Case Report

Neurogenic gluteus medius and minimus muscle atrophy with Trendelenburg's sign after a displaced acetabular fracture of the posterior column – A case report

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ARTICLE INFO

Keywords:
Acetabular fracture
Posterior column fracture
Nerve injury
Superior gluteal nerve
Abductor mechanism deficiency

ABSTRACT

Traumatic or iatrogenic sciatic nerve injury, but not superior gluteal nerve injury, is a well described complication after acetabular fractures. Most often, sciatic nerve injuries occur in fractures involving the posterior column/wall with a hip dislocation and posterior fracture displacement resulting in narrowing of the greater sciatic foramen and injuring the sciatic nerve passing through. In this case report, a case of abductor mechanism deficiency with positive Trendelenburg’s sign after an acetabular fracture of the posterior column with hip dislocation is presented. Postoperative clinical and MRI examination revealed a neurogenic atrophy of gluteus medius and minimus muscles suggesting a superior gluteal nerve injury due to initial subtotal incarceration of the greater sciatic foramen by a displaced posterior fracture fragment. An additional mild sciatic nerve injury resolved in the early postoperative course, while intensive physiotherapy improved the patient's complaints and muscular atrophy caused by the superior gluteal nerve injury within 12 months. This case report intends to raise awareness for rare neurological complications after acetabular fractures for their early detection.

Introduction

Acetabular fractures occur either after high energy trauma in young patients, such as road traffic accidents and falls from height, or after low energy trauma in elderly patients [1]. Isolated posterior column fractures are rare accounting for only 1–4 % of all acetabular fractures [1–3]. Characteristically, the fracture line of posterior column fractures begins at the greater sciatic notch and thus, the fracture fragments have a close proximity to the greater sciatic foramen. In many cases, the fracture is accompanied by a dislocation of the femoral head. These fracture characteristics lead to a high rate of complications, especially injuries of the sciatic nerve [3–5].

Acetabular fractures per se often require a lengthy and complex treatment as well as rehabilitation. Moreover, complications, such as nerve injuries, infections, heterotopic ossifications or posttraumatic osteoarthritis, can further impede and prolong rehabilitation [6]. Therefore, awareness of common as well as rare complications after acetabular fractures is important for their early detection and treatment.
Fig. 1. A) Initial polytrauma CT-scan showing an acetabular fracture of the posterior column with centrally incarcerated luxation of the femoral head, displaced posterior column fragment and because of this subtotal narrowed greater sciatic foramen. B) CT-scan of the pelvis after closed reduction of the femoral head showing also a partial reduction of the initially displaced posterior column fragment with widening of the greater sciatic foramen.
Case report

A 29-year-old male patient was transferred to our trauma hospital from Azerbaijan after he had fallen down about 15 stairs 5 days earlier. The initial treatment took place in the local hospital in Azerbaijan.

The polytrauma CT-scan at the local hospital revealed a right acetabular fracture of the posterior column with a centrally incarcered dislocation of the femoral head. Moreover, the initial CT-scan showed a subtotal narrowing of the greater sciatic foramen by the displaced dorsal fragment due to the central dislocation of the femoral head (Fig. 1A). The hip was primarily reduced at the local hospital and another CT-scan was performed afterwards (Fig. 1B).

At our emergency department, the patient presented awake and non-intubated with an unimpaired airway and breathing. The patient was hemodynamically stable at any time, the pelvis presented clinically stable, and no free intraabdominal fluid or organ injuries could be detected in the FAST scan. He showed a GCS of 15 with physiological pupillary reflex. Except for a mild and incomplete sensory deficit in the right sciatic nerve innervation area, no higher grade sensomotoric deficits were initially detected. There was a pain in the right inguinal and gluteal region and an inability to move the right hip joint due to pain.

Eight days after trauma, uncomplicated surgical treatment of the right posterior column fracture was performed by the senior author. A modified Kocher-Langenbeck approach with exposure through the Gibson's interval was utilized without surgical hip dislocation, which was not necessary in this case [7]. First a large osteochondral fragment (3 × 2 cm) was recovered. The fracture was mildly distracted using a Jungbluth clamp, cleaned and the osteochondral fragment was replanted to it's anatomical position in the posterior-superior dome. Allogenous cancellous bone chips were used to fill a void behind the fragment. A Schanz pin inserted to the sciatic tuber was used in the reduction process to control rotational alignment. Finally, two lag screws and a 6-hole reconstruction plate were used to fixate and secure the anatomical reduction. Intraoperative and postoperative X-rays confirmed sufficient reduction and proper placement of osteosynthesis material (Fig. 2).

