CASE REPORT

Open reduction and percutaneous fixation of a rare hamstring avulsion fracture

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SUMMARY

Surgical treatment has been advocated for ischial tuberosity avulsion fractures in athletes. This article presents the case of an elite rower with a large avulsion fracture involving the entire inferior obturator ring with a novel technique for open reduction using a limited Kocher-Langenbeck approach and percutaneous fixation using posterior column lag screws. The fracture healed anatomically, and at 1 year follow-up the patient had full range of motion, normal gait and had returned to high-level sporting activities.

BACKGROUND

Ischial avulsion fractures, which are present in 4% of hamstring injuries, place patients at risk of chronic pain and disability. Since, surgical intervention is generally indicated, particularly in athletes.¹⁻⁴ Described surgical techniques include primary repair using bone tunnels, suture anchors, lag screws or pelvic reconstruction plating, most commonly through an infraglenal approach.¹⁻⁵ For very proximal avulsion fractures, plating via a Kocher-Langenbach approach has also been described.³ The purpose of this article is to describe a novel surgical technique for treatment of a rare avulsion fracture of the entire inferior obturator ring using open reduction through a limited

Kocher-Langenbeck approach and percutaneous fixation with posterior column lag screws.

CASE PRESENTATION

A 16-year-old healthy, skeletally-immature elite rower presented with pain and inability to bear weight after sustaining a splits-type fall while water skiing. Neurological function was entirely intact with a notable absence of any sciatic symptoms. Radiographs of the pelvis demonstrated avulsion of the entire inferior obturator ring, with a grossly displaced fracture through the proximal ischium and minimally displaced fracture of the inferior pubic ramus nearing the parasymphseal region (figure 1A, B). CT and MRIs confirmed the radiographic findings with minimal soft tissue and apophyseal injury. The sciatic nerve was focally oedematous but otherwise in continuity without impingement. Given the patient's desire to return to a high level of activity and the marked displacement, it was elected to proceed with surgical intervention.

TREATMENT

Surgical technique

Following administration of general anaesthesia, the patient was placed prone on a radiolucent table

Figure 1 (A) Anteroposterior X-ray and (B) Three-dimensional reconstruction of the injury at presentation. There was a fracture through the ischium which was 1.3 cm distracted as well as a minimally displaced fracture of the inferior pubic ramus. The patient's ischial apophysis was unfused without obvious involvement.

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Figure 2 Our initial attempt at percutaneous reduction using a ball-spiked pusher which was placed through a transverse infragluteal incision. This did not allow for anatomic reduction, at which point we converted to open reduction.

with a bump under the pelvis to create approximately 30° of hip flexion. Initially, percutaneous reduction was attempted through a small transverse incision in the infragluteal fold ([figure 2](#)). Manipulation using a ball-spiked pusher under fluoroscopy with the hip extended and knee flexed failed to reduce the fracture adequately and the decision was made to convert to open reduction.

The inferior limb of a Kocher-Langenbeck incision was made, and the gluteal fascia and underlying gluteus maximus were split longitudinally to expose the short external rotators, which were left intact ([figure 3](#)). The sciatic nerve was palpated and retracted dorsally. Blunt dissection was undertaken to create an interval between the sciatic nerve dorsally and short external rotators ventrally. The path of the quadratus femoris was followed to the ischial tuberosity, where the ischial fracture was readily palpable, and was exposed using sharp dissection. Soft tissue was entrapped between the fracture fragments in addition to fracture haematoma, which required debridement to allow for an anatomic reduction. Unicortical drill holes were made using a 2.0 mm drill in the proximal and distal fragments. The tines of a modified point-to-point reduction clamp were then placed into the drill holes, and the anatomically reduced fracture was compressed ([figure 4A, B](#)).

