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Author(s)	Chan, VWK; Chan, PK; Chiu, PKY; Yan, CH; Ng, FY
Citation	Hong Kong Medical Journal, 2015, v. 21
Issued Date	2015
URL	http://hdl.handle.net/10722/214419
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Why do Hong Kong patients need total hip arthroplasty? An analysis of 512 hips from 1998 to 2010

Vincent WK Chan *, PK Chan, KY Chiu, CH Yan, FY Ng

ABSTRACT

Objective: To review patients who underwent primary total hip replacement between 1998 and 2010.

Design: Case series.

Setting: University teaching hospital, Hong Kong.

Patients: Data from the prospective joint registry of all patients who underwent primary total hip replacement from January 1998 to December 2010 were reviewed. Patients' age and sex, diagnosis, as well as Harris Hip Scores preoperation and at the last follow-up were analysed.

Results: There were 512 primary total hip replacements performed on 419 patients (43.4% males) during the study period. All had clinical follow-up for at least 2 years. The mean age of the patients was 57.6 (standard deviation, 16.6) years. In males, the main aetiology was osteonecrosis (50.9%), ankylosing spondylitis (19.5%), and post-traumatic arthritis (8.5%). For females, it was osteonecrosis (33.0%), primary osteoarthritis (18.8%), and post-traumatic arthritis (15.8%). Alcoholic-induced (52.5%) and idiopathic (40.7%) was the most common

cause of osteonecrosis in males and females, respectively. The mean preoperative Harris Hip Score and that at last follow-up was 43.9 (standard deviation, 18.3) and 89.7 (standard deviation, 13.0), respectively.

Conclusions: Osteonecrosis was the most common aetiology leading to total hip replacement although there were different causes in both sexes leading to it. The clinical result in terms of Harris Hip Score was good for all patients who required total hip replacement.

Hong Kong Med J 2015;21:Epub

DOI: 10.12809/hkmj144483

VWK Chan *, MB, BS

PK Chan, FHKCOS, FHKAM (Orthopaedic Surgery)

KY Chiu, FHKCOS, FHKAM (Orthopaedic Surgery)

CH Yan, FHKCOS, FHKAM (Orthopaedic Surgery)

FY Ng, FHKCOS, FHKAM (Orthopaedic Surgery)

Department of Orthopaedics and Traumatology, Queen Mary Hospital, The University of Hong Kong, Pokfulam, Hong Kong

* Corresponding author: loveholika@gmail.com

This article was published on 29 Sep 2015 at www.hkmj.org.

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New knowledge added by this study

- This study updates the disease pattern and epidemiology underlying the need for primary total hip replacement (THR) in our local Hong Kong population. In addition, the different causes leading to osteonecrosis of the hip were analysed.

Implications for clinical practice or policy

- The results of this study could have major implications on public health. They reveal that alcohol and its related health hazards remain a major health concern in Hong Kong. Study of the epidemiology of primary THR may enable us to better allocate our health care resources.

Introduction

Arthritis is a common clinical condition and its prevalence is increasing worldwide.¹⁻⁴ More than 20% of the United States population suffer from arthritis, and it is estimated that one in four may develop symptomatic hip osteoarthritis in their lifetime.^{1,5} It is an important clinical problem and a major burden on the health care system. Total hip replacement (THR) significantly improves quality of life and functional disability.⁶⁻⁸ The number of THR surgeries has been increasing all around the world over the past 10 years.⁹⁻¹²

Osteoarthritis is the most common indication

for THR in Caucasian populations. According to the Annual Report 2013 of the National Joint Registry for England, Wales and Northern Ireland, osteoarthritis was the most common cause of primary THR across all age-groups, accounting for more than 90% of those aged 50 years and above.¹⁰ Overall, 79.2% of primary THRs from 1992 to 2011 in the Swedish population was due to primary osteoarthritis, with a decreasing trend observed in THR for inflammatory arthritis.¹¹ As the prevalence of hip osteoarthritis is lower in Asians,¹³ the disease pattern for THR would also be expected to differ. A review of primary total hip arthroplasty (THA) in the

