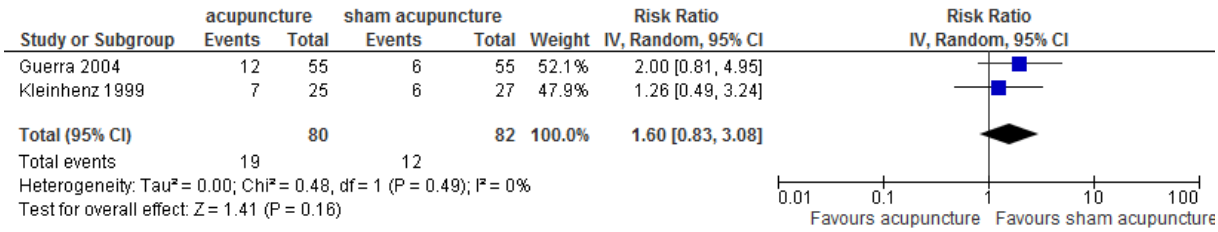


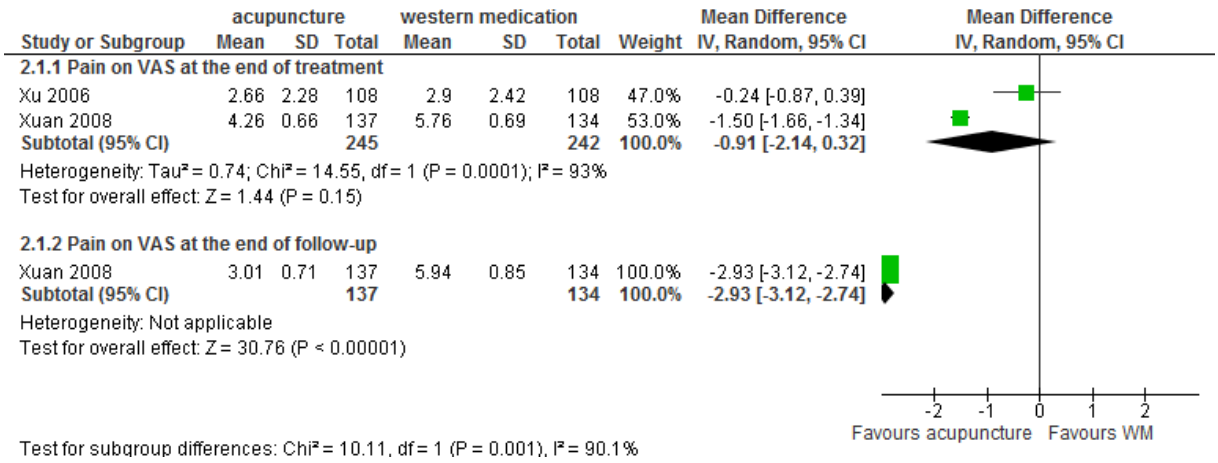

**Figure 16: Comparison of real and sham acupuncture for adverse events**

### 5.5.2 Acupuncture versus Western medication

Six studies compared acupuncture with Western medication (Che et al., 2005; M. L. Lin et al., 1994; Shao et al., 2006; Xu et al., 2006; Xuan et al., 2008; J. Zhang et al., 2012).

#### 5.5.2.1 Pain on Visual Analogue Scale (VAS)

Two of six studies evaluated the pain intensity using VAS (Xu et al., 2006; Xuan et al., 2008). The pooled data showed that there was no significant difference between acupuncture and western medication groups at the end of treatment (MD -0.91, 95% CI -2.14 to 0.32). The heterogeneity was substantial ($I^2$ = 93%) (Figure 17). No subgroup analysis was conducted to investigate the contributing factors to the substantial heterogeneity as only two studies were available. The drugs used in the control groups were different: Brufen in Xu 2006 and Diclofenac Sodium in Xuan 2008. These characteristics may contribute to the substantial heterogeneity. The Xuan 2008 study illustrated that real acupuncture significantly decreased pain scores at one month after the last treatment compared to oral administration Diclofenac Sodium (MD -2.93, 95% CI -3.12 to -2.74) (Figure 17).

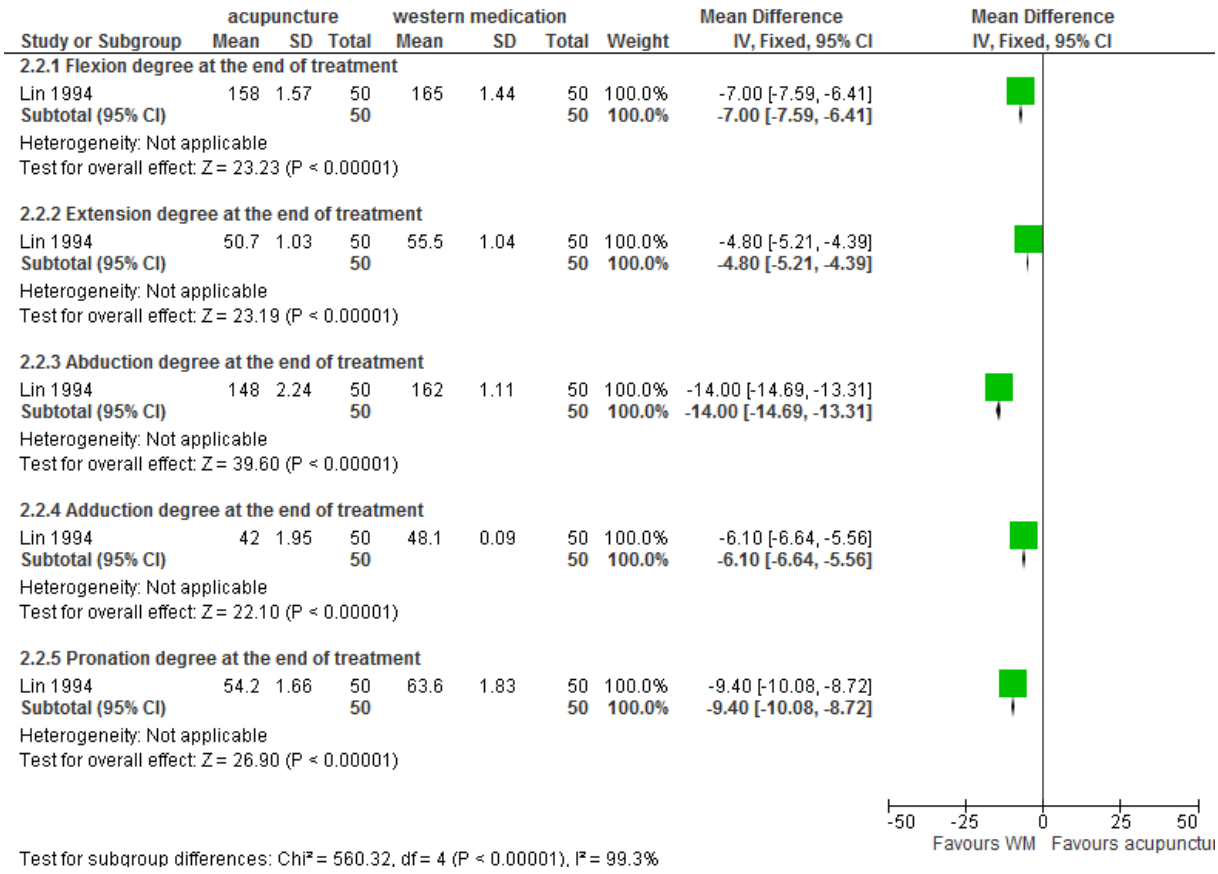



* Note: WM: Western medication

**Figure 17: Comparison of real and Western medication for pain relief using VAS**

### 5.5.2.2 Range of motion (ROM)

Among the six trials, only one study evaluated the ROM (M. L. Lin et al., 1994). It showed that nerve block (Xylocaine) was more effective than acupuncture after one session treatment for improving flexion degree (MD -7.00, 95% CI -7.59 to -6.41), extension degree (MD -4.80, 95% CI -5.21 to -4.39), abduction degree (MD -14.00, 95% CI -14.69 to -13.31), adduction degree (MD -6.10, 95% CI -6.64 to -5.56), and pronation degree (MD -9.40, 95% CI -10.08 to -8.72) (Figure 18).

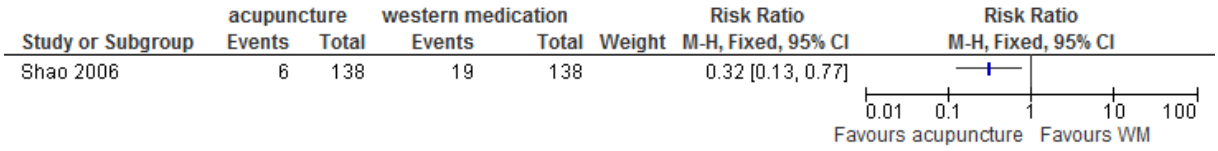



* Note: WM: Western medication

**Figure 18: Comparison of acupuncture and Western medication for range of motion**

### 5.5.2.3 Adverse events

Two out of six studies reported that no adverse events were observed (Xuan et al., 2008; J. Zhang et al., 2012). One study (Shao et al., 2006) observed six adverse events in acupuncture group, and 19 adverse events in West medication group (oral administration Diclofenac Sodium); however, it did not report the details. The meta-analysis showed that acupuncture caused significantly fewer adverse events than orally taken Diclofenac Sodium (RR 0.32, 95% CI 0.13 to 0.77) (Figure 19).




* Note: WM: Western medication

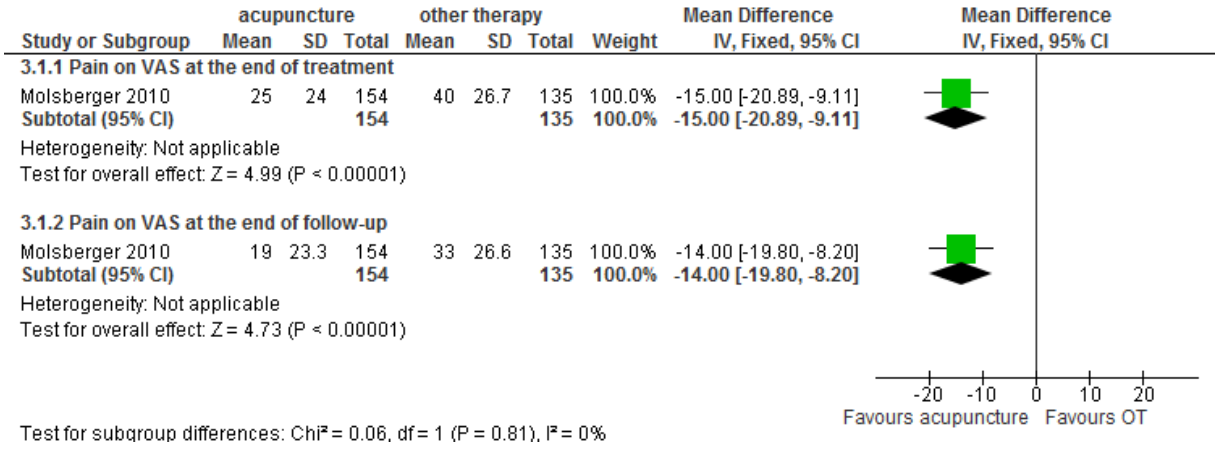
**Figure 19: Comparison of acupuncture and Western medication for adverse events**

### 5.5.3 Acupuncture versus other therapy

Two studies compared acupuncture with other therapy (Dyson-Hudson 2001, Molsberger 2010).

#### 5.5.3.1 Pain on Visual Analogue Scale (VAS)

One study evaluated pain on using VAS (Molsberger et al., 2010). It illustrated that acupuncture significantly decreased pain scores after three-month treatment compared to conventional orthopaedic therapy (MD -15.00, 95% CI -20.89 to -9.11), as well as at the three-month follow-up (MD -14.00, 95% CI -19.80to -8.20) (Figure 20).

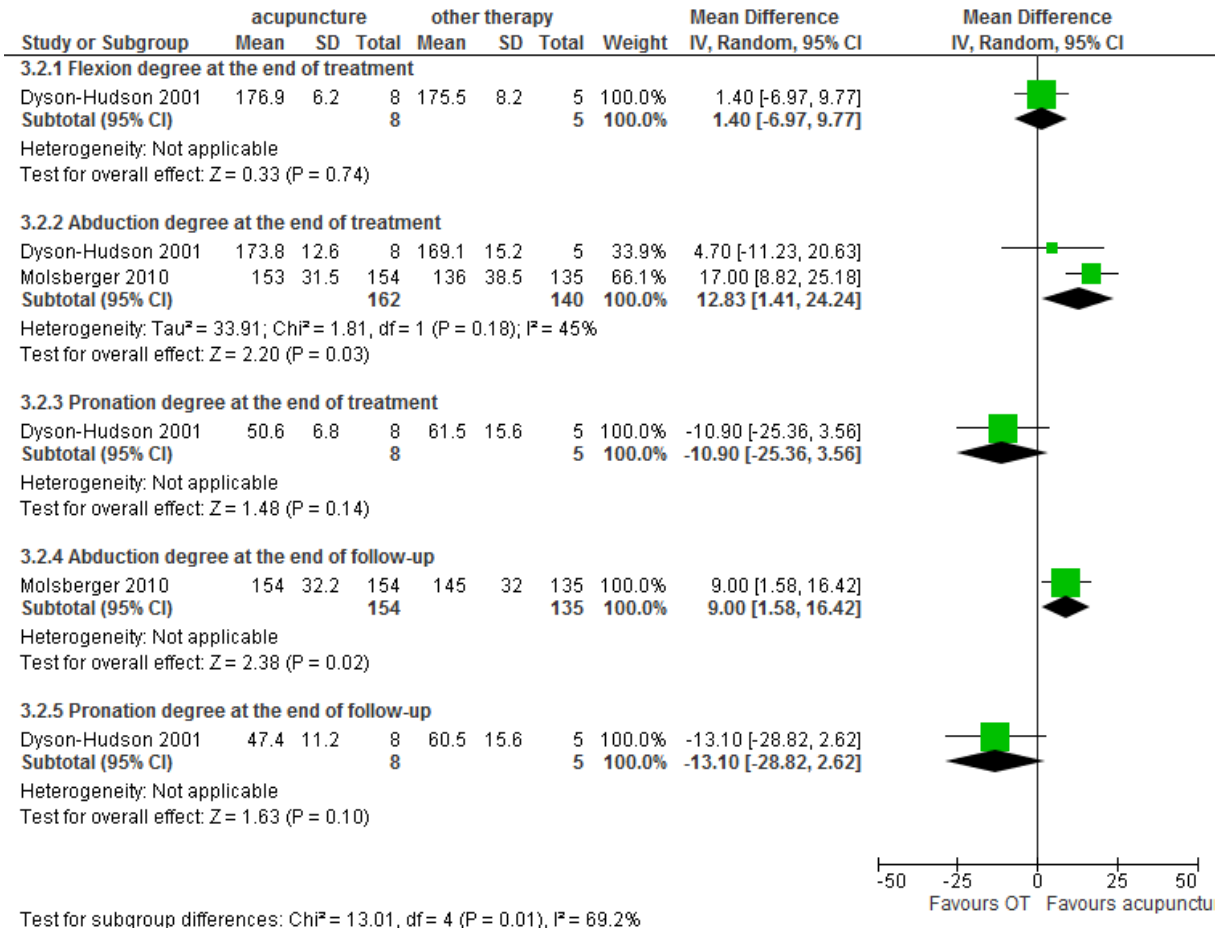



*Note: OT: other therapy

**Figure 20: Comparison of acupuncture and other therapy for pain relief using VAS**

#### 5.5.3.2 Range of motion (ROM)

Both of the trials assessed the ROM. The Dyson-Hudson 2001 study illustrated that there was no significant difference between acupuncture and Trager psychophysical integration for improving flexion degree at the end of five weeks' treatment (MD 1.40, 95% CI -6.97 to 9.77). The pooled data from two RCTs showed that acupuncture improved abduction degree more than other therapy (MD 12.83, 95% CI 1.41 to 24.24). The heterogeneity was moderate ($I^2$ = 45%). The Dyson-Hudson 2001 study demonstrated that there was no significant difference between acupuncture and Trager psychophysical integration for pronation degree after five-week treatment (MD -10.90, 95% CI -25.36 to 3.56) and five weeks after the last treatment (MD -13.10, 95% CI -28.82 to 2.62) The Molsberger 2010 study indicated that acupuncture was more effective than conventional orthopaedic therapy for abduction degree at three-month follow-up (MD 9.00, 95% CI 1.58 to 16.42) (Figure 21).




*Note: OT: other therapy.

**Figure 21: Comparison of acupuncture and other therapy for range of motion**

### 5.5.3.3 Adverse events

No information on adverse events was provided in these two trials.

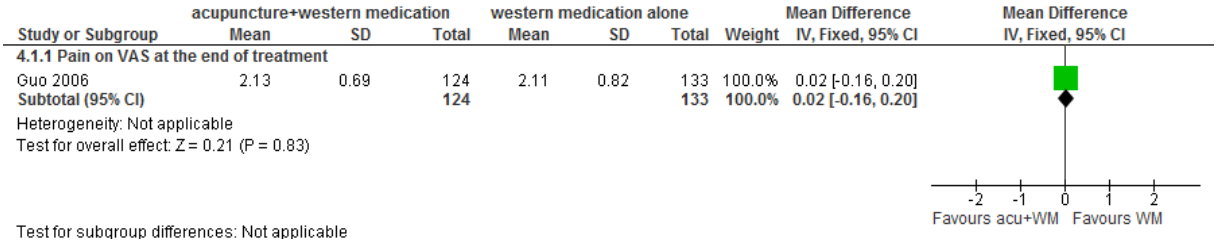
### 5.5.4 Acupuncture plus Western medication versus Western medication alone

Three studies compared acupuncture plus Western medication to with Western medication alone (Guo et al., 2006; M. L. Lin et al., 1994; H. Xiong & Wei, 2009).

### 5.5.4.1 Pain on Visual Analogue Scale (VAS)

Among the three studies, only one study measured the pain on VAS (Guo et al., 2006). It illustrated that there was no significant difference in relieving pain when

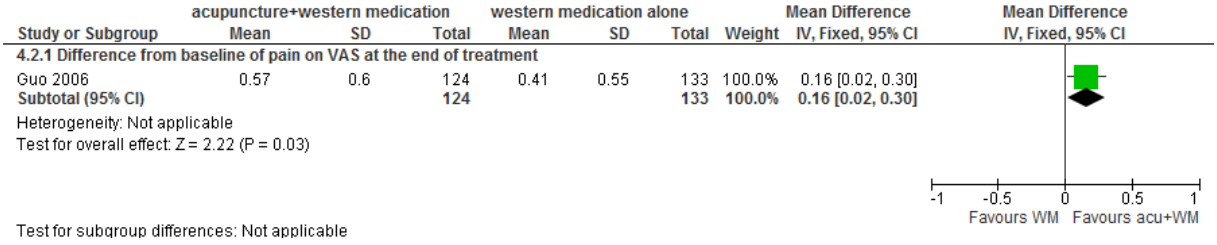
acupuncture was used as an adjunct therapy to oral Naproxen Sodium compared to oral Naproxen Sodium alone after one-session treatment (MD 0.02, 95% CI -0.16 to 0.20) (Figure 22).




* Note: WM: Western medication, acu: acupuncture

**Figure 22: Comparison of acupuncture plus Western medication and Western medication alone for pain relief using VAS**

For the change of pain score from baseline, the Guo 2006 study showed that acupuncture plus oral Naproxen Sodium was more effective than oral Naproxen Sodium alone after one-session treatment (MD 0.16, 95% CI 0.02 to 0.30) (Figure 23).




* Note: acu: acupuncture, WM: Western medication

**Figure 23: Comparison of acupuncture plus Western medication and Western medication alone for the change of pain on VAS**

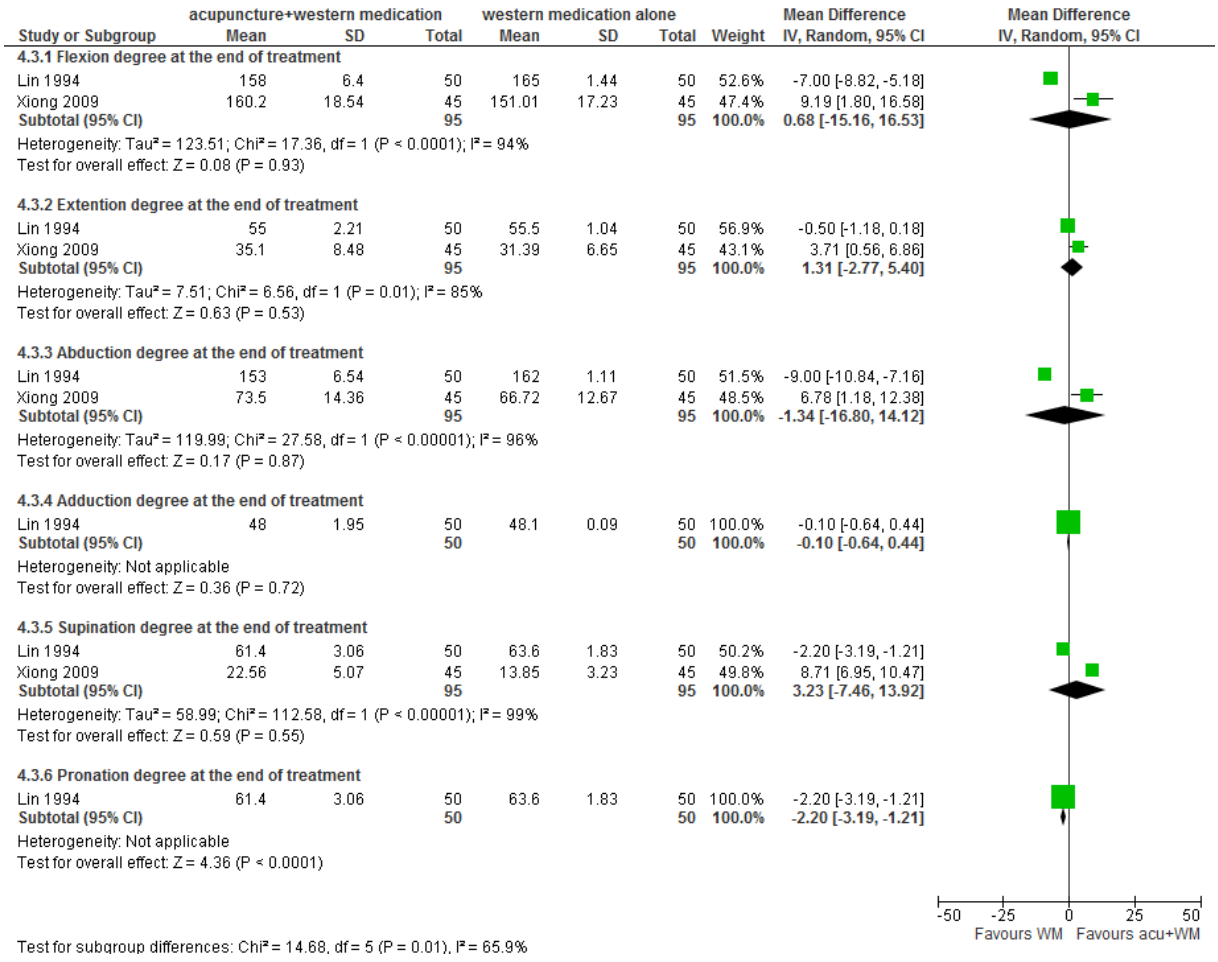
### 5.5.4.2 Range of Motion (ROM)

Two of three trials assessed the ROM (M. L. Lin et al., 1994; H. Xiong & Wei, 2009). The pooled data from two trials showed there was no significant difference in

improving flexion degree at the end of treatment between combination of acupuncture-Western medication group and Western medication alone group (MD 0.68, 95% CI -15.16 to 16.53). The heterogeneity was substantial ($I^2$ = 94%) (Figure 24). No subgroup analysis was performed to identify the source for substantial heterogeneity due to the small number of studies involved. A number of differences existed in these two trials. For instance, the sample size of Xiong 2009 (n = 257) was much larger than Lin 1994 (n = 150). The medications used in Xiong 2009 and Lin 1994 were orally taken Naproxen Sodium and Xylocaine for nerve block respectively. Lin 1994 used EA whilst Xiong 2009 applied manual acupuncture. The needle retention time in Lin 1994 (30 minutes) was double that in Xiong 2009 (15 minutes). The different characteristics between these two RCTs may be the factors contributing to the substantial heterogeneity.

The pooled data from two trials showed there was no significant difference in improving extension degree between acupuncture plus Western medication group and Western medication alone group at the end of treatment (MD 1.31, 95% CI -2.77 to 5.40). Substantial heterogeneity existed ($I^2$ = 85%). The pooled data demonstrated that there was no significant difference in improving abduction degree between acupuncture plus Western medication group and Western medication alone group after the last treatment (MD -1.34, 95% CI -16.80 to 14.12). The heterogeneity was substantial ($I^2$ = 96%). The Lin 1994 illustrated that there was no significant difference between acupuncture plus nerve block (Xylocaine) and nerve block (Xylocaine) alone group for adduction degree after one session treatment (MD -0.10, 95% CI -0.64 to 0.44). The pooled data from these two trials indicated that there was no significant difference in improving supination degree between acupuncture plus Western medication group and Western medication alone at the end of treatment (MD 3.23,

95% CI -7.46 to 13.92). The heterogeneity was substantial ($I^2$ = 99%). The Lin 1994 illustrated that nerve block (Xylocaine) alone group was more effective for improvement of pronation degree than acupuncture plus nerve block (Xylocaine) after one session treatment (MD -2.20, 95% CI -3.19 to -1.21) (Figure 24).




* Note: acu: acupuncture, WM: Western medication

**Figure 24: Comparison of acupuncture plus Western medication and Western medication alone for range of motion**

### 5.5.4.3 Adverse events

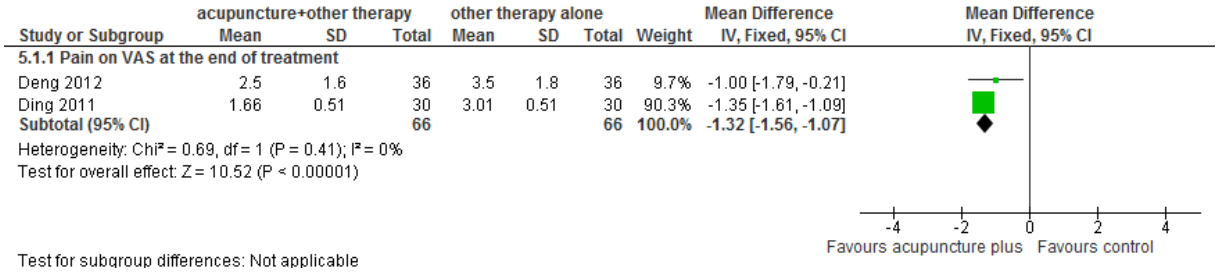
None of the three trials provided any information on adverse events.

### 5.5.5 Acupuncture plus other therapy versus same other therapy alone

Nearly half of included studies (18 out of 38) compared acupuncture plus other therapy with the same other therapy alone (Deng & Liu, 2012; Ding, 2011; Gao, 2009; He & Zhang, 2011; Huang et al., 2009; Jiang, 2011; Ke et al., 2012; Z. Li, 2011; K. O. Sun et al., 2001; Y. Sun, 2012; Tan & Yuan, 2003; Wan, 2002; X. Wang & Cheng, 2012; Xie, 2010; J. Yang et al., 2012; W. Yang, 2009; Y. Zhang, 2011; S. Zhao, 2008). Only seven of them reported the data of primary and/or secondary outcome measures and their data were pooled for meta-analysis (Deng & Liu, 2012; Ding, 2011; Ke et al., 2012; Z. Li, 2011; K. O. Sun et al., 2001; Y. Zhang, 2011; S. Zhao, 2008). Other therapies refer to Tuina, joint mobilisation and exercise.

#### 5.5.5.1 Pain on Visual Analogue Scale (VAS)

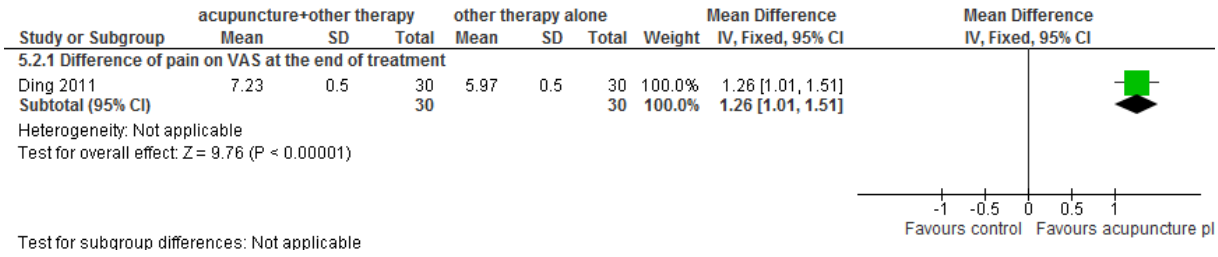
Among the 18 studies, two trials assessed the pain on VAS (Deng & Liu, 2012; Ding, 2011). The pooled data indicated that acupuncture plus Tuina group was more effective than Tuina alone group at the end of treatment (MD -1.32, 95% CI -1.56 to -1.07). There was no heterogeneity ($I^2$ = 0%) (Figure 25).




