CLINICAL REPORT

Anterior hip subluxation following fixation of a T-shaped acetabular fracture through an extended iliofemoral approach

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Summary We report the case of a 34-year-old female patient who, six weeks following her acetabular fracture ORIF through an extended iliofemoral approach, presented with anterolateral incomplete dislocation of the femoral head. In the absence of joint incongruence as demonstrated on radiographs and CT images, a capsular tightening was performed via the anterior Hueter approach. This capsular plasty stabilized the hip for 2 years, but gradual osteoarthritis deterioration resulted in the need for arthroplasty. At the 2-year follow-up, this secondary arthroplasty showed satisfactory result. The substantial muscle exposure of the lateral aspect of the acetabulum and the circumferential capsulotomy related to the use of the iliofemoral approach were retained as factors promoting this complication. In case early postoperative mobilization is impossible, temporarily maintaining the limb in abduction and flexion can be recommended after an extended iliofemoral approach with circumferential capsulotomy.

Introduction

Coxofemoral instability is rare after fracture of the acetabulum treated surgically, provided that reduction is satisfactory [1–3]. To our knowledge, only Tornetta and French [4] have reported comparable instability, which resolved spontaneously. Duquennoy et al. [2] reported no such fractures in a series of 403 at the SOFCOT symposium, and Judet and Letournel [3] mentioned none in 302 operated fractures. The extended iliofemoral approach is less frequently recommended today in favor of the ilioinguinal approach or combined approaches for treatment of recent complex fractures of the acetabulum [5–10]. It exposes the patient to ossifications [8,9,11] and can result in weakening the gluteus muscles. It is mainly recommended by Letournel [12], Johnson et al. [13], and Mayo et al. [14] for treating complex fractures, notably when they are operated beyond
Figure 1  T fracture identified on AP X-ray (A), 3/4 alar (B), and 3/4 obturator (C). The lower line is identified by an arrow on the 3/4 obturator (C). Instability in protrusion is clearly identified on the 3/4 alar image (B) with reproduction of the displacement.

21 days. It remains current in cases of transverse fractures with a tectal component, in presence of an extended fragment of the posterior wall or cotyloid lesions associated with ipsilateral sacroiliac lesions [15]. We observed one unusual complication with this approach when treating a T fracture. This complication occurred during the discharge period after osteosynthesis. It was asymptomatic and discovered unexpectedly on the 6-week follow-up X-rays.

Observation

A 34-year-old female patient was referred to our center 10 days after a left acetabulum fracture occurring after a traffic accident. Driving with her seatbelt attached, she was struck laterally, resulting in a T fracture with intrapelvic protrusion (Fig. 1) [3,7,16]. She had no other traumatic lesion but immediately presented paralysis in the lumbosacral area of the trunk including L4 and L5 muscle fibers. In the center where she had initially been treated, traction under anesthesia with image intensifier guidance succeeded in reducing the femoral head and transcondylar traction was applied. With no improvement in the congruence under traction, she was referred to our center on D10 and operated on D14 after preoperative multislice CT and three-dimensional reconstruction.

An extended iliofemoral approach according to Judet and Letournel [3,10] was used because of the tectal lesions of the posterior column. The intervention was conducted via the lateral part of the iliofemoral approach with extension toward the medial iliac fossa, necessary to reduce the impaction of the tectal fragments. The gluteus medius muscle was disinserted without trochanterotomy. A juxta-acetabular capsulotomy was performed to check that the joint reduction was accurate and that the two columns had been anatomically restored. Once the capsulotomy had been completed, it was possible to disengage the hip using a hook placed under the femoral neck without complete dislocation but providing a direct view of the joint surfaces of their reduction. The labral complex was continuous, as is usual in fractures with protrusion, with no enclavement once the fracture had been reduced. Two plates were necessary to fix the posterior column and the fragments of the posterior wall, whereas the fixation of the anterior column was provided by two iliopubic screws (Fig. 2). The capsulotomy was closed and the medius gluteus muscle reinserted using transosseous sutures at the iliac crest and the greater trochanter. The surgery lasted 4.5 h, for a total bleeding volume of 500 ml. The patient underwent no specific measures to prevent heterotopic ossification other than 5 l of pulsed lavage of saline solution.

Weightbearing was not authorized for 3 months. No traction was put in place, but flexion was limited to 30° and the patient was bedridden for 4 weeks in a convalescence center. Healing was uneventful and the patient was seen again on D40 for systematic clinical and radiographic follow-up.

At that time, she presented painless external rotation. Passive mobilization of the thigh showed stiffness with 30° flexion, 15° abduction, and external rotation limited to 45° with no internal rotation. The X-ray (Fig. 3) showed lateral and anterior subluxation. The CT taken in the emergency context confirmed the eccentric position of the femoral head. The gluteal muscles were continuous. Femoral neck anteversion was 19° in relation to the bicondylar plane. CT also confirmed the absence of intra-articular material and good congruence of the repaired cavity, with no anomalies in the femoral head and acetabular cavity radius ratios. Abduction under general anesthesia allowed us to recenter the hip (Fig. 4). We opted for surgical tightening of the anterior capsule via the Hueter approach. During the exploration, the anterior capsule was healed and we were able to maintain the recentering of the hip with overlap suture. This intervention was followed by 3 weeks of immobilization in flexion and
abduction with a Boppe splint. Partial weightbearing was allowed at 2.5 months after osteosynthesis and complete weightbearing at 3.5 months. The patient retained a deficit in the lumbosacral trunk area with the extensor hallucis and anterior tibial muscles scored at 3 and slight limping because of gluteus medius muscle insufficiency. Walking was possible without a cane and weightbearing was painless. Passive mobility was satisfactory (95°/10°; 30°/20°; 30°/20°; 30°/20°). The CT at 7 months after the initial accident showed fracture union as well as absence of a joint congruence defect and heterotopic ossifications. No subchondral cephalic compression has been noted. The patient was able to progressively resume sports activity (swimming and cycling). Later progression was marked by the appearance of post-traumatic osteoarthritis 2 years after the initial accident, with partial recurrence of the lateral subluxation. Arthroplasty was performed via the posterolateral approach at 2.5 years after the initial accident, with favorable results (Zweymuller® cementless stem, Metasul® insert cemented into Muller reinforcement ring). The capsule was deemed to be continuous during the intervention and we observed healing of the gluteus muscles on the trochanteric eminence.