為何香港患者須接受髖關節置換手術？從1998年至2010年的512宗病例分析

陳偉鈞、陳秉強、曲廣運、忻振凱、吳富源

目的：分析由1998年至2010年期間曾首次接受髖關節置換手術病人的數據。

設計：病例系列分析。

安排：香港一所大學教學醫院。

患者：回顧分析由1998年1月至2010年12月期間曾首次接受髖關節置換手術病人的數據，包括其年齡、性別、診斷結果、手術前和最後一次隨訪評估的Harris髖關節評分量表。

結果：研究期間共有419位患者首次接受了512次髖關節置換手術，當中男性佔43.4%。這些患者最少有兩年隨訪期。他們平均57.6歲（標準差16.6歲）。至於接受相關手術的主要原因，男性患者主要為缺血性壞死（50.9%）、強直性關節炎（19.5%）和創傷後關節炎（8.5%）；女性患者主要為缺血性壞死（33.0%）、原發性骨關節炎（18.8%）和創傷後關節炎（15.8%）。酒精引發的缺血性壞死是在男性患者中最常見的成因（52.5%）；而突發性缺血性壞死則是女性患者中最常見的成因（40.7%）。手術前和最後一次隨訪評估的Harris髖關節評分量表之平均得分分別為43.9（標準差18.3）和89.7（標準差13.0）。

結論：雖然導致男性和女性患者缺血性壞死的成因各有不同，但缺血性壞死仍是導致全髖關節置換手術的最常見原因。此外，Harris髖關節評分量表中的得分反映曾接受過全髖關節置換手術患者的臨床結果良好。

Hong Kong Chinese population from 1972 to 1997 showed that osteonecrosis was the most common cause, accounting for 45.6% of cases, while primary osteoarthritis contributed only 10.2%.¹⁴ Singh et al¹⁵ found that in Singapore, 42% of THRs from 2004 to 2006 was due to osteonecrosis. There are no other recent updates, however.

In view of our ageing population and rising number of primary THRs, study of the epidemiology in our locality is important to further plan and budget our health care resources. This study reviewed the demographics and disease spectrum leading to primary THR in the Chinese population from 1998 to 2010, and attempted to identify any changes since 1997.

Methods

All patients who underwent primary THR at Queen Mary Hospital (QMH), a university teaching hospital, from January 1998 to December 2010 were reviewed. Diagnosis was made according to clinical, radiological, and intra-operative findings and entered by the surgeon. Non-Chinese patients were excluded from further analysis. Patients' age and sex, diagnosis, preoperative and latest Harris

Hip Score¹⁶ at follow-up were analysed. All patients had clinical follow-up for at least 2 years. The causes of THR were then compared with the data from 1972 to 1997.¹⁴ Chi squared test and Student's *t* test were used for statistical analysis.

Results

A total of 512 THR surgeries were performed on 419 Chinese patients at QMH from January 1998 to December 2010. Of the cases, 43.4% were males and 48.4% were left hips. The mean age (\pm standard deviation) at the time of operation was 57.6 ± 16.6 years. The mean preoperative Harris Hip Score was 43.9 ± 18.3 (out of 100), and the mean Harris Hip Score at last follow-up was 89.7 ± 13.0 . The last follow-up Harris Hip Score had increased significantly compared with the preoperative Harris Hip Score (paired *t* test, $P < 0.05$; Table 1).

Osteonecrosis was the most common cause of primary THR in both males and females in our study population, accounting for 50.9% and 33.0%, respectively. The second most common cause was ankylosing spondylitis in males (19.5%) and osteoarthritis in females (18.8%). Post-traumatic arthritis was the third most common cause in both males (8.5%) and females (15.8%). Rheumatoid arthritis accounted for 2.5% of primary THRs in males, and 9.4% in females. Dysplasia contributed to 4.1% and 8.0% of primary THRs in males and females, respectively (Table 2).

