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Residual Symptoms and Function in Young, Active Hip Arthroplasty Patients: Comparable to Normative Controls?

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ABSTRACT

Background: Whether patient-reported symptoms and function after total hip and surface replacement arthroplasty in young, active patients compare favorably to those without known hip pathology has not been investigated.

Methods: A retrospective, multicenter study was designed in which 5 centers contributed patients aged <60 years with a presymptomatic University of California at Los Angeles score ≥6 undergoing hip arthroplasty. Data were collected by an independent, third-party survey center that administered a questionnaire assessing patient satisfaction and function. A "control" population with no prior hip interventions or hip pathology limiting their activity, that met the age and activity criteria, was identified for comparison using multivariate regression analyses.

Results: Eight-hundred six hip arthroplasties (682 total hip arthroplasty, 124 surface replacement arthroplasty) and 158 controls were included. A greater percentage of hip arthroplasty patients were male and aged >50 years which was controlled during multivariate regression analyses. Control patients reported the presence of a limp (15%), stiffness (11%), and pain in the hip (8%), but to a lesser degree than hip arthroplasty patients. Control patients were less likely to report pain in the hip (odds ratio [OR] = 0.4, 95% confidence interval [CI] = 0.2-0.7, $P = .006$), stiffness in the hip (OR = 0.5, 95% CI = 0.3-0.8, $P = .02$), and a limp (OR = 0.5, 95% CI = 0.3-0.8, $P < .001$) vs patients undergoing hip arthroplasty.

Conclusion: When interviewed by an independent third party, a substantial portion of control patients did note the presence of hip symptoms, but to a lesser degree than young, active patients undergoing hip arthroplasty.

Utilization of total hip arthroplasty (THA) in the management of degenerative hip disease continues to rapidly increase, with the fastest growing subset of patients aged <65 years [1,2]. Thus, patients seeking hip arthroplasty are now younger, more active, and place increased demands on their prostheses. However, despite the excellent clinical outcomes and survivorship of THA [3], persistent pain and residual symptoms remain a significant concern. Demographic factors such as patient age, gender, and activity level have been implicated as predictive variables of postoperative residual symptoms [4,5]. Recently, an investigation focusing on young, active patients after THA or surface replacement arthroplasty (SRA) noted 40% of patients to report pain in at least 1 location around the hip based on a patient-reported pain-drawing questionnaire, raising concerns about patient satisfaction in this demanding population [6].

SRA remains a viable alternative to THA in selected patients and has numerous proposed advantages including increased bone preservation, improved stability, decreased leg length inequality, and the potential to return to higher activity levels [7,8]. However, SRA is a more technically demanding procedure and increases the risk of metallosis, femoral neck fracture, early aseptic loosening, and thus the rate of revision compared with THA [9]. In addition, prior reports have noted an increased incidence of groin pain after

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SRA vs THA, again raising concerns about patient satisfaction in a younger, more active patient population [10-13]. Thus, surgical techniques and implant designs continue to be modified in hip arthroplasty with the goals of improving patient satisfaction and function.

Surgeon-derived outcome assessments are adequate for determining success based on pain relief, walking, and performing activities of daily living and have shown hip arthroplasty to be effective in relieving pain and restoring function [14]. However, given the recognized limitation and ceiling effects of surgeon-derived outcome measures [14-16], increased emphasis is now being placed on patient-reported outcomes after total joint arthroplasty [17-19]. For example, the Forgotten Joint Score has recently been introduced and is predicated on the assumption that the ultimate goal of joint arthroplasty is the ability to forget the presence of the artificial joint during everyday activities [19]. However, to our knowledge, little information is present regarding symptoms and functional limitations in a cohort of patients without a diagnosis of hip pathology. It is possible that people of a similar age and activity level may experience some degree of hip symptoms, but the frequency, severity, and characteristics remain unknown. Having this information for a "control" cohort of the population would prove useful in determining the success of THA and SRA and its ability to restore patients to a level of function comparable to normative controls. In addition, it would assist in providing informed consent, patient education, and setting expectations in patients electing to undergo hip arthroplasty. Thus, the purpose of this study was to compare the presence of residual symptoms and function in patients after hip arthroplasty vs "controls" without known hip pathology. Our hypothesis was that the control population would note a substantial incidence of hip symptoms, but to a much lesser extent than those after THA or SRA.

