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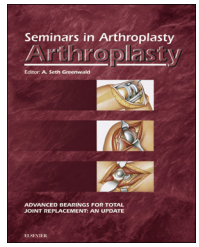

The direct anterior approach: First among equals—Opposes

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ABSTRACT

The anterior approach is increasingly practiced throughout the United States. Advocates claim it is minimally invasive, tissue friendly with decreased dislocation rates, decreased hospital stay, and improved outcomes. Recent data however, indicates high complication rates; wound problems, fractures, femoral loosening, and dislocation rates similar to other approaches. The superior approach is modeled after an ideal approach to total hip arthroplasty that is tissue-preserving, inexpensive, and reduces complications of other techniques. Features of the superior approach include simple positioning, no dislocation of the femoral head, preservation of abductors, anterior and posterior capsule, and most, if not all of the external rotators.

Total hip arthroplasty (THA) is one of the most common and successful surgical procedures in orthopaedics with more than 470,000 THAs performed annually in the United States [1]. As national focus shifts toward healthcare resource utilization, efforts have been made to decrease cost while increasing value in THA. Measures such as postoperative pain and disability, hospital length of stay, readmission and complication rates, rehabilitation utilization, episode cost, and patient satisfaction continue to drive evidence-based decision-making to improve patient outcomes [2]. In an effort to optimize these outcome measures, a major point of contention has been the choice of surgical approach through which to perform THA. Traditional approaches, such as the posterior or anterior approaches, have been modified to be less invasive to attempt to accelerate recovery and minimize their associated complications.

When designing an ideal approach for THA, several attributes are key to success and generalizability (Table). There are three general categories to consider: (1) exposure and soft tissue care, (2) adjunctive or specialized equipment, and (3) patient applicability. First, the incision placement should be in a relatively clean area where hygiene and wound care can be performed easily. Healing of the incision should be expected in every patient, regardless of body morphology. Between the skin incision and the hip joint, preservation of as many soft tissue structures as possible should be considered paramount to surgical safety. Muscles, tendons, and the joint capsule all contribute to stability, proprioception, and separation of the implants from the superficial tissue intervals. From a soft-tissue perspective, the capsule is the main static stabilizer of the total hip arthroplasty, while the abductors and the short external rotators function as main and

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Table – The Optimal Approach

Soft Tissues	Equipment	Applicability
Safe incision placement	No fluoroscopy	Generalizable
Preservation of soft tissues	No complex set-up	Revisions
Extensile nature	Minimal adjuncts	Conversions
		Any component design

secondary dynamic stabilizers, respectively [3,4]. Minimizing damage and/or directly repairing either or both structures during THA should help improve stability and decrease postoperative instability. Additionally, avoidance of injury to neurovascular structures, both cutaneous and deep should be straightforward and routine. Extensile exposure is of paramount importance, especially when a minimally invasive window is used. The ability to extend the incision proximally and distally into a well-recognized, familiar approach allows for safe management of any complex or unplanned challenges.

The second objective of a well-designed approach for THA is minimal reliance on expensive or complex equipment or additional personnel. Approach-dedicated tables and intricate positioning set-ups, aside from their up-front expense, may contribute to undue stress and confusion on the part of staff, nurses, and assistants. Intraoperative imaging, like routine fluoroscopy, adds radiation exposure, time, additional personnel into the operating room environment, and additional movement of personnel in and out of the operating room during the procedure. Further, such equipment creates additional opportunities for contamination of the surgical field. By positioning the patient in a physiologic and reproducible position, routine intraoperative trial reduction and assessment of tissue tension, stability, and potential impingement is straightforward.

An ideal approach would be generalizable to nearly all patients without consideration of body mass index, body habitus, or pannus location. An optimal approach would also allow for use of any implant design without restriction. When these criteria are met, THA using such an exposure should logically lead to enhanced patient outcomes and improved healthcare value.

Two contemporary surgical approaches for THA that have been described as minimally invasive or tissue-preserving are the anterior and superior approaches. The anterior approach, often referred to as the direct anterior approach (DAA), has gained attention and widely increased usage in the past decade [2,5], supported heavily by marketing on the part of device manufacturers. Although historically the approach was used for mold arthroplasty—predating total hip arthroplasty [6]—the anterior approach has been further adapted for modern use. Early outcome reports for this approach have demonstrated decreased time to ambulation, hospital stay, and dislocation rates as compared with reports of traditional posterior and lateral surgical techniques [5,7]. More recent data however, demonstrates significant shortcomings of the approach as a cause for concern.

The anterior approach meets few of the criteria for a well-designed, "ideal," approach to THA. The technique is often performed with a specialized table, additional personnel, and imaging equipment, and involves non-physiologic displacement and distortion of the patient's limb during the procedure. The technique does not allow access to the long axis of the femur, limiting component design choices, increasing the likelihood of fracture, and with limited access to address such fractures. The technique also often limits the surgeon's ability to perform a proper trial assembly and intraoperative assessment. Further, the incision is placed in a location that is notorious for bacterial overgrowth, wound problems, and unsightly scars. Consequently, it is not surprising that many complications ranging from nerve dysfunction, to femoral and acetabular failure, to wound healing are more pronounced than original reports indicated. The close vicinity of the lateral femoral cutaneous nerve (LFCN) makes it susceptible to injury during initial approach, retraction, or closure. In one study of 132 patients who underwent an anterior approach for THA or hip resurfacing, 107 (81%) reported LFCN neuropraxia postoperatively. In a subset analysis of 60 patients at mid-term follow up, 83% had sustained symptoms of LFCN neuropraxia at a mean of just over 1 year [8]. While this complication may not be considered to be significant, it is also entirely unnecessary for the performance of THA.

Intraoperative complications such as calcar fractures, trochanteric fractures, femoral canal perforations, and acetabular fractures have been reported in up to 3.2% of cases during the anterior approach. In a series of 800 anterior THAs, Jewett and Collins [9] reported relatively high incidences of intraoperative greater trochanteric fractures (2.3%) and femoral cortical perforations (0.37%). In another series of 899 patients, Cidambi et al. [10] reported a 1.1% overall rate of femoral sided complications either at the time of surgery or within 90-day follow up. Femoral loosening occurred at a rate of 0.55% in 2-year follow up, all of which occurred outside the initial 100 "learning curve" cases [10].

Considering the location of incision placement with this approach, wound healing may be problematic. Overall wound complication rates of 4.6% are highlighted by a 3% incidence of dehiscence of the proximal pole of the incision near the groin crease [9]. Superficial wound dehiscence requiring treatment occurs more frequently in patients with BMI $>$ 35 compared with patients BMI $<$ 35 [11]. Even in selected patients without an overhanging pannus, Christensen et al. [12] found a statistically significantly increased rate of wound complication requiring reoperation when comparing the anterior approach (1.4%) to the posterior approach (0.2%). Despite early reports of lower dislocation rates with the anterior approach, dislocation remains a problem in modern anterior THA [13]. In a direct comparison of anterior approach to posterior approach, Maratt et al. [14] found no difference in dislocation rates (0.84% vs. 0.79%, respectively).