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Abstract

The objective of this study is to investigate the effects of acupuncture, core-stability exercises, and treadmill 12-minute walking exercises in treating patients with postsurgical lumbar disc herniation. A 34-year-old woman with a history of lumbar disc prolapse who had undergone lumbar disc surgery on two different occasions was treated using acupuncture, core-stability exercises, and treadmill walking exercises three times per week for 12 weeks. The outcome measures used in this study were pain intensity, spinal range of movement, and general health. After 12 weeks of treatment, the patient had made improvement in terms of pain, which was reduced from 9/10 to 1/10. In a similar vein, the patient’s general health showed improvement of >100% after 12 weeks of treatment. Pre-treatment scores of spinal flexion and left-side flexion, which measured 20 cm and 12 cm, respectively, increased to 25 cm and 16 cm after 12 weeks of treatment. This study showed that acupuncture, core-stability exercises, and treadmill walking exercises were useful in relieving pain, increasing spinal range of movement, and improving the health of a patient with postsurgical lumbar disc herniation.

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1. Introduction

The lifetime prevalence of disc herniation has been estimated at 1–3% [1,2]. Although anatomic evidence of disc herniation is said to be present in 20–40% of imaging tests among asymptomatic individuals [3,4]. Most clinically relevant herniation occurs between the ages of 30 years and 50 years, but can also occur in adolescent and older people [5]. From 2% to 5% of patients seeking help are thought to suffer disc herniation while, in about 40% of patients with low back pain seeking help, the cause is disc herniation [6,7]. Although the literature contains several reports of spontaneous regression of herniated intervertebral discs, the exact mechanism of spontaneous disc regression remains unknown [8]. Many patients with extruded lumbar disc herniation require surgical intervention. However, current surgical techniques, even though less invasive than in the past, have significant problems in terms of effectiveness, safety, and cost [9]. Similarly, studies have reported a complication rate of 24% associated with surgical interventions, with about half of the complications being serious and 8% of patients who underwent surgery had complications [9]. These findings emphasize the importance of conservative care, which will be beneficial to most patients and have a very low complication rates [7].

Rehabilitation guidelines for postoperative management of patients undergoing spinal surgeries emphasize effective pain relief via adequate analgesia and suitable positioning coupled with patient education and advice on sitting related to patient’s function, on reinforcing self-management, and on building activities appropriately. Other areas of emphasis include awareness of the importance of good posture especially in sitting including going up and down stairs. In a similar vein, exercises in the form of core-stability exercises to include leg slides, gym ball exercises, balance work, proprioceptive training, general fitness exercises, and cardiorespiratory exercises are advocated [10].

Both acupuncture and exercise have been reported to have significant effects on reducing pain and improving quality of life among back-pain sufferers. Positive reinforcement effects might coexist in the use of acupuncture, core-stability exercises, and treadmill walking exercises in the management of low back pain [7]. Acupuncture analgesia improved the noxious descending inhibitory controls and pain gate mechanism and, therefore, helped the patients’ pain levels. The overall result was reduced pain, reduced functional disability due to pain, and improved well-being. Exercises remain the most frequently prescribed treatment in the management of low back disorders. Exercises for low back disorders are typically designed with the goal of relieving pain, strengthening the back, increasing back flexibility, and improving functional activities, cardiovascular endurance, and general wellness [10].

A recent focus in physiotherapy management of chronic low back pain has been to identify specific muscles that are able to stabilize the back and to enhance the activity of those muscles whose primary function is considered to be dynamic stability and segmental control of the spine. By contrast, general endurance exercises in the form of treadmill exercises may offer greater long-term benefit than specific exercises whose effects are aimed at the lumbar spine.

In the present study, the authors theorized that global pain relief associated with acupuncture combined with improved spinal segmental movement control associated with core-stability exercises and enhanced cardiovascular endurance and general wellness associated with treadmill walking exercises might be useful in alleviating the symptoms of low-back disorders. However, the effects of various physiotherapy modalities for treating patients after lumbar disc surgery have not been widely reported. The present case study involved the use of acupuncture, core-stability exercises, and 12-minute treadmill walking exercises in the treatment of a patient with postsurgical lumbar disc herniation.

2. Case report

2.1. Case presentation

Approval to carry out this study was obtained from the Research and Ethics Committee of the University of Maiduguri Teaching Hospital. Written informed consent was obtained from the patient prior to assessments and treatment.

