Anterior Longitudinal Osteotomy of the Greater Trochanter in Total Hip Arthroplasty

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Dislocation is a major complication of total hip arthroplasty (THA). The dislocation rate reported in the literature ranges from 1% to 10%, with 50% of dislocations occurring in the first 6 months after surgery. Etiological factors can be patient related (ie, age, sex, dementia, Parkinson’s disease, alcohol abuse), surgery related (ie, surgical approach, implant positioning, impingement), or implant related (ie, head diameter and offset).

Bone impingement is an important risk factor for THA dislocation that is often underestimated. It has been reported that approximately 22% of dislocations following THA through a posterolateral approach are related to bone impingement between the greater trochanter and the iliac bone. Large prosthetic heads have also been reported to increase the risk of bony impingement.

In this prospective preliminary study, the authors present an original anterior longitudinal osteotomy of the greater trochanter (ALOT) to prevent early dislocation in THA through a posterolateral approach.

MATERIALS AND METHODS

A total of 115 consecutive patients underwent THA at the authors’ institution between May 2011 and November 2013. All surgical procedures were performed by a single surgeon (M.F.S.). The mean age of the patients was 70.2 years (range, 39-85 years). Fifty-eight patients (50.4%) were male and 57 patients (49.6%) were female. There were 64 right (55.6%) and 51 left (44.4%) hips. Ninety-eight patients (85%) had primary hip osteoarthritis, 8 patients (7%) had developmental dysplasia of the hip, 7 patients (6%) had an avascular necrosis of the femoral head, and 2 patients (2%) had hip arthritis following an acetabular fracture.

Exclusion criteria were total hip replacement after a proximal femur fracture, psychiatric diseases, epilepsy, Parkinson’s disease, neuromuscular pathologies, or conditions that would require the use of modular cups.

All THAs were performed through a modified posterolateral approach. A trititanium cup (Tritanium Acetabular System; Stryker, Mahwah, New Jersey) and a Trident polyethylene liner (X3 Bearing Technology; Stryker) were implanted in all patients.

A noncemented stem VerSys Enhanced Taper (Zimmer, Warsaw, Indiana) was used in 58 cases (50.5%), a
noncemented Accolade II stem (Stryker) was used in 34 cases (29.6%), the VerSys Heritage cemented stem (Zimmer) was used in 20 cases (17.4%), a Wagner Cone Prosthesis (Zimmer) was used in 2 cases (1.7%), and an Alloclassic Zweymuller (Zimmer) was used in 1 case (0.8%). Patient age, sex, Singh index, and canal flare index determined which femoral implant was used.11,12

Metal heads were used in all cases and had 3 diameters: 28 mm (4 patients; 3.5%), 32 mm (99 patients; 86%), and 36 mm (12 patients; 10.5%).

Harris Hip Score and standard radiographic studies (anteroposterior view of the pelvis and anteroposterior and lateral views of the affected hip) were obtained preoperatively and at 3 and 6 months postoperatively.13

A single examiner (G.M.V.R.) evaluated recovery of range of motion, walking, and muscular strength at 3 and 6 months postoperatively. Preoperative and postoperative offset, inclination, and anteversion of the cup were calculated by the same single examiner using TraumaCad version 2.0 software (Orthocrat, Columbia, Maryland).

Data analysis was performed with SPSS version 11.0 software (SPSS Inc, Chicago, Illinois). Descriptive statistics were obtained. Independent and paired samples t tests were used for normal variables. Linear regression was performed to assess correlations. Statistical significance was set at $P<.05$.

**Surgical Technique**

The THA was performed through a tissue-sparing posterolateral approach, modified by the senior author (M.F.S.). This approach ensures good exposure of the hip joint while preserving the insertion of the gluteus medius, gluteus minimus, and quadratus femoris. However, release of the triceps coxae is crucial. Then, the capsule is incised in a “T” fashion and the femoral head is dislocated. The neck osteotomy is performed with a standard technique.14

Once the acetabulum was prepared and the cup was implanted within the safe zone, the femur was addressed.15 Broaching of the latter was performed with broaches of increasing size until the best fit was determined. The final broach was left in the femur to assess the anterosuperior femoroacetabular bone impingement or soft tissue interposition in flexion, adduction, and internal rotation.

