Introduction

Total hip arthroplasty is perhaps the most successful operation of the 20th century — this must be foremost in the mind of the surgeon who is considering the various alternative techniques to “traditional” hip-replacement approaches. The orthopedic surgery community of the 21st century must be careful not to change too radically or too quickly an operation with such a proven track record.

To be considered minimally invasive, any total hip-arthroplasty approach must lessen the impact of surgery on the patient’s quality of life and disruption of daily routine. Serious complications, such as nerve injury, leg-length discrepancy, dislocation and fracture must be minimized. The surgeon must pay attention to reducing surgical time in order to minimize blood loss, contamination leading to infection, and phlebitis. Minimally invasive does not mean just a small incision but refers more importantly to what goes on beneath the skin. The emphasis is on gentle exposure that minimizes overall muscle trauma. Although some exposures do not require removal of any muscle insertions, these indirect exposures can severely bludgeon the muscle and have the potential to create maximal trauma (invasion).

Mini-incision surgery requires careful patient selection and education. Patients must have realistic expectations consistent with their body habitus. It is essential that the surgeon discuss the benefits of small incision surgery balanced with the ultimate goal of accurate component positioning, minimal risk of complication and maximal potential for durable result.

Surgical Technique

Rationale

The antero-lateral mini-incision approach is a modification of the standard approach developed and used at Rothman Institute Orthopaedics over the past 20 years. The incision length is shortened, and therefore modified techniques and specialized equipment are required to maximize direct visualization without the need for fluoroscopy. Direct visualization of the bony anatomy of the hip is critical to a successful technical result.

The patient is positioned in the supine position. This allows simple and very accurate leg-length measurement, without the use of calipers or pins, by simply palpating the malleoli. Acetabular orientation is simplified without concern over intra-operative pelvic shift. The surgeon can directly palpate the anatomic landmarks of the pelvis (anterior superior iliac spines, pubic symphysis) and have an easier appreciation of the three-dimensional anatomy of the acetabulum. It is well documented that the antero-lateral approach has a lower dislocation rate than the other approaches (Maisonis, Bourne). The posterior capsule is retained to minimize post-operative restrictions and speed early recovery.

Instrumentation and Prosthetic Choice

Three special acetabular retractors have been designed to facilitate exposure (Fig. 7.21). One retractor is fitted with a fiberoptic light to improve visualization of the acetabulum (Fig. 7.22). Special acetabular compo-

W. J. Hozack et al. (eds.), Minimally Invasive Total Joint Arthroplasty
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Fig. 7.21. Acetabular retractors

Fig. 7.22. a Acetabular visualization without fiberoptic lighting. b Acetabular visualization with fiberoptic lighting

Fig. 7.23. Low profile Trident® (Stryker Howmedica Osteonics, Allendale, NJ) acetabular component impactors

Fig. 7.24. Low profile broach handle

Low-profile component impactors ease insertion of the final component (Fig. 7.23). The special femoral retractors consist two double-footed retractors. The broach handles have been modified for ease of insertion through a smaller incision (Fig. 7.24). The trial instruments have snap-on heads with a special insertion device to aid in head-neck trials. Low-profile component insertion handles and head impactors have been designed. This special instrumentation has been consolidated into a single-equipment tray (Fig. 7.25) available from Stryker Orthopedics (Mahwah, NJ). Finally, component selection is important. A system must be selected which facilitates component positioning through a small incision. This particu-
lar system must have proven clinically success, yet be extremely simple and quick to prepare the bone and implant the prosthesis (again minimizing the overall trauma to the patient). A proximally coated tapered titanium-alloy prosthesis is utilized to minimize long-term bone loss associated with distal fixation stems.

**Technique to Minimize Incision Length**

Overall incision length will vary from 8–12 cm depending upon patient weight, local adipose thickness, muscle mass, flexibility and anatomy. The initial incision should extend from the anterior third of the tip of the greater trochanter to a point several centimeters distal, along the diaphysis of the femur (Fig. 7.26). This initial incision can be extended proximally (for femoral exposure) or distally (for acetabular exposure) as needed. The initial incision is made through skin down to the level of the fascia. At this point the fat tissue is dissected bluntly off the fascia to maximize the visualization of the fascia. The skin and subcutaneous tissue can then be mobilized in any direction throughout the procedure to maximize visualization.