* Note: acu: acupuncture, OT: other therapy

**Figure 25: Comparison of acupuncture plus other therapy and same other therapy alone for pain relief using VAS**

For the changes of pain scores from baseline, the Ding 2011 study illustrated that acupuncture plus Tuina group was more effective than Tuina alone group after two-week treatment (MD 1.26, 95% CI 1.01 to 1.51) (Figure 26).

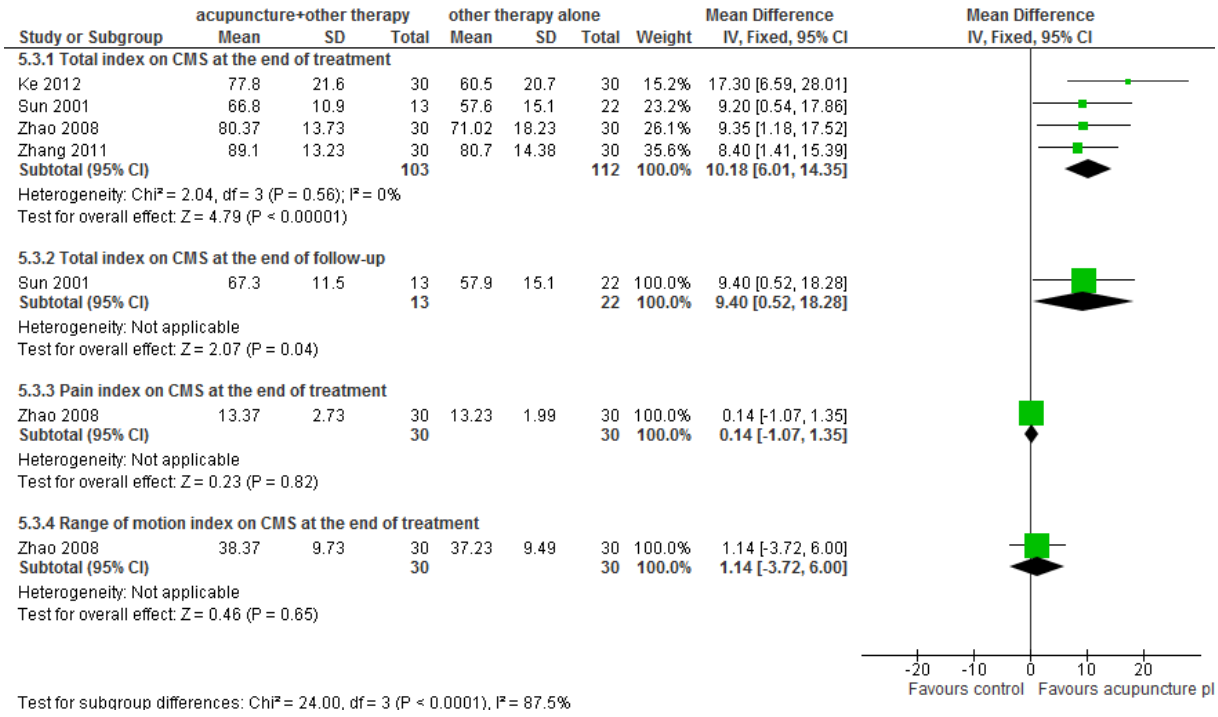



* Note: acu: acupuncture, OT: other therapy

**Figure 26: Comparison of acupuncture plus other therapy and same other therapy alone for the change of pain on VAS from baseline**

### 5.5.5.2 Constant Murley Score (CMS)

Among the 18 studies, four studies evaluated the CMS (Ke et al., 2012; K. O. Sun et al., 2001; Y. Zhang, 2011; S. Zhao, 2008). The pooled data from these four trials showed that the combined group was more effective to improve the total scores of CMS than the single therapy group at the end of treatment period (MD 10.18, 95% CI 6.01 to 14.35) (Figure 28). No heterogeneity existed ($I^2$ = 0%). For total index on CMS at the end of follow-up, the Sun 2001 trial also illustrated that acupuncture plus exercise was more effective than exercise alone at the 14 weeks after the last treatment (MD 9.40, 95% CI 0.52 to 18.28). The Zhao 2008 trial showed that there was no significant difference between acupuncture plus Tuina and Tuina alone for pain index on CMS after 10 sessions of treatment (MD 0.14, 95% CI -1.07 to 1.35). However, for ROM index on CMS, the Zhao 2008 trial demonstrated that there was no significant difference between acupuncture plus Tuina group and Tuina alone group at the end of 10 sessions of treatment (MD 1.14, 95% CI -3.72 to 6.00) (Figure 27).



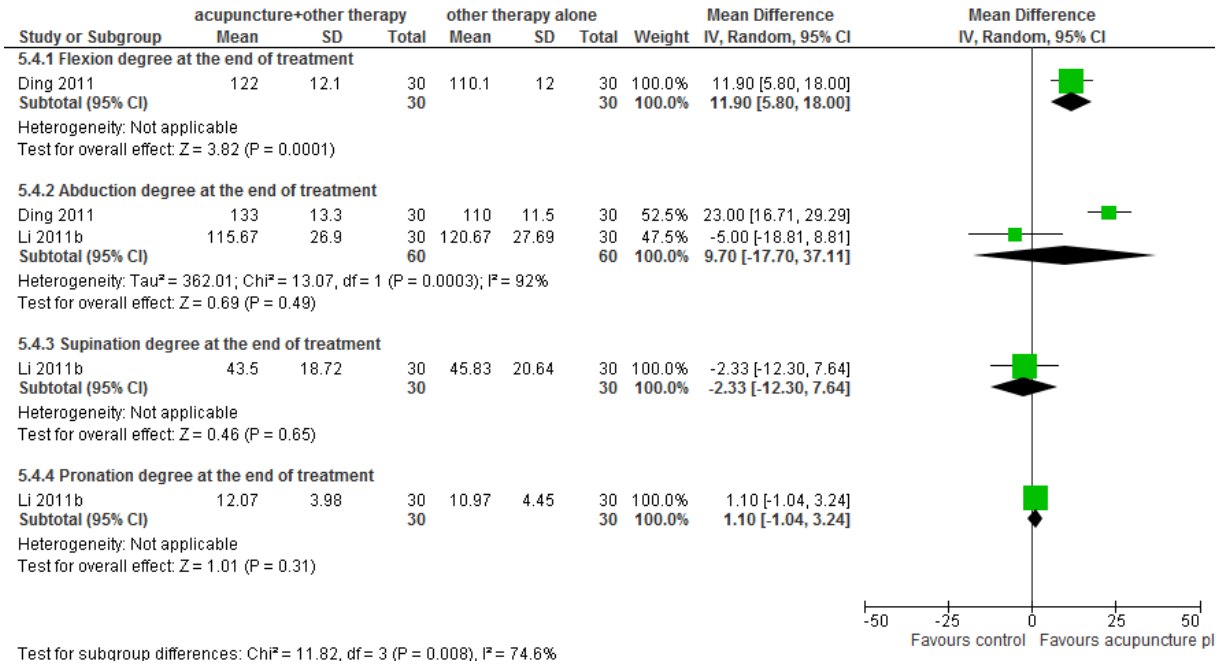

* Note: acu: acupuncture, OT: other therapy

**Figure 27: Comparison of acupuncture plus other therapy and same other therapy alone for constant Murley score**

### 5.5.5.3 Range of motion (ROM)

Two studies out of 18 studies measured the ROM (Ding, 2011; Z. Li, 2011). The Ding 2011 study illustrated that acupuncture plus Tuina was more effective than Tuina alone for flexion degree at the end of two weeks' treatment (MD 11.90, 95% CI 5.80 to 18.00). The pooled data from the two trials showed that there was no significant difference between acupuncture plus other therapy group and the same other therapy alone group for abduction degree at the end of treatment (MD 9.70, 95% CI -17.70 to 37.11). The heterogeneity was substantial ($I^2$ = 92%). No subgroup analysis was conducted to investigate the source for the substantial heterogeneity, as there were only two studies involved. The Ding 2011 trial used three acupoints, whilst the Li 2011b study only used single acupoint. The number of treatment sessions was 10 in the Ding 2011 study and 18 in Li 2011b. These different characteristics between the two RCTs may contribute to the substantial heterogeneity. The Li 2011b trial

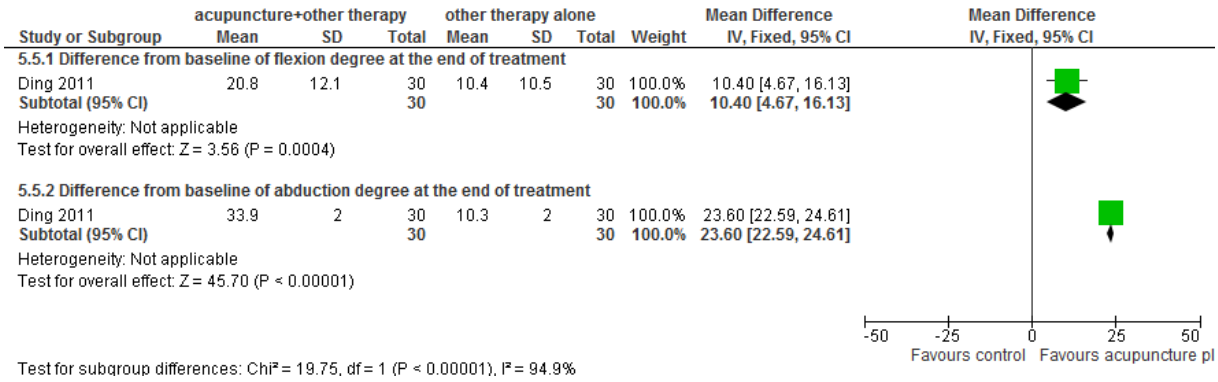
demonstrated that there was no significant difference between acupuncture plus Tuina group and Tuina alone group for improving supination degree (MD -2.33, 95% CI -12.30 to 7.64) and pronation degree (MD 1.10, 95% CI -1.04 to 3.24) at the end of two-week treatment (Figure 28).




* Note: acu: acupuncture, OT: other therapy

**Figure 28: Comparison of acupuncture plus other therapy and same other therapy alone for range of motion**

For the difference in flexion and abduction degrees between baseline and at the end of two-week treatment, the Ding 2011 trial illustrated that the acupuncture plus Tuina group was more effective than Tuina alone for improving flexion degree (MD 10.40, 95% CI 4.67 to 16.13), as well as abduction degree (MD 23.60, 95% CI 22.59 to 24.61) (Figure 29).




* Note: acu: acupuncture, OT: other therapy

**Figure 29: Comparison of acupuncture plus other therapy and same other therapy alone for the change of range of motion from baseline**

### 5.5.5.4 Adverse events

Only one study reported that adverse events were not observed (J. Yang et al., 2012).

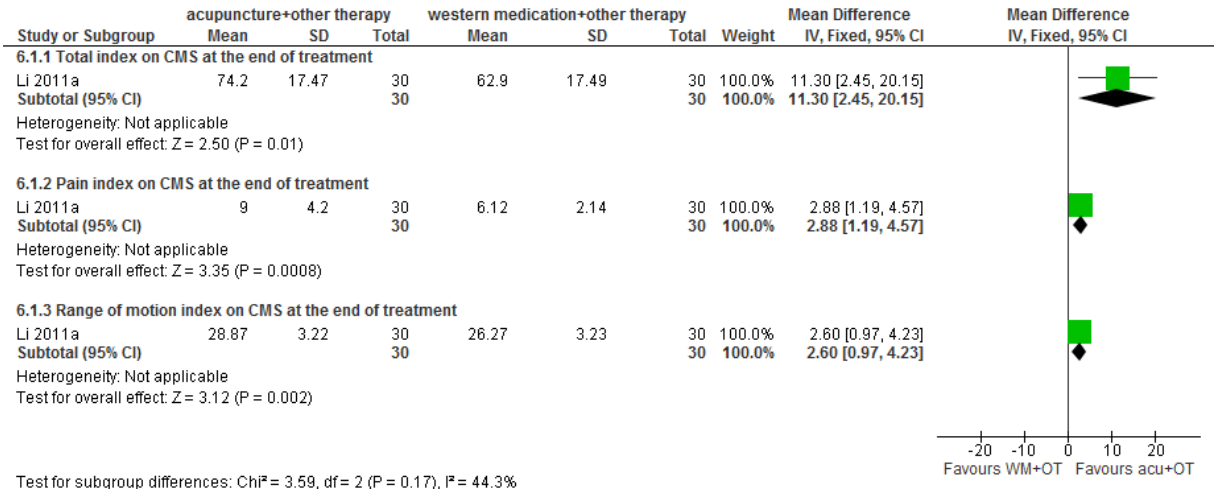
All the rest of studies did not provide any information on adverse events.

### 5.5.6 Acupuncture plus other therapy versus Western medication plus other therapy

Two studies compared acupuncture plus other therapy with Western medication plus other therapy (Z. Li, 2011; P. Wang et al., 2007).

### 5.5.6.1 Constant Murley Score (CMS)

Among the two trials, one study assessed the CMS (Z. Li, 2011). It indicated that acupuncture plus exercise was more effective than oral Ibuprone plus exercise for improving total index (MD 11.30, 95% CI 2.45 to 20.15), pain index (MD 2.88, 95% CI 1.19 to 4.57), and ROM index (MD 2.60, 95% CI 0.97 to 4.23) on the CMS at the end of 12-session treatment (Figure 30).




* Note: WM: acu: acupuncture, OT: other therapy, Western medication

**Figure 30: Comparison of acupuncture plus other therapy and Western medication plus other therapy for Constant Murley score**

### 5.5.6.2 Adverse events

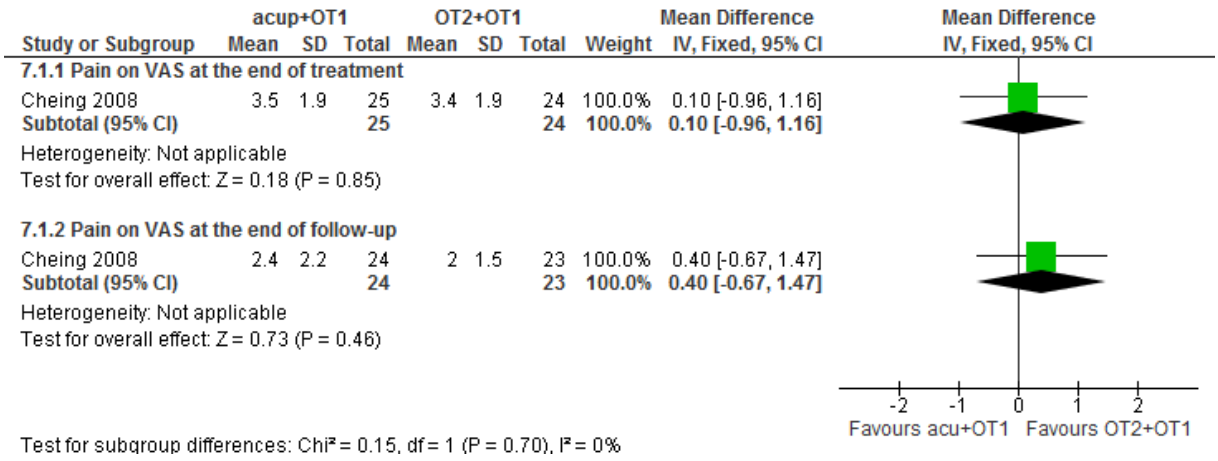
Neither of two trials reported any information on adverse events.

### 5.5.7 Acupuncture plus other therapy1 versus other therapy2 plus other therapy1

Two studies compared acupuncture plus other therapy1 with other therapy2 plus other therapy1 (Cheing et al., 2008; S. Li et al., 2010).

### 5.5.7.1 Pain on Visual Analogue Scale (VAS)

One study examined the pain on the VAS (Cheing et al., 2008). It demonstrated that there was no significant difference between EA plus exercise and interferential electrotherapy plus exercise for pain relief at the end of one-month treatment (MD 0.10, 95% CI -0.96 to 1.16), at one month after the last treatment (MD 0.40, 95% CI -0.67 to 1.47) (Figure 31).

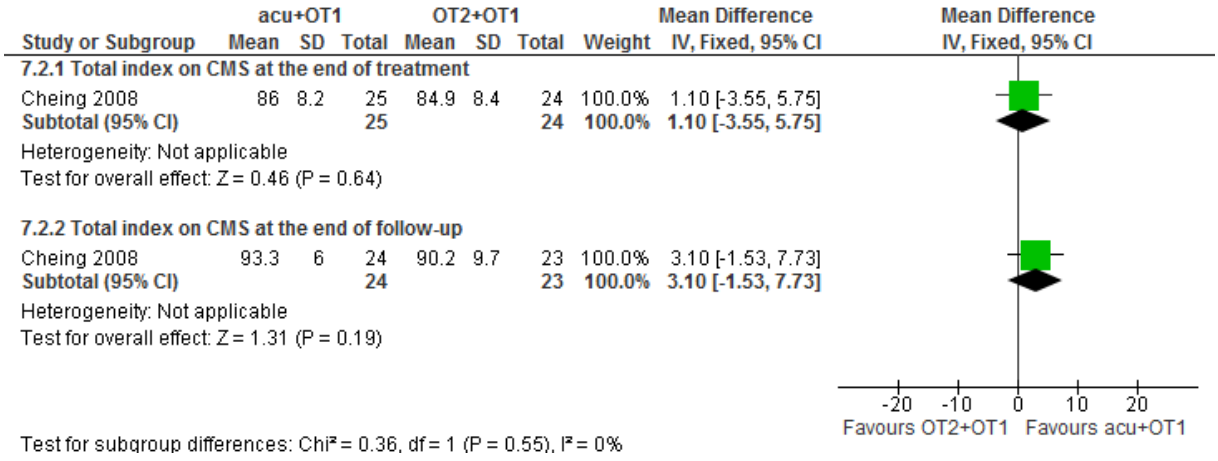



* Note: acu: acupuncture, OT1: other therapy1, OT2: other therapy2,

**Figure 31: Comparison of acupuncture plus other therapy1 and other therapy2 plus other therapy1 for pain relief using VAS**

### 5.5.7.2 Constant Murley Score (CMS)

One study tested the CMS (Cheing et al., 2008). It indicated that there was no significant between EA plus exercise group and interferential electrotherapy plus exercise group for improving total index at end of one month treatment (MD 1.10, 95% CI -3.55 to 5.75), and at the end of one-month after the last treatment (MD 3.10, 95% CI -1.53 to 7.73) (Figure 32).




* Note: OT1: acu: acupuncture, other therapy 1, OT2: other therapy 2

**Figure 32: Comparison of acupuncture plus other therapy1 and other therapy2 plus other therapy1 for Constant Murley score**

#### 5.5.7.3 Adverse events

The two trials did not provide any information on adverse events.

# CHAPTER SIX

# RESULTS II – SYSTEMATIC REIVEW OF NON-RCTS

This chapter reports the results of the systematic review of non-RCTs for using acupuncture to treat SP.

## 6.1 Description of included non-RCTs

As specified in Chapter 5.1, six non-RCTs were included in the current review. The study selection process is illustrated in Figure 9. Among the included studies, two studies were published in English (Johansson, Adolfsson, & Foldevi, 2005; Ma et al., 2006), and the other four studies were published in Chinese (H. Chen, 2011; Q. Chen, 2006; Su, Ding, & Ma, 2010; Y. Zhao, 2002). The characteristics of individual included non-RCTs are detailed in Appendix 6. Their design, sample sizes, participants, interventions and outcomes are summarised as below.

### 6.1.1 Design of studies

Four studies utilised two-armed design (H. Chen, 2011; Q. Chen, 2006; Johansson et al., 2005; Y. Zhao, 2002); one study employed three arms (Ma et al., 2006); and one study had four arms (Su et al., 2010). There were no cross-over trials among the included studies. For the studies with multi-arms only the groups meeting the comparison criteria were included for data analysis in this review.

Four studies were single-centre trials (H. Chen, 2011; Q. Chen, 2006; Ma et al., 2006; Su et al., 2010); one study was conducted in multi-centres (Johansson et al., 2005); and another trial did not provide enough information on the number of trial centres (Y. Zhao, 2002).

### 6.1.2 Sample sizes

The sample sizes of the included studies were varied. The sample sizes of five trials were between 40 and 100 participants (H. Chen, 2011; Q. Chen, 2006; Johansson et al., 2005; Ma et al., 2006; Y. Zhao, 2002); while the sample size of the remaining one study was 160 (Su et al., 2010).

### 6.1.3 Setting

Four of six trials were conducted in mainland China (H. Chen, 2011; Q. Chen, 2006; Su et al., 2010; Y. Zhao, 2002), one in Taiwan (Ma et al., 2006) and one in Sweden (Johansson et al., 2005). Only one study indicated that both in-patients and out-patients recruited (Su et al., 2010). The other five studies did not provide any information on patient source (H. Chen, 2011; Q. Chen, 2006; Ma et al., 2006; Su et al., 2010; Y. Zhao, 2002). Three trials were performed in a hospital setting (H. Chen, 2011; Q. Chen, 2006; Su et al., 2010) while two trials were conducted in medical centres (Johansson et al., 2005; Ma et al., 2006). The Zhao 2002 study did not provide any information.

### 6.1.4 Types of participants

The six included non-RCTs involved and analysed 570 participants. The age ranged from 19 to 70 years. One study did not provide the mean of ages (Q. Chen, 2006). Two studies provide mean value of ages but no standard deviation (H. Chen, 2011; Ma et al., 2006)

Three studies reported the mean ages in genders (Johansson et al., 2005; Ma et al., 2006; Y. Zhao, 2002).

All the non-RCTs recruited the participants with SP. However, no studies indicated whether acute or chronic pain was included. All of them provided broad diagnosis to the participants, including scapulohumeral periarthritis (H. Chen, 2011; Q. Chen, 2006; Su et al., 2010; Y. Zhao, 2002), frozen shoulder (Ma et al., 2006) or impingement (Johansson et al., 2005).

Two studies provided clear diagnostic criteria for SP, such as scapulohumeral periarthritis criteria in Clinical orthopedics and traumatology Science (H. Chen, 2011); and scapulohumeral periarthritis criteria in Practical Surgery (Y. Zhao, 2002). One study developed its own criteria according to the history and examination (Johansson et al., 2005). The rest three studies did not provide diagnostic criteria (Q. Chen, 2006; Ma et al., 2006; Su et al., 2010).

### 6.1.5 Types of interventions

Among the six included non-RCTs, five studies used manual acupuncture (Q. Chen, 2006; Johansson et al., 2005; Ma et al., 2006; Su et al., 2010; Y. Zhao, 2002), one study applied EA (H. Chen, 2011).

All six studies applied with multi-points. One study chose four points (Chen 2006, Zhao 2002). Two studies needled five points (Jahansson 2005, Ma 2006). One study used six points (Chen 2011). One study applied 12 points (Su 2010).

The most frequently used acupuncture points were Jianyu (LI 15) (six studies), Jianliao (TE 14) (five studies), Hegu (LI 4) (four studies), Jianqian (extra) (two studies), Quchi (LI 11) (two studies), Binao (LI 14) (two studies) and Tianzong (SI 11) (two studies).

Only one study inserted the needles in the affected side only (Y. Zhao, 2002). The rest of 5 studies did not clearly indicate whether affected or healthy side of the body was needled.

None of the six studies reported the depth of needling.

The treatment duration of the included studies lasted from 10 days to eight weeks, one study for 10 days (Y. Zhao, 2002), two studies from two weeks (inclusive) to four weeks (inclusive) (Q. Chen, 2006; Ma et al., 2006), and another three studies from four weeks (exclusive) to eight weeks (inclusive) (H. Chen, 2011; Johansson et al., 2005; Su et al., 2010). Only one study performed follow-up and followed up the participants for 12 months after the end of five-week treatment period (Johansson et al., 2005).

Treatment sessions varied from eight to 40 sessions. One study conducted eight sessions of acupuncture treatment (Ma et al., 2006). Two studies performed 10 treatment sessions of acupuncture treatment (Ma et al., 2006) while two studies performed 10 treatment sessions (Johansson et al., 2005; Y. Zhao, 2002). Another two studies delivered 30 sessions (H. Chen, 2011) and 40 sessions (Su et al., 2010) respectively.

All six trials reported the frequency of treatment. Four trials stated the frequency of acupuncture treatment which was once a day (H. Chen, 2011; Q. Chen, 2006; Su et al., 2010; Y. Zhao, 2002). The treatment frequency in another two studies was twice a week (Johansson et al., 2005; Ma et al., 2006).

Four trials described that *De Qi* sensation was obtained after needling (H. Chen, 2011; Q. Chen, 2006; Johansson et al., 2005; Y. Zhao, 2002). The rest two trials did not mention if *De Qi* sensation was achieved (Ma et al., 2006; Su et al., 2010).

The retention time of needling ranged from 15 minutes to 30 minutes. The Ma 2006 study inserted the needles for 15 minutes. The Su 2010 trial indicated that the retention time was from 20 to 30 minutes (Su et al., 2010). Four studies retained the needles for 30 minutes (H. Chen, 2011; Q. Chen, 2006; Johansson et al., 2005; Y. Zhao, 2002).

The interventions in the control group consisted of Western medication (oral ibuprofen) (Su et al., 2010; Y. Zhao, 2002), physical therapy (Ma et al., 2006), ultrasound (Johansson et al., 2005), joint mobilisation (H. Chen, 2011) and TDP irradiation (Q. Chen, 2006).

One four-arm trial compared acupuncture plus joint mobilisation with acupuncture, joint mobilisation and Western medication (oral ibuprofen) plus TDP irradiation (Su et al., 2010). One three-arm study compared acupuncture with physical therapy, acupuncture plus physical therapy (Ma et al., 2006).

One study compared acupuncture plus exercise with oral ibuprofen plus exercise (Y. Zhao, 2002). One study compared acupuncture plus exercise with ultrasound plus exercise (Johansson et al., 2005). One study compared EA plus joint mobilisation and exercise with joint mobilisation plus exercise (H. Chen, 2011). One study

compared acupuncture plus TDP irradiation with TDP irradiation alone (Q. Chen, 2006).

### 6.1.6 Types of outcome measures

All the included studies assessed one or more primary and/or secondary outcome measures. All the six studies assessed the outcomes at the end of treatment period. Only one study assessed the outcomes at the end of follow-up period (Johansson et al., 2005).

One study assessed acupuncture effects on pain intensity using VAS (Ma et al., 2006). This study also evaluated acupuncture effects on ROM and quality of life using the short form 36 (SF-36). One study compared the combined scores (including CMS, AL score, UCLA score) in the two groups to investigate the effects of acupuncture on pain and shoulder functions (Johansson et al., 2005). The other four studies (H. Chen, 2011; Q. Chen, 2006; Su et al., 2010; Y. Zhao, 2002) measured the improvement of symptoms by evaluation the effective rate. However, no scale was used for evaluating the effective rate; thus the data were not extracted for meta-analysis.

## 6.2 Risk of bias in included studies

The graph and summary of “Risk of bias” assessment of the six included non-RCTs are illustrated in Figures 33 and 34. Details of assessment of each paper are provided in Appendix 7. Each aspect of the assessment of risk of bias is summarised below.

