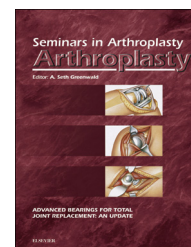


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The anterior approach with a positioning table: First among equals

Emanuele Serra, MD*, and Paul E. Beaulé, MD

Department of Orthopedic Surgery and Traumatology, Ottawa University Hospital, 501 Smyth Rd, Ottawa, Ontario, Canada K1H 8L6

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ABSTRACT

Direct anterior or Hueter approach (DA) is the only true muscle-sparing approach for total hip arthroplasty (THA) being purely internervous and intermuscular. Because this approach is executed in the supine position combined with the use of a dedicated positioning table, it allows for effective control of implant position. Although the DA can be done on a standard operating table, the use of a positioning table combines the advantages of facilitating femoral exposure as well as intraoperative imaging. Several studies of the DA have demonstrated more rapid recovery and return to unassisted ambulation without precautions, which is an attractive advantage for patients. Nevertheless, we strongly recommend following fellowship training or mentorship programs to minimize the initial learning curve with the anterior approach.

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Introduction

In the last 10 years, the delivery of care for patients receiving a total hip arthroplasty has changed significantly [1]. Financial as well as social factors have increased the demand of a more rapid recovery [2]. Thereby, the orthopaedic community has been faced with growing expectations among patients who undergo THA. Specifically, they seek to regain independence quickly, especially young active individuals with high functional requirements. Moreover, accelerated hospital pathway and early recovery time are the new goals for surgical elective procedures such as total hip arthroplasty, as this can reduce costs and thus benefit hospital budgets [3,4].

Among the various minimally invasive approaches, which have been claimed to achieve above-mentioned results, the direct anterior approach (DDA) has had a long track record [5].

The key for its success is related to the use of the Hueter interval with dissection within the tensor fascia lata (TFL) sheath and interval between rectus femoris and gluteus medius. This is a true internervous and intermuscular plane, which may be associated with less muscle damage as well as less pain and shorter hospital stays.

In addition, intraoperative imaging (static AP pelvis or fluoroscopy) and the proximal femur exposure, using as a positioning table to perform DDA has helped to render the procedure more reproducible as well as minimizing patient exclusion criteria. Having said that, as many new surgical techniques introduced in a clinical practice, this technique has a learning curve [6]. Accordingly, we suggest cadaveric training and one-on-one mentoring for implementing this approach into a surgeon's practice so that known early complications can be minimized.

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*Corresponding author.

E-mail address: eserra@toh.on.ca (E. Serra).

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Surgical approach

The Hueter anterior approach for total hip arthroplasty was initially described by Professor Judet for hip exposure to implant artificial femoral heads for arthroplasty since 1947 [7]. Thereby, the surgery was facilitated by operating on the Judet table with the patient in supine position. The technique was conceived in order to use the Smith-Petersen interval between the zones of innervation of the superior and inferior gluteal nerve laterally and the femoral nerve medially. This anterior interval is both intermuscular and internervous, potentially providing biomechanical advantages by preserving the abductor muscles insertion laterally and the stabilizer structures posterior. Theoretically, this confers immediate stability to the hip, obviating the need for dislocation precautions.

A randomized study done by Restrepo et al. [8] compared functional outcomes between anterior and direct lateral approach. They reported a significant difference in functional outcome shortly after the intervention (6 weeks and 6 months postoperatively) with the direct anterior approach patient having better physical functioning, general mental health, vitality energy as well as less role limitations, bodily pain, and less fatigue. Similarly, Kim [9] and Ogonda et al. [10], who in two randomized prospective studies, failed to show improvements in the 6 week HHS using a mini-posterior incision, perhaps because their approach involved direct muscle transection, and both identified a difference between a small incision approach and a truly muscle-sparing approach such as DAA. Conversely, two randomized trials comparing the anterior approach to the posterior approach, showed more rapid recovery and better function at 6 weeks [11,12].

Mayr et al. [13] in a prospective randomized gait analysis showed statistically significant improvement in THA done through a direct anterior approach in a larger variety of gait parameters and an early return to a normal gait. At 6 and 12 weeks, follow-up patients in the traditional anterolateral approach had improvement in fewer gait categories than did direct anterior approach patients. In fact, the direct anterior approach demonstrated statistically significant improvement in cadence, stride, time and length, walking speed, total hip range of motion, and foot contact.

The reproducibility of the direct anterior approach is related to the supine position and to some extent to the use of the positing table making this approach applicable to almost all patients (Fig). The patient is positioned supine with both legs placed in supportive boots without contact between the table and the patient distal to the pelvis. In addition, the radiolucent nature of the fracture table allows the surgeon to easily obtain intraoperative radiographs. There is excellent visualization of the acetabular anatomy and easy reaming of the acetabulum, all of which can also be obtained with a single assistant. The acetabular component is more accurately positioned as well as facilitating determination of leg length, and component offset.

Nevertheless, there are also disadvantages connected with this approach that probably could explain why in the late 1960s orthopaedic surgeons preferred to explore other

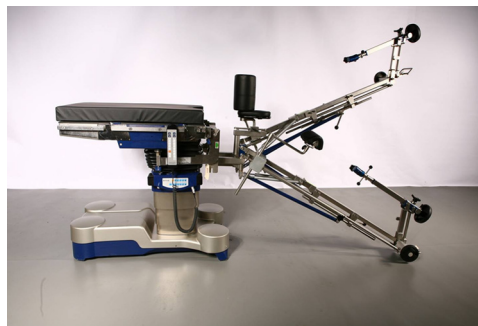


Figure – Fracture table allows for safe hyperextension, adduction and external rotation of the leg enhancing femoral exposure for component placement.

approaches such as the trochanteric osteotomy by a lateral approach used by Sir Charnley [14]. In fact, with the anterior approach, the exposure of the proximal femur is technically demanding in order to safely broach and avoid canal perforation and/or calcar crack [15,16]. In fact, to elevate the femur into the anterior aspect of the wound as well as providing proper external rotation of the femur, careful attention is required at releasing the pubofemoral ligament and medial capsule off the medial calcar. If not, vigorous traction on the proximal femur leads to the fracture of the great trochanter or leads towards wrong direction during broaching and consequently perforation of the femoral canal. Some have advocated the use of a hook to facilitate femoral exposure which is placed the lateral aspect of the femur and connected to the table by a bracket. However, this is not essential with other tables providing a support placed under the thigh out of the surgical field. One of the critical aspects of the successful outcome of primary total hip replacement is proper acetabular component position [17]. Jennings et al. [18] showed that when intraoperative imaging was used, 80% of combined abduction and anteversion angles fell within the safe zone compared to only 63% in the non-intraoperative imaging group, which represented a significant improvement. The anterior approach also is advantageous for the patient with bilateral hip disease [19]. The supine position allows a short anesthetic time because there is no need to change position and redrape during the surgery.

Complications

For experienced surgeons, major complications associated with THA using the DAA are rare and comparable to those of other approaches [20,21]. Dislocations due to component malposition remain the principal cause of instability as early complication of THA and 2–40% of affected patients require revision surgery [22,23]. Muscle-sparing approach such as the DAA confers immediate stability to the joint reducing the dislocation rate. This has been the subject of two large observational cohort studies. Siguier et al. [5] treated 1.037 patients with the anterior approach to THA with a dislocation rate of 0.96%. In another study, Keggi et al. [24] reported a dislocation rate of 1.3% in their series of 2.132 primary THA performed through an anterior approach. Matta et al. [25]

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