Trochanteric flip osteotomy: Revisited

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ABSTRACT

Visualising high posterior wall fractures and removing any intra-articular fragments has always been a challenge to the surgeon because the vascularity of femoral head is at great risk due to close relation of medial circumflex femoral artery (MCFA), the main vessel supplying the femoral head, with the external rotators of the hip. Posterior approach with Kocher-Langenbeck incision and surgical dislocation of the hip after trochanteric flip osteotomy and anterior capsulotomy preserves the vascularity as external rotators are not divided, which in turn protect the MCFA. We are reviewing the technique of digastric trochanteric flip osteotomy. We had tried to clear its known indications, mentioned in the literature along with the complications of this procedure.

Keywords: flip osteotomy, acetabular fracture, femoro-acetabular impingement

INTRODUCTION

There had been always the problem of exposure of high-T and high posterior wall fractures of the acetabulum. To allow complete visualization of the femur head and acetabulum, Ganz et al. described a safe method for surgical dislocation of the femoral head by means of a trochanteric flip (digastric) osteotomy and anterior capsulotomy, thereby preserving the posteriorly based femoral head blood supply. The technique is based on the detailed anatomical studies on the blood supply of the femoral head which is predominantly supplied by medial circumflex femoral artery (MCFA). This technique of surgical dislocation of hip has now been used in various other hip preserving surgeries.

Indications

The use of surgical dislocation of hip with trochanteric flip osteotomy has now been extended to various procedures involving the acetabulum and the head of femur. It has been used as an addition in standard Kocher-Langenbeck approach to have a better and direct view of the femur head and the acetabulum. The following are the main indications of digastric flip osteotomy:

1. Posterior fracture dislocation of hip, to remove intra-articular fracture fragment(s).

2. To fix femur head fractures (especially Pipkin type IV) directly under vision.

3. It gives good exposure in high T and posterior wall acetabular fractures with cranial extension. Also one can assess the fracture reduction of posterior wall and rule out any intra-articular placement of screw during fixation.


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This approach can be used in resurfacing hip arthroplasties as it preserves vascularity and hence oxygenation to femoral head. Reduced oxygenation is one of the cause proposed for fracture neck femur after surface replacements. 

**Technique:**

Patient is placed in lateral decubitus position. One posterior support is applied over the sacrum while the anterior support should be over the pubic symphysis. Kocher - Langenbech incision is given and fascia is incised in the distal part of the incision while gluteus maximus is split in the proximal part. In obese patients, Gibson approach is preferred to avoid the saddle back deformity with the curved incision. The trochanteric bursa is incised and reflected to expose the surface of the greater trochanter. The trochanteric branch of deep MCFA is seen at the upper border of the quadratus femoris and may be cauterized. The leg is internally rotated (20° to 30°) to view the posterior border of gluteus medius and posterosuperior edge of the greater trochanter. At this point, there is no need to visualize the piriformis tendon.

The osteotomy site is marked with the cautery, starting proximally from the posterosuperior edge of the greater trochanter to the posterior border of the vastus lateralis ridge distally. Then, with a thin oscillating saw, osteotomy is done, with its plane in line with the direction of external rotators (Figure 3). The most important point to keep in mind that the proximal part of osteotomy should start just anterior (~5mm) to the most posterior portion of the gluteus medius muscle. This helps to preserve the external rotators and thus prevent the injury to the deep part of MCFA. The saw should stop at the anterior cortex and the osteotome is then used to complete the osteotomy. With this, the anterior cortex is fractured, which helps in reduction while refixing the trochanter. This osteotomy should produce the trochanteric fragment of about 15mm in thickness. After releasing the remaining fibres of gluteus medius from the stable trochanter proximally and vastus lateralis fibres from the femur distally, the fragment is then flipped anteriorly with the retractor (Figure 4). This fragment has gluteus medius attached proximally and vastus lateralis distally.

After retraction, the piriformis tendon and gluteus minimus muscle is exposed, and the interval within these two is used to approach the capsule of the hip. Care is required as the sciatic nerve is beneath the piriformis. The gluteus minimus is sharply dissected proximally from the underlying capsule, exposing the anterior and posterosuperior part of the capsule. The leg is now flexed and externally rotated. A Z-shaped capsulotomy is then done. The capsule is first incised along the axis of the femoral neck anterolaterally. Then, anteroinferior capsular...
incision is made. This incision should always remain anterior to the lesser trochanter because the MCFA lies posterior and superior to it. This may injure some branches of lateral circumflex femoral artery, but there is no risk of vascular compromise as it does not contribute to the vascularity of the femur head. The proximal part of the first incision is extended by turning it posterior and perpendicular along the acetabular rim, thus completing its Z shape. This part of the incision is limited by the piriformis tendon. Care is taken to avoid damaging the labrum. The hip is now dislocated anteriorly by flexing and externally rotating the leg.

Thus, the vascularity of head is preserved as the external rotators are not divided which in turn cushions the deep MCFA, the main supplier to femoral head. A 2.0 mm drill hole made in the dislocated femoral head can document the preservation of its blood supply. Bleeding from the drill hole supports that the vascularity has been preserved. Most of the times, the ligamentum teres needs to be incised to achieve full dislocation. This can be done with no harm, as it has insignificant contribution to femoral head blood supply in an adult.

After dislocation of femoral head, we can have 360° view of acetabulum. Femoral head is directly visualised and so femur head fractures can be easily fixed. Furthermore, movements of head within acetabulum can be analysed for any femoroacetabular impingement.

For closure of the capsule, a running suture can be used and any tension in it is avoided because this can stretch the retinaculum and can compromisend perfusion of the femoral head. The flipped part of trochanter is put back to its original position and refixed with two or three 4.5mm cortical or 6.5 mm cancellous screws with washer. Screws should be aimed towards the lesser trochanter.

Fig.5 : The trochanteric fragment has been put back and fixed with two 6.5mm cancellous screws used along with washers

Post operatively, active abduction of hip is not allowed till 6-8 weeks which is the required time for union of trochanteric fragment. Also, flexion beyond 70° is not permitted till 8 weeks. Passive range of motion at hip can be started a week after surgery.

Complications
If osteotomy is done taking care of landmarks, the complications should not happen. Sciatic nerve is in close proximity to external rotators and is beneath piriformis, and hence, injury can occur, if not taken care. Another issue is of trochanteric non union which is also very rare as the trochanteric fragment is stabilised by the digastrics muscle. Ganz et al reported only 3 cases of failure of trochanteric fixation out of 213 procedures.

Heterotopic ossification is reported but the incidence is less than when only Kocher-Langenbeck approach is done. This is because glutaeus minimus is sharply dissected under vision and also overzealous retraction of glutaeus medius is not required during visualising acetabular fractures.

CONCLUSION
We conclude that the trochanteric flip osteotomy is very useful procedure to assess and fix certain acetabular fractures and femoral head fractures more accurately. Furthermore, one can see the labral and cartilage pathologies directly, which are usually not seen in imaging techniques. As the vascularity of the head of femur is preserved, hip preserving surgeries can easily be accomplished.

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