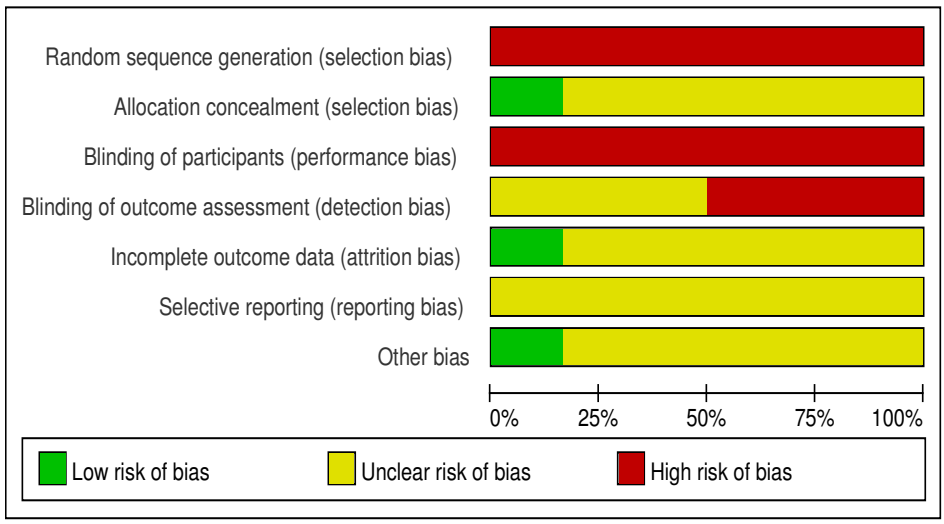



**Figure 33: Risk of bias graph of included non-RCTs**

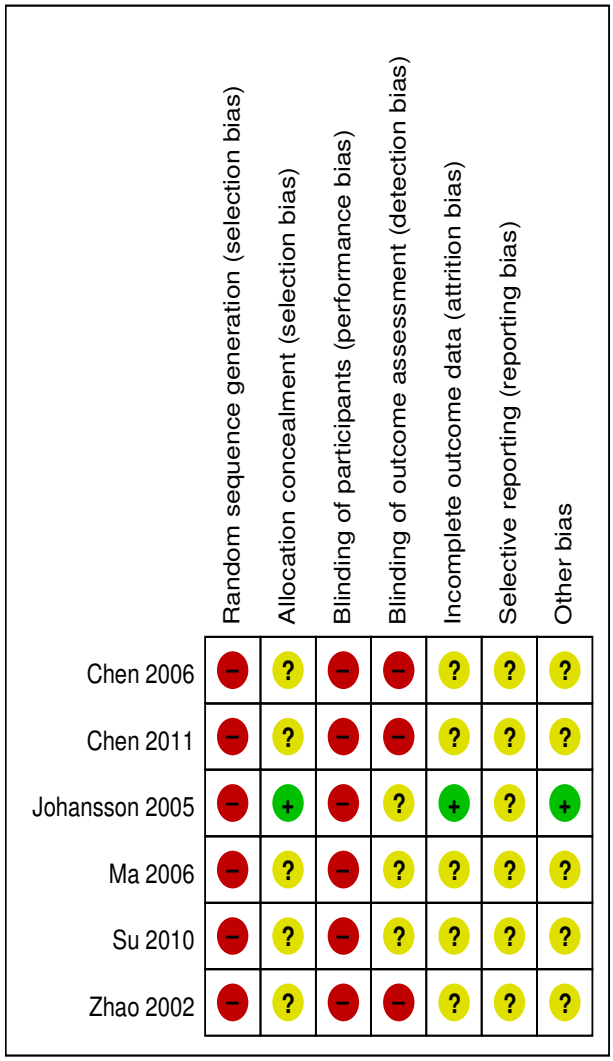



**Figure 34: Risk of bias summary of included non-RCTs**

### 6.2.1 Random sequence generation (selection bias)

All the six studies have been classified as non-RCTs. Therefore, their random sequence generation has been rated as “high risk".

### 6.2.2 Allocation concealment (selection bias)

None of the six studies provided sufficient information about the methods used for allocation of randomisation. Therefore it is impossible to determine whether or not the concealment of allocation has been performed.

### 6.2.3 Blinding (performance bias and detection bias)

None of six studies blinded either participants or practitioners. None of six trials provided information on the blinding of outcome assessors. However, three of them only had one author which made blinding of the outcome assessor impossible (H. Chen, 2011; Q. Chen, 2006; Y. Zhao, 2002).

### 6.2.4 Incomplete outcome data (attrition bias)

None of six studies provided detailed any information about dropouts/withdrawals.

### 6.2.5 Selective reporting (reporting bias)

Due to no protocol included studies reported prior to publishing of the complete trials, it is unclear as to whether these studies reported their results selectively.

### 6.2.6 Other bias

Among six non-RCT studies, five of them reported that the baseline characteristics of two groups were comparable (H. Chen, 2011; Johansson et al., 2005; Ma et al., 2006;

Su et al., 2010; Y. Zhao, 2002). However, only one study provided valid and feasible selection criteria (Johansson et al., 2005).

## 6.3 Effects of interventions

The effects of acupuncture compared to western medication and other therapy, with or without co-intervention, are reported as below.

### 6.3.1 Acupuncture versus western medication plus other therapy

One comparison in a four-arm study compared acupuncture with ibuprofen and chlorzoxazone and TDP irradiation (Su et al., 2010). The authors claimed that acupuncture was more effective than the combined therapies. However, due to lack of data for primary and secondary outcome measures, effect size analysis was not able to be performed. In addition, the authors did not report the information on adverse events.

### 6.3.2 Acupuncture versus physical therapy

One comparison of a three-arm trial compared acupuncture with physical therapy (Ma et al., 2006). It assessed pain intensity, ROM and quality of life (using SF-36). The authors concluded that acupuncture was more effective for pain relief whilst physical therapy was more beneficial for improving ROM. However, further effect size calculation could not be conducted due to lack of data provided in the published paper.

### 6.3.3 Acupuncture versus joint mobilisation

One comparison in the Su's four-arm trial compared acupuncture with joint mobilisation (Su et al., 2010). The author reported similar effective rate in

acupuncture group (82.5%) and joint mobilisation group (85%). However, the effect size was not calculated as inadequate outcome assessment criteria for the outcome measures were available. This trial did not monitor the adverse events.

### 6.3.4 Acupuncture plus other therapy versus same other therapy alone

Three studies included this comparison. Other therapies refer to physical therapy (Ma et al., 2006), joint mobilisation (Su et al., 2010) and TDP irradiation (Q. Chen, 2006). All the investigators claimed that the combined therapy was more effective than single therapy alone for symptomatic relief. However, due to insufficient data reported, the adjunct therapeutic effects of acupuncture to other therapy could not be determined through meta-analysis. Neither of them monitored the adverse events.

### 6.3.5 Acupuncture plus exercise versus western medication plus exercise

With exercise as co-intervention, one trial compared acupuncture with ibuprofen (Y. Zhao, 2002). The author claimed that the combined acupuncture treatment was more effective than the combined western drug treatment. However, as no scale was used to determine the effective rate, no effect size calculation was conducted.

The author did not observe any adverse events in the treatment group but four cases (two cases of nausea and vomiting, one case of diarrhoea and one case of skin rashes) in the control group. The pooled data showed that the combined acupuncture treatment caused much less adverse events than the combined Western medication treatment (RR 0.06, 95% CI 0.00 to 1.02).

### 6.3.6 Acupuncture plus exercise versus other therapy plus exercise

Two trials involved such comparison (H. Chen, 2011; Johansson et al., 2005). Other therapies included joint mobilisation (H. Chen, 2011) and ultrasound (Johansson et al., 2005). The investigators for both studies suggested that acupuncture was more effective to improve symptoms than joint mobilisation or physical therapy alone in addition to home exercise. However, due to insufficient data available to the outcome measures, meta-analysis was not able to be performed. The Chen's study did not report information on adverse events. The Johansson's trial reported that no adverse events were observed in treatment or control group.

# Chapter SEVEN

# DISCUSSION

This chapter discusses the findings of the entire project on acupuncture for the treatment of SP. In addition, recommendations are given for further clinical studies.

## 7.1 Summary of main results

### 7.1.1 Summary of main results of included RCTs

The current review identified 38 RCTs comparing acupuncture with sham acupuncture, western medication or other therapy, with or without co-intervention. All the trials focused on relieving pain and/or improving shoulder movement, particularly the change of abduction degree.

When used alone, acupuncture was more effective than sham acupuncture or conventional orthopaedic therapy for relieving pain at the end of the treatment period. However, there was no significant difference in pain relief between when compared to oral administration of Western drug (brufen or diclofenac sodium). For follow-up, acupuncture also showed more benefit for reduction of pain when compared to sham acupuncture, diclofenac sodium or conventional orthopaedic therapy. Acupuncture also significantly improved abduction degree of the shoulder joint comparing to sham acupuncture and other therapy (Trager psychophysical integration or conventional orthopaedic therapy) at the end of treatment. However, the effects of nerve block on all the directions of shoulder movement were better than acupuncture after one session of treatment.

When combined with other treatment (ie. Western medication, Tuina, joint mobilization, and/or exercise), acupuncture did not show additional effects to naproxen sodium or Xylocaine for nerve block on pain relief or improvement of abduction ROM at the end of treatment period; however, acupuncture was more beneficial for alleviating pain and improving flexion degree as an adjunct therapy to Tuina after two weeks' treatment. When Tuina or exercise was used co-intervention, EA did not demonstrate better effects than interferential electrotherapy.

Only about one sixth of included RCTs monitored adverse events. No severe adverse events were observed.

The assessment of risk of bias indicated that most of included RCTs had high risk in performance bias (blinding of participants), as well as unclear risk in selection bias (allocation concealment), detection bias (blinding of outcome assessment), attrition bias (incomplete outcome data), and reporting bias (selective reporting). These findings implied that the quality of included trials was low.

### 7.1.2 Summary of main results of included non-RCTs

This review included six non-RCTs comparing acupuncture with Western medication or other therapy (such as physical therapy, joint mobilisation), with or without co-intervention are reported. All of these studies claimed that the treatment group was more effective than the control group. Majority of them applied the "effective rate" as the outcome measure to evaluate the improvement of symptoms based on the change of pain intensity and ROM. However, none of them clearly described the scale/scoring system used for the assessment. Therefore, meta-analysis was not performed for data synthesis.

In addition, the risk of bias assessment also shows high risk existed in selection bias (random sequence generation) and performance bias (blinding of participants) across all the included studies as well as blinding of outcome assessment for half of included non-RCTs. There was unclear risk in selection bias (allocation of concealment), attrition bias (incomplete outcome data), reporting bias (selective reporting) and other bias (baseline imbalance as well as validity and feasibility of selection criteria) across most of papers, as well as in detection bias (blinding of outcome assessment) for half of included studies.

Only two studies monitored the adverse events and no adverse events related to acupuncture treatment were observed.

Although majority of included RCTs and non-RCTs reported positive results of acupuncture treatment, these results need to be interpreted with great caution as the quality of included studies is generally low due to high or unclear risk of bias, small sample size and unexplained substantial heterogeneity. Detailed discussion is provided in 7.3 Quality of the evidence.

## 7.2 Overall completeness and applicability of the evidence

The current review searched 13 English and three Chinese databases to identify the currently available RCTs and non-RCTs to be included. Traditional Chinese manual acupuncture or EA for treating adult patients with SP was considered.

Although the included studies adopted different acupuncture prescriptions, some acupoints were popularly used across both RCTs and non-RCTs. The top 10 most

frequently used acupoints were Jianyu (LI 15), Jianliao (TE 14), Jianzhen (SI 9), Jianqian (extra), Quchi (LI 11), Hegu (LI 4), Ashi, Binao (LI 14), Tiaokou (ST 38), and Waiguan (TE 5). These acupoints are widely used in clinical practice to release the exterior, expel Wind, promote the Qi movement, remove blood stasis and relieve pain. More than half of them are local points to treat the shoulder condition. Distal points were also selected to address the condition. In addition, majority of included studies compared acupuncture plus co-intervention (such as acupuncture, Western medication, Tuina, joint mobilisation and exercise) with co-intervention alone (24 trials) or with other therapy (such as Western medication and exercise) and co-intervention (five trials). This reflects the fact that it is a common practice to apply acupuncture as an adjunct therapy to conventional treatment or exercise for pain management.

The trials conducted outside mainland China reported acupuncture's effects with measurable outcomes (such as VAS and degree of ROM). However, the trials performed in mainland China tended to use the "effective rate" to demonstrate acupuncture's effects. Although the effective rate was calculated based on the change of pain intensity and ROM, the detailed data for each outcome were normally not reported which leads to difficult data synthesis. Separate reporting of individual outcome measure will make comparison of different studies possible. Furthermore, it will provide detailed and reliable evidence to clinical practice. Another important issue worth pointing out is that few of included studies assessed quality of life of SP sufferers. It is believed that assessment of quality of life is critical for Chinese medicine research as Chinese medicine focuses on the maintenance of the Yin-Yang balance of the entire body rather than targeting a specific symptom or pathological change then improves the life quality (Wong & Leung, 2008). Therefore, using a

validated questionnaire to measure quality of life should be considered in the future research for SP.

Generally speaking, findings from the present review reflect the up-to-date management of SP. Acupuncture seems effective and safe for managing SP. However, due to numerous confounding variables, such as age (19 to 90), sample size (17 to 424), number of acupoints (one to 13), treatment period (one day to 8 weeks), and low quality of studies, an ideal treatment regime is yet to be developed.

## 7.3 Quality of the evidence

In general, the quality of all the included RCTs and non-RCTs was consistently low due to methodological limitations, small sample size and unexplained heterogeneity.

Methodological limitations refer to high or unclear risk of bias in selection (random sequence generation and/or allocation concealment), performance, detection, attrition and reporting across majority of the studies. All the included RCTs claimed that randomisation was used. However, only 21 of them provided appropriate method used for randomisation and four of them reported the methods for allocation of randomisation. Apparently, all the non-RCTs did not apply randomisation for allocation of participants. The purpose of randomisation is to minimise bias in assigning treatment and facilitate the blinding of the treatment identity from investigators, participants and outcome assessors (Rosenberger & Lachin, 2004). Misuse of randomisation may lead to selection bias. Although it is impossible to blind the practitioners to perform acupuncture treatment, blinding of participants and outcome assessors are critical as the results of RCTs without blinding tend to generate more bias towards beneficial effects when the RCTs involve subjective

outcomes (Wood et al., 2008). In the current review, only seven RCTs blinded participants and 10 RCTs blinded the outcome assessors. None of non-RCTs blinded the outcome assessors. None of non-RCTs blinded participants or outcome measures. The high ratio of positive results from the included studies in this review needs to be cautious.

Substantial heterogeneity existed in a number of outcomes such as pain intensity (by VAS) (acupuncture compared to sham acupuncture) and ROM at the end of treatment (acupuncture plus Western medicine versus Western medication alone). The substantial heterogeneity may be attributed to a number of factors, including study factors (eg. quality of reporting), participant factors (eg. age, gender, diagnosis) and treatment factors (eg. co-intervention, formulation) However, due to the limited number of trials involved, subgroup analysis was not performed to identify the confounding variables.

## 7.4 Agreements and disagreements with other studies or reviews

As described in Chapter 3.5, three systematic reviews of RCTs using acupuncture for the management of SP have been published (Green et al., 2005; J. A. Lee et al., 2012; W. M. Peng et al., 2007). This current review has some similarities and differences from those published papers.

Firstly, this systematic review more performed comprehensive literature searches on 13 English databases and three Chinese databases. The Green's Cochrane systematic searched four English databases (Green et al., 2005); the Peng's review searched three English databases and two Chinese databases; and the Lee's review searched five English databases, five Korean databases and one Chinese database.

Secondly, the current review identified 38 RCTs and six non-RCTs to assess the effects and safety of acupuncture for the treatment of SP which was limited to the musculoskeletal condition. The Green and Peng's reviews included 9 and 6 RCTs respectively. Interestingly, there were only two duplicated RCTs in these two reviews although both of them focused on the similar SP condition to the present review. The Lee's review emphasised on SP after stroke and included seven RCTs.

Thirdly, the current review followed the Cochrane Handbook's instructions and assessed the risk of bias of each study. However, the other three reviews assessed the methodological quality using risk of bias, Modified Jadad Scores (MJS) and Cochrane Back Review Group Criteria List for Methodologic Quality Assessment of RCTs (CBRG). Consistent with those three reviews, this review also believes that the included studies were of low quality.

Finally, similar to the Green and Peng's reviews, the current review also found some promising results of acupuncture for treating SP. However, due to the high/unclear risks of bias and substantial heterogeneity across all the included studies, large scale RCTs with rigorous design are required to confirm the findings.

# CHAPTER EIGHT

# GENERAL CONCLUSIONS

This chapter discusses the strengths and limitations of the entire project on acupuncture for the treatment of SP. Furthermore, recommendations are made for future clinical practice and research studies.

## 8.1 Main achievements

This project investigated the effectiveness and safety of acupuncture for the management of adult patients with SP by systematically reviewing 38 RCTs and six non-RCTs. The findings of this review have identified some positive results of acupuncture for treating SP. However, there were several methodological weaknesses in these studies, including:

- Sham control was not used;
- Methods used for randomisation and allocation concealment were inappropriate and/or not provided;
- Blinding of assessors was not involved;
- Validated outcome measures for pain management were not used;
- Clinical effectiveness was presented as an effective rate without using measurable criteria;
- ITT analysis method was not applied.

Therefore, due to low methodological quality of included studies, the positive results need to be interpreted with caution. A rigorously designed RCT to overcome all the identified weaknesses is warranted.

## 8.2 Strengths and limitations

### 8.2.1 Strengths of the study

This study conducted a systematic review strictly following the methods specified in the Cochrane Handbook for Systematic Reviews of Interventions (Version 5.1) (Higgins, 2011). This ensures the quality of the current study is equivalent to that of a Cochrane systematic review. With the assumption that the quality of included RCTs was low, non-RCTs were included in the review as well.

### 8.2.2 Limitations of the study

The current study only searched the English and Chinese electronic databases to identify potential studies published in English and Chinese due to language barriers and limited access to databases developed in other languages. Therefore, the papers published in other languages such as Korean, Japanese or German may have been missed out. In addition, the present review did not incorporate unpublished data which may result in the loss of important information in the field.

## 8.3 Implication for clinical practice

Findings from the current review indicated that acupuncture might benefit the treatment of SP when applying acupuncture alone or as an adjunct therapy to Tuina or exercise. However, there were numerous confounders in the included studies, such as application of different acupoints with various treatment duration and high risks of bias. Therefore an ideal standardised treatment regime for clinical practice cannot be developed.

The preliminary findings support the beneficial effect of acupuncture in reducing pain and improving ROM. Local and distal acupoints can be considered to choose for SP.

Acupuncture can be performed from one day to eight weeks either by itself or as an additional therapy. As the overall quality of included studies was low, the current findings need to be confirmed in future well-designed RCTs.

## 8.4 Implication for future research

Future RCTs need to address the weaknesses identified in the current review. The study design is preferred to be of a large scale, randomised, double-blind, sham-controlled clinical trial. The methods used for random sequence generation and allocation concealment should be clearly described. Although it is infeasible to blind the practitioners who perform the acupuncture treatment in a RCT, the participants and personnel (such as the investigators for diagnosis and outcome assessment) involved in the trial should be properly blinded. It is essential to provide the information on acupoints, insertion depth, retention time and treatment duration of acupuncture and sham acupuncture. Moreover, all adverse events and withdrawals/drop-outs with their reasons for each group should be recorded and reported clearly.

RCTs should focus on assessing one fixed acupuncture prescription for one targeted Chinese medicine syndrome and evaluate the short-term, intermediate-term and/or long-term effects in addition to the immediate effects. Validated instruments for outcome measures should be used to assess the clinical effects of the intervention. Quality of life should be assessed as one of the key outcome measures.

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# APPENDICES

## Appendix 1: Search strategies

### 1) Cochrane Central Register of Controlled Trials

| | |
|---|---|
| #1 | (acupuncture):ti,ab,kw OR (needle):ti,ab,kw OR (electroacupuncture):ti,ab,kw OR "electro acupuncture":ti,ab,kw |
| #2 | (shoulder):ti,ab,kw OR "rotator cuff":ti,ab,kw OR "acromioclavicular joint":ti,ab,kw OR "glenohumeral joint":ti,ab,kw |
| #3 | (pain):ti,ab,kw OR (complaint):ti,ab,kw OR (arthritis):ti,ab,kw OR (bursitis):ti,ab,kw |
| #4 | (tendinitis):ti,ab,kw OR (tendonitis):ti,ab,kw OR (tears):ti,ab,kw |
| #5 | (#3 OR #4) |
| #6 | "shoulder pain":ti,ab,kw OR "humeroscapularperiarthritis":ti,ab,kw OR "adhesive capsulitis":ti,ab,kw OR "frozen shoulder":ti,ab,kw OR "shoulder impingement syndrome":ti,ab,kw |
| #7 | #1 AND #2 AND #5 |
| #8 | #1 AND #6 |
| #9 | #7 OR #8 |
| #10 | #9 in Trials |

### 2) PUBMED

| | |
|---|---|
| #1 | acupuncture[Title/Abstract] |
| #2 | acupuncture[MeSH Terms] |
| #3 | needle[Title/Abstract] |
| #4 | needle[MeSH Terms] |
| #5 | electroacupuncture[Title/Abstract] |
| #6 | electroacupuncture[MeSH Terms] |
| #7 | "electro acupuncture"[Title/Abstract] |
| #8 | "electro acupuncture"[MeSH Terms] |
| #9 | #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 |
| #10 | Shoulder[Title/Abstract] |
| #11 | Shoulder[MeSH Terms] |
| #12 | "rotator cuff"[Title/Abstract] |
| #13 | "rotator cuff"[MeSH Terms] |
| #14 | “Acromioclavicular joint”[Title/Abstract] |
| #15 | “Acromioclavicular joint”[MeSH Terms] |
| #16 | “Glenohumeral joint”[Title/Abstract] |
| #17 | “Glenohumeral joint”[MeSH Terms] |
| #18 | #10 OR #11 OR #12 OR #13 OR#14 OR #15 OR #16 OR #17 |
| #19 | Pain[Title/Abstract] |
| #20 | Pain[MeSH Terms] |
| #21 | complaint[Title/Abstract] |
| #22 | complaint[MeSH Terms] |
| #23 | arthritis[Title/Abstract] |
| #24 | arthritis[MeSH Terms] |
| #25 | Bursitis[Title/Abstract] |
| #26 | Bursitis[MeSH Terms] |
| #27 | Tendinitis[Title/Abstract] |
| #28 | Tendinitis[MeSH Terms] |
| #29 | Tendonitis[Title/Abstract] |
| #30 | Tendonitis[MeSH Terms] |
| #31 | Tears[Title/Abstract] |
| #32 | Tears[MeSH Terms] |

| | |
|---|---|
| #33 | #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 |
| #34 | “Shoulder pain”[Title/Abstract] |
| #35 | “Shoulder pain”[MeSH Terms] |
| #36 | “adhesive capsulitis”[Title/Abstract] |
| #37 | “adhesive capsulitis”[MeSH Terms] |
| #38 | "humeroscapularperiarthritis"[Title/Abstract] |
| #39 | "humeroscapularperiarthritis"[MeSH Terms] |
| #40 | “frozen shoulder”[Title/Abstract] |
| #41 | “frozen shoulder”[MeSH Terms] |
| #42 | “shoulder impingement syndrome”[Title/Abstract] |
| #43 | “shoulder impingement syndrome”[MeSH Terms] |
| #44 | #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 |
| #45 | #9 AND #18 AND #33 |
| #46 | #9 AND #44 |
| #47 | #45 OR #46 |

## 3) EMBASE

| | |
|---|---|
| #1 | acupuncture/ |
| #2 | acupuncture.m_titl. |
| #3 | needle/ |
| #4 | needle.m_titl. |
| #5 | electroacupuncture/ |
| #6 | electroacupuncture.m_titl. |
| #7 | "electro acupuncture".mp. |
| #8 | "electro acupuncture".m_titl. |
| #9 | #1 OR#2 OR#3 OR#4 OR#5 OR#6 OR#7 OR#8 |
| #10 | shoulder/ |
| #11 | shoulder.m_titl. |
| #12 | rotator cuff/ |
| #13 | "rotator cuff".m_titl. |
| #14 | acromioclavicular joint/ |
| #15 | "acromioclavicular joint".m_titl. |
| #16 | "glenohumeral joint".mp. |
| #17 | "glenohumeral joint".m_titl. |
| #18 | #10 OR#11 OR#12 OR#13 OR#14 OR#15 OR#16 OR#17 |
| #19 | pain/ |
| #20 | pain.m_titl. |
| #21 | complaint.mp. |
| #22 | complaint.m_titl. |
| #23 | arthritis/ |
| #24 | arthritis.m_titl. |
| #25 | bursitis/ |
| #26 | bursitis.m_titl. |
| #27 | tendinitis/ |
| #28 | tendinitis.m_titl. |
| #29 | tendonitis.mp. |
| #30 | tendonitis.m_titl. |
| #31 | tears.mp. |
| #32 | tears.m_titl. |
| #33 | #19 OR#20 OR#21 OR#22 OR#23 OR#24 OR#25 OR#26 OR#27 OR#28 OR#29 OR#30 OR#31 OR#32 |
| #34 | shoulder pain/ |
| #35 | "shoulder pain".m_titl. |
| #36 | "adhesive capsulitis".mp. |
| #37 | "adhesive capsulitis".m_titl. |
| #38 | Humeroscapular periarthritis/ |

| | |
|---|---|
| #39 | "humeroscapular periarthritis".m_titl. |
| #40 | frozen shoulder/ |
| #41 | "frozen shoulder".m_titl. |
| #42 | shoulder impingement syndrome/ |
| #43 | "shoulder impingement syndrome".m_titl. |
| #44 | #34 OR#35 OR#36 OR#37 OR#38 OR#39 OR#40 OR#41 OR#42 OR#43 |
| #45 | #9 AND #18 AND #33 |
| #46 | #9 AND #44 |
| #47 | #45OR  #46 |

## 4) CINAHL

| | |
|---|---|
| #1 | Acupuncture [TI] |
| #2 | Acupuncture [AB] |
| #3 | Acupuncture [MW] |
| #4 | Acupuncture [MH] |
| #5 | Needle [TI] |
| #6 | Needle [AB] |
| #7 | Needle [MW] |
| #8 | Electroacupuncture [TI] |
| #9 | Electroacupuncture [AB] |
| #10 | Electroacupuncture [MW] |
| #11 | Electroacupuncture [MH] |
| #12 | #1 OR#2 OR#3 OR#4 OR#5 OR#6 OR#7 OR#8 OR#9 OR#10 OR#11 |
| #13 | Shoulder [TI] |
| #14 | Shoulder [AB] |
| #15 | Shoulder [MW] |
| #16 | Shoulder [MH] |
| #17 | “Rotator cuff”[TI] |
| #18 | “Rotatorcuff”[AB] |
| #19 | “Rotatorcuff”[ [MW] |
| #20 | “Rotatorcuff”[ [MH] |
| #21 | “Acromioclavicular joint”[TI] |
| #22 | “Acromioclavicular joint”[AB] |
| #23 | “Acromioclavicular joint”[MW] |
| #24 | “Acromioclavicular joint”[MH] |
| #25 | “Glenohumeraljoint” [TI] |
| #26 | “Glenohumeral joint” [AB] |
| #27 | “Glenohumeraljoint” [MW] |
| #28 | “Glenohumeral joint” [MH] |
| #29 | #13 OR#14 OR#15 OR#16 OR#17 OR#18 OR#19 OR#20 OR#21 OR#22 OR#23 OR#24 OR#25 OR#26 OR#27 OR#28 |
| #30 | Pain [TI] |
| #31 | Pain [AB] |
| #32 | Pain [MW] |
| #33 | Pain [MH] |
| #34 | Complaint [TI] |
| #35 | Complaint [AB] |
| #36 | arthritis [TI] |
| #37 | arthritis [AB] |
| #38 | arthritis [MW] |
| #39 | arthritis [MH] |
| #40 | Bursitis [TI] |
| #41 | Bursitis [AB] |
| #42 | Bursitis [MW] |
| #43 | Bursitis [MH] |
| #44 | Tendinitis [TI] |
| #45 | Tendinitis [AB] |
| #46 | Tendinitis [MW] |

| | |
|---|---|
| #47 | Tendonitis [TI] |
| #48 | Tendonitis [AB] |
| #49 | Tendonitis [MW] |
| #50 | Tears [TI] |
| #51 | Tears [AB] |
| #52 | Tears [MW] |
| #53 | Tears [MH] |
| #54 | #30 OR#31 OR#32 OR#33 OR#34 OR#35 OR#36 OR#37 OR#38 OR#39 OR#40 OR#41 OR#42 OR#43 OR#44 OR#45 OR#46 OR#47 OR#48 OR#49 OR#50 OR#51 OR#52 OR#53 |
| #55 | “Shoulder pain” [TI] |
| #56 | “Shoulder pain” [AB] |
| #57 | “Shoulder pain” [MW] |
| #58 | “Shoulder pain” [MH] |
| #59 | “adhesive capsulitis” [TI] |
| #60 | “adhesive capsulitis” [AB] |
| #61 | “adhesive capsulitis” [MW] |
| #62 | “frozen shoulder” [TI] |
| #63 | “frozen shoulder” [AB] |
| #64 | “shoulder impingement syndrome” [TI] |
| #65 | “shoulder impingement syndrome” [AB] |
| #66 | “shoulder impingement syndrome” [MW] |
| #67 | #55 OR#56 OR#57 OR#58 OR#59 OR#60 OR#61 OR#62 OR#63 OR#64 OR#65 OR#66 |
| #68 | #12 AND#29 AND#54 |
| #69 | #12 AND#67 |
| #70 | #68 OR#69 |