At this point, the ALOT was performed for all patients. A Hohmann retractor was placed below the anterior margin of the greater trochanter to protect the anterior capsule. Then, with the use of an oscillating saw, a longitudinal osteotomy of the anterior portion of the greater trochanter extending below a 90° angle to the transverse axis of the femoral stem was performed (Figure). Once an
optimal range of motion was achieved with the trial components, the final femoral stem was implanted. Both the posterior capsule and the external rotators were reinserted through bony sutures. Finally, prior to wound closure, 2 suction drains were inserted.

RESULTS
At the 3- and the 6-month follow-ups, no dislocation and no greater trochanter fracture were observed. There was 1 case of superficial wound infection that was treated with surgical debridement and antibiotic therapy. There was 1 case of prosthetic infection that was treated with a 2-stage revision.

The mean preoperative Harris Hip Score was 57.1 (range, 31.1-72). Postoperatively, patients had fast recovery of range of motion and walking, with a mean Harris Hip Score of 83 (range, 63-97) at 3 months and 95.4 (range, 84-100) at 6 months (P<.001).

Radiographic examination revealed good orientation of the prosthetic components. The mean cup inclination was 46.2° (range, 35°-63°) and the mean anteversion was 19.2° (range, 7°-29°) (P=.036). The mean preoperative and postoperative offsets were 50.3 mm (range, 34.9-63.1 mm) and 48.8 mm (range, 34.9-69.1 mm), respectively. Hence, the preoperative/postoperative disparity was 1.5 mm (P=.031).

DISCUSSION
The data analysis indicated that early dislocation was absent in the first 115 THAs performed through a posterolateral approach and ALOT. This approach has often been correlated with a greater—up to 6 times higher—risk of dislocation.14 Other studies have reported dislocation rates of 5.8% and 2.3% for posterolateral and anterolateral approaches, respectively.11,16 A dislocation rate below 1% has been reported if a correct surgical technique, reinsertion of the capsule and the external rotators, and large-diameter heads are used.17,18 In a previous pilot study performed at the authors’ institution without ALOT, the reported dislocation rate for 268 THA implants was significantly decreased: 1.11%.19

Anterior femoral-iliac impingement is often underestimated, despite being one of the factors contributing to THA dislocation.20,21 Sahni et al10 reported that 22% of dislocations following THA performed through a posterolateral approach are attributable to anterior impingement between the greater trochanter and the iliac bone. Despite positioning prosthetic components within the so-called safe zone, it is often possible to intraoperatively appreciate an anterior impingement between the anterior portion of the greater trochanter and the iliac bone. Moreover, when an ALOT is performed, the surgeon can easily appreciate a reduction of that impingement, leading to increased stability of the implant and improved range of motion. The literature indicates that larger head diameter decreases the dislocation rate. This is achieved through an increase in the head-neck ratio, improved range of motion, and more soft tissue tensioning.20,21 Bartz et al10 reported that the dislocation rate increases in THA with 32-mm or larger heads because of anterior bony impingement between the femur and the iliac bone. Nonetheless, others have argued that larger heads increase stability and range of motion while decreasing the dislocation rate.22 The data from the current study suggest that the ALOT and larger femoral heads work well together. Indeed, greater range of motion without compromised stability is ensured because of the reduced extra-articular impingement.

This prospective preliminary study had 2 limitations: short follow-up and no control group. Patient enrollment is ongoing to detect the first dislocation.

CONCLUSION
Surgeon experience, component positioning, and head diameter are paramount to achieving a stable, long-lasting THA. Nonetheless, anterior bony impingement is an underestimated risk factor for dislocation in a THA performed through a posterolateral approach. Particularly in the case of implants with wider range of motion, the ALOT described here is a simple technique that reduces the overall dislocation rate below 1% and addresses a potential cause of dislocation in otherwise state-of-the-art implants.

REFERENCES
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