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Implant Survival and Patient-Reported Outcomes After Total Hip Arthroplasty in Young Patients With Juvenile Idiopathic Arthritis

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ABSTRACT

Juvenile Idiopathic Arthritis (JIA) is a common rheumatologic disease that frequently involves the hip joint and requires treatment with total hip arthroplasty (THA). A retrospective study with prospective follow-up was conducted to determine implant survival and patient-reported outcomes in JIA patients aged 35 or younger treated with THA. This study included 56 patients, and the mean time to follow-up was 12 years. The 10-year implant survival was 85%, and implant survival was significantly longer in older patients (P value = 0.04). Hip disability and osteoarthritis outcome (HOOS) scores were favorable at follow-up, but significantly worse in women and patients with custom implants or history of revision THA. Overall, patient factors and implant characteristics predict implant survival and outcomes after THA in young patients with JIA.

Background

Juvenile idiopathic arthritis (JIA) is the most common rheumatologic disease in children. The incidence of JIA is estimated at 2–20 cases per 100,000 children, and the prevalence is estimated at 16–150 cases per 100,000 children worldwide [1]. JIA has replaced formerly used terms such as juvenile rheumatoid arthritis (JRA) and juvenile chronic arthritis (JCA), and includes all forms of inflammatory arthritis, lasting greater than six months with onset prior to sixteen years of age [1]. More than one-third of patients with JIA have active disease into adulthood, and approximately 22% require a major surgical procedure, such as total joint arthroplasty [2]. The hip joint may be involved in up to 60% of patients with JIA [3], and it is an important cause of pain and disability. Total hip arthroplasty (THA) is the standard treatment for patients who fail non-operative management, as it is well documented to provide pain relief and improved functional outcome, at least in the short-term [4].

THA in younger patients is a more complex procedure requiring additional pre-operative planning and patient education compared to THA in older patients [5]. A recent review of total joint arthroplasty in adolescents concluded that THA implant survival is shorter in adolescents compared to an older population, and the majority of younger THA patients will require a revision surgery during their lifetime [6]. A review of the literature reveals that the majority of outcome studies in JIA patients undergoing THA have focused on survival rates of cemented [7,8] versus cementless [4,9–11] implants, and have found no clear difference in implant survival between theses fixation techniques [3,6]. However, the majority of these studies have small sample sizes and short-term follow-up, limiting their generalizability and use in clinical decision-making [6]. Similarly, very few studies describe the long-term outcomes of THA in young JIA patients, and only a handful of studies use standardized, validated measures of patient-reported outcomes [3,12]. Given the prevalence and morbidity associated with JIA, as well as the personal, surgical, and financial implications of THA in young patients with JIA, there is a considerable need to better define the long-term outcomes of THA in this population.

In this study, we will first describe patient characteristics and implant data for JIA patients aged thirty-five or younger who underwent a primary THA at our institution between 1982 and 2011. Secondly, we will assess the long-term implant survival and revision rate of primary THA in these young patients with JIA. Lastly, we will evaluate patient-reported outcomes after surgery in this population using validated outcome measures. We hypothesize that the majority of patients with JIA have a good surgical outcome with a low revision rate, and report a favorable long-term outcome after THA.

The Conflict of Interest statement associated with this article can be found at http://dx.doi.org/10.1016/j.arth.2014.09.018.

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Methods

Study Design

This retrospective study with prospective follow-up was conducted at a major tertiary academic medical center. This study had two major phases. The first phase included a retrospective chart review of primary THAs performed at our hospital in patients aged 35 or younger. Patients with a primary diagnosis of JIA were then identified based on surgical diagnosis listed in the pre-operative history and physical or operative note. In the second phase, these JIA patients were contacted by phone or email in an effort to determine implant survival and patient-reported outcomes. Our hospital's institutional review board approved this study.

Retrospective Chart Review

All patients aged 35 or younger who underwent a unilateral or bilateral primary THA were identified from a hospital-based registry. All primary THAs from 1982 to 2011 were eligible for this analysis, and charts were reviewed in a chronological manner. The data gathered by chart review included demographic information; primary diagnosis or indication for surgery as stated in the history and physical or operative note; surgical information, including the date of surgery, age at time of surgery, and laterality; past medical history, including orthopedic and surgical history; implant information, including the use of custom components and the use of cement for fixation; and if available, revision information. Each JIA patient was assigned a unique patient identifier and contacted by a research coordinator via phone or email for follow-up.