## 5) Science Direct

| | |
|---|---|
| #1 | TITLE-ABSTR-KEY(acupuncture) |
| #2 | TITLE-ABSTR-KEY(needle) |
| #3 | TITLE-ABSTR-KEY(electroacupuncture) |
| #4 | TITLE-ABSTR-KEY("electro acupuncture") |
| #5 | #1 OR #2 OR #3 OR #4 |
| #6 | TITLE-ABSTR-KEY(shoulder) |
| #7 | TITLE-ABSTR-KEY("rotator cuff") |
| #8 | TITLE-ABSTR-KEY("acromioclavicular joint") |
| #9 | TITLE-ABSTR-KEY("glenohumeral joint") |
| #10 | #6 OR #7 OR #8 OR #9 |
| #11 | TITLE-ABSTR-KEY(pain) |
| #12 | TITLE-ABSTR-KEY(complaint) |
| #13 | TITLE-ABSTR-KEY(arthritis) |
| #14 | TITLE-ABSTR-KEY(bursitis) |
| #15 | TITLE-ABSTR-KEY(tendinitis) |
| #16 | TITLE-ABSTR-KEY(tendonitis) |
| #17 | TITLE-ABSTR-KEY(tears) |
| #18 | #11 OR #12 OR #13 OR #14 OR #15 |
| #19 | #16 OR #17 |
| #20 | #18 OR #19 |
| #21 | TITLE-ABSTR-KEY(“Shoulder pain”) |
| #22 | TITLE-ABSTR-KEY(“humeroscapularperiarthritis”) |
| #23 | TITLE-ABSTR-KEY(“adhesive capsulitis”) |
| #24 | TITLE-ABSTR-KEY(“frozen shoulder”) |
| #25 | TITLE-ABSTR-KEY(“shoulder impingement syndrome”) |
| #26 | #21 OR #22 OR #23 OR #24 OR #25 |
| #27 | #5 AND#10 AND#20 |
| #28 | #5 AND#26 |
| #29 | #27 OR#28 |

## 6) Pro Quest

| | |
|---|---|
| #1 | su(acupuncture) OR ab(acupuncture) OR ti(acupuncture) |
| #2 | su(needle) OR ab(needle) OR ti(needle) |
| #3 | su(electroacupuncture) OR ab(electroacupuncture) OR ti(electroacupuncture) |
| #4 | su("electro acupuncture") OR ab("electro acupuncture") OR ti("electro acupuncture") |
| #5 | #1 OR #2 OR #3 OR #4 |
| #6 | su(shoulder) OR ab(shoulder) OR ti(shoulder) |
| #7 | su("rotator cuff") OR ab("rotator cuff") OR ti("rotator cuff") |
| #8 | su("acromioclavicular joint") OR ab("acromioclavicular joint") OR ti("acromioclavicular joint") |
| #9 | su("glenohumeral joint") OR ab("glenohumeral joint") OR ti("glenohumeral joint") |
| #10 | #6 OR #7 OR #8 OR #9 |
| #11 | su(pain) OR ab(pain) OR ti(pain) |
| #12 | su(complaint) OR ab(complaint) OR ti(complaint) |
| #13 | su(arthritis) OR ab(arthritis) OR ti(arthritis) |
| #14 | su(bursitis) OR ab(bursitis) OR ti(bursitis) |
| #15 | su(tendinitis) OR ab(tendinitis) OR ti(tendinitis) |
| #16 | su(tendonitis) OR ab(tendonitis) OR ti(tendonitis) |
| #17 | su(tears) OR ab(tears) OR ti(tears) |
| #18 | #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 |
| #19 | su("shoulder pain") OR ab("shoulder pain") OR ti("shoulder pain") |
| #20 | su("adhesive capsulitis") OR ab("adhesive capsulitis") OR ti("adhesive capsulitis") |
| #21 | ab(humeroscapularperiarthritis) OR ti(humeroscapularperiarthritis) OR su(humeroscapularperiarthritis) |
| #22 | su("frozen shoulder") OR ab("frozen shoulder") OR ti("frozen shoulder") |
| #23 | su("shoulder impingement syndrome") OR ab("shoulder impingement syndrome") OR ti("shoulder impingement syndrome") |
| #24 | #19 OR #20 OR #21 OR #22 OR #23 |
| #25 | #5AND #10 AND #18 |
| #26 | #5 AND#24 |
| #27 | #25 OR #26 |

## 7) WEB OF KNOWLEDGE

| | |
|---|---|
| #1 | Title=(acupuncture) OR Topic=(acupuncture) |
| #2 | Title=(needle) OR Topic=(needle) |
| #3 | Title=(electroacupuncture) OR Topic=(electroacupuncture) |
| #4 | Title=("electro acupuncture") OR Topic=("electro acupuncture") |
| #5 | #1 OR #2 OR #3 OR #4 |
| #6 | Title=(shoulder) OR Topic=(shoulder) |
| #7 | Title=("rotator cuff") OR Topic=("rotator cuff") |
| #8 | Title=("acromioclavicular joint") OR Topic=("acromioclavicular joint") |
| #9 | Title=("glenohumeral joint") OR Topic=("glenohumeral joint") |
| #10 | #6 OR #7 OR #8 OR #9 |
| #11 | Title=(pain) OR Topic=(pain) |
| #12 | Title=(complaint) OR Topic=(complaint) |
| #13 | Title=(arthritis) OR Topic=(arthritis) |
| #14 | Title=(bursitis) OR Topic=(bursitis) |
| #15 | Title=(tendinitis) OR Topic=(tendinitis) |
| #16 | Title=(tendonitis) OR Topic=(tendonitis) |
| #17 | Title=(tears) OR Topic=(tears) |
| #18 | #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 |

| | |
|---|---|
| #19 | Title=("shoulder pain") OR Topic=("shoulder pain") |
| #20 | Title=("adhesive capsulitis") OR Topic=("adhesive capsulitis") |
| #21 | Title=("frozen shoulder") OR Topic=("frozen shoulder") |
| #22 | Title=("shoulder impingement syndrome") OR Topic=("shoulder impingement syndrome") |
| #23 | Title=("humeroscapularperiarthritis") OR Topic=("humeroscapularperiarthritis") |
| #24 | #19 OR #20 OR #21 OR #22 OR #23 |
| #25 | #5AND #10 AND #18 |
| #26 | #5AND #24 |
| #27 | #25 OR #26 |

## 8) Informit

| | |
|---|---|
| #1 | TI=(acupuncture) |
| #2 | SUBJECT=(acupuncture) |
| #3 | TI=(needle) |
| #4 | SUBJECT=(needle) |
| #5 | TI=(electroacupuncture) |
| #6 | SUBJECT=(electroacupuncture) |
| #7 | TI=("electro acupuncture") |
| #8 | SUBJECT=("electro acupuncture") |
| #9 | #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 |
| #10 | TI=(shoulder) |
| #11 | SUBJECT=(shoulder) |
| #12 | TI=("rotator cuff") |
| #13 | SUBJECT=("rotator cuff") |
| #14 | TI=("acromioclavicular joint") |
| #15 | SUBJECT=("acromioclavicular joint") |
| #16 | TI=("glenohumeral joint") |
| #17 | SUBJECT=("glenohumeral joint") |
| #18 | #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 |
| #19 | TI=(pain) |
| #20 | SUBJECT=(pain) |
| #21 | TI=(complaint) |
| #22 | SUBJECT=(complaint) |
| #23 | TI=(arthritis) |
| #24 | SUBJECT=(arthritis) |
| #25 | TI=(bursitis) |
| #26 | SUBJECT=(bursitis) |
| #27 | TI=(tendinitis) |
| #28 | SUBJECT=(tendinitis) |
| #29 | TI=(tendonitis) |
| #30 | SUBJECT=(tendonitis) |
| #31 | TI=(tears) |
| #32 | SUBJECT=(tears) |
| #33 | #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 |
| #34 | TI=("shoulder pain") |
| #35 | SUBJECT=("shoulder pain") |
| #36 | TI=("adhesive capsulitis") |
| #37 | SUBJECT=("adhesive capsulitis") |
| #38 | TI=("frozen shoulder") |
| #39 | SUBJECT=("frozen shoulder") |
| #40 | TI=("shoulder impingement syndrome") |
| #41 | SUBJECT=("shoulder impingement syndrome") |
| #42 | #34 OR #35 OR #36 OR #37 OR # 38 OR #39 OR #40 OR #41 |
| #43 | #9 AND #18 AND #33 |
| #44 | #9 AND #42 |
| #45 | #43 AND #44 |

## 9) LILACS

| | |
|---|---|
| #1 | acupuncture shoulder |

## 10) Blackwell Synergy

| | |
|---|---|
| #1 | acupuncture in Article Titles AND shoulder in Article Titles |

## 11) KoreaMed

| | |
|---|---|
| #1 | acupuncture [ALL] shoulder [ALL] |

## 12) INDMED

| | |
|---|---|
| #1 | acupuncture [Title] shoulder [Title] |

## 13) Ingenta

| | |
|---|---|
| #1 | Title, Keywords OR Abstract contains ‘acupuncture shoulder’ |
| #2 | Title, Keywords OR Abstract contains ‘electroacupuncture shoulder’ |
| #3 | #1 OR #2 |

## 14) VIP

| | |
|---|---|
| #1 | M=((肩+肩袖+回旋套+旋转套+肩关节+肩锁关节)*(针灸+针刺+电针)*(痛+炎+撕裂+关节炎+滑囊炎+黏液囊炎+腱炎)+ (肩痛+肩周炎+肩凝症+冰冻肩+粘连性肩关节囊周围炎+肩关节夹挤症候群+肩撞击综合征+肩夹击症候群+肩冲击综合症)*(针灸+针刺+电针)* (痛+炎+撕裂+关节炎+滑囊炎+黏液囊炎+腱炎)) |

## 15) CNKI

| | |
|---|---|
| #1 | ((TI=肩 OR TI=肩袖 OR TI=回旋套 OR TI=肩关节 OR TI=肩锁关节) AND (TI=痛 OR TI=炎 OR TI=撕裂 OR TI=关节炎 OR TI=滑囊炎 OR TI=黏液囊炎 OR TI=腱炎) AND (TI=针灸 OR TI=针刺 OR TI=电针)) OR ((TI= 肩痛 OR TI=肩周炎 OR TI=肩凝症 OR TI=冰冻肩 OR TI=粘连性肩关节囊周围炎 OR TI=肩关节夹挤症候群 OR TI=肩撞击综合征 OR TI=肩夹击症候群 OR TI=肩冲击综合症) AND (TI=针灸 OR TI=针刺 OR TI=电针)) |
| #2 | ((SU=肩 OR SU=肩袖 OR SU=回旋套 OR SU=肩关节 OR SU=肩锁关节) AND (SU=痛 OR SU=炎 OR SU=撕裂 OR SU=关节炎 OR SU=滑囊炎 OR SU=黏液囊炎 OR SU=腱炎) AND (SU=针灸 OR SU=针刺 OR SU=电针)) OR ((SU=肩痛 OR SU=肩周炎 OR SU=肩凝症 OR SU=冰冻肩 OR SU=粘连性肩关节囊周围炎 OR SU=肩关节夹挤症候群 OR SU=肩撞击综合征 OR SU=肩夹击症候群 OR SU=肩冲击综合症) AND (SU=针灸 OR SU=针刺 OR SU=电针)) |
| #3 | #1 OR #2 |

## 16) WANFANGDATA

| | |
|---|---|
| #1 | (TITLE=针灸 OR TITLE=针刺 OR TITLE=电针 OR KEYWORDS=针灸 OR KEYWORDS=针刺 OR KEYWORDS=电针) AND (TITLE=肩痛 OR TITLE=肩周炎 OR TITLE=肩凝症 OR TITLE=冰冻肩 OR TITLE=粘连性肩关节囊周围炎 OR TITLE=肩关节夹挤症候群 OR TITLE=肩撞击综合征 OR TITLE=肩夹击症候群 OR TITLE=肩冲击综合症 ORKEYWORDS=肩痛 OR KEYWORDS=肩周炎 OR KEYWORDS=肩凝症 OR KEYWORDS=冰冻肩 OR KEYWORDS=粘连性肩关节囊周围炎 OR KEYWORDS=肩关节夹挤症候群 OR KEYWORDS=肩撞击综合征 OR KEYWORDS=肩夹击症候群 OR KEYWORDS=肩冲击综合症) |
| #2 | (TITLE=针灸 OR TITLE=针刺 OR TITLE=电针 OR KEYWORDS=针灸 OR KEYWORDS=针刺 OR KEYWORDS=电针) AND (TITLE=肩 OR TITLE=肩袖 OR TITLE=回旋套 OR TITLE=肩关节 OR TITLE=肩锁关节 ORKEYWORDS=肩 OR KEYWORDS=肩袖 OR KEYWORDS=回旋套 OR KEYWORDS=肩关节 OR KEYWORDS=肩锁关节) AND (TITLE=痛 OR TITLE=炎 OR TITLE=撕裂 OR TITLE=关节炎 OR TITLE=滑囊炎 OR TITLE=黏液囊炎 OR TITLE=腱炎 ORKEYWORDS=痛 OR KEYWORDS=炎 OR KEYWORDS=撕裂 OR KEYWORDS=关节炎 OR KEYWORDS=滑囊炎 OR KEYWORDS=黏液囊炎 OR KEYWORDS=腱炎) |
| #3 | #1 OR #2 |

## Appendix 2: Data extraction form template

| | Study 1 | Study 2 |
|---|---|---|
| Title | | |
| Author | | |
| Publication | | |
| Language of publication | | |
| Year of publication | | |
| Country | | |
| Rural/city | | |
| Single centre / multicentre | | |
| Setting (out-patient/in-patient) | | |
| Aim of intervention | | |
| Aim of the study | | |
| Sponsor | | |
| Informed consent obtained (Yes/No/Unclear) | | |
| Ethical approval (Yes/No/Unclear) | | |
| Funding (including source, amount, if stated). | | |
| Statistical methods and their appropriateness (if relevant) | | |
| **Types of studies** | | |
| **RCT/non-RCT** | | |
| **Quality** | | |
| Randomisation sequence generation (High/Unclear/Low risk) | | |
| Allocation concealment (High/Unclear/Low risk) | | |
| Blinding of participants (High/Unclear/Low risk) | | |
| Blinding of administrator of treatment (High/Unclear/Low risk) | | |
| Blinding of outcome assessment (High/Unclear/Low risk) | | |
| Described incomplete outcome data (dropout/losses to follow-up/withdrawals) (High/Unclear/Low risk) | | |
| Incomplete outcome bias (High/Unclear/Low risk) | | |
| Selective bias (High/Unclear/Low risk) | | |
| Intention-to- treat analysis (ITT) | | |
| Baseline comparisons | | |
| Adequate follow-up | | |
| **Other criteria** | | |
| Parallel study (yes/no) | | |
| Sham controlled | | |
| Active medication(s) controlled | | |
| Cross-over study | | |
| Run-in period | | |
| Wash-out period (for cross-over trials) | | |
| Carryover effect described (for cross-over trials) | | |
| Period effect described | | |
| **Participants** | | |
| Description (eg. Patients/consumers; carers; parents of patients/consumers; health professionals; well people in the community) | | |
| Geographic location (eg. City/State/Country) | | |
| Sample collection time | | |
| Methods of recruitment of participants | | |
| Setting (eg. Community, home, primary health centre, acute care hospital, extended care facility) | | |
| Age (range) | | |
| Age (mean, SD) | | |
| Age (range, mean, SD) [intervention] | | |

| | Study 1 | Study 2 |
|---|---|---|
| Age (range, mean, SD) [control] | | |
| Gender (if relevant) | | |
| Ethnicity (if relevant) | | |
| Inclusion criteria for participation in study | | |
| Exclusion criteria for participation in study | | |
| Principal health problem or diagnosis (if relevant) | | |
| Chinese medicine syndromes (diagnosis) | | |
| Other health problem/s (if relevant) | | |
| Stage of problem/illness (if relevant) | | |
| Sample size | | |
| Analysed size | | |
| Withdrawals/drop-outs/lost to follow-up described | | |
| % drop-out/withdrawals/lost to follow-up | | |
| Drop out [intervention] | | |
| Drop out [control] | | |
| Reasons for drop-outs/withdrawals/losses to follow-up described | | |
| Pre-defined subgroups | | |
| Post-hoc defined subgroups | | |
| Compliance measured | | |
| Compliance measured, method | | |
| n [randomised to treatment group] | | |
| n [randomised to control group] | | |
| Gender [intervention] | | |
| Gender [control] | | |
| Number of female | | |
| Number of male | | |
| Ethnicity (if relevant) [intervention] | | |
| Ethnicity (if relevant) [control] | | |
| Measurement validated | | |
| Co-intervention (s) (dose, route, timing) [intervention] | | |
| Co-intervention (s) (dose, route, timing) [control] | | |
| Similarity of groups at baseline | | |
| P score | | |
| Duration of pain before treatment | | |
| Duration of pain before treatment [intervention] | | |
| Duration of pain before treatment [control] | | |
| Pain score (mean, SD) | | |
| Pain score (mean, SD) [intervention] | | |
| Pain score (mean, SD) [control] | | |
| **Interventions [if studies have more than two groups, add extra rows]** | | |
| Comparison | | |
| Co-interventions | | |
| Arms | | |
| **Needling details** | | |
| Style of acupuncture | | |
| Side (s) of needling | | |
| Local/distal points | | |
| Names (or location if no standard name) of points used | | |
| Numbers of needles inserted per subject (mean and range where relevant) | | |
| Depth of insertion | | |
| Response sought (e.g. *De Qi* or muscle twitch response) | | |

| | Study 1 | Study 2 |
|---|---|---|
| Needle stimulation (e.g. manual or electrical) | | |
| Needle retention time | | |
| Needle type (diameter, length, and manufacturer or material) | | |
| **Treatment regimen** | | |
| Frequency of treatment | | |
| Number of treatment sessions | | |
| Duration of treatment | | |
| Duration of follow-up | | |
| **Control intervention(s)** | | |
| Number of control intervention groups | | |
| Name of control interventions | | |
| Is control or comparator sham acupuncture or any other type of acupuncture-like control is used? (yes/no) | | |
| Name of sham control intervention | | |
| Dose | | |
| Style of acupuncture | | |
| Number of needle insertions per subject per session (mean and range where relevant) | | |
| Names (or location if no standard name) of points used (uni/bilateral) | | |
| Depth of insertion, based on a specified unit of measurement, or on a particular tissue level | | |
| Response sought (e.g. *De Qi* or muscle twitch response) | | |
| Needle stimulation (e.g. manual, electrical) | | |
| Needle/control treatment retention time | | |
| Needle type (diameter, length, and manufacturer or material) | | |
| Frequency and duration of treatment sessions | | |
| Number of treatment sessions | | |
| Duration of treatment | | |
| Duration of follow-up | | |
| Rationale for the control or comparator in the context of the research question (e.g. active comparison, minimally active penetrating or non-penetrating sham, inert) | | |
| | | |
| Explanations given to patients of treatment and control interventions | | |
| | | |
| Sources that justify choice of control | | |
| **Co-interventions** | | |
| Other interventions (e.g. moxibustion, cupping, herbs, exercises, life-style advice) | | |
| Dose | | |
| Frequency of treatment | | |
| Number of treatment sessions | | |
| Duration of treatment | | |
| Length of follow-up | | |
| **Acupuncture rationale** | | |
| Rationale of treatment (e.g. syndrome patterns, segmental levels, trigger points) provided or individualisation used | | |
| Literature sources to justify rationale | | |
| **Practitioner background** | | |
| Description of participating acupuncturists (qualification or professional affiliation, years in acupuncture practice, other relevant experience) | | |
| **Outcome parameters [if studies have more than two groups, or if outcomes were assessed at different time points, add extra rows]** | | |
| Assess point | | |
| Outcomes | | |
| Primary outcome measure | | |

| | Study 1 | Study 2 |
|---|---|---|
| Rationale of this primary outcome measure | | |
| Method of primary outcome measure | | |
| Measurement validated | | |
| Validity and reliability of primary outcome measure | | |
| Definition of responder | | |
| Dropout evaluation | | |
| Secondary outcome measure | | |
| Method of secondary outcome measure | | |
| Measurement of secondary outcome measure validated | | |
| Validity and reliability of secondary outcome measure | | |
| Definition of responder | | |
| Dropout evaluation | | |
| Methods of follow-up for non-respondents | | |
| Frequency of outcome assessment | | |
| Length of follow up outcome assessment (for each outcome) | | |
| Adverse events (eg complaints, levels of dissatisfaction, adverse incidents, side effects) | | |
| **Notes** | | |
| Contact with author (Yes (information obtained)/No) | | |
| Power calculation | | |
| Duplicate publication | | |
| Multiple publication | | |
| Record if the study was translated from a language other than English. | | |
| **Results** | | |
| Attached sheets | | |
| P value (primary outcome) | | |
| P value (secondary outcome) | | |
| **Conclusion** | | |

# Appendix 3: Characteristics of included RCT studies

## Ceccheerelli 2001

| | |
|---|---|
| Methods | -Randomised controlled trials.<br>-Single blind (participants).<br>-2 arms. |
| Participants | -Sample size: 44.<br>-Treatment group (T): deep acupuncture (n=22).<br>-Control group (C): superficial acupuncture (n=22).<br>-Gender (female/male): total: 15/29, T: 8/14; C: 7/15.<br>-Range of ages: total: 40-65.<br>-Mean of ages (SD): T: 53.9 (11.58); C: 58.4 (8.74).<br>-Duration of pain: >3 months.<br>-Inclusion criteria: patients, males and females, 40 to 65 years of age that presented shoulder pain radiating to the superior arm during at least from 3 months with preceding episode of acute shoulder pain, contraction of rotatory muscles and/or trapezius and levator scapuli, reappearance of acute pain after functional overload,x-ray alterations (none, calcification of the head of the homerus or in the periarticular soft tissues, intervertebral spaces conserved without spondylosis, no adhesive capsulitis with anatomical compromise of the movements).<br>-Exclusion criteria: chronic systemic disease, rheumatologic illness, primary fibromyalgia, neurologic or psychiatric illness (multiple sclerosis, peripheral neuropathies, epilepsy, cerebrovascular disease, traumas of the head) or chronic assumption of benzodiazepines, chronic exposure to heavy metals or neurotoxic solvents. |
| Interventions | Treatment group (deep acupuncture):<br>-Number of points: 13.<br>-Depth of insertion: 25 mm.<br>-Stimulation method: manual.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.30*29 mm.<br>-Frequency of treatment: 2/week.<br>-Number of treatment session: 10.<br>-Duration of treatment: 5 weeks.<br><br>Control group (superficial acupuncture):<br>-Number of points: 13.<br>-Depth of insertion: 4 mm.<br>-Stimulation method: manual.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.30*29 mm.<br>-Frequency of treatment: 2/week.<br>-Number of treatment session: 10.<br>-Duration of treatment: 5 weeks. |
| Outcomes | Assessed before and post-treatment, 1 month follow-up, 3 months follow-up<br>-McGill Pain Questionnaire (MGPQ) |
| Notes | Country origin: Italy. |

## Che 2005

| | |
|---|---|
| Methods | -Randomised controlled trials.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 60.<br>-T: EA (n=30).<br>-C: Diclofenac Sodium Sustained Release Capsules (n=30). |

| | |
|---|---|
| | -Gender (female/male): total: 35/25.<br>-Mean of ages: T: 50.2; C: 49.1.<br>-Duration of pain: T: 1-6 months; C: 2 weeks-7 months.<br>-Inclusion criteria: either history of chronic strain or trauma or deficiency of Qi and blood plus being attacked by pathogenic Wind, Cold or Dampness; around fifties, more female than male, mostly physical laborers, and chronic onset; pain around shoulder, especially at night, always induced by weather changes and fatigue, motor dysfunction of shoulder joints; atrophy of the shoulder muscle, tenderness in anterior, posterior and lateral aspects of the shoulder, marked limitation of shoulder abduction with typical shoulder carrying; x-ray examination usually shows negative, and osteoporosis occurs with chronic duration.<br>-Exclusion criteria: complication of life-endangered primary diseases such as cardio-cerebral vascular, liver, kidney, and hematopoietic system problems as well as mental diseases; simultaneous administration of glucocorticosteriod drugs which may affect the curative efficacy; unwilling to participate in the study, drop out or loss of contact; pregnant women; concurrence of bone tuberculosis or tumor, acute shoulder trauma Occurs during treatment. |
| Interventions | Treatment group (EA):<br>-Treatment side: healthy side.<br>-Number of points: single.<br>-Stimulation method: electric and manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.38*40 mm.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (Diclofenac Sodium Sustained Release Capsules):<br>-Dose: 75 mg.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 2 weeks. |
| Outcomes | Assessed 15 days follow-up<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Cheing 2008

| | |
|---|---|
| Methods | -Randomised controlled trial.<br>-Double blind (participants, evaluator).<br>-3 arms.<br>-No intention to treat (ITT) analysis. |
| Participants | -Sample size: 74 randomised; 70 analysed.<br>-T: EA plus exercise (n=24).<br>-C1: interferential electrotherapy plus exercise (n=23).<br>-C2: no treatment (n=23).<br>-Gender (female/male): total: 48/22.<br>-Range of ages: total: 33-90.<br>-Range of duration of pain: total: 1-24 months.<br>-Mean of duration of pain (SD): T: 6.71 (6.5); C1: 6.7 (6.05); C2: 8.26 (7.94).<br>-Inclusion criteria: patients who reported localized pain over one shoulder, experienced night pain and had restricted active and passive shoulder motions.<br>-Exclusion criteria: a history of trauma, fractures, previous shoulder surgery, cervical or thoracic pain syndrome, complex regional pain syndrome, malignancies, on anti-coagulant therapy, or had received acupuncture |

| | |
|---|---|
| | treatment to the painful shoulder in the past 6 months.<br>-Drop-outs: 4 (2 in the treatment, no improvement; 2 in the follow-up, time restriction). |
| Interventions | Treatment group (EA plus exercise):<br>-Number of points: multi.<br>-Local/distal points: yes.<br>-Stimulation method: electric.<br>-Depth of insertion: 15- 25 mm.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.30*40 mm.<br>-Frequency of treatment: 2-3/week.<br>-Number of treatment session: 10.<br>-Duration of treatment is 4 weeks.<br>-Co-intervention: exercise.<br>-Frequency of co-intervention: 5/day.<br>-Duration of co-intervention: 6 months.<br><br>Control group (interferential electrotherapy plus exercise):<br>-Intensity: 80-120 Hz.<br>-Region of treatment: shoulder region in a coplanar arrangement.<br>-Retention time: 20 minutes.<br>-Number of treatment session: 10.<br>-Duration of treatment: 4 weeks.<br>-Co-intervention: same as treatment group<br><br>Control group (no treatment): |
| Outcomes | Assessed 1 month, 3 months, 6 months follow-up<br>-Constant Murley score (CMS)<br>-Visual analogue scale (VAS) |
| Notes | Country origin: Hong Kong, China. |

## Deng 2012

| | |
|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 72.<br>-T: acupuncture plus Tuina (n=36).<br>-C: Tuina (n=36).<br>-Gender (female/male): total: 31/41; T: 16/20; C: 15/21.<br>-Range of ages: total: 49-70; T: 50-70; C: 49-70.<br>-Mean of ages (SD): T: 59 (7); C: 58 (8).<br>-Range of duration of pain: total: 3-15 days; T: 3-14 days; C: 4-15 days.<br>-Mean of duration of pain (SD): T: 7 (3) days; C: 8 (3) days.<br>-Mean of VAS (SD): T: 6.7 (2.3); C: 6.7 (2.4).<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”).<br>-Exclusion criteria: with acute shoulder soft tissue injury, fracture, infectious inflammation, cervical vertebra diseases, rheumatoid arthritis and gout. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: 7.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Co-intervention: Tuina.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulate on acupoints: no.<br>-Duration of co-intervention: 20 minutes. |

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| | -Frequency of treatment: 1/day.<br>-Number of treatment sessions: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (Tuina):<br>-same as the treatment group. |
| Outcomes | Assessed at post-treatment<br>-Visual analogue scale (VAS)<br>-Level of TNF-α and IL-6<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Ding 2011