**Surgical Approach**

The initial incision is made to the level of the fascia, as described above. The fascia is then split just anterior to the most lateral aspect of the greater trochanter. The anterior and posterior aspect of the gluteus medius muscle is identified. The anterior third of the gluteus medius, the entire gluteus minimus, and the anterior half of the hip capsule are elevated anteriorly in one flap. The femoral head is then dislocated and the neck osteotomized. This gentle exposure limits trauma to the muscle belly, yet closure of this flap is readily obtained (Fig. 7.27). The superior capsule is incised along the posterior aspect of the gluteus minimus, and the inferomedial capsule is incised with care not to divide the iliopsoas tendon. This technique – capsular incision rather than capsular excision – maximizes exposure and stability and minimizes the potential for leg-length discrepancy. It also allows the patient full, unrestricted activity immediately after the surgery.

![Fig. 7.25. Accolade™ Femoral Hip System modified instruments (Stryker Howmedica Osteonics, Allendale, NJ)](image)

![Fig. 7.26. Planned incision with the greater trochanter marked](image)

![Fig. 7.27. Split of the gluteus medius, with minimal trauma, prior to repair](image)
Acetabular retractors are placed in the following sequence: anterior, superior, inferior. The anterior cobra retractor is placed with the hip flexed so as to relax the anterior neurovascular structures, allowing safe placement of this retractor. The superior retractor is best positioned at the 10:00 position on a right hip (2:00 on a left hip). The initial inferior retractor is a double-angle type and is best placed on the ischium as medial as possible. The medial capsular structures are placed on stretch by this retractor. The medial capsule is then incised, taking care not to violate the iliopsoas tendon. The visualization of the acetabulum is then assessed and, if deemed suboptimal, the double-angle is replaced with a double-footed retractor placed as medial as possible onto the ischium. At this juncture, the surgeon should be able to visualize the entire periphery of the acetabulum prior to reaming (Fig. 7.28).

The surgeon should identify all the landmarks important for acetabular positioning including the anterior and posterior columns, anterior and posterior walls, crotloid fossa, and the acetabular notch prior to reaming. The reaming should progress sequentially so that a hemisphere is created that is medialized and so that the inferior edge of the cup is at the level of the teardrop. Great care must be taken not to aggressively ream away walls or columns. Proper placement of the acetabular retractors protects the skin from damage by the reamers, regardless of incision size. The cup is generally under-reamed by 1 mm so as to obtain a press-fit. The acetabular component is then inserted under direct visualization. Screws are generally not needed. At this point, a trial liner or the actual liner may be impacted into place.

Femoral exposure requires externally rotation and adduction of the leg. A double-footed retractor is placed posterior to the femur and another double-footed retractor is placed lateral to the femur to facilitate broaching (Fig. 7.29). Properly placed, the retractors will minimize soft-tissue and muscle injury from the instruments. If the femur cannot be adequately exposed for broaching despite appropriate leg and retractor positioning, the incision must be extended proximally. The entire cortical rim of the proximal femur must be exposed to properly assess version, axial stability and rotational stability, and for early detection of fracture, should it occur, during the femoral preparation and component insertion. The starter reamer is used to open the canal and then the femur is sequentially broached. Elimination of all but the small starter reamer minimizes the potential for trauma to the gluteus medius muscle. The broach serves as a trial and a special head-neck insertion device is available to make trial reduction easier. After testing for stability, impingement, leg length and offset, the final component is then inserted. The incision is closed in layers, with careful attention paid to repair of the gluteus medius tendon. The closed incision is pictured (Fig. 7.30).

**Post-Operative Management**

Patients are not required to use bracing, hip precautions or restricted weight bearing. The morning after surgery, the Foley catheter and all intravenous medications and
fluids are discontinued. Physical therapy is given twice daily, but the patient is encouraged to be out of bed as much as possible. Oral pain management consists of oxycodone for the inpatient stay and for discharge. The pain management is supplemented by non-steroidal anti-inflammatory medication. The patient is discharged to home on the second or third post-operative day based solely on progress in therapy. The patient uses a walker on the first day, is discharged with crutches and progresses to a cane by 2 weeks.

Fig. 7.30. Closed small-incision total hip arthroplasty