Materials and Methods

This was a multicenter, retrospective investigation in which 5 total joint centers and an independent third-party survey center (University of Wisconsin Survey Center [UWSC], Madison, WI) participated. Before the initiation of this study, institutional review board approval was obtained at all participating centers. The 5 centers participating in this study are all high-volume institutions with a group of adult reconstructive trained surgeons who routinely perform >100 hip arthroplasty procedures per year. In addition, each center had a well-established joint registry database in place that could be used to identify patients and evaluate inclusion and exclusion criteria. At each institution, modern multimodal pain management and rapid mobilization protocols were used.

Investigators queried their total joint registries and compiled a list of patients meeting the following inclusion criteria: (1) males or females aged 18-60 years, (2) patients requiring primary hip arthroplasty surgery due to noninflammatory arthritis, (3) and a presymptomatic University of California at Los Angeles (UCLA) activity level score of 6 or more [20]. Age limits and a UCLA activity score of $\geq$6 before the onset of hip symptoms (presymptomatic) were used in an attempt to capture a young, active patient population. Exclusion criteria were the following: (1) subjects with a history of prior hip infection, fracture, or dislocation; (2) patients with extensive medical comorbidities including renal failure, coronary artery disease, liver disease, sickle cell disease, cancer, and so forth, which would limit their activity level; and (3) patients with radiographic signs of component loosening or requiring revision surgery since their index procedure. These patients were systematically excluded to allow comparison of a young, active patient population with well-performing implants. In addition, the UWSC identified and contacted a cohort of "control" patients using a "random digit dial call method" involving the geographic regions in which the participating institutions were located. In this method, a computer is programmed to dial a 4-digit random sequence of numbers to add to the combination of selected area code and telephone exchange. These telephone numbers are then called in the attempt to identify a working residential number and potential control patient. The major advantage of this method is that people are contacted and surveyed at random, and it will identify unlisted numbers not present in a telephone book. The disadvantage is that a large percentage of numbers (approximately 80%) will not result in a working residential number. To improve identification of working residential numbers, the survey center used a method in which once a working residential number was identified, telephone numbers with the same first 8 digits (but different last 2 digits) were called as telephone companies typically assign phone numbers in a sequence rather than at random. This method increases the likelihood of identifying another working residential number [21]. Once a working residential number was identified, the respondent was first asked if they would be willing to participate in a 5- to 15-minute telephone survey regarding hip health and were notified that they would not receive compensation for their time. They were then screened to ensure that they met the aforementioned age and activity inclusion criteria. Controls were asked if they had ever had an operation on either of their hips, if they had any major problems with their hips that prevented them from being as active as they wanted, or if they had any other medical problems that prevented them from being as active as they wanted. If the answer to any of these questions was "yes," the subject was excluded from participating in the study, and the survey was discontinued.

All THAs were performed with the use of a cementless, titanium, proximally coated and tapered stem with cementless, hemispherical acetabular fixation. Each patient was considered a good candidate for cementless femoral stem fixation at the surgeon's discretion based on preoperative radiographs and intraoperative assessment demonstrating good bone quality and a proximal femur anatomy suitable for a proximally coated, tapered stem. Surgical approaches used in the THA cohort were posterolateral (54%), anterolateral (33%), direct anterior (5%), 2 incision (4%), and direct lateral (4%). Indications for SRA were (1) adequate bone stock to support the device, (2) avascular necrosis involving <25% of the femoral head, (3) BMI of 35 kg/m^2 or less, (4) limb length discrepancy of <1 cm, (5) absence of femoral head cysts larger than 1 cm, (6) no known metal hypersensitivity or moderate/severe renal insufficiency, (7) relatively normal bony anatomy, and (8) women not of childbearing potential. Surgical approaches used in the SRA cohort were posterolateral (99%) and direct lateral (1%). All THA and SRA acetabular and femoral components demonstrated good fixation without signs of radiographic loosening on analysis of their most recent anteroposterior and cross-table lateral radiographs.

To eliminate observer bias, an independent, blinded third party performed all data collection. The UWSC survey center was selected for their expertise in collecting health data for state and federal agencies and for having no affiliation with the participating centers [22,23]. The UWSC, in collaboration with the coordinating center (Washington University School of Medicine, St. Louis, MO), designed an instrument that would collect specific data regarding the level of satisfaction, function, and residual symptoms after hip arthroplasty. The survey center staff studied the literature on questionnaire design and suggested what is shown to be the most valid and reliable research methods [24,25], and a formal review was conducted to design questions using the most valid scales and scale labels. Selected questions were adapted from commonly used