Anterior Double Incision

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Introduction

The concept of two separate incisions in total hip arthroplasty was originally introduced and popularized by Dana Meers, though Kristaps Keggi has extensive long-term experience with multiple incision surgery. The idea being each implant, i.e. cup and stem, are introduced through separate portals, thereby allowing for smaller incisions and less muscle release and disruption. The theoretical benefit of this so called “muscle sparing” approach is less pain, faster return of function and therefore earlier discharge from hospital and overall quicker recovery. It appears from preliminary data that these are viable goals, but safety in terms of complications and longer term questions of implant positioning and fixation have yet to be answered.

Anatomical Considerations

The double-incision approach as described by Meers incorporated an anterior incision centered over the neck of the femur in the interval between sartorius and tensor fascia muscles and a second incision above the trochanter. The anterior incision approaches the acetabulum via an internervous plane, the Smith-Peterson interval (Table 7.1).

From experience with pelvic osteotomy and anterior approaches to the hip, there are numerous problems with this incision. Unless the incision is oriented in the line of the groin crease, the anterior incision tends to heal with a certain degree of spreading and puckering, which in a situation where one of the indications for the technique is cosmesis, the ugly nature of the resultant scar is a concern.

The lateral cutaneous nerve of the thigh, which supplies a large area of sensation over the antero-lateral thigh is at risk in this interval, and damage either by traction or directly can cause permanent aggravating numbness or paresthesia.

For most orthopedic surgeons in the world, except our European colleagues, an anterior approach to the hip is unfamiliar and this contributes to the learning curve especially in relation to acetabular reaming and implant placement. To this end the surgical technique recommends the use of 32 mm heads and offset liners, where the offset is placed anteriorly, to reduce the risk of anterior dislocation. There is a tendency to increased anteversion of the acetabular component.

If problems arise during the procedure, the anterior approach is not extensile and therefore a separate third incision is required, positioned more laterally and allowing more conventional exposure of the proximal femur and the hip.

Based upon these concerns I embarked upon an anatomical study and cadaveric dissection to see whether these problems could be overcome. The only way to reliably do this was to shift the anterior incision laterally, and use the interval between gluteus medius and tensor fascia, i.e. the Watson–Jones interval.

The incision is lateral over the anterior border of the trochanter, in line with the femur, and cosmetically heals more acceptably. The nerve supply to tensor fascia passes high on the interval and is not at risk, and concerns over the lateral cutaneous nerve are removed.

The patient can be placed supine or in the lateral decubitus position, and the interval provides a much straighter access to the acetabulum, both for reaming and implant placement. The incision is easily extensile into a modified Hardinge approach, and it is recom-
Table 7.1

<table>
<thead>
<tr>
<th>Smith-Peterson</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>1. True internervous plane</td>
<td>1. Lateral cutaneous nerve at risk</td>
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<td></td>
<td>2. Easy access to femoral neck</td>
<td>2. Cosmesis of scar</td>
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<tr>
<td></td>
<td>3. Easier access for trial necks and heads</td>
<td>3. Increased risk of eccentric reaming</td>
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<table>
<thead>
<tr>
<th>Watson-Jones</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td></td>
<td>1. Relatively internervous plane</td>
<td>1. More difficult access to femoral neck for trial neck and head insertion</td>
</tr>
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<td></td>
<td>2. Patient supine or lateral decubitus</td>
<td>2. Cosmesis better</td>
</tr>
<tr>
<td></td>
<td>3. Scar cosmesis better</td>
<td>3. Increased risk of eccentric reaming</td>
</tr>
<tr>
<td></td>
<td>4. Straighter access for acetabulum reaming and up insertion</td>
<td>4. Increased difficulty in accurate cup placement, i.e. anteversion</td>
</tr>
<tr>
<td></td>
<td>5. Easily extensible</td>
<td>5. Not extensible</td>
</tr>
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</table>

mended that surgeons new to the procedure can familiarize themselves with it by using a single longer skin incision, then placing the cup with full exposure of the trochanter and gluteus medius, going anterior to that muscle. The femoral preparation can then be performed by the standard gluteal split as for the anterior two-incision approach.

The difficulty with moving the incision laterally is access to the top of the femur for neck trial and head placement as the femoral neck is directed medially away from the incision. This difficulty has been overcome with specialized instruments for manipulating the neck trials and the femoral heads.

**Implant Selection**

Selection of implants has played an important role in the development of the minimally invasive two-incision surgery. Whereas virtually any type, size or shape of implant can be placed with single mini-incision techniques, there are specific restrictions, especially on the femoral side, at present with two-incision surgery, using existing implant systems.

Mini-incision surgery allows better visualization of the proximal femur and hence cemented stems and proximal fit/fit style cementless stems can be utilized. For two-incision surgery this access is restricted and hence more certainty is achieved with cementless fixation using fully porous coated stems, or in my hands the Taperloc design of the Accolade System.