During the postoperative inpatient course no complications were noted, and the patient was successfully mobilized by physiotherapy under partial weight-bearing of 20 kg. The initial incomplete sensory deficit fully resolved in the further course. Heterotopic ossification prophylaxis was performed postoperatively with Ibuprofen for 3 weeks. The patient was discharged 7 days postoperatively with non-inflamed wound and intact sensomotoric functions.

About 5 months postoperatively the patient presented at our outpatient clinic with persistent complaints during walking after beginning full weight bearing 10 weeks postoperatively. Clinically, a Trendelenburg's sign of the right hip imposed as an expression of an abductor mechanism deficiency. The other peripelvic muscles showed no muscular weakness and no other sensomotoric deficits could be detected. X-ray and CT-scan showed a consolidated fracture with a maintained congruence of the joint surface and without posttraumatic degeneration or heterotropic ossifications (Fig. 3).

An MRI examination revealed an intact gluteus medius tendon but showed an atrophy of the right gluteus medius and minimus muscles consistent with a neurogenic atrophy. The cross-sectional area of the right gluteus medius muscle in the transversal MRI-slices was considerably lower than on the left side (45,03 cm$^2$ vs. 58,20 cm$^2$) (Fig. 4A). In the synopsis of the current MRI findings and the initial narrowing of the greater sciatic foramen by a displaced dorsal fragment, we interpreted the gluteus muscle atrophy as a consequence of an initial traumatic damage of the superior gluteal nerve, which passes the greater sciatic foramen. A conservative treatment was discussed with the patient and intensive physiotherapy was recommended.

On follow-up presentation at our outpatient clinic 11 months postoperatively, the patient reported a marked improvement of the complaints during walking. Clinically, the patient exhibited an almost physiological gait pattern with a negative Trendelenburg’s sign. A current MRI examination showed a progressive recovery of the atrophy of the right gluteus medius and minimus muscles (Fig. 4B).

Discussion

Sciatic nerve injuries after acetabular fractures occur either traumatic due to fracture dislocation (as in this case), iatrogenic due to

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![Fig. 2. Postoperative pelvic a.p., obturator and ala view X-rays (from left to right) showing sufficient reduction and placement of osteosynthesis material.](image-url)
Fig. 3. Pelvic a.p. X-ray and CT-scan of the pelvis 5 months postoperative showing consolidation of the fracture without posttraumatic degeneration or heterotopic ossifications.

Fig. 4. A) MRT examination of the pelvis 5 months postoperative showing atrophy of right gluteus medius and minimus muscles with decreased cross-sectional area compared to the left side (45.03 cm² vs. 58.20 cm²). B) MRT examination of the pelvis 11 months postoperative showing a progressive recovery of the atrophy of the right gluteus medius and minimus muscles.
intraoperative damage or within the postoperative course, e.g. due to muscular scarring, implant malposition or heterotopic ossifi-
cations [5]. Posttraumatic and iatrogenic sciatic nerve injuries have a prevalence of about 5.1 % and 1.4 %, respectively [8]. Fractures
involving the posterior column and wall were found to be more prone to suffer sciatic nerve injuries with preoperative lesions detected
in up to 23.3 % of patients [2–5,8]. In these fracture types, a posterior fracture-dislocation and hip dislocation can lead to a contusion,
stretching or even laceration of the sciatic nerve [5]. Although the superior gluteal nerve also runs through the greater sciatic foramen
like the sciatic nerve, to our knowledge this is the first report of a superior gluteal nerve injury leading to a neurogenic gluteus medius
und minimus atrophy after a posterior column fracture. In this case, a significantly displaced posterior column fragment due to an
incarcerated hip dislocation led to a subtotal narrowing of the greater sciatic foramen. This may have been the most likely reason for
the nerve injury in this particular case.

Interestingly, another case report from 1996 described a disruption of the superior gluteal arteria due to a T-type acetabular
fracture with a displacement of the transverse fracture component at the greater sciatic notch. However, no injury of the superior
gluteal nerve was reported in their case [9].

In this report, we could notice an improvement of the neurogenic atrophy of gluteus medius and minimus muscles within 11
months after trauma. Reinnervation of muscles mainly occurs until 12–18 months [8]. Consistently, significant to complete recovery of
sciatic nerve injuries can be observed in 60–75 % of the patients within 1.5 to 24 months [5,8]. This is also in line with the high rate of
spontaneous recovery in patients with a tractory superior gluteal nerve injury after THA suggesting a “wait and see” approach [10]. We
feel that the intensive physiotherapy was an additional important pillar for improvement of the symptoms in this patient.

This case report intends to expand the awareness for uncommon nerve injuries after acetabular fractures to detect and treat them at
an early stage.

Informed consent

Written informed consent for publication was obtained from the patient.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or not-for-profit sector.

Declaration of competing interest

All authors declare that they have no conflict of interests, neither financial nor personal.

Acknowledgements

None.

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