A 34-year-old woman, who is a nurse, with a more than 2-year history of lower back and left leg pain was referred for physiotherapy treatment in June 2013. She had previously consulted an orthopedic surgeon and had been diagnosed as having a disk herniation in the right L4–5 region based on a computed tomography scan and magnetic resonance imaging results. She had undergone two surgical treatments (decompressive laminectomy), the first in 2012 and the second in 2013, with little or no changes to her symptoms.

The patient reported no red flags, such as abdominal pain, night pain, rectal bleeding, or bowel or bladder irregularities. The patient’s chief complaint was low back pain that had started more than 2 years earlier. The initial back pain and leg pain on her first visit were each rated as 9/10. Pain was exacerbated by prolonged sitting and standing and was eased by moving about. Magnetic resonance imaging of the lumbar spine obtained prior to the first surgery showed a 4-mm extruded disc fragment on the left side of the spinal canal at the L4–5 level. She had no complaints of cardiac, respiratory, and/or skin sensation dysfunction.

On physical examination, the patient weighed 62 kg and was 1.65 m in height (body mass index = 22.8 kg/m²). On the 1st day of visit to our department, she walked slowly with reduced weight bearing on the left lower extremity. Pain intensity was assessed and graded using a numeric pain rating scale [11]. A modified Schober’s test was used to assess spinal range of movement [12]. Active flexion and left-side flexion of the lumbar spine were limited by pain. All other active spinal ranges of motion were within normal limits and were without pain. The straight leg raise test was positive only on the left side, within a 40–70° angle raise. A prone instability test was carried out to assess segmental spinal instability; it showed a positive result indicative of spinal segmental instability in this patient [12]. The knee-jerk and the ankle-jerk tendon reflexes were intact.
As outcome measures, pain intensity and spinal range of movement were assessed prior to commencement of treatment and at the end of each week until the end of the 12-week treatment. The Rand 36 questionnaire was used to measure the impact of back pain on the general health of the patient [13]. The reliability and the content validity of the Rand 36 questionnaire are reported in [13].

Our clinical impression was a postsurgical lumbar spine decompressive laminectomy with impairments of pain and reduced lumbar spinal range of movement. The main aims of the treatment were to reduce the back and the leg pain from 9/10 to 0–2/10 and to increase both the spinal range of movement to at least 75% of the full range and the general health of the patient by not less than 75%. The patient’s main desire was to be pain free.

2.2. Interventions

2.2.1. Acupuncture treatment

The patient was properly instructed on what to expect in terms of the acupuncture treatment and some possible side effects. Informed consent was obtained prior to treatment. The patient was placed in a prone position lying with proper pillow support under her head, hip, and ankle joints for comfort. She received acupuncture treatment at selected acupuncture points for 20 minutes in the lower back and the lower limb areas. The selected acupuncture points used in the present study are widely accepted for treating low back pain: Shensu (BL23), Dachangshu (BL25), Ciliao (BL32), Weizhong (BL40), Kunlum (BL60), Huantiao (GB30), and Yanglingquan (GB34) [14]. At each point, the skin was wiped with alcohol, and the therapist hands were cleaned with alcohol gel prior to needle insertion. Disposable stainless-steel needles (0.2 mm × 40 mm; Seirin Co., Ltd., Skizuoka, Japan) were inserted into a muscle to a depth of 10 mm by using the sparrow-pecking acupuncture technique (alternate pushing and pulling of the needle). The needle manipulation was stopped when the patient felt dull pain or acupuncture sensation (de qi: numbness, soreness, and/or radiating sensation), and the needle was left in position for another 20 minutes. Acupuncture treatment was carried out three times per week for 12 weeks.

2.2.2. Core-stability exercises

The researcher demonstrated to the patient the locations of the core-stability muscles in the body and how to activate those muscles. The techniques of core-stability—muscle activation used in this study were as described by Sokunbi et al [15]. Core-stability exercises were carried out for 20 minutes three times per week for 12 weeks.

2.2.3. Treadmill walking exercises

Treadmill walking exercises commenced after six sessions, i.e., after 2 weeks of treatment with acupuncture and core-stability—muscle exercises, at which point the patient had experienced a 50% reduction in pain. A modified Bruce protocol for the treadmill was carried out as described by Sokunbi et al [16]. The patient was asked to do a 5-minute warm-up walk at 1.6 m/second on a 2.5% grade for 5 minutes. This was then followed by a continuous multistage run. The speed of the run was adjusted by adding 14% of 1.6 m/second each minute for a maximum period of 10 minutes. Criteria set for stopping the exercise were aggravation of back and leg pain, breathlessness, and dizziness [16]. Treadmill walking exercises were carried out three times per week for 10 weeks.