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 90.<br>-T: acupuncture plus Tuina (n=30).<br>-C1: Tuina (n=30).<br>-C2: acupuncture (n=30).<br>-Gender (female/male): total: 50/40; T: 16/14; C1: 18/12; C2: 16/14.<br>-Range of ages: T: 43-66, C1 46-65, C2 45-63.<br>-Mean of ages (SD): T: 52.72 (2.74); C1: 52.94 (4.68); C2: 52.31 (3.52).<br>-Mean of VAS (SD): T: 8.98 (0.51); C1: 8.98 (0.5); C2: 8.79 (0.46).<br>-Inclusion criteria: in accordance with the diagnostic criteria of scapulohumeralperiarthritis (“Disease diagnosis of TCM curative effect standard” and “The second session of periarthritis of shoulder academic seminar”); no item in the exclusion criteria; can according the plan to finish the whole treatment, and co-operate with the administers; the range of age is between 45 and 65 years; during the treatment, do not use other interventions which not belong to the this trial.<br>-Exclusion criteria: neck disease, trauma, rupture of ligament, shoulder tuberculosis, tumour, cholecystitis, rheumatoid arthritis, systemic lupus erythematosus. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: 3.<br>-Depth of insertion: 10-15 mm.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Needle type: 0.38*50 mm.<br>-Co-intervention: 4–step Tuina.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulated on acupoints: yes.<br>-Frequency of treatment: 1/day, 5 treatments rest 2 days.<br>-Number of treatment session: 10.<br>-Duration of treatment: 2 weeks.<br><br>Control group (Tuina):<br>-Tuina is same as treatment group.<br><br>Control group (acupuncture):<br>-Acupuncture is same as treatment group. |
| Outcomes | Assessed post-treatment<br>-Visual analogue scale (VAS)<br>-Range of motion (total scale used Melle score, abduction and fexion used degree, finger-spine and finger-ear distance used cm)<br>-Effective rate (no scoring system used) |

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| Notes | Country origin: Hong Kong, China. |

## Dyson-Hudson 2001

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| Methods | -Randomised controlled trial.<br>-Single blind (participants).<br>-2 arms.<br>-ITT analysis not used. |
| Participants | -Sample size: 18.<br>-T: acupuncture (n=9).<br>-C: Trager psychophysical integration (n=9)<br>-Gender (female/male): total: 4/14; T: 2/7; C: 2/7<br>-Range of ages: total: 28-69<br>-Mean of ages (SD): total: 45.1 (11.4); T: 49.6 (11.3); C: 40.6 (10.1)<br>-Mean of duration of pain (SD): total: 5.8 (4.9) years; T: 7.7 (5.6) years; C: 4 (3.5) years.<br>-Inclusion criteria: participants had to have chronic shoulder pain of musculoskeletal origin (defined as musculoskeletal pain localized to the shoulder complex for 3 months), be at least 1-year post-SCI, and use a manual wheelchair as the primary means of mobility (ie, individuals with complete and incomplete SCI, between the levels C6–T12).<br>-Exclusion criteria: subjects were excluded if they had shoulder pain of non-musculoskeletal origin, were pregnant, had a history of bleeding disorders, were using intravenous heparin, were using narcotic pain medications, or had a history of psychopathology that required hospitalization. In addition, subjects initially qualifying for the study were later excluded from further participation if they suffered severe upper-extremity trauma or experienced other medical problems that required hospitalization or surgery during their participation in the study.<br>-Drop-outs: 2.(in treatment group, unrelated medical conditions). |
| Interventions | Treatment group (acupuncture):<br>-Treatment side: both sides.<br>-Number of points: multi, up to 6 local and 2 distal points, 1 to 4 Ashi points.<br>-Depth of insertion: 10-30 mm.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.20*40 mm.<br>-Frequency of treatment: 10/5 weeks.<br>-Number of treatment sessions: 10.<br>-Duration of treatment: 5 weeks.<br><br>Control group (Trager psychophysical integration):<br>-Operator: Trager practitioner.<br>-Duration of treatment: 45 minutes.<br>-Frequency of treatment: 10/5 weeks.<br>-Number of treatment sessions: 10.<br>-Duration of treatment: 5 weeks. |
| Outcomes | Assessed post-treatment, 5 weeks follow-up<br>-Wheelchair User's Shoulder pain index (WUSPI)<br>-Numeric rating scale (NRS)<br>-Verbal rating scale (VRS)<br>-Range of motion (ROM) (degree) |
| Notes | Country origin: United States. |

## Dyson-Hudson 2007

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| Methods | -Randomised controlled trial. |

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|---|---|
| | -Double blind (participants, evaluator).<br>-2 arms. |
| Participants | -Sample size: 17.<br>-T: acupuncture (n=8).<br>-C: sham acupuncture (n=9).<br>-Gender (female/male): total: 2/15; T: 1/7; C: 1/8.<br>-Mean of ages (SD): total: 38.7 (11.1); T:  T: 36 (10); C: 41.1 (12.1).<br>-Mean of WUSPI (SD): total: 44.1 (28.7); T: 52.1 (29.1); C: 37.1 (28).<br>-Inclusion criteria: they had to be between 18 and 70 years of age, have had no experience with acupuncture, have had chronic musculoskeletal shoulder pain (defined as a history of musculoskeletal shoulder pain for more than 3 months and that physical examination found to be localized to the subacromial space and/or to the regional muscles of shoulder complex), were at least 1 year post-SCI, and used a manual wheelchair as their primary means of mobility (40 h/wk).<br>-Exclusion criteria: if they were pregnant or had a medical condition that would interfere with the study or the interpretation of the study's results. All participants provided written informed consent, in accordance with procedures approved by the appropriate institutional review board. |
| Interventions | Treatment group (acupuncture):<br>-Number of points: 8, up to 6 local points and 2 distal points.<br>-Depth of insertion: 10-30 mm.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.20*40 mm.<br>-Frequency of treatment: 10/5 weeks.<br>- Number of treatment sessions:  ten.<br>-Duration of treatment: 5 weeks.<br><br>Control group (sham acupuncture):<br>-Number of points: 8, up to 6 local points and 2 distal points.<br>-Points locations: 1 Chinese anatomic inch away from established meridian points and extra points.<br>-Depth of insertion: superficial.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.20*40 mm.<br>-Frequency of treatment: 10/5 weeks.<br>-Number of treatment sessions: 10.<br>-Duration of treatment: 5 weeks. |
| Outcomes | Assessed post-treatment, 5 weeks follow-up.<br>-Wheelchair User's Shoulder pain index (WUSPI).<br>-Numeric rating scale (NRS).<br>-Activity Level.<br>-Analgesic Intake. |
| Notes | Country origin: United States. |

## Gao 2009

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|---|---|
| Methods | -Randomised control trial.<br>-Double blind (participants, evaluator).<br>-2 arms. |
| Participants | -Sample size: 120.<br>-T: acupuncture plus Tuina (n=60).<br>-C: Tuina (n=60).<br>-Gender (female/ma): total: 78/42.<br>-Range of ages: total: 45-68.<br>-Mean of ages: total: 51.<br>Inclusion criteria: the participants with diagnosis of scapulohumeral |

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| | periarthritis (“Disease diagnosis of TCM curative effect standard”). |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: 8.<br>-Depth of insertion: 10-30 mm.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulated on acupoints: yes.<br>-Frequency of treatment: 1/day.<br>-Number of treatment sessions: 15.<br><br>Control group (Tuina):<br>-Tuina is same as the treatment group. |
| Outcomes | Assessed post-treatment<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Guerra 2004

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| Methods | -Randomised controlled trial.<br>-Double blind (participants, evaluator).<br>-2 arms.<br>-No ITT analysis. |
| Participants | -Sample size: 130.<br>-T: EA (n=65).<br>-C: sham EA (n=65).<br>-Gender (female/male): total: 97/33; T: 48/7; C: 49/16.<br>-Mean of ages (SD): T: 58.6 (11.9); C: 59.7 (10).<br>-Duration of pain (SD): EA 6.8 (8.6) months, sham EA 5.7 (6.1) months.<br>-Inclusion criteria: shoulder soft tissues lesions, cuff tendonitis, capsulitis, bicipital tendonitis, bursitis with shoulder pain plus decreased movement (active, passive, counter resistance), local tenderness, and no swelling signs: local Heat, redness; no recent shoulder trauma (previous 3 months); no previous acupuncture treatments; age of 18 or older, without upper limit but patient able to come to clinic for evaluation and treatment by his own means.<br>-Exclusion criteria: no swelling signs: local Heat, redness; no recent shoulder trauma (previous 3 months); no previous acupuncture treatments. critical physical or mental condition, febrile condition, systemic dermatological conditions, neoplasms, allergy to diclofenac, referred pain from neck or thorax, rupture of tendons or bone fractures, pregnancy, litigation, no intention to participate or follow instructions.<br>-Drop-outs: 20 (in the treatment, 5 no time, 7 discontinued intervention, 3 discontinued follow-up, 5 no explanation). |
| Interventions | Treatment group (EA):<br>-Number of points: 4.<br>-Local/distal: both.<br>-Depth of insertion: 1 Chinese anatomic inch.<br>-Stimulation method: electric.<br>-*De Qi*: yes.<br>-Needle retention time: 15 minutes.<br>-Needle type: 0.32*40 mm.<br>-Frequency of treatment: 1/week.<br>-Number of treatment sessions: 8.<br>-Duration of treatment: 8 weeks.<br><br>Control group (sham EA):<br>-Number of points: 4.<br>-Local/distal: both. |

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| | -Depth of insertion: not penetrate the skin.<br>-Stimulation method: dummy electric (without intensity).<br>-*De Qi*: yes.<br>-Needle retention time: 15 minutes.<br>-Needle type: 0.32*40 mm.<br>-Frequency of treatment: 1/week.<br>-Number of treatment sessions: 8.<br>-Duration of treatment: 8 weeks. |
| Outcomes | Assessed 7 weeks, 3 months, 6 months from baseline<br>-Visual analogue scale (VAS)<br>-Lattinen Index<br>-Range of motion (degree)<br>-SPADI<br>-Credibility<br>-Quality of life score<br>-Number of pills consumed<br>-Adverse events |
| Notes | Country origin: Spain. |

## Guo 2006

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|---|---|
| Methods | -Randomised controlled trial.<br>-Single blind (evaluator).<br>-2 arms. |
| Participants | -Sample size: 257.<br>-T: EA plus oral Western medication plus exercise (n=124).<br>-C: oral Western medication plus exercise (n=133).<br>-Gender (female/male): total: 150/107; T: 73/51; C: 77/56.<br>-Range of ages: total: 20-76; T: 37-75; C: 20-76.<br>-Mean of ages: T: 55.54; C: 53.4.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (Traditional Chinese medicine new drug clinical research guiding principles and The 2nd conference on scapulohumeral periarthritis), and patients are with following syndrome differentiations in traditional Chinese medicine: Wind-Cold-Dampness, Qi-stagnation and blood stasis, and both of them; ages of patients are between 40 to75 years old; the duration of disease in half year; patients agree to attend the trials and sign informed consent.<br>-Exclusion criteria: exclude other disease which will cause shoulder pain and impairment of mobility. |
| Interventions | Treatment group (EA plus oral Western medication):<br>-Number of points: single.<br>-Depth of insertion: 25-40 mm.<br>-Stimulation method: electric.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Drug name of co-intervention: naproxen sodium capsule.<br>-Administration route: oral.<br>-Dose of co-intervention: 0.22g.<br>-Frequency of treatment: 1/day.<br>-Number of treatment sessions: 12.<br>-Duration of treatment: 15 days.<br><br>Control group (oral Western medication):<br>-The oral Western medicine is same as intervention group. |
| Outcomes | Assessed post-treatment (after 1 session treatment)<br>- Visual analogue scale (VAS)<br>- Melle score<br>- Effective rate (no scoring system used) |

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| Notes | Country origin: P. R. China. |

## He 2011

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| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 100.<br>-T: acupuncture plus Tuina (n=50).<br>-C: Tuina (n=50).<br>-Gender (female/male): total 59/41.<br>-Range of ages: total 35/67.<br>-Range of duration of pain: 1 week-5 years.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”).<br>-Exclusion criteria: exclude other disease which will cause shoulder pain and impairment of mobility. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: multi.<br>-Point through point acupuncture: yes.<br>-Depth of insertion: 0.8-1.5 Chinese anatomic inch.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Co-intervention manipulated on acupoints: yes.<br>-Frequency of treatment: 1/day.<br>-Number of treatment sessions: 30.<br>-Duration of treatment: 33-35 days.<br><br>Control group (Tuina):<br>-Tuina is same as treatment group |
| Outcomes | Assessed post-treatment<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Huang 2009

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 104.<br>-T: EA plus TDP (n=52).<br>-C1: acupuncture plus TDP (n=26).<br>-C2: TDP (n=26)<br>-Gender (female/male): total: 62/43; T: 32/20; C1: 15/11; C2: 14/12.<br>-Range of ages: total: 42-75.<br>-Range of duration of pain: total: 3 days-2 years.<br>-Mean of duration of pain: T: 183 days, C1: 165; C2: 180.<br>-Inclusion criteria: above 40 years, have raw Wind evil invasion history or history of trauma; shoulder pain and activity pain, the night is aggravating, and emit to hand; shoulder function was limited: such as flexion, abduction, pronation, supination; shoulder had the pressure pain, especially around especially biceps long head tendon groove; x-ray and laboratory tests is in general and no abnormal findings.<br>-Exclusion criteria: exclude other disease which will cause shoulder pain and impairment of mobility. |
| Interventions | Treatment group (EA plus TDP irradiation): |

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| | -Number of points: 5.<br>-Stimulation method: electric.<br>-*De Qi*: yes.<br>-Needle type: 0.3* 50mm.<br>-Needle retention time: 30 minutes.<br>-TDP exposed region: around Jianyu point.<br>-Intensity of TDP: tolerance of patients.<br>-Frequency of treatment: 1/day.<br>-Number of treatment sessions: 10.<br>-Duration of treatment is 10 days.<br><br>Control group 1 (TDP irradiation):<br>-TDP is same as intervention group<br><br>Control group 2 (Acupuncture):<br>-Acupuncture is same as intervention group |
| Outcomes | Assessed at post-treatment<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Jiang 2011

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 68.<br>-T: acupuncture plus TDP (n=50).<br>-C: TDP (n=50).<br>-Gender (female/male): total: 39/29; T: 21/15; C: 18/14.<br>-Range of ages: total: 40-70; T: 40-70; C: 43-69.<br>-Mean of duration of pain: T: 5.4 months; C: 5.6 months.<br>-Inclusion criteria: age is higher than 40 years old, have the history of Wind-Cold Damp pathogen affecting, shoulder pain and pain of activities, enhanced at night, radiated to hands, but no other disorders; shoulder joints activities often shows limitation on flexion, abduction, supination, pronation; shoulder has pressure pain, especially around biceps long head tendon groove; shoulder muscular spasm and atrophy; there is no abnormal in x-ray test and other laboratory examination. |
| Interventions | Treatment group (acupuncture plus TDP irradiation):<br>-Number of points: 4.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Needle type: 0.38*50 mm.<br>-TDP exposed region: affected side shoulder, centred on the Jianyu.<br>-Intensity of TDP: lower than the tolerant patients.<br>-Frequency of treatment: 1/day.<br>-Number of treatment sessions: 30.<br>-Duration of treatment: 30 days.<br><br>Control group (TDP irradiation):<br>-The TDP is same as treatment group. |
| Outcomes | Assessed post-treatment<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Ke 2012

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|---|---|
| Methods | -Randomised control trial<br>-No-blinded<br>-2 arms |
| Participants | -Sample size: 60.<br>-T: EA plus ultrashort wave plus joint mobilization (n=30).<br>-C: ultrashort wave plus joint mobilization (n=30).<br>-Gender (female/male): total: 43/17; T: 22/8; C: 21/9.<br>-Mean of ages (SD): T: 48.4 (10.3); C: 50.2 (9).<br>-Mean of duration of pain (SD): T: 3.3 (0.7) weeks; C: 3.6 (0.5) weeks.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis. |
| Interventions | Treatment group (EA plus ultrashort wave plus joint mobilisation):<br>-Number of points: 8.<br>-Stimulation method: manual and electric.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Ultrashort wave machine: CBD-1ultrashort wave electrotherapy machine made in Shanghai.<br>-Ultrashort wave applied position: two 20*15 square cm electrodes on the affect side of shoulder joint, opposed located in the front region and back region of shoulder<br>-Intensity: 40.68 MHz, wavelength is 7.37 m, the output power of 200 W.<br>-Ultrashort wave retention time: 15 minutes.<br>-Shoulder joint mobilization lasted time: 30 minutes.<br>-The Frequency of treatment: 1/day.<br>-Number of treatment sessions: 21.<br>-Duration of treatment: 3 weeks.<br><br>Control group (ultrashort wave plus joint mobilisation):<br>-Ultrashort wave and joint mobilization are same as treatment group. |
| Outcomes | Assessed post-treatment<br>-Constant Murley score (CMS)<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Kleinhenz 1999

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| Methods | -Randomised controlled trial.<br>-Double blind (participants, evaluator).<br>-2 arms.<br>- ITT analysis used |
| Participants | -Sample size: 52.<br>-T: acupuncture (n=25).<br>-C: sham acupuncture (n=27).<br>-Gender (female/male): total: 21/31; T: 12/13; C: 9/18.<br>-Mean of ages (SD): T: 33.72 (7.91); C: 37.37 (10.08).<br>-Mean of duration of pain (SD): T: 29.04 (34.86) months; C: 26.52 (35.13) months.<br>-Inclusion criteria: rotator cuff disease due to sport (Stage I and II of the impingement classification of Neer), age over 18 years, under 50 years, duration of disease more than 4 weeks, no acupuncture therapy during the last 6 months, CMS under 81 points, written informed consent.<br>-Exclusion criteria: cervical or thoracic pain syndromes (neck), previous operation of the shoulder, rupture of tendons<br>calcification in the rotator cuff, degeneration of gleno-humeral or acromio-clavicular joints, pregnancy, allergic reactions to plaster. |

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| | -Drop-outs: 7 (in the treatment, 1 no time, 1worsening, 1 fainting spell, 4 no explanation) |
| Interventions | Treatment group (acupuncture):<br>-Number of points: 12.<br>-Depth of insertion: deeper tissue layers.<br>-Needle retention time: 20 minutes.<br>-Points selection: this combination was used for four sessions. If no improvement was reported thereafter another examination was performed to choose alternate points for the next four sessions.<br>-Number of treatment sessions: 8.<br>-Duration of treatment: 4 weeks.<br><br>Control group (sham acupuncture):<br>-Number of points: 12 points.<br>-Depth of insertion: no penetrate the skin.<br>-Needle retention time: 20 minutes.<br>-Number of treatment sessions: 8.<br>-Duration of treatment: 4 weeks. |
| Outcomes | Assessed post-treatment at post-treatment and 4 months after the baseline.<br>-modified Constant Murley score (MCMS)<br>-subjective ratings<br>-adverse events |
| Notes | Country origin: Germany. |

## Lathia 2006

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|---|---|
| Methods | -Randomised controlled trial.<br>-Double blind (participants, evaluator).<br>-2 arms.<br>- ITT analysis used |
| Participants | -Sample size: 31.<br>-T: acupuncture (n=11).<br>-C1: sham acupuncture (n=11).<br>-C2: standardized acupuncture (n=9).<br>-Gender (female/male): total: 3/28; T: 0/11; C1: 3/8; C2: 0/9.<br>-Mean of ages (SD): T: 61.8 (3.6); C1: 59.4 (2.9); C2: 65 (4.6).<br>-Mean of duration of pain (SD): T: 47.9 (13.6) months; C1: 50.6 (16.8) months; C2: 28.1 (10.4) months.<br>-Inclusion criteria: eligible subjects were patients at least 18 years of age with symptoms of shoulder pain for at least 8 weeks and a total SPADI score of 30; they might not have received previous treatment or might have failed conventional treatment at least 1 month prior to enrolment, and they had to be naýve to acupuncture; diagnoses included were adhesive capsulitis, rotator cuff syndromes, rotator cuff tear, osteoarthritis, biceps tendonitis, and subacromial bursitis.<br>-Exclusion criteria: patients were excluded if they had an inflammatory or infectious arthritic condition, a shoulder fracture, a stroke, or were pregnant; also, patients who had corticosteroid injections in the past 3 months were excluded.<br>-Drop-outs: 3 (in treatment group, 2 time constraints, 1 increased pain) |
| Interventions | Treatment group (acupuncture):<br>-Number of points: up to 7 points.<br>-Depth of insertion: 1/8-1 Chinese inch.<br>-Needle retention time: 30 minutes.<br>-*De Qi*: yes.<br>-Needle type: 0.2 mm diameter.<br>-Frequency: 2/week.<br>-Number of treatment sessions: 12.<br>-Duration of treatment: 6 weeks. |

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| | Control group (sham acupuncture):<br>-Number of points: up to 7.<br>-Depth: no penetrate the skin.<br>-Needle retention time: 30 minutes.<br>-Needle type: 0.2 mm diameter.<br>-Frequency is 2/week.<br>-Number of treatment sessions: 12.<br>-Duration of treatment: 6 weeks.<br><br>Control group (standardized acupuncture)<br>-Number of points: up to 7.<br>-Depth is 1/8-1 inch.<br>-Needle retention time: 30 minutes.<br>-Needle type: 0.2 mm diameter.<br>-Frequency: 2/week.<br>-Number of treatment sessions: 12.<br>-Duration of treatment: 6 weeks. |
| Outcomes | Assessed post-treatment at post-treatment<br>-Shoulder Pain and Disability Index (SPADI) |
| Notes | Country origin: United States. |

## Li 2010

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample: 120.<br>-T: EA plus Tuina (n=60).<br>-C: ozone injection plus Tuina (n=60).<br>-Gender (female/male): total: 76/44.<br>-Mean of ages (SD): T: 49.43 (5.38); C: 51.26 (5.72).<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); informed consent; did not use acupuncture, physical therapy, Chinese or oral Western medication over 2 weeks.<br>-Exclusion criteria: the participants are not with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”) and inclusion criteria; patients are not willing to receive acupuncture or acupoint injection; patients cannot insist the treatment for 2 coursed; patients are with other sever diseases on heart, lung, liver, kidney and mental disorder. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: multi.<br>-Needle retention time: 20 minutes.<br>-Co-intervention: 3-step Tuina.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulated on acupoints: yes.<br>-Number of treatment sessions 20.<br>-Stimulation method: electric.<br><br>Control group (ozone injection plus Tuina):<br>-Ozone Machine: Germany Herman high pressure ozone treatment system.<br>-Operate position: Ashi point (pain point) in shoulder region.<br>-Density of ozone: 35 ug/ml.<br>-Stimulation method: manual stimulation.<br>-*De Qi*: yes.<br>-Dose of ozone: 4 ml.<br>-Tuina is same as treatment group. |
| Outcomes | Assessed post-treatment at post-treatment |

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| | -Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Li 2011a

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-Two arms. |
| Participants | -Sample size: 60.<br>-T: acupuncture plus exercise (n=30).<br>-C: oral ibuprofen plus exercise (n=30).<br>-Gender (female/male): total: 33/27; T: 16/14; C: 17/13.<br>-Mean of ages(SD): T: 49.83 (6.22); C: 49.1 (5.84).<br>-Mean of duration of pain (SD): T: 53.3 (20.03) days; C: 52.4 (20.76) days.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); ages are between 40 and 65 years old, the duration of disease is not over half year; did not use analgesics, or stop using over 2 weeks; patients informed and can cooperate during the trial.<br>-Exclusion criteria: the participants are not with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”) and inclusion criteria; patients with shoulder tuberculosis and tumor; patients cannot insist the treatment and stop in the midway. |
| Interventions | Intervention group (acupuncture plus exercise):<br>-Number of points: 8.<br>-Stimulation method: manual.<br>-Needle retention time: 30 minutes.<br>-Needle type: 0.30*40 mm.<br>-Frequency of acupuncture: 1/day, 6/week.<br>-Number of treatment sessions: 12.<br>-Duration of treatment: 13 days.<br>-Frequency of co-intervention: 3/day<br><br>Control group (oral ibuprofen plus exercise):<br>-Drug name: Ibuprofen Sustained Release Capsules (made by Smith Kline & French Laboratories Ltd).<br>-Administration route: oral.<br>-Dose: 0.3g.<br>-Frequency: 2/day.<br>-Exercise is same as intervention group. |
| Outcomes | Assessed post-treatment at post-treatment<br>-Constant Murley score (CMS)<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Li 2011b

| | |
|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 60.<br>-T: acupuncture plus Tuina (n=30).<br>-C: Tuina (n=30).<br>-Gender (female/male): total: 36/24; T: 20/10; C: 16/14.<br>-Range of ages: total: 35-69; T: 35-67; C: 35-69.<br>-Mean of ages (SD): acupuncture plus Tuina 53 (8.14), Tuina 52.87 (8.44).<br>-Range of duration of pain: total: 30-1080 days; T: 30-1080 days; C: 40-807. |

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| | -Mean of duration of pain (SD): T: 292.63 (250.7) days; C: 234.73 (186.06) days.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); informed consent and cooperated with administers; ages is between 30 to 70 years old.<br>-Exclusion criteria: with severe heart, liver, kidney and other system diseases; physical condition is bad, with severe neurosis, dementia and severe osteoporosis; with shoulder tumor, or shoulder joint dislocation; with leukaemia, thrombocytopenia with bleeding tendency; do other treatment at the same time, within 3 weeks the start of this observation to receive other treatment; cannot cooperate during treatment, follow-up. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: single.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Needle type: 0.30*40 mm.<br>-Co-intervention: 3-step manipulation.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulated on acupoints: yes.<br>-Frequency of treatment: 1/day, 6/week.<br>-Number of treatment sessions: 18.<br>-Duration of treatment: 20 days.<br><br>Control group (Tuina):<br>-Tuina is same as treatment group. |
| Outcomes | Assessed post-treatment at post-treatment<br>-Range of motion (mean/difference) (degree)<br>-Effective rate (no scoring system used) |
| Notes | Country origin: Hong Kong, China. |

## Lin 1994

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| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 150.<br>T: EA plus nerve block (n=50).<br>C1: EA (n=50).<br>C2: nerve block (n=50).<br>-Inclusion criteria: the participants with diagnosis of frozen shoulder. |
| Interventions | Treatment group (EA plus nerve block):<br>-Number of points: multi.<br>-Point through point acupuncture: yes.<br>-Stimulation method: electric.<br>-Needle retention time: 30 minutes.<br>-Drug name: Xylocaine.<br>-Dose: 1% 10ml.<br>-Co-intervention method: Stellate Gang. block and suprascapular nerve block.<br>-Number of treatment sessions: 1.<br><br>Control group (EA):<br>-EA is same as treatment group.<br><br>Control (nerve block)<br>-Nerve block is same as intervention group. |

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| Outcomes | Assessed post-treatment at post-treatment<br>-Range of motion (degree)<br>-Bromage pain score |
| Notes | Country origin: Taiwan. |

## Molsberger 2010

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| Methods | -Randomised controlled trial.<br>-Double blind (participants, evaluator).<br>-3 arms.<br><br>-ITT analysis used. |
| Participants | -Sample size: 424.<br>-T: acupuncture (n=135)<br>-C1: sham acupuncture (n=154).<br>-C2: conservative orthopaedic treatment (COT) (n=135).<br>-Gender (female/male): total: 264/156; T: 66/88; C1: 45/89; C2: 45/87.<br>-Range of age: total: 25-65.<br>-Mean of age (SD): total 50.8 (9.7) T: 50.3 (9.6); C1: 51.3 (9.4); C2: 50.8 (10).<br>-Mean of VAS (SD): T: 66.3 (13.6) mm; C1: 66 (13.8) mm; C2: 66.2 (13.9) mm.<br>-Inclusion criteria: one-sided shoulder pain for at least 6 weeks and up to two years; an average pain score of 50 mm or more on a 100-mm visual analogue scale (VAS) in the past week; the ability to communicate in German.<br>-Exclusion criteria: the patients who have neurological disorders causing shoulder pain; referred pain from the cervical spine; osteoarthritis of the gleno-humeral joint or systemic bone and joint disorder (e.g. rheumatoid arthritis); history of shoulder surgery; other current therapy involving analgesics; no overt psychiatric illness; pregnancy; incapacity for work longer than 3 months preceding the trial, and pending compensation procedure (the latter to exclude a conflict of interest between the expected social benefit payments and possible positive treatment effects).<br>-Drop-outs: 64 (during treatment, non-responders), 116 (during follow-up, non-responders). |
| Interventions | Treatment group (acupuncture):<br>-Number of points: 5-10 points (average 8).<br>-Depth of insertion: 10-20 mm.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Needle type: AisaMed 0.3 mm.<br>-Frequency of acupuncture: 1-3/week.<br>-Number of treatment sessions: 15.<br>-Duration of treatment: 3 months.<br><br>Control group (sham acupuncture):<br>-Number of points: 5-10 points (average 8).<br>-Points location: non-acupuncture points.<br>-Depth of insertion: < 5 mm.<br>-Needle retention time: 20 minutes.<br>-Needle type: AisaMed 0.3 mm.<br>-Frequency of acupuncture: 1-3/week.<br>-Number of treatment sessions: 15.<br>-Duration of treatment: 3 months.<br><br>Control group (COT):<br>-Drug name: diclofenac.<br>-The dose of diclofenac. |

