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Original Article

Is the Direct Superior, Iliotibial Band-Sparing Approach Associated With Decreased Pain After Total Hip Arthroplasty?

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ABSTRACT

Background: Recently, the direct superior approach (DSA) has been introduced in total hip arthroplasty (THA) with the goal of limiting soft tissue dissection. This study's purpose was to use a visual pain diagram questionnaire to determine the location and severity of pain in patients undergoing THA via a DSA vs miniposterior approach (MPA).
Methods: This was a prospective, Institutional Review Board (IRB)-approved investigation from 3 centers. Patients aged 18-70 years with a diagnosis of osteoarthritis were included. Two centers used the MPA, while 1 center the DSA. The DSA uses a 9- to 12-cm incision with its distal extent at the posterosuperior greater trochanter. Dissection into the iliotibial band is avoided, and the capsule at the inferior femoral neck is preserved. All THAs in both cohorts received a cementless, titanium, proximally coated femoral stem and a hemispherical acetabular component.
Results: A total of 42 DSA and 196 MPA THA patients were included. Overall, 43% of patients reported pain in at least 1 of the 8 anatomic areas assessed. There was no difference in the incidence of moderate to severe pain in any anatomic area of interest between the MPA and DSA cohorts ($P = .1$-$.9$). Specifically, the incidence of moderate to severe trochanter (17% MPA vs 17% DSA, $P = .9$), anterior thigh (15% MPA vs 17% DSA, $P = .9$), and lateral thigh pain (12% MPA vs 12% DSA, $P = .9$) was nearly identical in both cohorts.
Conclusion: This study was unable to demonstrate a difference in the incidence of residual pain after use of a DSA or an MPA approach after THA.

Despite the excellent clinical outcomes and survivorship achieved with total hip arthroplasty (THA) in the management of hip disease [1], persistent pain even in the presence of well-fixed components remains a significant concern [2-4]. Postoperatively, the reported incidence of residual pain is as high as 40% [4-8]. Potential etiologies include infection, implant loosening, fracture, soft-tissue impingement, bursitis, tendonitis, or hypersensitivity to metallosis [9,10] while demographic factors such as patient age, gender, activity level, and length of follow-up have been implicated as predictive variables of pain postoperatively [11-14]. While the etiology of pain after THA can be multifactorial, modifications in surgical technique, implant design, and perioperative protocols continue to be explored with the goal of improving patient outcomes.

One modification in surgical technique has been the introduction of the “minimal incision” or “minimally invasive” posterior surgical approach, with potential advantages including decreased pain, decreased narcotic requirements, faster rehabilitation, and return to function [15-18]. Given the familiarity of the standard posterolateral approach to the majority of hip surgeons, the MIS posterior approach represents a natural progression from the traditional 20- to 25-cm incision length to 8- to 12-cm incision lengths. While initially there were concerns of increased complications during the learning with the use of a miniposterior approach (MPA) [19], numerous other investigations have reported satisfactory results [20-22]. However, this progression has even continued to the recent introduction of “microposterior”

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approaches that often preserve the short external rotators of the hip with the exception of the piriformis or conjoined tendon [21,23]. These surgical approaches require the use of specialized retractors and instruments that facilitate access and preparation for both the femoral and acetabular components. An example of a "microposterior" approach has been termed the "direct superior approach (DSA)." The primary proposed short-term benefit of both MIS and "micro" approaches include a more rapid recovery with decreased narcotic requirements, but a hypothesized long-term benefit may be preservation of the soft tissue envelope and potentially decreased residual symptoms after THA.

To our knowledge, the impact of a microposterior approach on residual pain after THA has not been investigated. The purpose of this study was to use a visual pain diagram to determine the anatomic location, incidence, and severity of pain in patients undergoing THA via a direct superior vs a miniposterior surgical approach. Our hypotheses were that (1) a large percentage of patients after THA would report the presence of persistent pain and (2) no difference would be present in the incidence or location of patient-reported pain between the direct superior and miniposterior surgical approach.

Materials and Methods

This study was a prospective, Institutional Review Board (IRB)-approved investigation of 3 centers with extensive experience in performing THA. At 2 centers, THAs were routinely performed using an MPA, while at 1 center, the DSA was used. Only patients between the ages of 18 and 70 years undergoing an elective, primary THA for a diagnosis of osteoarthritis was included. Each patient had a minimum of 1-year clinical and radiographic follow-up from their index THA. Patients were excluded if they had a history of postoperative infection, fracture, dislocation, or revision of the operative hip; were indicated for revision of their THA or received a metal-on-metal–bearing surface. These exclusion criteria were implemented to hopefully identify cohorts of patients with well-functioning implants after their THA. Thus, this would assist in determining the incidence of pain and potential benefit of the DSA approach in well-performing implants after THA. All centers included in this investigation initiated mobilization the day of surgery with full weight bearing on the operative extremity and utilized multimodal pain management protocols including the use of regional analgesia, oral pain medications, and local anesthetic infiltration intraoperatively.

