APPLICATION OF THE SAFE SURGICAL HIP DISLOCATION TECHNIQUE TO COMPLEX PEDIATRIC HIP DEFORMITY

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INTRODUCTION

Recent advances in our understanding of the femoral head vascular supply and surgical techniques for the hip have allowed us to safely surgically dislocate the hip. We have utilized this technique for treating pediatric hip deformities such as Legg-Calve-Perthes disease and slipped capital femoral epiphysis. Not only does this technique allow full inspection of the intraarticular pathology but allows complete access to the hip joint for debridement of labral tears and osteophytes, as well as for femoral neck osteotomy and bone grafting.

The main femoral head blood supply has been understood for some time to be derived from the medial femoral circumflex artery. Only recently, however, have Gautier et al[4] studied the detailed surgical anatomy about the hip joint and determined that a safe dislocation of the hip can be accomplished when appropriate technique is utilized. Indeed, Ganz et al[3] have recently reported 213 surgical dislocations of the hip utilizing a trochanteric osteotomy without avascular necrosis.

Legg-Calve-Perthes disease can lead to a misshapen femoral head that impinges with flexion and internal rotation[5]. This impingement can lead to labral tears. In addition, intraarticular loose bodies can develop from osteochondritis of the femoral head[6]. All of these associated pathologies of Legg-Calve-Perthes disease could be addressed utilizing the surgical dislocation technique. In a single operative procedure, all intraarticular lesions could be inspected and treated, and osteotomy performed to optimize joint congruency.

Slipped capital femoral epiphysis results in an intraarticular deformity with the femoral head translocated posteriorly. This may result in an external rotation gait and difficulty in flexion. Over the long term, early degenerative arthritis may develop. Currently the safest recommended treatment

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is in situ fixation[1]; however, this results in a deformed hip. Theoretically, the best method of correcting the resultant deformity is at the femoral head-neck junction. However, this procedure has been associated with a high rate of avascular necrosis, although there have been series with low rates of complications reported[2]. Traditionally, the femoral neck osteotomies have been performed without dislocating the hip. With the ability to safely dislocate the hip, the femoral head blood supply can be fully inspected and protected during the subcapital osteotomy, potentially making this an operation with acceptable risks.

SURGICAL TECHNIQUE

The patient is placed in a lateral decubitus position. An incision is made over the lateral aspect of the proximal femur with the cephalad limb curving posteriorly for the Kocher-Langenbeck approach. Standard direct lateral approach to the proximal femur is performed. The leg is then internally rotated and the posterior border of the gluteus medius is identified. An incision is made from the posterior edge of the greater trochanter to the posterior border of the vastus lateralis ridge. This line should be anterior to the trochanteric crest in order to avoid injury to the insertion of the external rotators. The vastus lateralis will remain attached to the greater trochanter along with the gluteus medius after the trochanteric osteotomy. At its proximal end, the osteotomy should exit just leaving a sliver of medius attached to the trochanteric fragment. This will leave the majority of the piriformis insertion on the proximal femur and not on the trochanteric fragment. The piriformis tendon protects the ramus profundus of the medial circumflex artery, which becomes intracapsular at the level of the gemellus superior muscle.

The greater trochanter fragment is then mobilized anteriorly from the femoral cortex and the capsule by elevating the vastus lateralis and the capsular minimus. If the osteotomy is done correctly only part of the fibers of the piriformis tendon have to be released from the trochanteric fragment for its further mobilization. The gluteus minimus is separated from the relaxed piriformis tendon and underlying capsule is exposed. Using this interval the constant anastomosis between the inferior gluteal artery and the medial femoral circumflex artery, which runs along the distal border of the piriformis muscle and tendon, is preserved. The anterior superior capsular insertion of the gluteus minimus muscle is released while preserving the minimus tendon insertion to the trochanteric fragment. The entire flap is then further retracted

Figure 1
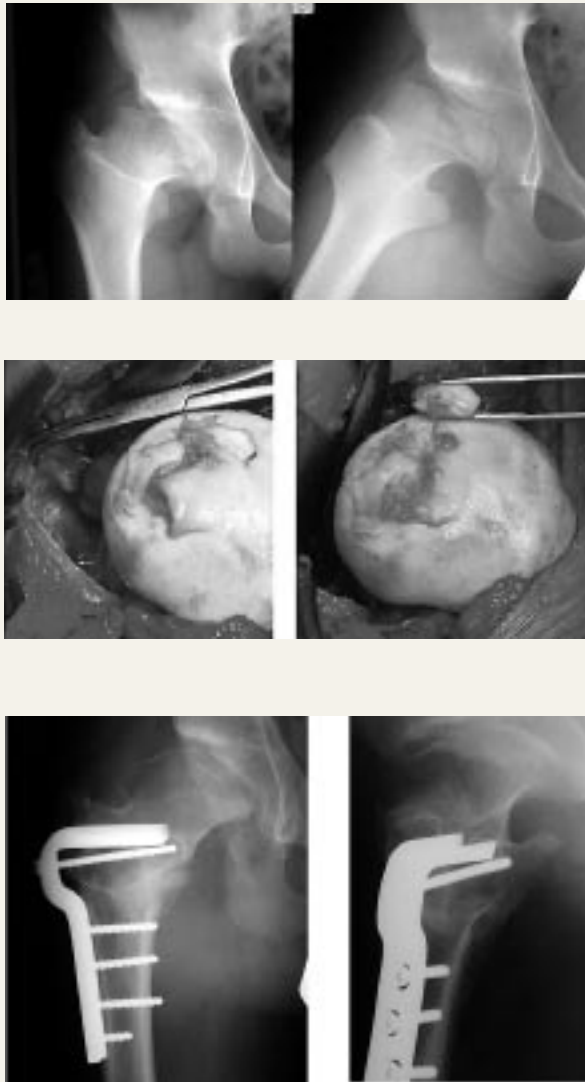
anteriorly and superiorly to expose the superior capsule. The anterior and posterior-superior capsule is now visualized.