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| | -Administration route: oral.<br>-Dose: 50mg/d.<br>-Other treatment: physiotherapy, physical exercise, Heat or Cold therapy, ultra-sonic treatment and TENS. |
| Outcomes | Assessed post-treatment at post-treatment, 3 months follow-up<br>-Visual analogue scale (VAS).<br>-Range of motion (ROM).<br>-Pain relief 50%<br>-Shoulder mobility: positive Jobe test n (%)<br>-Full elevation of arm possible (%) |
| Notes | Country origin: Germany. |

## Moore 1976

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| Methods | -Randomised controlled trial.<br>-Double blind (participants, evaluator).<br>-2 arms. |
| Participants | -Sample size: 42.<br>-T: acupuncture (n=22).<br>-C: sham acupuncture (n=20).<br>-Inclusion criteria: patients with shoulder pain<br>-Exclusion criteria: systemic, inflammatory arthritis, significant cardiovascular problems, bleeding tendencies, increases susceptibility to infection, serious mental disorders. |
| Interventions | Treatment group (acupuncture):<br>-Number of points: 7.<br>-Depth of insertion: 0.5-1 inch.<br>-Stimulation method: manual.<br>-Needle retention time: 17 minutes.<br>-Frequency of treatment: 1/week.<br>-Number of treatment session: 3.<br>-Duration of treatment: 3 weeks.<br><br>Control group (sham acupuncture):<br>-Number of treatment: 7.<br>-Depth of insertion: not penetrate the skin.<br>-Stimulation method: manual.<br>-Needle retention time: 17 minutes.<br>-Frequency of treatment: 1/week.<br>-Number of treatment session: 3.<br>-Duration of treatment: 3 weeks. |
| Outcomes | Assessed 1 week follow-up.<br>-Improvement of discomfort. |
| Notes | Country origin: United States. |

## Shao 2006

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| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 276.<br>-T: EA (n=138).<br>-C: oral Diclofenac Sodium (n=138).<br>-Range of ages: T: 37-75; C: 20-76.<br>-Mean of JOA (SD): T: 14.87 (5.02); C: 14.17 (3.3).<br>-Inclusion criteria: outpatients; age is between 40 and 65, gender is restrict; with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM |

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| | curative effect standard"); sign the informed consent.<br>-Exclusion criteria: with sever diseases which will endanger life such as heart cerebrovascular, liver, kidney and hematopoietic system, with mental disorders; taken glucocorticoid drugs which will affect the effectiveness; patients are not willing to attend the trial or stop in the midway or drop out; pregnancy; with bone tuberculosis, bone tumours, and injury of shoulder during the treatment. |
| Interventions | Treatment group (EA):<br>-Treatment side: healthy side.<br>-Number of points: single.<br>-Depth: 1 inch.<br>-Stimulation method: manual and electric.<br>-Needle retention time: 20 minutes.<br>-Type of need: 0.3*40mm.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 6.<br>-Duration of treatment: 6 days.<br><br>Control group (oral Diclofenac Sodium):<br>-Drug name: Diclofenac Sodium (sustained release tablet).<br>-Administration route: oral.<br>-Dose: 75 mg.<br>-Frequency of treatment: 1/week.<br>-Number of treatment session: 6.<br>-Duration of treatment: 6 days. |
| Outcomes | Assessed at post-treatment.<br>-Japanese Orthopaedic Association shoulder score (JOA).<br>-Adverse events |
| Notes | Country origin: P. R. China. |

## Sun 2001

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|---|---|
| Methods | -Randomised controlled trial.<br>-Single blind (evaluator).<br>-2 arms.<br><br>- ITT analysis used. |
| Participants | -Sample size: 35.<br>-T: acupuncture plus exercise (n=13).<br>-C: exercise (n=22).<br>-Gender (female/male): total: 24/11; T: 4/9; C: 7/15.<br>-Range of ages: total: 41-69; T: 41-64; C: 42-69.<br>-Mean of ages (SD): T: 55 (7.6); C: 57.1 (8.6).<br>-Range of duration of pain: total: 1-11 months, T: 3-9; C: 1-12.<br>-Mean of duration of pain: T: 5.5 months; C: 7.1 months.<br>-Inclusion criteria: shoulder pain for at least 1 month and less than 12 months' duration; appreciable restriction of both active and passive motion with abduction and flexion not exceeding 90° and external rotation not exceeding 30°; pain at night, with inability to lie on the affected side.<br>-Exclusion criteria: history of major shoulder injury or surgery; clinical or radiological evidence of other pathology that could possibly account for symptoms; patients with evidence of cervical radiculopathy, paresis, or other neurological changes in the upper limb on the involved side; the presence of underlying fracture, associated inflammatory arthritis, known renal or hepatic disease, haemopoietic disorder, malignancy, any mental disorder likely to interfere with the course or assessment of the disease process; and painful arc between 40° and 120° abduction indicative of rotator cuff disease.<br>-Drop-outs: 5 (in treatment group, 1 fear of needle pain, 4 reasons not provided). |

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| Interventions | Treatment group (acupuncture plus exercise):<br>-Treatment side: both sides.<br>-Number of points: single.<br>-Depth of needle: 6.24 cm.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Type of need: 0.3*75mm.<br>-Co-intervention: physiotherapy in the form of a standard group exercise programme led by physiotherapist.<br>-Co-intervention duration of each session: 30 minutes.<br>-Frequency of treatment: 2/week.<br>-Number of treatment session: 12.<br>-Duration of treatment: 6 weeks.<br><br>Control group (exercise):<br>-Exercise is same as the intervention group. |
| Outcomes | Assessed at 6 weeks, 20 weeks after baseline.<br>-Constant Murley score (CMS).<br>-Analgesic intake. |
| Notes | Country origin: Hong Kong, China. |

## Sun 2012

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 60.<br>-T: acupuncture plus rehabilitation (n=32).<br>-C: rehabilitation (n=28).<br>-Gender (female/male): total: 27/33; T: 14/18; C: 13/15.<br>-Range of ages: total 21-58, T: 23-52; C: 21-58.<br>-Range of duration of pain: total 10 days-8 months, T: 2 weeks-7 months; C: 10 days-8 months.<br>-Inclusion criteria: with diagnosis of Biceps long head tendon tenosynovitis (“Disease diagnosis of TCM curative effect standard”) |
| Interventions | Treatment group (acupuncture plus rehabilitation):<br>-Treatment side: affected side.<br>-Number of treatment: single.<br>-Stimulation method: manual.<br>-Needle retention time: 20 minutes.<br>-Type of need: 0.3*50mm.<br>-Co-intervention duration of each session: 20 minutes.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (rehabilitation):<br>-Rehabilitation is same as treatment group. |
| Outcomes | Assessed at post-treatment<br>-University of California at Los Angeles End-Result Score (UCLA) |
| Notes | Country origin: P. R. China. |

## Tan 2003

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| Methods | -Randomised controlled trial.<br>-No blind. |

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| | -2 arms. |
| Participants | -Sample size: 171.<br>-T: acupuncture plus exercise (n=88).<br>-C: exercise (n=83).<br>-Gender (female/male): total: 77/94.<br>-Range of ages: total: 42-73; T: 45-73; C: 42-71<br>-Mean of ages(SD): acupuncture plus exercise 52.3 (7.12), exercise 51.65 (6.8)<br>-Range of ages: total: 8 days-7 months; T: 8 days-7 months; C: 10 days-6 months<br>-Range of duration of pain: total: 10 days-8 months; T: 2 weeks-7 months; C: 10 days-8 months.<br>-Mean of duration of pain: T: 3.63 (2.86) months; C: 3.14 (2.47) months.<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis (“The second national conference on scapulohumeral periarthritis”) |
| Interventions | Treatment group (acupuncture plus exercise):<br>-Number of points: 8.<br>-Stimulation method: manual and electric.<br>-*De Qi*: yes.<br>-Needle retention time: 15 minutes.<br>-Type of need: 0.3*40mm or 0.3*50mm.<br>-Co-intervention: 4-section exercise.<br>-Co-intervention operator: patients themselves.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (exercise):<br>-Rehabilitation is same as treatment group. |
| Outcomes | Assessed at post-treatment.<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Wan 2002

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| Methods | -Randomised controlled trial<br>-No-blinded<br>-3 arms |
| Participants | -Sample size: 183.<br>-T: acupuncture plus Tuina (n=69).<br>-C1: acupuncture (n=56).<br>-C2: Tuina (n=58).<br>-Gender (female/male): total 77/106.<br>-Range of ages: total 21-63<br>-Range of duration of pain: total 2 weeks-2 years.<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Treatment side: affected side.<br>-Number of points: single.<br>-Stimulation method: manual.<br>-Needle retention time: 20 minutes.<br>-Type of need: 0.3*50mm.<br>-Co-intervention: Tuina.<br>-Co-intervention duration of each session: 20 minutes.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 24.<br>-Duration of treatment: 5 weeks. |

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| | Control group (Tuina):<br>-Tuina is same as treatment group.<br><br>Control group 2 (Acupuncture):<br>-Acupuncture is same as treatment group. |
| Outcomes | Assess at post-treatment<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Wang 2007

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 90.<br>-T: acupuncture plus exercise (n=30).<br>-C1: Diclofenac Sodium external plus exercise (n=30).<br>-C2: Tuina plus exercise (n=30).<br>-Gender (female/male): total 29/61, T: 11/19, C1 10/20, C2 8/22.<br>-Mean of ages (SD): T: 52.58 (3.12), C1 55.69 (6.67), C2 54.32 (5.48).<br>-Mean of duration of pain(SD): T: 2.68 (1.24) months, C1 2.81 (1.33) months, C2 2.52 (2.12) months.<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis (“Rehabilitation Medicine”); did not receive any other treatment within 1 week before this trial; age is between 40 and 65 year old, gender is not limited; signed informed consent.<br>-Exclusion criteria: Age is lower than 40 years, older than 65 years; were not with diagnosis of scapulohumeral periarthritis (“Rehabilitation Medicine”); medium and severe osteoporosis or shoulder diseases which are not recovered; combined with f heart, liver, kidney, hematopoietic system, endocrine system serious primary diseases, tumor and mental diseases; long term use drugs and therapies which would affect the effectiveness and safety. |
| Interventions | Treatment group (acupuncture plus exercise):<br>-Number of points: multi.<br>-Stimulation method: manual.<br>-Frequency of acupuncture: 1/day, every 6 days treatment, rest 1 day.<br>-Number of treatment session: 12.<br>-Duration of treatment: 2 weeks.<br>-Frequency of co-intervention: 2/day<br>-Intensity of co-intervention: feeling slight painful.<br><br>Control group (Diclofenac Sodium external plus exercise):<br>-Drug name: Diclofenac Sodium (Beijing Novartis Pharma Ltd).<br>-Administration route: external.<br>-Frequency of treatment: 3/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 14 days.<br>-Exercise is same as treatment group.<br><br>Control group (Tuina plus exercise):<br>-Tuina operator: medical practitioners.<br>-Tuina manipulate on acupoints: no.<br>-Tuina duration of each session: 20 minutes.<br>-Exercise is same as treatment group. |
| Outcomes | Assessed at post-treatment.<br>-Effective rate (no scoring system used).<br>-Self refit score.<br>-Adverse events (no happen). |

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| Notes | Country origin: P. R. China. |

## Wang 2012

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 52.<br>-T: EA plus electro treatment plus Tuina (n=24).<br>-C: electro treatment plus Tuina (n=28).<br>-Gender (female/male): total 33/19.<br>-Range of ages: total 38-65.<br>-Mean of ages (SD): total 56.7.<br>-Range of duration of pain: total 2 months-4 years.<br>-Mean of duration of pain: 1.2.<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis |
| Interventions | -Treatment group (electroacupuncture plus electro treatment plus Tuina):<br>-Number of points: 5.<br>-Depth of insertion: 1.5 inch.<br>-Stimulation method: electric.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Type of need: 0.35*40 and 0.35*50mm.<br>-Machine of electro treatment: DY-1 computer intermediate frequency therapy apparatus<br>-Intensity of electric stimulation: 15-40 mA, in the tolerance of patients.<br>-Treatment duration of each session: 20 minutes.<br>-Tuina operator: medical practitioners.<br>-Tuina manipulated on the acupoints: yes.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: twenty.<br>-Duration of treatment: 20 days.<br><br>Control group (electro treatment plus Tuina):<br>-electro treatment and Tuina is same as treatment group. |
| Outcomes | Assessed at post-treatment.<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Xie 2010

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample: 150.<br>-T: acupuncture plus Tuina (n=50)<br>-C1: acupuncture (n=50).<br>-C2: Tuina (n=50).<br>-Gender (female/male): total 91/59.<br>-Range of ages: total 40-70.<br>-Mean of ages (SD): total 52.57.<br>-Range of duration of pain: total 3 weeks-12 months.<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); age is between 40 and 70 years old, gender is not limited; stop using other medicine or therapies during the trial.<br>-Exclusion criteria: with shoulder joint tuberculosis, tumor or fracture; with serious osteoporosis; did not follow plan to receive treatment, data is absent |

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| | or dropped out. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Treatment side: affected side.<br>-Number of points: 5.<br>-Stimulation method: manual.<br>-Needle retention time: 30 minutes.<br>-Tuina operator: medical practitioners.<br>-Tuina manipulate on the acupoints: no.<br>-Tuina duration of each session: 20 minutes.<br>-Frequency of treatment: 1/day, every five days rest two days.<br>-Number of treatment session: 20.<br>-Duration of treatment: 26 days.<br><br>Control group (Tuina):<br>-Tuina is same as treatment group.<br><br>Control group (acupuncture):<br>-Tuina is same as treatment group. |
| Outcomes | Assessed at post-treatment.<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Xiong 2009

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 90.<br>-T: acupuncture plus Ashi point injection (n=45).<br>-C: Ashi point injection (n=45).<br>-Gender (female/male): total: 51/39; T: 25/20; C: 26/19.<br>-Mean of ages (SD): T: 46 (3); C: 47(4).<br>-Mean of duration of pain (SD): T: 34.32 (7.18) days; C: 35.54 (7.29) days.<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis (“The 2nd national conference on scapulohumeral periarthritis”).<br>-Exclusion criteria: the shoulder joint dysfunction, due to Neurogenic or tumor diseases. |
| Interventions | Treatment group (acupuncture plus Western medication injection):<br>-Treatment side: both sides.<br>-Acupuncture style: balancing acupuncture.<br>-Number of point: 3.<br>-Stimulation method: manual.<br>-Needle retention time: 20-40 minutes.<br>-Frequency of acupuncture: 1/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 2 weeks.<br>-Drug name of co-intervention: Xylocaine, Vitamin B12, Triamcinolone Acetonide Acetate Injection.<br>-Dose of drug: 2% 5ml (Xylocaine), 1mg (Vitamin B 12), 40mg (Triamcinolone Acetonide Acetate Injection).<br>-Injection position: Ashi points around shoulder joint.<br>-Frequency of injection: 1/week.<br>-Number of treatment session: ≤3.<br>-Duration of treatment: 3 weeks.<br><br>Control group (Western medication injection):<br>-Same as treatment group. |
| Outcomes | Assessed at post-treatment |

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| | -Range of motion (degree)<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Xu 2006

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 216.<br>-T: acupuncture (n=108).<br>-C: oral Brufen (n=108)<br>-Gender (female/male): total 140/76, T: 71/37; C: 69/39.<br>-Mean of ages (SD): T: 53.6 (2.4); C: 55.1 (2.3).<br>-Range of duration of pain: total 6 days-2.8 years.<br>-Mean of duration of pain (SD): T: 4.6 (2.1) months; C: 4.8 (2.3) months.<br>-Mean of VAS (SD): T: 7.23 (1.67); C: 7.28 (1.57).<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”) and it was in the early stage of the adhesion; age is between 40 and 65 years old, gender is not limited; signed the informed consent.<br>-Exclusion criteria: with shoulder joint tuberculosis, tumor or fracture; with serious osteoporosis; did not follow plan to receive treatment, data not available or dropped out. |
| Interventions | Treatment group (acupuncture):<br>-Treatment side: affected side.<br>-Number of points: single.<br>-Depth of insertion: 1 inch.<br>-*De Qi*: yes.<br>-Stimulation method: manual and electric.<br>-Needle retention time: 30 minutes.<br>-Type of need: 0.3*40mm.<br>-Frequency of acupuncture: 1/day.<br>-Number of treatment session: 7.<br>-Duration of treatment: 7 days.<br><br>Control group (oral Brufen):<br>-Drug name: Brufen.<br>-Administration route: oral.<br>-Dose of drug: 0.6g/day.<br>-Frequency of treatment: 2/day.<br>-Number of treatment session: 7.<br>-Duration of treatment: 7 days. |
| Outcomes | Assessed at post-treatment.<br>-Visual analogue scale (VAS).<br>-Range of motion (“shoulder and neck pain”).<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Xuan 2008

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms.<br><br>-ITT analysis not used. |
| Participants | -Sample size: 276. |

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| | -T: EA (n=138).<br>-C: oral Diclofenac Sodium (n=138).<br>-Gender (female/male): total: 174/102; T: 82/56; C: 92/46.<br>-Range of ages: total: 35-65; T: 35-65; C: 35-65.<br>-Mean of VAS (SD): T: 5.93 (0.61); C: 5.89 (0.67).<br>-Inclusion criteria: with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”), staging criteria (“Scapulohumeral Periarthritis”); age is between 30 and 65 years old; signed the informed consent.<br>-Exclusion criteria: patients were not with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); with other serious and life-threatening primary diseases, such as cardio-cerebral vascular disease, diabetes mellitus, tumor, hematopathy and mental disorders; pregnancy and lactation; receive other treatment; cannot insist to finish the trial, or severe adverse reactions lead to no finishing the trial.<br>-Drop-outs: 5 (in treatment group, reasons not provided). |
| Interventions | Treatment group (EA):<br>-Treatment side: both sides.<br>-Number of point: single.<br>-Depth of insertion: 1.2 inch.<br>-Stimulation method: electric.<br>-Needle retention time: 30 minutes.<br>-Frequency of acupuncture: 1/day.<br>-Number of treatment session: 5.<br>-Duration of treatment: 5 days.<br><br>Control group (oral Diclofenac Sodium):<br>-Drug name: Diclofenac sodium enteric sustained-release capsules (Sea split pharmaceutical company).<br>-Administration route: oral.<br>-Dose of drug: 100mg.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 5.<br>-Duration of treatment: 5 days. |
| Outcomes | Assessed at post-treatment, 1month follow-up<br>-Visual analogue scale (VAS)<br>-Range of motion (Melle)<br>-Adverse events (no happen) |
| Notes | Country origin: P. R. China. |

## Yang 2009

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-Two arms.<br><br>-ITT analysis not used. |
| Participants | -Sample size: 20.<br>-T: acupuncture plus joint mobilisation (n=10).<br>-C: joint mobilisation (n=10).<br>-Gender (female/male): total: 13/7; T: 7/3; C: 6/4.<br>-Range of ages: T: 45-84; C: 45-80.<br>-Mean of ages (SD): T: 58.7 (11.26); C: 59 (10.5).<br>-Mean of JOA (SD): T: 10 (7.07); C: 9.5 (5.99).<br>-Inclusion criteria: shoulder injury, shoulder pain and activity limitation (adhesive shoulder joint bursitis, shoulder impingement syndrome, impairment of rotator cuff and Infraspinatus tendinitis); the age of 40 to 85 years old; Duration of disease within 18 months; patients agreed to participate in the experiment and sign a informed consent form. |

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| | -Exclusion criteria: other diseases affecting the shoulder pain and dysfunction (shoulder joint fracture, dislocation, tumor, tuberculosis); receive other treatment may affect the observation of study index; combined with seriously and life-threaten primary diseases (heart cerebrovascular, liver, kidney and hematopoietic system) and mental illness; age under 40 years old or over the age of 85 patients; patients with pregnancy or lactation; with rheumatoid arthritis, sequela of stroke; radiation to the neck disease shoulder pain; with heart, biliary disorders reflective shoulder pain.<br>-Drop-outs: 5 (in treatment group, 2 far from hospital, 2 no time due to work, 1 Intolerance of treatment). |
| Interventions | Treatment group (acupuncture plus joint mobilisation):<br>-Treatment side: both sides.<br>-Number of point: single.<br>-Depth of treatment: 1-1.5 inch.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 20 minutes.<br>-Type of need: 0.30*50 mm.<br>-Number of treatment session: 12.<br>-Duration of treatment: 24 days.<br>-Co-intervention: Joint mobilisation<br>-Co-intervention duration of each session: 20 minutes.<br>-Frequency of treatment: once every other day.<br><br>Control group (joint mobilisation):<br>-Joint mobilisation is same as treatment group. |
| Outcomes | Assessed post-treatment<br>-Japanese Orthopaedic Association shoulder score(JOA) |
| Notes | Country origin: P. R. China. |

## Yang 2012

| | |
|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample: 62.<br>-T: EA plus joint mobilisation (n=31).<br>-C: joint mobilisation (n=31).<br>-Mean of Micheal Reese score (SD): T: 31.37 (5.17), joint mobilisation 30.52 (4.71).<br>-Inclusion criteria: with diagnosis of “shoulder BI” (“Conventional medical disease diagnosis and treatment in TCM”); age is between 40 and 65 years old; signed the informed consent.<br>-Exclusion criteria: acute shoulder injury, shoulder joint tuberculosis, tumor, rheumatic arthritis; with other serious and life-threatening primary diseases, such as cardio-cerebral vascular disease, diabetes mellitus, tumor, hematopathy and mental disorders; with sequela of apoplexy. |
| Interventions | Treatment group (EA plus joint mobilisation):<br>-Number of points: 6-10.<br>-Depth of insertion: 5-20 mm.<br>-Stimulation method: electric.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Frequency of acupuncture: 1/day.<br>-Number of treatment session: 5.<br>-Duration of treatment: 5 days.<br>-Co-intervention: joint mobilisation.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulate on acupoints: yes. |

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| | -Co-intervention duration of each session: 20 minutes.<br>-Frequency of joint mobilisation: 2/day.<br>-Number of treatment sessions: 10.<br>-Duration of treatment: 5 days.<br><br>Control group (joint mobilisation):<br>-Joint mobilisation is same as treatment group. |
| Outcomes | Assessed at post-treatment.<br>-Range of motion (Michael Reese).<br>-Effective rate (no scoring system used).<br>-Adverse events.<br>-Pain score (Michael Reese). |
| Notes | Country origin: P. R. China. |

## Zhang 2011

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 60.<br>-T: acupuncture plus Tuina (n=30).<br>-C: Tuina (n=30).<br>-Gender (female/male): total 36/24, T: 19/11; C: 17/13.<br>-Range of ages: total 38-60.<br>-Mean of ages (SD): T: 49.07(4.94); C: 49.8 (4.63).<br>-Mean of duration of pain (SD): T: 6.3 (4.73); C: 5.87 (2.66)<br>-Inclusion criteria: patients were not with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); age is between 35 and 65 years old, gender is not limited; patients agreed to participate in the experiment and sign a informed consent form.<br>-Exclusion criteria: acute shoulder injury, shoulder joint tuberculosis, tumor, rheumatic arthritis; with other shoulder disease except scapulohumeral periarthritis; patients with contraindications; other medical disease leading to shoulder pain (such as cholecystitis, rheumatoid arthritis, arthritis, systemic lupus erythematosus); mental disorders; combined with other treatment, affect observation of effectiveness. |
| Interventions | Treatment group (acupuncture plus Tuina):<br>-Number of points: 5.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Type of need: 0.30*40 mm.<br>-Duration of treatment: 40 days.<br>-Co-intervention operator: medical practitioners.<br>-Co-intervention manipulated on acupoints: yes.<br>-Co-intervention duration of each session: 25 minutes.<br>-Frequency of treatment: 1/2weeks.<br>-Number of treatment session: 20.<br><br>Control group (Tuina):<br>-Tuina is same as treatment group. |
| Outcomes | Assessed post-treatment.<br>-Constant Murley score (CMS).<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Zhang 2012

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|---|---|
| Methods | -Randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 90.<br>-T: acupuncture (n=30).<br>-C1: Tuina (n=30).<br>-C2: external Diclofenac Sodium (n=30).<br>-Mean of ages (SD): T51.66 (4.32), C151.09 (6.1), C2 48.81 (5.66).<br>-Mean of duration: T: 2.68 (1.24) months, C1 2.52 (2.12) months, C2 2.81 (1.33) months.<br>-Inclusion criteria: with diagnosis of frozen shoulder (“Classification and the classification standard of Orthopaedic disease”, “Clinical bone traumatology science” and “Diagnosis of disease and curative effect of traditional Chinese medicine standard”) |
| Interventions | Treatment group (acupuncture):<br>-Number of points: 7 points.<br>-Simulation method: manual.<br>-Needle retention time: 20 minutes.<br>-Frequency of acupuncture: 1/day.<br>-Number of treatment sessions: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (Tuina):<br>-Tuina operator: medical practitioners.<br>-Tuina manipulated on acupoints: no.<br>-Tuina syndrome differentiation: yes.<br>-Treatment duration of each session: 20 minutes.<br>-Frequency of treatment: 1/day.<br>-Number of treatment sessions: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (external Diclofenac Sodium):<br>-Drug name: Diclofenac Diethylamine Emulgel (Beijing Novartis Pharma Ltd).<br>-Administration route: external.<br>-Dose of drug: 2-4g.<br>-Frequency of treatment: 3/day.<br>-Duration of treatment: 14 days. |
| Outcomes | Assessed after 6th session and 10th session of treatment<br>-Range of motion (Michael Reese)<br>-Pain score (Michael Reese)<br>-Effective rate (no scoring system used)<br>-Adverse events (no happen) |
| Notes | Country origin: P. R. China. |

## Zhao 2008

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| Methods | -Randomised controlled trial.<br>-Singe-blinded (evaluator).<br>-4 arms. |
| Participants | -Sample size: 120.<br>-T: acupuncture plus Guiwei Tuina (n=30).<br>-C1: Guiwei Tuina (n=30).<br>-C2: conventional Tuina (n=30).<br>-C3: acupuncture (n=30).<br>-Gender (female/male): total: 66/54; T: 16/14; C1: 18/12; C2: 17/13; C3: |

| | |
|---|---|
| | 15/15.<br>-Mean of ages (SD): T: 49.36 (5); C1: 46.20 (4.2); C2: 46.51 (4.53); C3: 47.58 (5.56).<br>-Mean of CMS (SD): T: 50.58 (15.56); C1: 54.78 (15.6); C2: 50.97 (15.39); C3: 51.20 (14.20).<br>-Inclusion criteria: patients were not with diagnosis and stage criteria of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); age is between 30 and 65 years old; patients agreed to participate in the experiment and sign an informed consent form.<br>-Exclusion criteria: patients were not with diagnosis of scapulohumeral periarthritis (“Disease diagnosis of TCM curative effect standard”); with other serious and life-threatening primary diseases, such as cardio-cerebral vascular disease, diabetes mellitus, tumor, hematopathy and mental disorders; pregnancy and lactation; receive other treatment; combined with other treatment, affect observation of effectiveness. |
| Interventions | Treatment group (acupuncture plus Guiwei Tuina):<br>-Number of points: 5.<br>-Stimulation method: manual.<br>-Needle retention time: 20 minutes.<br>-Type of need: 0.25*40 mm.<br>-Frequency: the first 6 treatments, once a day, the following 4 treatments, once every other day.<br>-Number of treatment session: 10.<br>-Duration of treatment 14.<br>-Guiwei Tuina operator: medical practitioners.<br>-Guiwei Tuina manipulated on acupoints: no.<br>-Frequency of Guiwei Tuina: the first 6 treatments, once a day, the following 4 treatments, once every other day.<br>-Number of treatment session: 10.<br>-Duration of Guiwei Tuina: 14 days.<br><br>Control group 1 (Guiwei Tuina):<br>-Guiwei Tuina is same as treatment group.<br><br>Control group 2 (Conventional Tuina):<br>-No details provided.<br><br>Control group 3 (Acupuncture):<br>-Same as treatment group. |
| Outcomes | Assessed post-treatment<br>-Constant Murley score (CMS)<br>-Effective rate (no scoring system used) |
| Notes | Country origin: Taiwan. |

# Appendix 4: List and characteristics of excluded studies

## Appendix 4-1: List of excluded studies


Bao, T. (2004). Zhenci Zusanlixue zhiliao jianguanjie zhouweiyan 80 li [Zusanli (ST 36) for the treatment of 80 cases of shoulder periarthritis]. *Shandong Zhongyi Zazhi*, (10), 604-605.