3. Results

The outcome of this study was improvement with reduction in pain intensity from 9/10 to 1/10 at the end of the 12th week of treatment. After the first treatment with acupuncture, the patient reported a 54.2% reduction in overall pain intensity scores with visual analog scale scores reduced from 9/10 (preacupuncture) to 4.8/10 (post-acupuncture). Prior to seeking physiotherapy intervention, the patient had reported taking pain medications, such as nonsteroidal anti-inflammatory drugs (diclofenac), and an antidepressant (amitriptyline) regularly according to a prescription given by her physician. After 2 weeks of treatment with acupuncture and core-stability exercises, the patient reported more than a 50% reduction in the number of tablets of pain medication required to control her pain. After four weeks of treatment, the patient was rarely taking any pain medication at all; i.e., the patient was taking medication only for pain aggravation. After 7 weeks of treatment, the patient no longer took any pain medication.

Similarly, the spinal ranges of flexion and extension, which measured 20 cm and 12 cm, respectively, prior to the intervention increased to 25 cm and 16 cm, respectively, at the end of the 12-week treatment (Fig. 1). The general health of the patient did not show improvement until the 6th week of treatment, after which it increased by more than 100% (Fig. 2).

4. Discussion

This study showed that a combination of acupuncture, core-stability exercises, and treadmill walking exercises produced improvement in terms of pain reduction, increased spinal mobility, and improved general health of the patient following lumbar disc herniation surgery. A
more pronounced improvement was observed after 6 weeks of treatment in all the outcome measures applied. This might be due to the initial limiting effect of pain on the spinal mobility and the general health of the patient; however, with the use of acupuncture to relieve pain by about 50% after 6 weeks of treatment, the patient was able to carry out the exercises more comfortably. At this point, light aerobic exercises (treadmill walking exercises) were implemented to promote cardiovascular endurance and general fitness.

The positive overall effects of the treatment in the present study, however, are opposite to those reported in a previous study, in which no relative effectiveness of postoperative physiotherapeutic rehabilitation was observed [17]. This seems to generate the question of what form of physiotherapy treatment will be effective to manage postsurgical lumbar disc herniation. Acupuncture analgesia improves the noxious descending inhibitory controls and pain gate mechanism and, therefore, helps reduce the patient's pain level. The overall result is that of reduced pain, increased spinal mobility, and improved general health. Positive reinforcement may occur when acupuncture, core-stability exercises, and treadmill walking exercises are combined, and psychological components may very well also provide a positive element in the healing process [18,19]. Studies have shown that, in the short term, acupuncture has a positive effect on relief from chronic low back pain, but when compared to conventional or alternative therapies, it was found not to be any more effective in reducing pain [19]. However, when applied in conjunction with conventional therapies, greater improvement might be seen [19]. The current study indicates that acupuncture combined with core-stability and treadmill-walking exercises may help in the management of postsurgical lumbar disc herniation.

A stabilization exercise program has been shown to produce short-term improvements in global impression of recovery and in activity for people with low back pain, and the results are maintained after 6 months and 12 months [19]. The benefits of spinal stabilization exercises have been linked to improved pattern of activation and onset of activity (in the transversus abdominis muscle and the multifidus muscles), decreased muscular fatigability, and restoration of muscle size following muscle atrophy caused by pain and reflex inhibition [20]. Sokunbi et al [15] have also reported a 17% increase in plasma serotonin levels in patients with chronic low back pain after 30 minutes of core-stability exercises. Thus, serotonin may also be involved in the mechanism of exercise-induced analgesia [15]. In addition, core-stability exercises may empower the patient with a better coping strategy for dealing with the pain [15].

Studies on the effects of treadmill walking exercises for treating post-surgical lumbar disc herniation are not many. One of the most popular types of exercise equipment used by physiotherapist in rehabilitation is the treadmill, which provides a straightforward, efficient aerobic workout. For many patients and therapists, treadmill exercises are a good choice for an exercise routine because walking is well tolerated by most individuals regardless of fitness level and back condition. The therapeutic benefit of treadmill exercises for treating chronic low back pain, besides improving cardiovascular fitness and general wellness, might be similar to the benefit of core-stability exercises.

This present study is limited in that it is a single case study, so the results cannot be generalized. Thus, large studies in the form of blinded, randomized, controlled trials investigating the efficacies of different interventions and the efficacy of a combination of acupuncture and exercises are needed to produce findings that can be generalized to all cases of postsurgical disc herniation.

Disclosure statement

The authors declare that they have no conflicts of interest and no financial interests related to the material of this manuscript.

References