**Discussion**

This type of complication has only been reported in a single article in the literature [4]. However, the circumstances were different since the acetabulum fracture was associated with a proximal fracture of the ipsilateral femur. Tornetta and French [4] treated the acetabulum fracture via the ilioinguinal approach, i.e., keeping the gluteal muscles and capsule intact. However, the gluteus capsules and muscles were crossed for the femoral osteosynthesis via the lateral approach. A similar complication was reported by Kaneko et al. [17] in treating an isolated fracture of the superior extremity of the femur. These two articles imply that there may be other factors than the extended iliofemoral approach to explain the onset of this complication.

The factors that could have contributed to the onset of this complication are as follows.

**Excessive anteversion of the femoral neck**

Excessive anteversion of the femoral neck causing episodes of anterior instability [18], but our patient had no antecedents on this hip and her femoral anteversion measured on CT was normal. In addition, there was no recurrence of instability after capsular tightening and no radiographic signs of acetabular dysplasia were present.

**Cartilaginous, labral, or capsular interposition**

Cartilaginous, labral, or capsular interposition [19–21], but subluxation had been observed immediately. However, we observed no capsular interposition or foreign body on CT images and during revision surgery. Moreover, this subluxation was reduced by simply placing it in abduction.

**Congruency defect**

A congruency defect explaining the expulsion of the femoral head, but simple placement in abduction provided satisfactory reduction of the subluxation and CT confirmed the absence of a congruency defect.

**Weakness of the gluteus medius muscle**

Weakness of the gluteus medius muscle following extensive opening with partial disinsertion of the trochanter and the iliac, aggravated by the lesion of the lumbosacral trunk may have contributed to this complication [22]. The problems with reinsertion of the gluteal muscles on the trochanter, resulting in postoperative muscle weakness, should be stressed. De Peretti et al. [8] suggested performing trochanterotomy, allowing earlier postoperative...
solicitation of the gluteus muscles. The superior gluteal nerve, the collateral branch of the lumbosacral trunk, innervates the gluteus medius muscle. The trunk lesion in this patient may have contributed to delaying the recovery of the gluteal abductor muscle, as in injuries to the pelvic ring [28]. The absence of limping at the last follow-up, after implantation of the prosthesis, argues in favor of an initial neurapraxia of this nerve and delayed distant recuperation of the muscle’s contractile force. In contrast to this neurological hypothesis, Tornetta and French [4] observed similar subluxation after osteosynthesis of the acetabulum via the ilioinguinal approach in the absence of initial paralysis.

Circumferential capsulotomy

Circumferential capsulotomy seems to be the preponderant factor. No postoperative anterior instability has been reported in the series in the literature specifically studying this approach [5,8]. However, the technical details of a possible circumferential capsulotomy are not discussed in these articles [5,8,9]. In the case presented herein, a wide capsulotomy seems indispensable to control the reduction, usually difficult in these T fractures [3,8–10]. It may result in a pouch of loosened material, comparable to what was observed by Boisgard et al. [23] in recurrent posterior dislocations of the hip after initial posterior dislocation. This hypothesis is also retained by Tornetta and French [4], who underscore the deficit in the abductor muscles in hip instability. This muscle defect allied with capsular laxity produces adduction and a deformation in flexion, by placing the axis of hip rotation at the level of the lesser trochanter. The femoral head is uncovered in its lateral and forward aspects [26,27]. In our observation, this hypothesis is supported by the favorable progression after anterior overlap capsulorraphy associated with reinforcement of the gluteus muscles. The patient’s spontaneous limb in external rotation by the favorable progression after anterior overlap suture underscores the deficit in the abductor muscles in hip instability. This muscle defect allied with capsular laxity produces adduction and a deformation in flexion, by placing the axis of hip rotation at the level of the lesser trochanter. The femoral head is uncovered in its lateral and forward aspects [26,27]. In our observation, this hypothesis is supported by the favorable progression after anterior overlap capsulorraphy associated with reinforcement of the gluteus muscles. The patient’s spontaneous limb in external rotation added to capsular weakness explains the progressive onset of subluxation.

This complex fracture could have been treated through the ilioinguinal approach, possibly associated with a Kocher Langenbeck posterior approach. The tectal lesions of this T fracture motivated us to choose an extended iliofemoral approach. The operative and functional results are simpler including a circumferential capsulotomy. The most probable cause seems to be the combination of capsular and muscular lesions. To prevent this complication, we preferred to practice early mobilization of the lower limb with gentle muscle rehabilitation aiming at coxofemoral joint recentering. If this is impossible for reasons of associated lesions or delayed functional rehabilitation, slight traction in abduction and flexion of the lower limb seems necessary.

Conclusion

A hip subluxation can be encountered in the immediate stages following an extended iliofemoral cotyloid approach including a circumferential capsulotomy. The most probable

Conflict of interest statement

None.

References