Bao, Y., Wang, Y., Chu, J., Zhu, G., Wang, Z., Hou, H. (2012). Dianzhen jiehe kangfu dui zhongfenghou piantan jiantong huanzhe tengtong ji shangzhi yundong gongneng gaishan zuoyong de linchuang guancha [Clinical observation of combination of acupuncture and rehabilitation for pain relief and improvement of upper limb movement for the patients with shoulder pain after stroke]. *Zhongguo Zhongyiyao Keji*, 19(1), 59-60.

Berry, H., Fernandes, L., Bloom, B., Clark, R. J., & Hamilton, E. B. (1980). Clinical study comparing acupuncture, physiotherapy, injection and oral anti-inflammatory therapy in shoulder-cuff lesions. *Curr Med Res Opin, 7*(2), 121-126. doi: 10.1185/03007998009112038

Cao, X., & Du, H. (2006). Wanhuaizhen peihe tuina zhiliao jianzhouyan 80 li [Combination of wrist-ankle acupuncture and Tuina for the treatment of 80 patients with scapulohumeral periarthritis]. *Shaanxi Zhongyi*, 2(9), 1120-1121.

Chen, G., & Gao, W. (2011). Yuanduan quxue dongfa zhiliao jianzhouyan de linchuang guancha [Clinical observation of distal acupuncture for the treatment of scapulohumeral periarthritis]. Zhenjiu Linchuang Guancha, (10), 39-41.

Chen, J. (2011). Ashixue qicifa wenzhenjiu peihe guoguan zhiliao jianguanjie zhouweiyan 59 li linchuang fenxi [Clinical analysis of Ashi needling, warm acupuncture combined with cuppig for the treatment of 59 cases of shoulder periarthritis]. *Weichuang Yixue*, (3), 271.

Chen, N. (2004). Fenbu zhencifa zhliao yuanfaxing jianzhouyan 169 li [Acupuncture for the treatment of 169 cases of primary shoulder periarthritis], *Fujian Zhongyiyao*, (4), 28-29.

Ding, Y. (2011). Dongliuzhen peihe guanjie songdongshu zhiliao jianzhouyan liaoxiao guancha [Clinical observation of shoulder periarthritis treated by combination of acupuncture and joint mobilisation]. Journal of Changchun University of Traditional Chinese Medicine, (3), 451-452.

Du, W. Z., He, Y. G., & Zhang, J. P. (2011). Single point and two-step acupuncture treatments for shoulder periarthritis. *Zhongguo Zhen Jiu, 31*(8), 720.

Fang, H. (1994). Bizhen zhiliao jianzhouyan 100 li liaoxiao guancha. [Clinical observation of nose needling for the treatment of 100 cases of shoulder periarthritis], *Zhongguo Zhenjiu,* (51), 199-201.

Fang, J.-q., Zhang, Y., Xuan, L.-h., Liu, K.-z., & Chen, L. (2006). Observation on clinical therapeutic effect of transcutaneous point electric stimulation on periarthritis of shoulder at different stages. *Zhongguo zhen jiu = Chinese acupuncture & moxibustion, 26*(1), 11-14.

Feng, Z. (2003). Two-hundred and ten cases of shoulder periarthritis treated by needling lingxia and sanjian. *J Tradit Chin Med, 23*(3), 201-202.

Fu, J. (1997). Changxiaoying jiehe dianzhen zhiliao jianzhouyan 69 li [Field effects combined with electroacupuncture for the treatment of 69 cases of shoulder periarthritis]. *Zhongguo Minjian Liaofa*, (5), 15.

Fu, S. (2005). Manzhen, dianzhen zhiliao jianzhouyan 69 li [Embedded needles and electroacupuncture for the treatment of 69 cases of shoulder periarthritis]. *Zhenjiu Linchuang Zazhi,* 21(10), 39-40.

Guerra, J., Bassas, E., Andres, M., Verdugo, F., & Gonzalez, M. (2003). Acupuncture for soft tissue shoulder disorders: a series of 201 cases. *Acupunct Med, 21*(1-2), 18-22; discussion 22.

Guo, Z. (1999). Tuina zhenci zhongyao zhiliao nianlianqi jianzhouyan liaoxiao bijiao [Comparison of effects of Tuina, acupuncture and Chinese herbal mecicine for treatment of adhesive shourlder periarthritis]. *Shandong Zhongyi Zazhi*, (10), 455.

Hao, L. Su, J. (1999). Shoufa peihe zhenci Zhongping qixue zhiliao jianguanjie zhouweiyan 60 li [Manipulation combined with Zhongping point for the treatment of 60 cases of shoulder periarthritis]. *Zhengjiu Linchuang Zazhi*, (3), 29.

Hu, J. (2006). Acupuncture treatment of shoulder pain. *J Tradit Chin Med, 26*(1), 78-79.

Huang, C. (2010). Zhenci Zhongpingxue jiehe zhongyao refu zhiliao jianguanjie zhouweiyan de linchuang yanjiu [Clinical study of needling Zhongping point combined with Chinese herbal heat pack for the treatment of shoulder periarthritis (Masters thesis)]. Guangzhou University of Traditional Chinese Medicine.

Ji, J., Ji, J. (2008). Treatment of shoulder impingement syndrome by Tuina and acupuncture plus functional training: A report of 40 cases. *Journal of Acupuncture and Tuina Science,* 6(1), 56-57.

Jia, C., Ge, J., Ma, X., Sun, L., Wang, S. (2003). Erzhen yanpi touxueci zhiliao jianzhouyan jishi xiaoying guancha [Clinical observation of immediate effects of ear-acupuncture for the treatment of shoulder periarthritis]. *Zhongguo Zhenjiu*, 23(4), 2.

Jiang, H. (2008). Tuina peihe ranguanfa zhiliao jianzhoyan 84 li [Tuina combined with cupping for the treatment of 84 cases of shoulder periarthritis]. *Neimenggu Zhongyiyao*, (8), 29.

Jiang, H. (2012). Zhenjiu tuina zonghe zhiliao jianzhouyan 52 li [Combination of acupuncture and Tuina for the treatment of 53 cases of shoulder periarthritis]. *Anmo Yu Kangfu Yixue*, 3(5), 47.

Jiang, Y. Zhang, Y. (2011). Dianzhen jiehe baguan zhiliao jianzhouyan 60 li liaoxiao guancha [Clinical observation of 60 cases of shoulder periarthritis treated by electroacupuncture combined with cupping]. *Yunnan Zhongyi Zhongyao Zazhi*, 32(9), 54.

Jin, D., & Li, Z. (2003). Acupuncture and the elevation manipulation of massage for treatment of frozen shoulder. *J Tradit Chin Med, 23*(3), 212-213.

Jin, Y. (2010). Dianzhen, tuina peihe TDP zhiliao jianzhouyan 78 li [Electroacupuncture, Tuina combined with TDP for the treatment of 78 cases of shoulder periarthritis]. *Zhongyi Waizhi Zazhi*, (2), 45.

Kong, L. (2011). Buyuangujian zhenjiufa zhiliao piantan jiantong de linchuang yanjiu [Clinical study of tonifying Kidney and strengthening shoulders for the treatment of shoulder pain due to hemiplegia (Masters thesis)]. Shandong University of Traditional Chinese Medicine.

Lafortuna, C. L., & Rossi, E. (2006). The treatment of chronic shoulder pain with wrist-ankle acupuncture. *Journal of Chinese Medicine*(80), 56-60.

Li, B., Li, L., Zhang, Z., Huang, X., Chen, J. (2009). Huang Xuanwei zhenci zhiliao jianzhouyan linchuang guancha [Clinical observation of Huang Xuanwei's acupuncture for the treatment of shoulder periarthritis]. *Shanghai Zhenjiu Zazhi*, (1), 42-43.

Li, H. (1995). Bianzheng zhenci zhiliao jianzhouyan 108 li [Acupuncture for the treatment of 108 cases of shoulder periarthritis]. *Zhongguo Zhenjiu*, (S1), 98.

Li, H. (1997). Di'er zhanggu quanxi zhenfa jia TDP zhiliao jianzhouyan 89 li [second metacarpal bone acupuncture plus TDP for the treatment of 89 cases of shoulder periarthritis]. *Zhongyiyao Xuebao*, (5), 30.

Li, J. (2010). Zhenjiu jiehe tuina dianxuefa zhiliao jianzhouyan 66 li linchuang guancha [Clinical observation of 66 cases of scapulohumeral periarthritis treated by combination of acupuncture and Tuina]. *Heilongjiang Yiyao*, 23(3), 451-452.

Li, J., Wang, Y., Liu, B. (2006). Zhenjiu jiehe kangfu shoufa zhiliao naocuzhonghou jiantong de liaoxiao guancha [Clinical observation of combination of acupuncture and rehabilitation for shoulder pain after stroke]. *Zhongguo Shangcan Yixue*, 14(1), 37.

Li, Y. (2005). Zhenjiu dui zhongfenghou piantan jiantong de linchuang guancha [Therapeutic effects of acupuncture and moxibustion on shoulder pain in the patient of poststroke hemiplegia (Masters thesis)]. *Guangxi College of Traditional Chinese Medicine*.

Lian, W. (2006). Jianyuxue huanongjiu zhiilao jianzhouyan 78 li [Jianyu (LI 15) with festering moxibustion for the treatment of 78 cases of shoulder periarthritis]. *Shaanxi Zhongyi*, (11), 1415-1416.

Liang, Y. (2004). Zhenci weizhu zhiliao jianbu zhuangjizheng 40 li linchuang guancha [Clinical observation of acupuncture for the treatment of 40 cases of Shoulder impingement syndrome]. Paper presented at the 9th Conference of Guangdong Provincial Association of Acupuncture.

Liu, T. (2012). Dongtai zhencifa peihe tuina zhiliao jianzhouyan 105 li [Combination of acupuncture and Tuina for the treatment of 105 cases of shoulder periarthritis]. *Zhongyi Waizhi Zazhi*, 21(3), 25.

Lu, J., Zhang, H., Liu, K., Wang, T., Lu, J., Chen, X., Jiang, X. (2011). Dianzhen jiehe kangfu shoufa zhiliao zhongfenghou jinguanjie bantuowei de linchuang guancha [Clincial observation of electroacupuncure combined with rehabilitation for the treatment of semi-dislocation of shoulder joint]. Paper presented at the 2011 China Association of Acupuncture and Moxibustion Annual Conference.

Luo, K.-M. K. M., Hou, Z. Z., & Yang, L. L. (2008). Observation on therapeutic effect of electroacupuncture on activity disturbance of the shoulder joint after operation of fracture. *Zhongguo zhen jiu = Chinese acupuncture & moxibustion, 28*(10), 727-729.

Miao, C., Zhang, Z. (1994). Sanzhen touxue liaofa zhiliao jianguanjie zhouweiyan [Three needle with threading method for the treatment of shoulder periarthritis]. *Henan Zhongyi*, (1), 43.

Pa, Li., Sha, B., Nu, L. (1999). Hongwaixian zhaoshe jia maichong dianzhen zhiliao jianzhouyan [Infrared plu electroacupuncture for the treatment of shoulder periarthritis]. *Zhongguo Kangfu*, (2), 113.

Peng, L., & Zhang, S. (2001). Danxue zhenci zhiliao jixing jianguanjie zhouweiyan 76 li [Single acupoint for the treatment of 76 cases of acute scapulohumeral periarthritis]. *Zhongguo Minjian Liaofa*, 9(2), 14-15.

Rui, X. Huang, G. (2004). Treatment of 100 Cases of Shoulder Periarthritis with Tuina and Acupuncture. *Journal of Acupuncture and Tuina Science*, 2(2), 48-50.

Sha, Y., Wang, Y. (2007). Zhenci yu tuina liaofa zhiliao butong shiqi jianguanjie zouweiyan liaoxiao guancha [Clinical observation of acupuncture and Tuina for the treatment of shoulder periarthritis at the different phases]. *Zhenjiu Linchuang Zazhi*, (9), 9-11.

Shi, D., Tang, X. (2011). Wanhuaizhen peihe kangfu liaofa zhiliao naocuzhonghou jiantong de linchuang yanjiu [Clinical study of wrist-ankle acupunctue plus rehabilitation for the treatment of shoulder periarthritis after stroke]. Chengdu Zhongyiyao Daxue Xuebao, (1), 33-35.

Shin, B.-C., Lim, H.-J., & Lee, M. S. (2007). Effectiveness of combined acupuncture therapy and conventional treatment on shoulder range of motion and motor power in stroke patients with hemiplegic shoulder subluxation: A pilot study. *International Journal of Neuroscience, 117*(4), 519-523. doi: 10.1080/00207450600773533

Su, G., Zhu, J., Luo, J., Zheng, G., Wei, F. (2012).Bicong mazuixia shoufa songjie, tuina zhiliao jianguanjie zhouweiyan de linchuang guancha [Clinical observation of joint mobilisation under brachial plexus anesthesia and Tuina for the treatment of shoulder periarthritis]. *JIngyaotong Zazhi*, (4), 311-312.

Su, M., Zhang, Q., Li, J. (1984). Gaoyuan yundong xitong yanzheng zhenjiu zhiliao jianzhouyan (125 li) liaoxiao guancha [Clinical observatioin of acupuncture for the treatment of 125 cases of shoulder periarthritis due to motion system inflammation at the plateau]. *Qinghai Yixueyuan Xuebao*, (2), 44-48.

Su, S., Deng, B., Huang, J., Hu, Y., He, Y., Huang, Y. (2009). Zhenci zhiliao zhongfeng piantanhou jiantong 40 li linchuang guancha [Clinical observation of acupuncture for the treatment of 40 cases of shoulder pain due to hemiplegia]. *Guangxi Zhongyiyao*, (2), 32-34.

Su, S., Deng, B., Li, Y., Zhou, E. (2010). Clinical observation on the post-stroke shoulder pain and blood viscosity treated by acupuncture-moxibustion therapy. *Journal of Acupuncture and Moxibustion Science*, 8(6), 360-363.

Sun, C. (2007). Zhenci zhiliao jianzhouyan 79 li [Acupuncture for the treatment of shoulder periarthritis]. *Xin Zhongyi*, 39(12), 68-69.

Sun, H.-b. (2012). Acupunture at Yunmen (LU 2) with deep insertion for thirty-two cases of scapulocostal syndrome. *Zhongguo zhen jiu = Chinese acupuncture & moxibustion, 32*(6), 484-484.

Sun, L. (1986). Dianzhen kangfu zhiliao 48 li jianzhouyan xiaojie [Electroacupuncture and rehabilitation for the treatment of 48 cases of shoulder periarthritis]. *Zhongguo Kangfu Yixue Zazhi,* (5), 8.

Tachibana, K., Ueki, N., Uchida, T., & Koga, H. (2012). Randomized comparison of the therapeutic effect of acupuncture, massage, and Tachibana-style-method on stiff shoulders by measuring muscle firmness, VAS, pulse, and blood pressure. *Evidence-based Complementary and Alternative Medicine, 2012*(989705). doi: http://dx.doi.org/10.1155/2012/989705

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Vas, J., Ortega, C., Olmo, V., Perez-Fernandez, F., Hernandez, L., Medina, I., . . . Aguilar, I. (2008). Single-point acupuncture and physiotherapy for the treatment of painful shoulder: a multicentre randomized controlled trial. *Rheumatology (Oxford), 47*(6), 887-893. doi: 10.1093/rheumatology/ken040

Wang, C., Qi, W. (2008). Zhenci yundong liaofa zhiliao laonian jianguanjie zhouweiyan 56 li linchuang guancha [Clinical observation of acupuncture plus exercise for the treatment of 56 cases of shoulder periarthritis in elders]. *Zhongguo Laonianxue Zazhi*, (19), 1959.

Wang, H. (2011). Jianzhouyan 60 li zhenjiu yu kangfu zhiliao ji huli [Acupuncture and rehabilitation for the treatment and care of 60 cases of shoulder periarthritis]. *Zhongguo Jiankang Yuekan*, A, 1.

Wang, H., Luo, M. (1994). Miaozhen jia xunzheng zhiliao jianguanjie zhouweiyan liaoxiao guancha [Clinical observation of Miao needles plus steaming method for the treatment of shoulder periarthritis]. *Zhongyuan Yikan*, (3), 21-22.

Wang, M. (2001). Zhenci pei jufeng zhiliao jianzhouyan 54 li linchuang zongjie [Acupuncture combined with local injection for the treatment of 54 cases of shoulder periarthritis]. *Shiyong Xiangcun Yisheng Zazhi*, 8(1), 28.

Wang, Q. (1999). Anmo zhiliao jianguanjie zhouweiyan 128 li [Massage for the treatment of 128 cases of shoulder periarthritis]. *Neimenggu Zhongyiyao*, (2), 35.

Wang, R. (2007). Zhenci zhiliao naogengsihou jiantong 20 li [Acupuncture for the treatment of 20 cases of shoulder pain after stroke], *Zhongguo Zhenjiu*, 27(12), 926.

Wang, W. (1989). Zhenci Zhongpingxue zhiliao jianzhouyan 2099 li [Zhongping point for the treatment of 2099 cases of shoulder periarthritis]. *Zhongguo Yiyao Xuebao*, (6), 39-41.

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White, A. R. (2003). Acupuncture for soft tissue shoulder disorders: A series of 201 cases. Commentary. [Note]. *Acupuncture in Medicine, 21*(1-2), 22.

Wu, C. (2009). Zhenjiu tuina jiehe gongneng duanlian zhiliao jianzhouyan de linchuang guancha [Clinical observation of combination of acupuncture, Tuina and exercise for the treatment of shoulder periarthritis]. *Zhongguo Minzu Yiyao Zazhi*, (22), 100-101.

Wu, J. Han, C. (2004). Treatment of 36 cases of scapulohumeral periarthritis mainly by contralateral needle. *Shijie Zhenjiu Zazhi*, (2), 29.

Xiao, Q. (2006). Zhenci peihe manxian zhiliao zhongfenghou piantan jiantong de linchuang liaoxiao guancha [Clinical observation of acupuncture with embedding for the treatment of shoulder pain due to hemiplegia]. *Zhongguo Zhongyiyao Xiandai Yuancheng Jiaoyu*, (12), 31-33.

Xie, Y. (2005). Zhenjiu jiehe weibo fushe zhiliao jianzhouyan linchuang guancha [Clinical observation of combination of acupuncture and microwave irradiation for the treatment of shoulder periarthritis]. *Zhongguo Chengxiang Qiye Weisheng*, (5), 55.

Xu, M. (2002). Dianzhen yu xuewei zhushe zhiliao jianzhouyan 50 li [Electroacupuncture and acupoint injection for the treatment of 50 cases of shoulder periarthritis]. *Zhongyi Waizhi Zazhi*, (1), 38-39.

Yan, J. (2007). Zhenci yu yaowu bingyong zhiliao jianzhouyan liaoxiao guancha [Clinical observation of shoulder periarthritis treated by combination of acupuncture and Western medication]. *Xiandai Yiyao Weisheng*, 23(17), 2584.
Yang, A., Wang, X. (1997). Jiansanzhen zhiliao jianzhouyan 50 li liaoxiao guancha [Three acupoints on the shoulder for the treatment of shoulder periarthritis]. Tengtongxue Zazhi, (3), 133.
Yang, C., Du, X. (1990). TDP, zhenci zhiliao jianzhouyan 72 li fenxi [Analysis of acupuncture for the treatment of 72 cases of shoulder periarthritis]. Shaanxi Zhongyi, (7), 324.
Yang, S.. Zhang, F., Tian, Y. (2000). Zhenci zhiliao danchunxing jianjia neicejian tong [Acupuncture for the treatment of simple medial scapular pain]. Neimenggu Zhongyiyao, (1), 30.
Yang, W. (2012). Shoufa, dianzhen jia TDP zhaoshe zhiliao jianguanjie ruanzhuzhi cuoshang 58 li [Manipulation, electroacupuncture plus TDP irradiation for the treatment of 58 cases of soft tissue contusions of shoulder joint]. Zhongwai Yixue Yanjiu, (16), 89.
Yang, X., Yang, J. (2011). Xuewei fengbi peihe dianzhen TDP zhiliao wanguxing jianzhouyan 60 li [Acupoint injection with electroacupuncture and TDP for the treatment of 60 cases of intractable shoulder periarthritis]. Yunnan Zhongyi Zhongyao Zazhi, (8), 50-51.
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## Appendix 4-2: Characteristics of excluded studies

### Bao 2004

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with massage.<br>OUTCOMES<br>No outcome assessment point |

### Bao 2012

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

### Berry 1980

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with shoulder cuff lesions<br>INTERVENTION<br>Patients received acupuncture plus moxibustion in comparison with other therapy alone. |

### Cao 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received wrist-ankle acupuncture plus Tuina in comparison with Tuina alone.<br>OUTCOMES<br>No outcome assessment point |

### Chen 2004

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received one type of acupuncture in comparison with another type of acupuncture. |

### Chen 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial |

| | |
|---|---|
| | PARTICIPANTS<br>Included patients with shoulder-hand syndrome |

## Chen 2011a

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received distal acupuncture in comparison with standard acupuncture. |

## Chen 2011b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Ding 2011b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>The intervention assessed was acupuncture mixed with exercise. |

## Du 2011

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Fang 1994

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Fang 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received TENS in comparison with EA. |

## Feng 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Fu 1997

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Fu 2005

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Guerra 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Guo 1999

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Tuina<br>OUTCOMES<br>No outcome assessment point |

## Hao 1999

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Hu 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Huang 2010

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus Chinese medicine Heat pack plus exercise in comparison with EA plus exercise. |

## Ji 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Jia 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Jiang 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus cupping in comparison with Tuina plus cupping. |

## Jiang 2011b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Jiang 2012

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus TDP plus Tuina in comparison with Tuina<br>OUTCOMES<br>No outcome assessment point |

## Jin 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Jin 2010

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus TDP plus Tuina plus exercise in comparison with Tuina plus exercise. |

## Kong 2011

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

## Lafortuna 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Li 1995

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Li 1997

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Li 2005

| | |
|---|---|
| Reason for exclusion | PARTICIPANTS<br>Included patients with SP after stroke |

## Li 2006

| | |
|---|---|
| Reason for exclusion | PARTICIPANTS<br>Included patients with SP after stroke |

## Li 2009

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Western medication<br>OUTCOMES<br>No outcome assessment point |

## Li 2010b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received different Tuina treatment in 2 groups |

## Lian 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Liang 2004

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN |

| | |
|---|---|
| | Controlled trial<br>PARTICIPANTS<br>Included patients with shoulder impingement syndrome<br>INTERVENTIONS<br>Patients received acupuncture plus TDP in comparison with Western medication. |

### Liu 2012

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Lu 2010

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with shoulder subluxation after stroke |

### Luo 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with shoulder activity dysfunction. |

### Miao 1994

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Pa 1999

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus infrared therapy in comparison with infrared therapy alone<br>OUTCOMES<br>No outcome assessment point |

### Peng 2001

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus exercise in comparison with Western medication. |

## Rui 2004

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Sha 2007

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Tuina. |

## Shi 2011

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

## Shin 2007

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Su 1984

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Su 2009

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

## Su 2010

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

## Su 2012

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus TDP plus Tuina plus exercise in comparison with joint mobilization plus Tuina. |

## Sun 1986

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Sun 2007

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with massage<br>OUTCOMES<br>Assessment point is unclear |

## Sun 2012b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Tachibana 2012

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with stiff shoulder |

## Tu 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Tuina. |

## Vas 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with painful shoulder<br>INTERVENTIONS<br>Patients received acupuncture plus physiotherapy in comparison with TENS plus exercise. |

## Wang 1989

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Western medication |

| | |
|---|---|
| | OUTCOMES<br>No outcome assessment point |

### Wang 1994

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Wang 1999

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>When acupuncture still remain in the body, patients need do exercise. It is not traditional acupuncture |

### Wang 1999b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Wang 2007b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

### Wang 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>When acupuncture still remain in the body, patients need do exercise. It is not traditional acupuncture |

### Wang 2011

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Wei 2010

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### White 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN |

| | |
|---|---|
| | Not a controlled trial |

### Wu 2004

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Part of acupuncture treatment is warmth acupuncture. It was not traditional acupuncture. |

### Wu 2009

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus infrared therapy in comparison with Tuina. |

### Xiao 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

### Xie 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Part of acupuncture treatment is warmth acupuncture. It was not traditional acupuncture. |

### Xu 2002

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Yan 2007

| | |
|---|---|
| Reason for exclusion | PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus Western medication in comparison with Western medication plus exercise. |

### Yang 1990

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN |

| | |
|---|---|
| | Controlled trial<br>PARTICIPANTS<br>Included patients with pain in scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus TDP in comparison with TDP<br>OUTCOMES<br>No outcome assessment point |

## Yang 1997

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Yang 2000

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with pain in inside of the shoulder blade<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Tuina.<br>OUTCOMES<br>No outcome assessment point |

## Yang 2011

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus physiotherapy in comparison with acupoint injection. . |

## Yang 2012b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Yao 1995

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## You 2009

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with frozen shoulder<br>INTERVENTIONS<br>Patients received acupuncture plus warm acupuncture plus exercise in comparison with warm acupuncture plus exercise. . |

## Yu 2000

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus TDP in comparison with EA plus TDP. |

## Zhang 1986

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Zhang 1988

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus physical therapy plus exercise in comparison with joint mobilisation. |

## Zhang 1997

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Zhang 2001

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with shoulder pain after stroke |

## Zhang 2002

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Zhang 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received massage plus exercise in comparison with EA plus exercise<br>OUTCOMES<br>The assessment point is unclear |

## Zhang 2005

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Zhang 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus Tuina in comparison with Tuina.<br>OUTCOMES<br>No outcome assessment point |

## Zhang 2008

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with acute scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus exercise plus EA plus TDP in comparison with EA plus TDP. |

## Zhang 2011b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received EA plus acupoint injection in comparison with acupoint injection.<br>OUTCOMES<br>No outcome assessment point |

## Zhang 2011c

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus laser acupuncture in comparison with laser acupuncture. |

## Zhang 2012b

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

### Zhang 2012c

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

### Zhao 1992

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Zhao 1994

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Zhao 2004

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received EA plus wrist-ankle acupuncture in comparison with EA. |

### Zhao 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Only Tiaokou (ST 38) used sham acupuncture, other points are same as intervention. |

### Zheng 2010

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Zhong 2003

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

### Zhong 2006

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Not a controlled trial |

## Zhou 2002

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with SP after stroke |

## Zhu 1997

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture in comparison with Tuina.<br>OUTCOMES<br>No outcome assessment point |

## Zhu 2012

| | |
|---|---|
| Reason for exclusion | STUDY DESIGN<br>Controlled trial<br>PARTICIPANTS<br>Included patients with scapulohumeral periarthritis<br>INTERVENTIONS<br>Patients received acupuncture plus moxibustion in comparison with acupoint injection. |

# Appendix 5: Risk of bias of included RCT studies

## Ceccheerelli 2001

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "69 patients were divided at random (using an assignment board) into two groups".<br>Comment: The method used for randomisation was not clearly provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | Low risk | Comment: The comparison was deep acupuncture versus superficial acupuncture. It is possible to blind for patients. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of assessor. |
| Incomplete outcome data (attrition bias) | Unclear risk | No information provided. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: “NS” was used to describe the difference between two groups in total scores of McGill Pain Questionnaire (MGPQ) before the therapy. However, the meaning of NS was not provided in the trial.<br>Comment: The balance of baseline was unclear. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Che 2005

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "The patients were divided into 2 groups using a random number table"<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA versus Western medication (Diclofenac Sodium Sustained Release Capsules). It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "The two groups were comparable and there were no |

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| | | significant differences in sex, age and duration of disease" at the baseline. Only exclusion criteria were reported.<br>Comment: The baseline imbalance did not exist. Inclusion criteria were not provided. |

## Cheing 2008

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "The subjects were randomly allocated into 2 groups".<br>Comment: The specific randomisation method was not described clearly. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus exercise versus interferential electrotherapy plus exercise. It is impossible to blind patients. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "An independent assessor was blind to the group allocation" |
| Incomplete outcome data (attrition bias) | High risk | Quote: "2 subjects dropped out because they experienced no improvement." This trial did not use ITT analysis to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "Demographic data were compared and no significant difference was found between groups (all *p*-value > 0.05)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Deng 2012

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated by randomised number table"<br>Comment: Randomised number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |

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| Other bias | Unclear risk | Quote: "Demographic data were compared and no significant difference was found between group in gender, age and duration of disease ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Ding 2011

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "randomise number table…subjects were randomly located".<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus Tuina versus acupuncture. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: “Demographic data were compared and no significant difference was found between group in gender, age, pain scale, VAS, Melle score and ROM ($p > 0.05$).”<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Dyson-Hudson 2001