Following open reduction, attention was turned to the initial infragluteal incision. With a starting point at the tip of the ischial tuberosity, an 0.062" Kirschner wire was used to obtain the correct trajectory. Outlet and iliac oblique fluoroscopic views were used to guide the coronal and sagittal trajectory, respectively. We then drilled using a cannulated 4.5 mm drill bit which allowed us to modify the trajectory to stay a safe distance from the hip joint. A 7.0 mm cannulated screw was then placed which provided excellent compression, confirmed by direct inspection of the fracture site. A second screw was then placed in similar fashion to provide rotational stability. Both screws were counter-sunk within the hamstring origin to minimise prominence. During insertion of the wire, drill and screw, the surgeon's free hand was kept in the open Kocher-Langenbeck wound to ensure protection of the sciatic nerve. Multiple oblique fluoroscopic views were obtained to ensure we had not violated the hip joint ([figure 5A, B](#)). The hip was taken through

Figure 3 A transverse infragluteal incision which was used for attempted percutaneous reduction and later placement of lag screws. In addition, a limited Kocher-Langenbeck approach was used for open reduction. (Left hip with the patient prone with the head towards the top of the figure).

a full range of motion to ensure there was neither fracture distraction, nor crepitus.

Postoperatively, the patient remained neurovascularly intact. Hip flexion was limited to 90° and he was made toe-touch weight bearing on the affected extremity for 6 weeks. At 6 weeks, the patient was started on a graduated weight-bearing schedule with pool therapy and quad strengthening. At 3 months, the patient had advanced to weight bearing as tolerated, and had no pain with range of motion, ambulation or sitting. At that time he was allowed to advance to activity as tolerated with referral to sports therapy for assistance with hamstring, core and lumbopelvic flexibility and strengthening. At 6 months, the patient had returned to full participation in rowing without any symptoms. At 1 year, his visual analogue pain score was zero and he was asymptomatic with the exception of occasional sensation of gluteal muscle subluxation over the ischial tuberosity. He had returned to his previous level of competition, and the fracture was united with minimal heterotopic ossification ([figure 6](#)).

DISCUSSION

Surgery is generally indicated for displaced ischial avulsion fractures because of the potential for exuberant callous formation or non-union, which may lead to buttock pain, impaired sitting, sciatic nerve irritation and ischiofemoral impingement.^{1 4-6} Furthermore, acute intervention has been shown to lead to

Figure 4 (A and B) Anatomic reduction of the fracture site with compression applied using a modified point-to-point clamp. In (B), the patient's head is to the left, the sciatic nerve and gluteus maximus are retracted dorsally, and the short external rotators are visible ventrally.

easier anatomic reduction, fewer sciatic nerve complications and improved long-term pain, function and strength.^{1 2 7}

Typically, these fractures involve only the ischial tuberosity or apophysis, which allows for easy access through a transgluteal or infragluteal approach.^{1–7} However, in rare cases such as the one presented here, the fracture may extend cephalad to the tuberosity, which makes fixation using this usual approach impractical. We are aware of only one other description of this fracture variant in the literature, which was treated with open reduction and plating through a Kocher-Langenbeck approach.³ While we also obtained open reduction through a limited Kocher-Langenbeck approach, we elected for percutaneous retrograde lag screw fixation of the fracture through a small infragluteal incision. This resulted in secure fixation while preserving soft tissue attachments with potentially less hardware prominence. Percutaneous, retrograde, posterior column screws have previously been described for treating minimally displaced acetabular fractures, but never in combination with an open reduction or for ischial avulsion fractures.⁸

This case of displaced ischial avulsion fracture in an adolescent, elite rower is unique in regard to both presentation and management. Potential complications included injury to the sciatic nerve and violation of the hip joint, which should be avoidable by using careful surgical technique and proper

Figure 5 (A) Obturator and (B) iliac oblique views following placement of two 7.0 mm partially threaded cannulated screws without violation of the hip joint.

Figure 6 X-rays obtained 1 year postoperatively.

fluoroscopic views. It is our opinion that open reduction through a limited Kocher-Langenbeck exposure combined with percutaneous retrograde posterior column screw fixation should be considered for large ischial avulsion fractures which extend cephalad to tuberosity.

Learning points

- ▶ Displaced hamstring avulsion fractures may be associated with long-term morbidity when treated non-operatively.
- ▶ Avulsion fractures can present with varying severity, rarely involving the entire obturator ring.
- ▶ Percutaneous posterior column fixation techniques are possible for appropriate fracture patterns, and may be associated with less symptomatic ischial hardware prominence.

Competing interests None.

Patient consent Obtained.

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