The underlying causes of osteonecrosis in females and males were further analysed. The cause of osteonecrosis was entered by the operating surgeon based on medical records, as well as clinical, radiological, and intra-operative findings. The most

TABLE 1. Demographics of primary total hip replacement in Chinese patients at Queen Mary Hospital from 1998 to 2010

Demographics	Data*
Total No. of patients	419
Total No. of hips	512
Sex	
Male	43.4%
Female	56.6%
Laterality	
Left	48.4%
Right	51.6%
Age (years)	57.6 ± 16.6 (22-96)
Harris Hip Score	
Preoperative	43.9 ± 18.3 (9-97)
At last follow-up	89.7 ± 13.0 (49-100)

* Data are shown as No., %, or mean \pm standard deviation (range)

common cause of osteonecrosis was alcoholism in males (52.5%) and idiopathic osteonecrosis in females (40.7%). Steroid-induced and idiopathic osteonecrosis was the second and third most common causes in males, accounting for 26.7% and 15.0%, respectively. In females, steroid-induced and post-traumatic osteonecrosis was the second and third most common causes, accounting for 29.7% and 23.1%, respectively (Table 3).

Our data were compared with the results from a previous study from 1972 to 1997 of primary THR in the Chinese patients.¹⁴ We concluded that

TABLE 2. Diseases leading to primary total hip replacement in the Chinese patients at Queen Mary Hospital from 1998 to 2010

	Total	Male	Female
Osteonecrosis	41.2%	50.9%	33.0%
Osteoarthritis	12.5%	5.1%	18.8%
Post-traumatic	12.5%	8.5%	15.8%
Ankylosing spondylitis	10.4%	19.5%	2.5%
Rheumatoid arthritis	6.3%	2.5%	9.4%
Dysplasia	6.3%	4.1%	8.0%
Past tuberculosis infection	1.8%	0.9%	2.5%
Others	9.2%	8.5%	9.9%

TABLE 3. Causes of osteonecrosis in the Chinese patients receiving total hip replacement at Queen Mary Hospital from 1998 to 2010

	Male	Female
Alcoholic-induced	52.5%	4.4%
Steroid-induced	26.7%	29.7%
Idiopathic	15.0%	40.7%
Post-traumatic	5.0%	23.1%
Post-radiation therapy	0.8%	0
Diving	0	2.2%

TABLE 4. Comparison of causes of primary total hip arthroplasty in the Chinese patients between 1972-1997 and 1998-2010¹⁴

	1972-1997 ¹⁴	1998-2010 (the present study)	P value*
Osteonecrosis	45.6%	41.2%	0.15
Post-traumatic	15.6%	12.5%	0.16
Ankylosing spondylitis	13.3%	10.4%	0.15
Osteoarthritis	10.2%	12.5%	0.26
Rheumatoid arthritis	3.3%	6.3%	0.025

* Values were compared using Chi squared test

osteonecrosis remains the most common cause of primary THR in the Chinese population. Other common causes, such as post-traumatic arthritis, ankylosing spondylitis and osteoarthritis, showed no statistically significant changes. The percentage of primary THR in the Chinese population due to rheumatoid arthritis, however, has increased significantly from 3.3% to 6.3% (P=0.025; Table 4¹⁴).

Discussion

Total hip replacement is a well-established surgical procedure for end-stage arthritis. The number of THR surgeries is increasing worldwide in parallel with the rising number of patients with advanced arthritis. This will place a huge socio-economic burden on our health care system in the future. Study of the epidemiology and diseases underlying the need for THR might help reduce the number of patients who progress to advanced arthritis, and in so doing, reduce the burden on our health care system. In our local community, osteonecrosis was the most common cause of primary THA from 1972 to 2010.¹⁴ Alcoholism was the most common underlying aetiology of osteonecrosis in men, accounting for more than 50% of cases. It is evident that alcoholism remains a major social and health issue in Hong Kong. The World Health Organization defines alcoholism as chronic and continual drinking or periodic consumption of alcohol, characterised by impaired self-control, frequent intoxication, and use of alcohol despite adverse consequences. There is no exact alcohol level that defines alcoholism. Alcoholism was identified as the cause of osteonecrosis in our studied patients according to the clinical context and patient's social history. The importance of alcoholism in Hong Kong is further echoed by a publication by the Department of Health stating that alcohol consumption per capita has risen from 2004 to 2010.¹⁷ The prevalence of adult and underage drinking also increased between 2005 and 2010.¹⁷ More than 15% of drinkers in Hong Kong drank beyond the recommended daily limit in 2010.¹⁷ Local and global strategies are needed to tackle alcoholism and its associated health problems.