**Surgical Technique**

**Patient Positioning**

The patient is placed supine with a bolster under the involved sacro-iliac joint, elevating the buttock and hip off the bed (Fig. 7.94). This position is favored as leg-length determination can be more accurately assessed compared to the lateral decubitus position and allows easier access to pelvic landmarks for computer navigation. The patient's arm is elevated and adducted across the chest out of the way. The whole leg is painted up to the costal margin, across to the midline, groin and buttock, and the leg is free draped.
Acetabular Placement

The skin incision is placed along the anterior border of the trochanter, starting approximately 1 cm distal to the tip, and is usually 5–6 cm in length. The size of the skin incision is determined by the pre-operative template size of the acetabular component, and the size of the patient (Fig. 7.95, 7.96). A 68 mm acetabular component will not fit in a 40 mm skin incision no matter how hard you try!

On exposure of fascia lata, tensor can usually be seen coming down obliquely to its insertion into fascia, and a longitudinal incision is made through fascia where the muscle inserts, and extends proximally in line with the skin incision. The interval between the muscles is easily defined and an index finger can be passed through the interval onto the anterior capsule. This is partially covered by fat, the origin of vastus intermedius fibers and more medially rectus muscle.

The hip is flexed and a curved pointed Hohmann style retractor is placed under rectus over the anterosuperior rim of the acetabulum. Rectus can be released if necessary. A specially developed light-source retractor greatly aids visualization at this point through the small incision.

Fat and vastus are stripped from the capsule and narrow curved Hohmann retractors placed superiorly and inferiorly fully exposing the anterior capsule. An anterior capsulectomy is then performed (Fig. 7.97).

A superior capsulotomy both on the acetabulum and femoral side at this point will help with femoral preparation. The narrow retractors are then placed around the neck inside the capsule to protect the soft tissues and a femoral neck osteotomy is performed (Fig. 7.98).

A segment of neck can be removed, as this allows easier extraction of the femoral head from the acetabulum using a corkscrew. I have not found this always necessary, as long as the neck osteotomy is complete and mobilized (Fig. 7.99).

The complete circumference of the acetabulum cannot be visualized, but with sequential placement of retractors the whole margin can be exposed in a step-wise fashion from anterior, superior to posterior to allow debridement of labrum and osteophytes.

The acetabulum is reamed in the usual fashion with a straight reamer. Traction on the femur certainly aids in seating the reamers and removal of acetabular retractors. Reaming should not be performed until palpation...
Part II· The Hip

Fig. 7.98. a Segment of neck removal aids in easy extraction of the femoral head. b Femoral head easily removed with a thredded extractor

Fig. 7.99. Good views are obtained of the acetabulum, though sequential positioning of the retractors is required to perform a circumferential debridement

Fig. 7.100. Component positioning is easier with more direct visualisation than with the more anterior window

has confirmed that the reamer is centered in the acetabulum.

Acetabular placement can be performed with a straight inserter, but a curved inserter allows easier positioning, using the curvature to help clear the femur and the inferior aspect of the wound. Seating of the component can be inspected by replacement of the light-source retractor and viewing the polar hole.

I use a standard 28-mm articulation with an offset acetabular insert placed superiorly. Using a ceramic articulation sometimes requires the use of larger heads, determined by the size of the acetabular component in the Trident acetabular system. Ceramic liners are neutral without offset available (Fig. 7.100).

Femoral Preparation

The preparation of the femur is far more familiar in concept for most surgeons, as it equates fairly closely to closed rodding of a femoral fracture.

The superior neck is palpated and a curved scissor is then pushed through gluteus medius, out towards the skin as close to the tip of the trochanter as possible. During the maneuver the leg is flexed and adducted across the other leg. The tip of the scissors are advanced until easily palpated under the skin, then a 3 cm incision is made onto the tips, with the alignment of the skin incision according to the estimated version of the component to facilitate insertion of the stem (Fig. 7.101).
From cadaveric dissection, the split in gluteus medius tends to be at the junction of middle and posterior third, and the importance of keeping the split as close to the tip of the trochanter is emphasized, as the anterior branch of the superior gluteal nerve is at risk with insertion of the stem. Raspings do not pose the same risk as these do not usually have a neck segment.

An important part of the femoral preparation is to ensure that the bone of the superior femoral neck is removed. This can be performed through the lateral incision or with a box chisel from above. The straight awl should be introduced with control coming from the first incision, and as it is advanced, the handle should be pulled laterally to ensure straight placement and not varus. A similar technique is adopted for broach seating.

During femoral preparation the leg is kept in its adducted flexed position, and orientation of the broaches judged using the position of the femur and knee. If the final broach size differs greatly from the templated size then this usually indicates the broach is in varus. This can be checked using image intensifier if necessary, and certainly with initial experience, an image intensifier adds confidence (Fig. 7.102).

A specially designed reverse-offset broach handle for the Accolade system is required for femoral preparation, as the standard and straight rasp handles tend to impinge on the skin and soft tissues, and not enough clearance makes it difficult to impact onto them with a hammer.