All THAs were performed using a cementless, titanium, proximally coated, and tapered stem with cementless, hemispherical acetabular fixation. Each patient was deemed 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 femoral anatomy suitable for a proximally coated, tapered stem. All THAs utilized either a 32- or a 36-mm femoral head and a highly cross-linked polyethylene-bearing couple. Femoral heads used were ceramic, oxidized zirconium, or cobalt alloy at the surgeon's discretion. All acetabular and femoral components demonstrated good fixation without signs of radiographic loosening upon analysis of their most recent anteroposterior and cross-table lateral radiographs.

All surgical procedures were performed with the patient in the lateral decubitus position. Two fellowship-trained adult reconstructive surgeons performed THAs using an MPA [20]. In this approach, a 10 $\pm$ 2-cm incision was made over the posterior border of the greater trochanter with approximately two-thirds of the incision distal and one-third of the incision proximal to the tip of the greater trochanter. Dissection was carried distally through the iliotibial band and proximally through the gluteus maximus fascia. The short external rotators, piriformis, and posterior capsule were released in a single flap and tagged for later repair. The capsulotomy was performed in a trapezoidal fashion extending distally and released off the inferior aspect of the femoral neck. The femoral head was then dislocated from the acetabulum, and the femoral neck resection was performed. The acetabulum was prepared, and the final component inserted, followed by preparation of the femoral stem with the lower extremity in 90° of flexion and 90° of internal rotation. After component implantation, the posterior soft-tissue structures were repaired through drill holes through the greater trochanter. One fellowship-trained adult reconstructive surgeon performed THAs using a DSA [23]. In this approach, a 10 $\pm$ 2-cm incision was made with its distal extent at the posterosuperior corner of the greater trochanter. Dissection did not extend distally into the iliotibial band. The gluteus maximus muscle fibers were split proximally, and the interval between the gluteus medius and minimus was identified. The confluence of the obturator internus and piriformis tendons was detached, tagged, and reflected posteriorly. The capsule was then incised anterior distal to posterior proximal to create a window in which the inferior capsular flap was left attached to the femoral neck. An in situ neck cut was performed, and the femoral head removed. Angled reamers were then used to prepare the native acetabulum and for placement of the acetabular component. Femoral preparation was then performed with the lower extremity in 40° of flexion, 40° of adduction, and 40° of internal rotation. After component implantation, a direct side-to-side repair of the capsule was performed, and the obturator internus and piriformis tendons were attached to the posterior aspect of the gluteus medius tendon.

Patients at both institutions meeting the inclusion and exclusion criteria were mailed a letter explaining the purpose of the study and asking them to complete a previously described pain-drawing questionnaire (Fig. 1) [4]. Potential participants who did not return the questionnaire within 6 months of the initial mailing were sent a second letter and questionnaire. The questionnaire asked participants to identify whether or not they experienced pain in 8 anatomic areas of interest: groin, anterior thigh, lateral thigh, posterior thigh, buttock, lower back, trochanteric region, and the knee. Pain intensity was rated using a pain scale scored from 0 to 5, with 0 being "no pain," and 5 being "pain that wakes you up at night, or pain all the time." University of California at Los Angeles (UCLA) activity scores for each patient were also collected at their most recent follow-up visit. Completed questionnaires were returned to their respective centers, and deidentified data were sent to the coordinating center for analysis.

Data Analysis

Data were analyzed assessing the incidence and severity of pain scores as categorical variables. Pain was categorized as "no pain" if scored with a 0, "mild" if scored with a 1 (pain only with extreme activity), or "moderate to severe" if scored between 2 and 5 (pain with moderate activity, daily activities, at rest during the day, at night that wakes you up, or all the time). These categories were compared to report the severity of pain for each location (ie, the incidence of "moderate to severe" pain was compared between the 2 cohorts). Chi-square analysis or Fisher exact tests (if a variable had a reported count of <5) were used to analyze categorical variables. Independent Student *t* tests were used to compare continuous variables (age, UCLA activity score, length of follow-up). All *P* values <.05 were considered statistically significant. An independent statistician not involved in patient care performed all data analyses using SPSS software (IBM SPSS Statistics, version 22).

A post hoc power analysis was conducted to assess the research question that there would be no difference in the