Although alcohol is a well-known risk factor for development of osteonecrosis, the pathogenesis and dose-response relationship is less established. Pathological studies in rabbits show that marrow fat cell hypertrophy and proliferation, thinning of trabecular, and increased empty osteocyte lacunae are observed in alcohol-induced osteonecrosis.¹⁸ Previous studies proposed that the alcohol exposure threshold for osteonecrosis in humans is 150 L of 100% ethanol, consumed at a rate of 400 mL of absolute ethanol weekly.^{19,20} More studies, however, are needed to understand the dose and duration effect of alcohol-induced osteonecrosis.

The Swedish Hip Arthroplasty Register, one

of the earliest registries, is an excellent resource to study the demographic pattern of joint replacement in Caucasians. According to their Annual Report 2011, the number of primary THRs steadily increased from 14 312 in 2007 to 15 945 in 2011.¹¹ Primary osteoarthritis of the hip has been the most common cause of THA in Sweden for more than 20 years, accounting for 83% in 2011, while idiopathic osteonecrosis only contributed to 3.2% in 2011.¹¹ On the contrary, our study showed that osteonecrosis is the most common cause of THR in the Chinese population and osteoarthritis accounts for only 12.5%. Such discrepancy is also observed in other studies in Asian populations. A recent publication in India found that osteonecrosis was the most common indication for THR, accounting for 49% of those performed from 2006 to 2012.²¹ In Singapore, 42% of THRs were due to osteonecrosis from 2004 to 2006.¹⁵ Although the exact underlying mechanism is unclear, the prevalence of hip osteoarthritis has been shown to be lower in Orientals than Caucasians.¹³

The proportion of primary THR performed in Sweden for inflammatory arthritis decreased over a period of 5 years, from 2.08% in 2007 to 1.51% in 2011.¹¹ In the Hong Kong population, however, the proportion of THR performed for rheumatoid arthritis increased between 1972-1997 and 1998-2010. We postulate that such discrepancy is due to our delay in adopting an early strict treatment strategy for rheumatoid arthritis. It has been shown by various studies that joint destruction occurs early in the course of rheumatoid arthritis.²²⁻²⁴ Early disease control is essential to prevent joint destruction and hence, need for joint replacement surgery. Such a concept had been incorporated in the European League Against Rheumatism treatment guideline of 2007.²² Despite this, it is only recently that the Hong Kong Society of Rheumatology has modified the local treatment guidelines on rheumatoid arthritis.²⁵ Future epidemiological study might be needed to observe any changes in primary THR requirement for rheumatoid patients.

In this study, the disease leading to THR was entered by the operating surgeon based on clinical, radiological, and intra-operative assessments. Nonetheless, the underlying aetiology is sometimes difficult to determine in patients with end-stage arthritis and those with multiple risk factors. This causes possible information bias, and is a limitation of this study.

All data within the study period were pooled for analysis. Hence, any significant changes within the period from 1998 to 2010 might have been missed. In addition, data from this study were limited to a regional hospital in Hong Kong and generalisation of the results to the present Chinese population might not be accurate. A total of 15 hospitals were performing THR within the study period, and QMH

accounted for 15% of surgeries. As a university teaching hospital, QMH also serves as a tertiary and quaternary referral centre in Hong Kong, and may therefore encounter a different disease spectrum compared with peripheral hospitals in Hong Kong. We believe a territory or nationwide joint registry, such as the Swedish Hip Arthroplasty Register or National Joint Registry (for England, Wales, Northern Ireland), is needed for more representative results. In view of the rising number of patients who suffer from advanced arthritis and hence, the rising number of joint replacement surgeries, the setting up of a joint registry is important for further research and budgeting of our health care resources.

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