**Trial Reduction**

After seating of the final broach, the handle is disengaged and removed through the superior incision. The femoral neck trial appropriate along with the trial head is grasped in the special reduction forceps. A bone hook is placed either into the trochanter or around the medial femoral neck and the proximal femur is distracted away from the side of the pelvis and the reduction forceps and the head/neck trial is introduced onto the spigot of the trial broach. External rotation and traction by the assistant on the leg can facilitate this maneuver. The lighted retractor can be re-introduced for this part of the procedure. Leg lengths and stability are checked, the hip is re-dislocated and the reduction forceps re-introduced to remove the head/neck trial.

It is occasionally necessary to place the head/neck trial into the acetabulum, and then reduce the femur onto it, once again using the reduction forceps to manipulate the head/neck trial.

**Femoral Stem Insertion and Final Reduction**

The broach handle is then re-inserted through the superior incision and engaged, and the broach is removed.

The most difficult and taxing part of the procedure is the femoral component insertion. Soft-tissue impinge-
ment on the neck and morse taper tends to push the implant into anteversion, especially the superior capsule and acetabular rim. Care must be taken using palpation and visualization that the stem is not catching as it is being impacted. The penalty for not taking care with this step is seating in increased anteversion and risking a proximal femoral fracture. To assist with this, it is a good idea to pull the neck segment through into the hip before final seating of the implant. This is achieved by traction on the leg, using a finger through the lateral incision, palpating the trunion and ensuring it is moving through the gluteal split and not catching on the superior capsule and acetabular margin (Fig. 7.103).

Once the stem is seated, a further trial reduction can be performed, externally rotating the leg and slipping the trial head onto the trunion.

The final head is introduced via the lateral incision using the specially designed head impactor.

**Closure**

As the anterior capsule is excised, there is no tissue available for deep or capsule closure, therefore only deep fascia, fat and skin require closure (Fig. 7.104).

**Discussion**

There is a considerable amount of skepticism surrounding the need for or advisability of minimally invasive techniques in hip replacement considering the success of conventional exposures and techniques. Skeptics view it as a cosmetic procedure with no clinical benefit and certainly from the standpoint of someone with considerable experience, it does make the procedure slightly more complex, but only because it is currently based upon the use of existing implant and instrument designs.

Cosmesis is certainly a valid reason and should not be discounted. The average age of patients presenting for joint replacement is decreasing and body image is playing a far more important role in today’s society. If a patient is offered the same procedure, with a choice between an 8 cm incision or a 15–20 cm incision, 9 patients out of 10 would choose the smaller incision. As surgeons we have already seen this trend in our practices due to the popularizing and marketing of minimally invasive surgery via the internet and popular press.

The clinical expectation of patients in terms of recovery is also affected by the size of their incision, and our study (see chapter 4) has shown that discharge times and early recovery can be improved with both two-incision and mini-incision surgery.

From a technical perspective, there is a significant learning curve for two-incision surgery, as the emphasis moves away from full exposure and visualization to a combination of exposure and tactile feedback and, in the future, computer navigation. To this end, the technique needs to have strong educational backup provided by the companies, preferably with a mentoring system available.
Clinical Results

In my own series, there has been a significant improvement in operating times and complications, though interestingly my average in-patient time has not reduced as my experience improves (Table 7.2). In-patient stay over my consecutive series from day 1 using two-incision surgery is 2.4 days, compared to 4.2 days for my first 200 cases using a mini-posterior approach.

Complications

There have been many valid concerns raised about the popularization of two-incision hip-replacement surgery. The principle flies in the face of basic surgical tenet “Exposure, Exposure, Exposure” and therefore must be scrutinized with careful scientific study to ensure safety.

Of the complications that have occurred in my consecutive series, one calcar fracture became significant when the patient stumbled and fell landing heavily on the hip 3 weeks after surgery. The fracture propagated to become a periprosthetic fracture with implant subsidence and required a second procedure to cable the proximal femur.

The infection rate is of concern. Currently the technique entails insertion of instruments and implants past the skin edges and hence the theoretical risk of contamination. The one infection in the series presented 6 months after the index procedure with ongoing pain, an elevated C-reactive protein and sedimentation rate. The infecting organism was coagulase negative Staphylococcus and the patient required a two-stage revision.

As instruments and implants evolve for the procedure, I am sure, safety will improve, and computer navigation will certainly improve feedback and confidence with the technique.

Table 7.2. Case number

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<tr>
<td>Operative-time average</td>
<td>117</td>
<td>112</td>
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<td>Blood-loss average</td>
<td>890</td>
<td>860</td>
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<tr>
<td>Hospital stay</td>
<td>2.4</td>
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<tr>
<td>Complications</td>
<td>2 fractures</td>
<td>1 fracture, 1 infection</td>
<td>Nil</td>
<td>1 fracture</td>
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