



Original Article

Etiologies and outcome of osteonecrosis of the femoral head: Etiology and outcome study in a Taiwan population

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Abstract

Background: Osteonecrosis of the femoral head (ONFH) is an important indication for total hip arthroplasty in Taiwan. We demonstrated the etiologies of ONFH and outcomes based on stratification of patients according to different etiologies.

Methods: We reviewed medical records and images from January 2000 to May 2010 in our database with the diagnosis of “osteonecrosis of the femoral head.” We categorized all patients into different etiologies, including corticosteroid, alcohol, and idiopathic. All patients received subsequent follow up for ipsilateral precollapse ONFH and contralateral disease-free femoral head status after initial diagnosis.

Results: Of the 1153 patients who had undergone 1674 hip surgeries including core decompression and total hip replacement, alcohol use was the most prevalent etiology in our population (45.2%). Patients with corticosteroid- and alcohol-associated ONFH were younger and more likely to have bilateral disease. Patients with alcohol- or steroid-associated ONFH were found to have a higher rate of contralateral disease and faster progression of precollapse ONFH than patients who had or had not undergone core decompression.

Conclusion: Alcohol use had the greatest impact on ONFH in our population. Nonidiopathic ONFH patients had the worst outcome. Understanding the nature of progression of ONFH and incidence of contralateral disease may provide great prognostic value to detect and perform early intervention.

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1. Introduction

More than 4000 primary total hip replacement (THR) surgeries are performed annually in Taiwan. Indications for primary THR in Taiwan have been reported to be greatly different from those in Norway and Sweden. Instead of osteoarthritic (OA) hip, osteonecrosis of the femoral head (ONFH)

is the leading indication for primary THR, accounting for 46.9% of all indications.^{1–3} For a patient with precollapse ONFH, conservative treatment or surgical intervention would be expected to prolong the duration to progress to the post-collapse status. Hip arthroplasty remains the main choice of treatment in patients with postcollapse ONFH. These patients are generally young, with great functional requirement, and a long life expectancy. Revision arthroplasty could be expected in their lifetime because of wear, loosening, or breakage of the implants, which would greatly impair the life quality of the patient and increase the burden on the medical service system.

There are several risk factors associated with the collapse of the femoral head, including the initial stage, lesion size, location, and sickle cell anemia.^{4–9} Goker and Block¹⁰ stated

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that positive initial radiographic evidence at the contralateral hip indicated risk of progression to symptomatic disease or a more advanced stage. However, there had not been a study that compared the outcome of patients with ONFH among etiologies.

The aim of this study was to show the demographic data in our population and prognosis for ONFH patients with different etiologies. First, we demonstrated the prevalence of etiologies in our population. We also demonstrated the age at which patients had undergone surgeries and the proportion of bilateral disease. Second, we demonstrated the incidence of contralateral ONFH when unilateral ONFH was detected. Third, among the study groups, we showed the survival rate of patients with precollapse ONFH and their progress to post-collapse ONFH.

2. Methods

Medical records and all images including plain film, nuclear scan, or magnetic resonance image from a single medical center database, from January 2000 to May 2010, with the diagnosis of “osteonecrosis of femoral head” were reviewed by a single experienced orthopedist. Informed consent was obtained from each participant for this retrospective study. A total of 1500 patients fulfilled the search criteria that they had been treated as outpatients or inpatients. Patients with diagnosis of OA hip, rheumatoid arthritis of the hip, ankylosing spondyloarthritis of the hip, developmental dysplasia of the hip, pigmented villonodular synovitis, Legg–Calvé–Perthes disease or femoral neck fracture but wrongly recorded as ONFH, missing images and medical records, or trauma-associated ONFH were excluded. We excluded 93, 110, and 144 patients because of wrong diagnosis, missing data, and trauma-associated ONFH, respectively. A total of 1153 patients who had undergone 1674 surgeries, including 354 core decompression surgeries and 1320 hip arthroplasty surgeries, were included. Patients who experienced hip fractures with subsequent ONFH were defined as trauma-associated ONFH. For precollapse ONFH cases, we performed core decompression without bone grafting or with nonvascularized trochanteric bone grafting. For postcollapse ONFH cases, hemiarthroplasty or total hip arthroplasty was performed. After the surgery, we arranged monthly follow ups during the first 3 months, then once every 3 months up to 1 year, and annually thereafter. During the follow up, plain films or magnetic resonance imaging (MRI) was taken to check for new onset or progression of the disease. If unilateral ONFH was found on the image before surgery, all subsequent images were checked for contralateral ONFH. The interval between the onsets of bilateral ONFH was recorded. For patients with precollapse ONFH, duration to progress to postcollapse ONFH was recorded.

All patients were categorized into the following three groups: alcohol users, corticosteroid users, and idiopathic. We defined alcohol users using the records of daily consumption of different types of alcoholic drinks including beer, wine, and liquors. Average daily amount was estimated as g of ethanol/d by multiplying average daily consumption of liquors in

milliliters by the percentage of ethanol contained in the liquors. We defined corticosteroid users using the records of regular follow up at the outpatient department with a diagnosis indicated for regular corticosteroid use. To define idiopathic ONFH, we first excluded alcohol- or corticosteroid-associated ONFH. We reviewed medical records to rule out additional risk factors including Caisson disease, Gaucher disease, sickle cell anemia, vasculitis, polycythemia, coagulopathies, and disseminated intravascular coagulation. Patients were then recorded as idiopathic ONFH. In all three groups, sex, weight, height, body mass index (BMI), and age of patients who had undergone core decompression or arthroplasty were recorded.

Comparisons of patient characteristics were performed using chi-square test and analysis of variance with Tukey honest significant difference test for categorical and continuous variables, respectively. Univariate survival outcomes for patients with precollapse ONFH and contralateral disease-free femoral head status were estimated using the Kaplan–Meier method and compared using log-rank statistics. To determine whether observed differences in survival were independently associated with different etiologies, multivariate analysis was performed using the Cox proportional hazards model. In addition to etiologies, additional study variables included in the model were age, sex, body height, body weight, and whether the patient had undergone core decompression surgery. We used SPSS software version 17.0 (SPSS Inc., Chicago, IL, USA) for all statistical calculations.

3. Results

Patients underwent core decompression and hip arthroplasty surgeries at the average ages of 44.5 years and 50.2 years, respectively. Among these patients, the alcohol consumption group accounted for the most cases of ONFH (45.2%) in our population. The steroid (21.7%) and idiopathic (33.1%) groups accounted for the rest. Overall, 663 (59.1%) patients had bilateral ONFH. The proportion of bilateral ONFH was higher in the corticosteroid group (72.4%) than in the alcohol (62.5%) and idiopathic groups (45.3%). Patients who had undergone surgery for an unknown indication at an outside hospital in one hip and presented with ONFH in the contralateral hip were recorded “not determined” (Fig. 1). Among the 93 patients with other diagnosis but wrongly recorded as ONFH, the most common diagnosis was OA hip (59.0%). The most common indication for corticosteroid use was systemic lupus erythematosus (SLE; 43.6%; Table 1). Among the patients categorized as alcohol-associated ONFH, the average daily alcohol consumption was 86.21 ± 109.8 g (range 15–556 g).

Concerning the demographic data of these patients (Table 2), we found male preponderance (69.3%). Among the male patients, alcohol (62.1%) was the most important risk factor for ONFH. By contrast, idiopathic (49.2%) and corticosteroid-associated ONFH (43.7%) were more prevalent in female patients. Body height and weight were higher in the alcohol group than in others, however, BMI was not different. The average ages for patients undergoing core decompression and

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