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "subjects were randomised to…by means of coin toss"<br>Comment: Coin toss is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture versus Trager psychophysical integration. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "evaluators were blinded to treatment group assignment" |
| Incomplete outcome data (attrition bias) | High risk | Quote: "Two additional subjects withdrew during the treatment period because of unrelated medical condition."<br>Comment: This trial had dropouts. It did not use ITT analysis to address missing data. |
| Selective reporting | Unclear risk | The protocol for the study was not available. |

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| (reporting bias) | | |
| Other bias | Low risk | Quote: “The pre-treatment *t* tests revealed no significant differences between the acupuncture and Trager groups in age, duration of SCI, duration of shoulder pain, activity levels, or the PC-WUSPI scores recorded at time of entry into the study. Chi-square analysis revealed no significant differences in medical and demographic data between the two groups.”<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Dyson-Hudson 2007

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "participants were randomly assigned to…through a stratified block".<br>Comment: Stratified block is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | Low risk | Quote: "double blind (participants, evaluator) "<br>Comment: The comparison was acupuncture versus sham acupuncture. It is possible to blind patients. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "The physician who performed the exams was blinded to treatment group assignments." |
| Incomplete outcome data (attrition bias) | Low risk | Quote: “Efficacy analyse were performed on the ITT population, which consisted of all randomised participants who received at least 1 acupuncture or sham acupuncture…there were no dropouts during treatment or follow-up periods in either the acupuncture or sham acupuncture groups”. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: “Before treatment began, *t* tests comparing acupuncture and sham-acupuncture groups found no significant differences in age, duration of SCI, activity levels, WUSPI scores, and NRS scores at time of entry into the study. Chi-square analysis revealed no significant differences between two groups with respect two medical and demographic data.”<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Gao 2009

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method of randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants | High risk | Comment: The comparison was acupuncture plus Tuina versus |

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|---|---|---|
| (performance bias) | | Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of assessor. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "There were no significant differences in gender, age and duration of disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Guerra 2004

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "Participants were randomly allocated to…using computer software (Sigesmuw) without stratification or blocking procedure"<br>Comment: This study used the computer-generated random number which is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Low risk | Quote: "via a telephone call from the independent evaluator to the external centralised office. The allocation group was revealed only to the treating acupuncturist, who had no knowledge of diagnoses or other data evaluations." |
| Blinding of participants (performance bias) | Low risk | Quote: "The study was…placebo-controlled trial"<br>Comment: The comparison was EA versus sham EA. It is possible to blind patients. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "Evaluation during the follow-up period, and drug treatment recommendations, were performed in different places and times and by different evaluators, who had no knowledge of the type of acupuncture (real or placebo) applied to the patient." |
| Incomplete outcome data (attrition bias) | High risk | 20 patients dropped out, including 5 due to no time, 7 due to discontinued intervention, 3 due to discontinued follow-up and 5 without explanation.<br>Comment: The reasons of drop-outs were not provided. The study did not use ITT analysis to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Comment: Demographic data for two groups at the baseline were reported. However, no comparison results were reported. The baseline data seemed balanced. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Guo 2006

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "subjects were randomly located using randomised number table"<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook.. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus oral Western medication plus exercise versus oral Western medication plus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "It used singe-blinding (researcher, administer, assessor separated) clinical principle" |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no significant differences in gender, age and severity of disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## He 2011

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated…"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Comment: The balance of baseline data and selection criteria were not reported. |

## Huang 2009

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: Author used the rate 2:1:1 to randomise the subjects. But the detailed randomisation method was not provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus TDP versus acupuncture plus TDP versus TDP. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for this study was not available. |
| Other bias | Unclear risk | Comment: The balance of baseline data and selection criteria were not reported. |

## Jiang 2011

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus TDP versus TDP. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | No information provided. Blinding was unlikely, as it is impossible for one author to conduct a trial with blinding of assessors. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | Comment: The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "The two groups were comparable and there were no significant differences in gender, age and severity of disease between two groups ($p > 0.05$)" at the baseline. Only inclusion criteria were reported.<br>Comment: The baseline imbalance did not exist. Exclusion criteria were not provided. |

## Ke 2012

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus ultrashort wave plus joint mobilisation versus ultrashort wave plus joint mobilisation. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "There were no statistical significant differences between two groups" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Kleinhenz 1999

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | Low risk | Quote: "a new placebo-needle as control", "No procedure differences can be realised by the patient or by third persons"<br>Comment: The comparison was acupuncture versus sham acupuncture. It is possible to blind patients. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "Assessment was made at least 2 days after the last treatment by the same orthopaedist of the initial assessment who had not been informed about the treatment of the patients." |
| Incomplete outcome data (attrition bias) | Low risk | Quote: "Data were analysed on an intention to treat basis including all randomised patients."<br>Comment: Seven subjects dropped out during treatment and reasons included no time (n=1), worsening (n=1), fainting spell (n=1), no explanation (n=4). The study used ITT analysis to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: “Baseline characteristics have been subjected to statistical analysis and revealed no relevant differences.” |

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| | | Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Lathia 2006

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote:"Randomisation was conducted in blocks of four using a table of random numbers"<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Low risk | Quote: "Numbered, opaque envelopes containing the treatment group allocation were prepared and were opened in succession by the treating physician as the patients were enrolled". |
| Blinding of participants (performance bias) | Low risk | Comment: The comparison was acupuncture versus sham acupuncture versus standard acupuncture. It is possible to blind patients. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "Assessment …was given to each patient by an investigator who was blinded to treatment allocation." |
| Incomplete outcome data (attrition bias) | Low risk | Quote: "All analyses were conducted on an intention-to-treat basis."<br>Comment: Three participants dropped out, due to time constraint and pain increase. It used ITT analysis to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: “With the exception of sex, baseline variables were similar between the three groups ($p > 0.05$).”<br>Comment: The key baseline data were balanced. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Li 2010

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated…by random number table"<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus ozone injection plus Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |

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|---|---|---|
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "The two groups were comparable and there were no statistically significant differences between two groups ($p$ > 0.05)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Li 2011a

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated by random number table"<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus exercise versus oral ibuprofen plus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences between two groups ($p$ > 0.05)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Li 2011b

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were assigned into two groups……using randomisation block method"<br>Comment: Randomisation block method is an accepted method for randomisation. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus Tuina. It is impossible to blind participants. |
| Blinding of outcome | Unclear risk | No information provided. |

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|---|---|---|
| assessment (detection bias) | | |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: At the baseline, "the two groups were comparable and there were no statistically significant differences in sex, age and duration of disease between two groups ($p > 0.05$). However, the scores for pain intensity, abduction and supination in control group were significantly higher than those in treatment group ($p < 0.05$). The scores for pronation in treatment group were higher than those in control group ($p = 0.039$)." Chi-square was used for data analysis.<br>Comment: The baseline imbalance existed for severity of disease but was addressed by data analysis. The selection criteria were clearly reported, valid and feasible to be implemented. |

### Lin 1994

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus nerve block versus nerve block versus EA. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Comment: The balance of baseline data and selection criteria were not reported. |

### Molsberger 2010

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "Using central telephone randomisation (Department of Statistics in Medicine, Heinrich Heine University Düsseldorf), the patients were randomly allocated to treatment groups and informed via fax. The randomisation list was prepared with the SAS software package, version 6.12." |

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| | | Comment: This study used the computer-generated random number which is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Low risk | Quote: "ring central telephone randomisation (Department of Statistics in Medicine, Heinrich Heine University Düsseldorf), the patients were randomly allocated to treatment groups and informed via fax…and was concealed and recorded on a secure central database." |
| Blinding of participants (performance bias) | Low risk | Quote: "The patients were blinded to the type of acupuncture"<br>Comment: The comparison was acupuncture versus sham acupuncture versus conservative orthopaedic treatment. It is possible to blind patients. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Quote: "The patients who received at least one study treatment constituted the safety population and the intention-to-treat (ITT) analysis, …"<br>Comment: The reasons of dropouts were not provided. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: “All baseline characteristics (gender, age, duration of disease, intensity of pain, radiographic and clinical diagnosis) were similar across the three treatment groups ($p > 0.05$).”<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Moore 1976

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: “According to a random assignment, half of the subjects received acupuncture …and half had a sham procedure, the placebo.”<br>Comment: The study did not provide the method used for randomisation. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | Low risk | Quote: "half had a sham procedure, the placebo."<br>Comment: The comparison was acupuncture versus sham acupuncture. It is possible to blind for patients. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "research assistant, who had no knowledge of what treatment conditions the subject had experienced, again recorded the subject’s appraisal of the amount of shoulder discomfort present and measured his range of motion in the same manner as before treatment". |
| Incomplete outcome data (attrition bias) | Unclear risk | No information provided. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Comment: The balance of baseline data was not reported. Little information on selection criteria was reported. |

## Shao 2006

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | low risk | Quote: "patients were randomly allocated…by random number table".<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA versus oral Diclofenac Sodium (sustained release tablet). It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences in gender, age, severity of disease and JOA scores between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Sun 2001

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "we designed the current randomised controlled trial…using random number table method"<br>Comment: Random number table is an accepted method used for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus exercise versus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "Functional mobility, power, and pain were assessed by a blinded assessor using the Constant Shoulder Assessment, at baseline, 6 weeks and 20 weeks." |
| Incomplete outcome data (attrition bias) | Low risk | Quote: ”Analysis was based on the intention-to-treat principle”, “one patient in exercise plus acupuncture group discontinued treatment after the second acupuncture session due to fear of needle pain, which 4 patients withdrew from the exercise group after 6 weeks of exercise practice”.<br>Comment: The study had drop-outs with reasons. It used ITT analysis to address missing data. |

| | | |
|---|---|---|
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: The baseline characteristics were reported and there were no significant differences in sex, age and duration of symptoms between two groups ($p > 0.05$).<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Sun 2012

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus rehabilitation versus rehabilitation. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of unlikely. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Comment: The balance of baseline data and selection criteria were not reported. |

## Tan 2003

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus exercise versus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |

| | | |
|---|---|---|
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "The two groups were comparable and there were no statistically significant differences in age, severity of disease and duration of disease between two groups (*p* value not reported)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Wan 2002

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated".<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus acupuncture versus Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of assessor. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other risk | Unclear risk | Comment: The balance of baseline data and selection criteria were not reported. |

## Wang 2007

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus exercise versus Diclofenac Sodium externally plus exercise vs Tuina plus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data |

| | | |
|---|---|---|
| | | only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other risk | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences in sex, age and duration of disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Wang 2012

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was electro-acupuncture plus electro treatment plus Tuina versus electro treatment plus Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "There were no statistically significant differences between two groups ($p$ value not reported)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Xie 2010

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus acupuncture versus Tuina. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of assessor. |

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|---|---|---|
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences in sex, age and duration of disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Xiong 2009

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Unclear risk | Quote: "patients were randomly allocated"<br>Comment: No information on the specific method used for randomisation provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Ashi point injection versus Ashi point injection. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: "The two groups were comparable and there were no statistically significant differences in sex, age, location of disease and duration of disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Xu 2006

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated...by random number table "<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |

| | | |
|---|---|---|
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture versus oral Brufen. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences in sex, age and duration of disease between two groups (*p* value not reported)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Xuan 2008

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated…by soft ware SAS6.1"<br>Comment: This study used the computer-generated random number which is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA versus oral Diclofenac Sodium. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | High risk | Comment: 5 patients dropped out, but author did not clearly provide the reason. It did not use ITT analysis to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: There were no statistically significant differences in sex and age between two groups ($p > 0.05$) at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Yang 2009

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection | Low risk | Quote: "patients were randomly allocated", "computer create random numbers" |

| | | |
|---|---|---|
| bias) | | Comment: This study used the computer-generated random number which is an accepted method for randomisation as per Cochrane Handbook |
| Allocation concealment (selection bias) | Low risk | “Random envelopes” were Used for allocation. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus joint mobilisation versus joint mobilisation. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | High risk | Quote: "the reasons of dropouts were far from hospital (n=2), no time due to work (n=2), intolerance of treatment (n=1)"<br>Comment: but the study did not use ITT to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: The two groups were comparable and there were no statistically significant differences in sex, age and JOA scores between two groups ($p > 0.05$) at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Yang 2012

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated", "random number table used"<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus joint mobilisation versus joint mobilisation. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | High risk | The study did not report the results of adverse events which were listed in the methods section as an outcome measure. |
| Other bias | Low risk | Quote: “The two groups were comparable and there were no statistically significant differences in sex, age, pain intensity and range of motion of affected limbs between two groups ($p > 0.05$)” at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Zhang 2011

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated…by randomisation block".<br>Comment: Randomisation block is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Tuina versus Tuina. It is impossible to blind patients |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences in age, sex, duration of disease and CMS between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Zhang 2012

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated…by random number table".<br>Comment: Random number table is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture versus Tuina versus external Diclofenac Sodium. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: Six participants dropped out but no reason of drop-outs was provided. The  it did not do ITT analysis. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: “The two groups were comparable and there were no statistically significant differences in sex, age, duration of |

| | | |
|---|---|---|
| | | disease and severity of disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Zhao 2008

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | Low risk | Quote: "patients were randomly allocated…using SAS 6.12 software"<br>Comment: This study used the computer-generated random number which is an accepted method for randomisation as per Cochrane Handbook. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus Guiwei Tuina versus Guiwei Tuina versus conventional Tuina. It is impossible to blind patients |
| Blinding of outcome assessment (detection bias) | Low risk | Quote: "The researcher, administer and evaluator were separated. They were not involved in the conduct of treatment. They did not know which intervention each participant received.". |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "The two groups were comparable and there were no statistically significant differences in sex, age and CMS between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

# Appendix 6: Characteristics of included non-RCT studies

## Chen 2006

| | |
|---|---|
| Methods | -Non-randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 80.<br>-T: acupuncture (n=48).<br>-C: TDP (n=32).<br>-Gender (female/male): total: 53/27.<br>-Range of age years: total: 19-70.<br>-Range of duration of pain: total: 3 days-18 months.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis. |
| Interventions | Treatment group (acupuncture):<br>-Number of points: 4.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Length of needle: 25-40 mm.<br>-Frequency of treatment: 1/day.<br>-Number of treatment session: 14.<br>-Duration of treatment: 2 weeks.<br><br>Control group (TDP irradiation):<br>-TDP duration of each session: 20 minutes.<br>-Frequency: 1/day.<br>-Number of treatment session: 14.<br>-Duration: 2 weeks. |
| Outcomes | Assessed post-treatment<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Chen 2011

| | |
|---|---|
| Methods | -Non-randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 80.<br>-T: EA plus joint mobilization plus exercise (n=50).<br>-T: Joint mobilization plus exercise (n=30).<br>-Gender (female/male): total: 48/32.<br>-Range of ages: total: 40-68.<br>-Mean of ages: total: 54.<br>-Range of duration of pain: total: 1 month-3 years.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis (“science of clinical orthopaedics and traumatology”). |
| Interventions | Treatment group (EA plus joint mobilisation plus exercise):<br>-Number of points: 6.<br>-Stimulation method: electric.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Type of needle: 0.3*40 mm.<br>-Joint mobilisation operator: medical practitioners.<br>-Joint mobilisation manipulate on acupoints: no. |

| | |
|---|---|
| | -Frequency of treatment: 1/day.<br>-Number of treatment session: 30.<br>-Exercise operator: patients themselves.<br>-Frequency of exercise: 3/day.<br>-Duration of treatment: 30 days.<br><br>Control group (joint mobilisation plus exercise):<br>-Joint mobilisation and exercise are same as treatment group. |
| Outcomes | Assessed at post-treatment.<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

## Johansson 2005

| | |
|---|---|
| Methods | -Non-Randomised controlled trial.<br>-No blind.<br>-2 arms.<br>- ITT analysis used. |
| Participants | -Sample size: 85.<br>-T: acupuncture plus exercise (n=44).<br>-C: ultrasound plus exercise (n=41).<br>-Gender (female/male): total: 59/26; T: 32/12; C: 27/14.<br>-Mean of age (SD): T: 49 (7); C: 49 (8).<br>-Inclusion criteria: 30–65 years of age; typical history: pain located in the proximal lateral aspect of the upper arm (C5 dermatome), especially during arm elevation; a positive Neer impingement test (subacromial injection of anaesthetic); At least 2 months' duration of the current episode. Three of the following 4 inclusion criteria must be positive; Hawkins-Kennedy impingement sign; Jobe supraspinatus muscle test (in 90° of abduction in the scapular plane); Neer impingement sign; Painful arc between 60° and 120° of active abduction.<br>-Exclusion criteria: radiological findings: malignancy, osteoarthritis of the glenohumeral joint, skeletal abnormalities decreasing the subacromial space (bony spurs, osteophytes); known or suspected polyarthritis, rheumatoid arthritis, or diagnosed fibromyalgia; previous fractures of any bone in the shoulder complex or shoulder surgery on the affected side; Dislocation of the glenohumeral joint or the clavicular joints on the affected side; history or current clinical findings of instability in any joint of the shoulder complex (negative apprehension sign–relocation test for exclusion of ventral instability of the glenohumeral joint); suspicion of frozen shoulder: time-dependent decreased range of movements following the capsular pattern (external rotation–abduction–internal rotation) and pain during intra-articular mobilization; problems from the cervical spine: shoulder symptoms reproduced with neck movements or a positive test for the foramina intervertebralia (pain or neurological symptoms during manual extension combined with manual lateral flexion and rotation toward the tested side); having received any of the treatment alternatives in the study earlier for the current problem; having received a corticosteroid injection during the last 2 months for the current problem; a clinical picture of ruptured rotator cuff (trauma, pronounced weakness, atrophy); acute subacromial bursitis, making a clinical examination impossible due to pain; difficulty participating in data collection due to communication problem.<br>-Drop-out: 21 (during follow-up period, 17 receiving additional treatments, 1 time conflict with work, 1 no improvement, 2 undergo surgical subacromial decompression). |
| Interventions | Treatment group (acupuncture plus exercise):<br>-Number of points: 5.<br>-Stimulation method: manual.<br>-*De Qi*: yes. |

| | |
|---|---|
| | -Needle retention time: 30 minutes.<br>-Frequency of acupuncture: 2/week.<br>-Number of treatment sessions: 10.<br>-Duration of treatment: 5 weeks.<br>-Co-intervention: 2-step home exercise.<br>-Frequency of acupuncture: 1/day.<br>-Duration of treatment: 14-15 weeks.<br><br>Control group (ultrasound plus exercise):<br>-Treatment duration of each session: 10 minutes.<br>-Machines type: Phyaction 190† ultrasound device.<br>-Intensity of ultrasound: frequency1MHz, spatial-average intensity 1W/square cm, gel coupling, 4 square cm.<br>-Treatment position: covering an area of about 8 to 10 square cm, inferior to the anterior and lateral part of the acromion. The transducer head was moved in small circles covering the area.<br>-Frequency of ultrasound: 2/week.<br>-Exercise is same as treatment group. |
| Outcomes | Assessed post-treatment, 3 months from first treatment, 6 months from first treatment, 12 months from first treatment<br>-Constant Murley score (CMS)<br>-AL score<br>-University of California at Los Angeles End-Result Score (UCLA) |
| Notes | Country origin: Sweden. |

## Ma 2006

| | |
|---|---|
| Methods | -Non-randomised controlled trial.<br>-No blind.<br>-3 arms. |
| Participants | -Sample size: 75.<br>-T: acupuncture plus physical therapy (n=15).<br>-C1: physical therapy (n=30).<br>-C2: acupuncture (n=30).<br>-Gender (female/male): total: 39/36.<br>-Mean of ages: total: 54.8; T: 52.8; C1: 54.1; C2: 56.4.<br>-Mean of duration of pain: total: 25.8 weeks.<br>-Inclusion criteria: subjects of this study included patients who had spontaneous frozen shoulder pain for at least three months, could not lift their arms more than 135°, and were willing to follow the medical treatments designed by the authors.<br>-Exclusion criteria: patients who had non-spontaneous frozen shoulders caused by nervous system diseases, acute inflammation and broken bones, acupuncture syncope and skin infection surrounding acupuncture points were not included in this study. |
| Interventions | Treatment group (acupuncture plus physical therapy):<br>-Number of points: 5.<br>-The needle retention time: 15 minutes.<br>-Frequency of acupuncture: 2/week.<br>-Number of treatment sessions: 8.<br>-Co-intervention: physical therapy (hot pack for 15 minutes, joint mobilisation for 5-10 minutes and active shoulder exercises for 5-10 minutes).<br>-Duration of treatment: 4 weeks<br><br>Control group 1 (physical therapy):<br>-Physical therapy is same as treatment group.<br><br>Control group 2 (acupuncture):<br>-Acupuncture is same as treatment group. |

| | |
|---|---|
| Outcomes | Assessed at second and fourth week treatment<br>-Visual analogue scale (VAS)<br>-Range of motion<br>-Quality of life (SF-36) |
| Notes | Country origin: P. R. China. |

## Su 2010

| | |
|---|---|
| Methods | -Non-randomised controlled trial.<br>-No blind.<br>-4 arms. |
| Participants | -Sample size: 160.<br>-T: acupuncture plus joint mobilisation (n=40).<br>-C1: acupuncture (n=40).<br>-C2: joint mobilisation (n=40).<br>-C3: Western medication plus TDP (n=40).<br>-Gender (female/male): total: 101/59; T: 24/16; C1: 27/13; C2: 25/15; C3: 25/15.<br>-Range of ages: total: 40-69; T: 40-68; C1: 42-68; C2: 46-69; C3: 40-66.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis. |
| Interventions | Treatment group (acupuncture plus joint mobilisation):<br>-Number of points: 12 points.<br>-Stimulation method: manual.<br>-Needle retention time: 20 to 30 minutes.<br>-Joint mobilisation operator: medical practitioners.<br>-Joint mobilisation manipulated on acupoints: yes.<br>-Joint mobilisation duration of each session: 40 minutes.<br>-Frequency of treatment: 1/day, rest 2 days after every 10 treatments.<br>-Duration of treatment: 8 weeks.<br>-Number of treatment sessions: 40.<br><br>Control group (acupuncture):<br>-Acupuncture is same as treatment group.<br><br>Control group (joint mobilisation):<br>Joint mobilisation is same as treatment group.<br><br>Control group (Western medication plus TDP):<br>-Drug name: ibuprofen (fenbid) and Chlorzoxazone.<br>-Administration route: oral.<br>-Dose of drugs: 0.3g (Ibuprofen), 0.3g (Chlorzoxazone).<br>-Frequency of drugs: 2/day (Ibuprofen), 3/day (Chlorzoxazone),<br>-The duration of treatment: 96 days. |
| Outcomes | Assessed at post-treatment<br>-Effective rate (no scoring system used) |
| Notes | Country origin: P. R. China. |

## Zhao 2002

| | |
|---|---|
| Methods | -Non-randomised controlled trial.<br>-No blind.<br>-2 arms. |
| Participants | -Sample size: 90.<br>-T: acupuncture (n=60).<br>-C: oral ibuprofen (n=30).<br>-Gender (female/male): total: 53/37; T: 36/24; C: 17/13. |

| | |
|---|---|
| | -Range of ages: total 40-58.<br>-Mean of ages (SD): T: 49.2 (6.3); C: 49.3 (6.1).<br>-Range of duration of pain: total: 1 month-1 year; T: 1 month-1 year; C: 1 month-1 year.<br>Mean of duration of pain (SD): T: 6.8 (4.2) months; C: 6.5 (4.4) months.<br>-Inclusion criteria: the participants with diagnosis of scapulohumeral periarthritis |
| Interventions | Treatment group (acupuncture plus exercise):<br>-Treatment side: affected side.<br>-Number points: 4 points.<br>-Use point to point acupuncture: yes.<br>-Stimulation method: manual.<br>-*De Qi*: yes.<br>-Needle retention time: 30 minutes.<br>-Length of needle: 50 mm.<br>-Frequency: 1/day.<br>-Number of treatment sessions: 10.<br>-Duration of treatment: 10 days.<br><br>Control group (oral ibuprofen plus exercise):<br>-Drug name: ibuprofen.<br>-Administration route: oral.<br>-Frequency of administration: 2 pills, 3 times a day.<br>-Duration of treatment: 10 days. |
| Outcomes | Assessed at post-treatment.<br>-Effective rate (no scoring system used). |
| Notes | Country origin: P. R. China. |

# Appendix 7: Risk of bias of included non-RCT studies

## Chen 2006

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | High risk | Comment: No “randomisation” was mentioned. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: No information provided. The comparison was acupuncture versus TDP. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of assessor. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Comment: The balance of baseline data and selection criteria were not reported. |

## Chen 2011

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | High risk | Quote: "allocated patients according to the odd and even admission date"<br>Comment: This was quasi-randomisation, thus this study has been classified as non-RCT. Imbalance of treatment group and control group (50:30) implies randomisation was not properly used |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was EA plus joint mobilisation plus exercise versus joint mobilisation plus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding of assessor. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: “The two groups were comparable and there were no statistically significant differences in age, sex and duration of |

| | | |
|---|---|---|
| | | disease between two groups ($p > 0.05$)" at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not clearly reported and their validity and feasibility were difficult to determine. |

## Johansson 2005

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | High risk | Quote: "Concealed randomisation, based on a random list, with the treatment alternative in the envelopes was carried out beforehand".<br>Comment: It seems the treatment was allocated alternatively to the two groups which implies that this was quasi-randomisation, thus this study has been classified as non-RCT. |
| Allocation concealment (selection bias) | Low risk | Quote: "Concealed randomisation, based on a random list, with the treatment alternative in the envelopes was carried out beforehand". |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture plus exercise versus ultrasound plus exercise. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Low risk | Quote: "No adverse effects or side effects were reported in either group during or after the treatment period. Nine patients in the acupuncture group and 8 patients in the ultrasound group received additional treatment. These 17 patients were consequently not adhering to the study protocol, and their data were included in the ITT analysis".<br>Comment: No subjects dropped out during treatment period, though 21 subjects dropped out in follow-up. The study used ITT analysis to address missing data. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Low risk | Quote: "Before treatment, there were no differences in the background variables between treatment groups ($p > 0.05$)."<br>Comment: The baseline imbalance did not exist. The selection criteria were clearly reported, valid and feasible to be implemented. |

## Ma 2006

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | High risk | Quote: "These subjects were randomly assigned to one of three groups…30 in control group (received physical therapy only), 30 in experimental group I (received acupuncture only) and 15 in experimental group II (received both therapies)".<br>Comment: The imbalanced number of participants in each group indicated that randomisation was not properly used. This study has been classified as non-RCT. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants | High risk | Comment: The comparison was acupuncture plus physical |

| | | |
|---|---|---|
| (performance bias) | | therapy versus acupuncture alone versus physical therapy alone. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: “There was no statistically significant difference in age among these three groups ($p$ = 0.3306). Similarly, the average duration of developing disease was 25.8 weeks and no statistically significant difference among the groups ($p$ = 0.2307). There was also no statistically significant difference in gender…($p$ = 0.254). In terms of the side of frozen shoulder…with rarely used hand, showing no statistically significant difference among groups ($p$ = 0.345).”<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Su 2010

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | High risk | Comment: The participants were divided into four groups. However, no information on randomisation was provided. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparisons included Western medication plus TDP versus acupuncture alone versus joint mobilisation alone versus acupuncture plus joint mobilisation. Blinding was unlikely used as different forms of therapies were provided to 4 groups. |
| Blinding of outcome assessment (detection bias) | Unclear risk | No information provided. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: “The two groups were comparable and there were no statistically significant differences in age, sex and pain intensity between two groups ($p$ > 0.05)” at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |

## Zhao 2002

| Bias | Authors' judgement | Support for judgement |
|---|---|---|
| Random sequence generation (selection bias) | High risk | Quote: "90 participants were randomly assigned into 2 groups, treatment group (n=60) and control group (n=30)".<br>Comment: The imbalanced number of participants in 2 groups indicated that randomisation was improperly used. This study has been classified as non-RCT. |
| Allocation concealment (selection bias) | Unclear risk | No information provided. |
| Blinding of participants (performance bias) | High risk | Comment: The comparison was acupuncture versus oral ibuprofen. It is impossible to blind participants. |
| Blinding of outcome assessment (detection bias) | High risk | Comment: No information provided. Blinding was unlikely as it is impossible for one author to conduct a trial with blinding. |
| Incomplete outcome data (attrition bias) | Unclear risk | Comment: The same number of participants was recruited and reported in the outcomes. However, it is not clear if the author selectively reported the participants with completed trial data only. |
| Selective reporting (reporting bias) | Unclear risk | The protocol for the study was not available. |
| Other bias | Unclear risk | Quote: The two groups were comparable and there were no statistically significant differences in age, sex and duration of disease between two groups ($p > 0.05$) at the baseline.<br>Comment: The baseline imbalance did not exist. The selection criteria were not reported and their validity and feasibility were difficult to determine. |