Follow-Up Survey

The senior author (MPF) designed a follow-up survey for patients with JIA. The survey was intended to be informative, concise, easy to understand, and included the hip disability and osteoarthritis outcome score (HOOS), which is used to assess a patient's opinion about their hips, as well as evaluate symptoms and functional limitations. HOOS is a validated and highly reproducible tool, and it can be used to describe hip disability in patients with or without osteoarthritis [13]. This outcome measure is comprised of a series of questions focusing on the following five subscales: pain, other symptoms, function—activities of daily living (ADL), function—sports and recreation, and hip-related quality of life (QOL). All subscales except hip-related QOL were used in our survey, and all questions were asked with the last week as the reference point. Patient responses were used to calculate a normalized score for each subscale with 0 representing extreme symptoms and 100 representing no symptoms.

Although the HOOS outcome measure includes Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) subscales, we focused our analysis on HOOS scores as they are more sensitive measures in younger, potentially more active patients [13,14]. HOOS-Pain and HOOS-Symptom scores were hip-specific, while HOOS-ADL and HOOS-Sport scores were patient-specific. Even though McGrory and Harris [15] showed that WOMAC scores can be used to accurately and concurrently evaluate different hip joints in the same patient, we decided to use the worst HOOS-Pain and HOOS-Symptoms scores as the most accurate measure of a patient's level of disability in patients with bilateral THA. In addition to validated patient-reported outcomes, information regarding THA revision, employment history, and disability were also collected through the follow-up surveys.

All JIA patients were contacted using the contact information listed in their chart as well as public databases. At least five attempts were made to contact patients by phone or email before considering them as being lost to follow-up.

Outcome Measures

The primary outcome measure was implant survival after primary THA. Patients were explicitly asked about hip revision after THA during the follow-up survey, and this report was verified by chart review if the revision surgery was performed at our hospital. Implant survival was calculated for each THA by determining the number of days between the date of primary surgery and date of survey for primary THAs, and the number of days between the date of primary surgery and date of revision surgery for revision THAs. Our other outcome measures included the HOOS scores for pain, symptoms, function-ADLs, and function-sports/recreation, as well as a patient's current employment status and ability to work.

We stratified our survival analysis by the patient's gender and age at time of surgery (less than or greater than 25 years of age), as well as implant characteristics such as the type of implant (standard or custom) and the use of cement for implant fixation. Similarly, we stratified patient-reported outcomes by the patient's gender and age at time of surgery (less than or greater than 25 years of age), as well as implant characteristics such as the type of implant (standard or custom) and type of THA (primary or revision). Fig. 1 provides an overview of our study design.

Statistical Analysis

Descriptive statistics (rates and proportions frequency distributions, means, medians, and standard deviations) were used to describe the baseline and follow-up data, such as the number of THAs, patient characteristics, implant data, and patient-reported outcomes. A two-sample Student's t-test or a Kruskal–Wallis test was performed to evaluate differences in continuous variables between groups depending on the distribution of the data. ANOVA (Analysis of Variance) was performed for comparison between multiple groups. Furthermore, Chi-Square or Fisher's exact test was utilized to compare the proportions between groups.

Implant survival was defined as the duration of time from the date of primary THA to the date of revision THA (implant failure). We defined revision THA as our failure event for each primary THA, and we regarded each joint as an individual observation. As a result of this joint-based analytic plan, each patient could have potentially contributed twice to the survival analysis. Survival curves with associated 95% confidence intervals were constructed using Kaplan–Meier survival method. The survival curves between the groups were compared using the Log-Rank test. Multiple regression analysis was used to compare the difference in patient-reported outcomes between groups, controlling for age, gender, implant type (standard or custom), and whether there was a revision surgery prior to follow-up.

All tests were two-sided and the significance level was set to 0.05 for all comparisons. SAS software (version 9.2, SAS Institute Inc., Cary NC) was used for all of our statistical analyses.

Results

Retrospective Chart Review and Follow-Up

Records were available for 711 patients aged 35 or younger, who underwent a primary THA between 1982 and 2011. In this group, there were 91 patients with a diagnosis of JIA, and we attempted to contact all of these patients. Of the 91 patients with JIA, 5 patients were deceased, 3 patients declined participation, and we were unable to contact 27 patients despite multiple attempts. As a result, 56/86 (65%) of patients completed the follow-up survey. These 56 patients had a total of 97 primary THAs (41 bilateral THAs and 15 unilateral THAs) at or before the age of 35. The mean time to follow-up was 12 years with a range of 2 years to 23 years.