To this point, the branch of the medial femoral circumflex artery is safe in the external rotators, and the retinacular vessels on the postero-superior neck are not part of the operative field. The capsule is first incised anterolaterally along the axis of the femoral neck while taking care not to injury the articular cartilage of the femoral head and labrum. Incision in this area prevents injury to the deep branch of the medial femoral circumflex artery. Next, the anteroinferior capsule is cut on the femoral side as there is no danger to the retinacular vessels. The capsule reaching down to the antero-medial calcar is released from the femur. The capsulotomy must remain anterior to the lesser trochanter to avoid any damage to the main branch of the medial femoral circumflex artery,

which comes into this vicinity of the femur just superior and posterior to the lesser trochanter. The anterior-inferior flap now can be elevated enabling visualization of the labrum. The capsular cut is then extended towards the acetabular rim, where it is sharply turned posteriorly parallel to the labrum. A postero-superior flap is made by incising the capsule close to the acetabular rim and stopping before the retracted tendon of the piriformis. The leg is placed into sterile bag draped over the anterior side of the table. In this position, the femoral head is dislocated from the acetabulum. If needed, a hook can be placed around the calcar to ease the hip dislocation with a gentle pull. Most of the acetabulum can now be inspected and assessed for articular cartilage damage. The round ligament is sharply incised and removed for further visualization.

CASE 1

Patient 1 is a 15 year old boy with no prior history of hip disorders. He started to have severe groin pain with locking symptoms after playing football. On physical exam, the patient has a 1 cm leg length discrepancy, left greater than right. The right hip flexes up to 90 degrees, while the left hip flexes up to 120 degrees. In extension, the right hip has essentially no internal or external rotation. The left hip internally rotates 30 degrees and eternally rotates 30 degrees. The right hip has about 20 degrees of abduction. The left hip abducts more than 30 degrees. With flexion, adduction, and internal rotation of the right hip, severe groin pain is elicited (positive impingement test).

Plain radiographs show the deformed femoral head characteristic of Perthes (Figure 1, top panel). Surgical dislocation was performed and the labral tear (Figure 1, left middle panel) and loose body (Figure 1, right middle panel) were removed. In addition, the impinging anterior head was trimmed. The best articular surface was located medial and posteriorly; therefore, a valgus flexion osteotomy (Figure 1, bottom panel) was performed. The patient's locking symptoms and pain resolved and his range of motion improved.

CASE 2

This patient is a 10-year-old girl who has been having six months of right thigh pain. One week ago, she was riding a horse when she fell. The day after, she was unable to weight bear on the right leg. Plain radiographs were taken which showed a 50 degree slip-angle SCFE on the right (Figure 2, top panel). No evidence of a slip was seen on the left side. After in situ pinning, the femoral head was dislocated (Figure 2, left middle panel). Subcapital osteotomy was performed and the articular surface reduced (Figure 2, right middle panel). Bleeding from the femoral head was seen after fixation of the subcapital osteotomy. A bone scan performed 6 weeks after surgery showed a viable femoral head. Both the subcapital and trochanteric osteotomy healed (Figure 2, bottom panel).

DISCUSSION

Traditionally, disorders of the hip joint have been difficult to study and treat due to the limited surgical access. Limited visualization has been possible through an anterior approach

Figure 2

and subluxation, but complete access to the entire joint has been difficult. With the advent of hip arthroscopy, visualization has improved, but currently the ability to treat conditions arthroscopically is limited to debridement procedures.

The anterior dislocation technique through a trochanteric osteotomy appears to be a safe surgical approach in terms of preserving the vascularity of the femoral head. This technique provides complete visualization as well as the ability to debride and reconstruct hip pathology. We have illustrated two potential applications of this technique to pediatric hip disorders using the above case examples. The long term benefits of this approach are unclear at present; however, we are hopeful that we will be able to improve our understanding and treatment of these disorders using this technique.

ACKNOWLEDGMENT

References

1. **Aronsson D, Loder R**. Treatment of the unstable (acute) slipped capital femoral epiphysis. *Clin Orthop*, 1996. 322: 99-110.
2. **Fish J.** Cuneiform osteotomy of the femoral neck in the treatment of slipped capital femoral epiphysis. *J Bone Joint Surg Am*, 1984. 66: 1153-68.
3. **Ganz R, Gill T, Gautier E, et al.** Surgical dislocation of the adult hip a technique with full access to the femoral head and acetabulum without the risk of avascular necrosis. *J Bone Joint Surg Br*, 2001. 83B: 1119-24.
4. **Gautier E, Ganz K, Krugel N, et al.** Anatomy of the medial femoral circumflex artery and its surgical implications. *J Bone Joint Surg Br*, 2000. 82B: 679-83.
5. **Kim H, Wenger D.** Surgical correction of "functional retroversion" and "functional coxa vara" in late Legg-Calve-Perthes disease and epiphyseal dysplasia: correction of deformity defined by new imaging modalities. *J Pediatr Orthop*, 1997. 17: 247-54.
6. **Wood J, Klassen R, Peterson H.** Osteochondritis dessicans of the femoral head in children and adolescents: a report of 17 cases. *J Pediatr Orthop*, 1995. 15: 313-6.