Ganz safe surgical dislocation of hip: an overview

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INTRODUCTION

Surgical dislocation of hip has been indicated for many pathological conditions in adults and children. One common complication of this procedure is avascular necrosis of femoral head.

Ganz et al. described a technique of surgical dislocation of hip involving trochanteric flip osteotomy and anterior capsulotomy preserving the blood supply to femoral head. The technique is based on extensive study of blood supply to the proximal femur. This technique allows us to completely dislocate the joint creating a space of up to 11cm which allows complete access to intraarticular pathology. This technique has also been used for hip arthroplasties.

Blood supply to femoral head

Based on cadaveric studies on twenty four hips, Gautier et al. have postulated that the blood supply of femoral head is mainly based on medial circumflex femoral artery (MFCA). The course of MFCA in its extracapsular division is relatively constant. This extracapsular ring gives inferior, posterior and superior retinacular vessels. Damage to short external rotators can interfere with the perfusion of femoral head.

Gautier et al. proposed that the relation between the deep branch of MFCA and that of Obturator Externus is surgically important because the tendon protects the branch from being disrupted or stretched during dislocation of hip traumatically or surgically.

It is found that the risk of AVN in an uncomplicated hip dislocation treated conservatively is 11% as compared to 31% in a surgically treated fracture dislocation. Ganz et al. postulates that this difference may be due to the rupture of Obturator Externus and the resultant damage of deep branch of MCFA.

Gautier et al. also studied the average distance of deep branch of MFCA from trochanteric crest which can be considered as a useful guide for the surgeon while operating the hip. The average distance was 18.2 mm from the lesser trochanter, 8.8 mm at the level of Obturator Externus tendon and 12.4 mm at the level of Obturator Internus tendon.

This shows that the artery is always farthest from lesser trochanter and always closest to the trochanteric crest at the level of Obturator Externus. Gautier also found on their detailed dissection that the ascending branch of lateral circumflex artery (LCFA) contributes very little to the blood supply of the femoral head and the anastamosis between MFCA and LFCA undergoes involution after one year of age.

There is an always constant anastamosis between deep branch of MFCA and a branch of inferior gluteal artery along the piriformis. This might compensate for the reduction in blood supply after injury to the former vessel.

Indications
Paediatric population
1. Femoral head impingement in deformed head due to Legg - Calve - Perthes disease.
2. Correction of intra articular deformity in Slipped capital femoral epiphysis.

Adult population
1. Femoral head fractures
2. To remove intra articular fracture fragments in fracture dislocation of femoral head.
3. Re fixation of labral tears under vision.
4. Correction of femoro acetabular impingement.
5. As an approach for surface replacement arthroplasty.
6. As an approach for acetabular fractures.
7. To approach intra articular pathologies like synovial chondromatosis, pigmented villonodular synovitis and in joint debridement.

Steps of safe surgical dislocation
Exposure: The patient in positioned in the lateral decubitus position. A Kocher-Langenbeck approach is used and fascia is split accordingly in the superior portion and gluteus maximus fibres split along the inferior portion. An alternative approach is the Gibson approach. The leg is internally rotated and the posterior border of gluteus medius is identified.

Trochanteric flip osteotomy
An incision is done from the postero superior trochanteric edge to the posterior border of ridge of vastus lateralis. Trochanteric osteotomy is done with a maximal thickness of 1.5 cm and the trochanteric fragment is mobilised anteriorly with the fibres of vastus lateralis. A successful osteotomy means the upper edge of the osteotomy passes just anterior to the most posterior border of gluteus medius and only a part of fibres of the tendon of piriformis need to be released for the mobilisation of the greater trochanteric fragment.

Capsular exposure
The leg is then flexed and slightly rotated externally and vastus lateralis and intermedius are elevated from the lateral and anterior aspects of the proximal femur.

The tendon of piriformis can be carefully dissected by anterosuperior retraction of the posterior border of gluteus medius. The inferior border of gluteus minimus is separated from the relaxed piriformis and underlying capsule. The constant anastomosis between the inferior gluteal artery and MFCA, which runs along the distal border of the piriformis muscle and tendon, is preserved. Care has to be taken to avoid injury to the sciatic nerve, which passes inferior to the piriformis muscle into the pelvis.

The entire flap, including gluteus minimus, is retracted anteriorly and superiorly to expose the superior capsule, facilitated by further flexion and external rotation of the hip. This exposes the anterior, superior and postero superior capsule.

Capsulotomy
An anterolateral incision on the capsule along the axis of the femoral neck is done. An antero inferior incision along the intertrochanteric line ending just anterior to the lesser trochanter to avoid damage to the main branch of the MFCA, which lies posterosuperior to lesser trochanter.

Elevation of the antero inferior flap allows visualisation of the labrum. The first capsularecision is then extended towards the acetabular rim where it is sharply turned posteriorly parallel to the labrum reaching the retracted tendon of piriformis. Care must be taken not to damage the labrum.

Hip dislocation
Hip can be anteriorly dislocated by flexing and externally rotating the leg, which can be completed by incising the ligamentum teres.

This allows a gap of up to 11 cm between the head and the acetabulum, giving a view of the femoral head of about 360° and a full 360° view of the acetabulum. For a complete inspection of acetabulum three retractors are needed.

To check the vascular status of femoral head intra operatively, Ganz has proposed three techniques
1. A 2.0 mm drill hole in the dislocated femoral head
2. Active bleeding while removing the osteophytes
3. Laser flow Doppler study

Hip can be reduced by minimal traction and internal rotation. Ganz recommends that the capsule should be sutured without tension and the greater trochanter is reattached using two to three 3.5 mm cortical screws.

Post operatively active abduction of hip and active flexion beyond 70 degrees is allowed after 8 weeks and passive range of motion exercises can be advised one week after the procedure.

Ganz et al. carried out this procedure in 213 hips between 1992 to 1999 excluding hips which had a pre-existing avascular necrosis and those hips converted to total hip replacement. The mean operating time in their study was 25 to 45 minutes and mean blood loss was around 300 ml. The follow up period
ranged from 2 to 7 years and no hip had developed avascular necrosis.

Complications

1. Sciatic nerve damage. This can be prevented if the surgical landmarks are closely followed.
2. Trochanteric non-union is rare.
3. Heterotopic ossification is reported in 37% (79 of 213 hips) cases by Ganz et al. The commonest site of ossification was at the tip of greater trochanter and this can be prevented by careful retraction of gluteus medius.

Conclusion

Ganz safe surgical dislocation of hip is a very useful procedure for the exposure of intra articular pathologies of hip. It does not compromise the blood supply of the head of the femur. Hence there is no risk of avascular necrosis. By this technique the hip preserving surgeries can be easily performed with a good exposure to intra articular and peri articular tissues.

References