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Surgical treatment of old pelvic fractures

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Abstract We report on 4 patients, aged 24–51 years, with untreated pelvic ring fractures. The chief complaints were gait disturbances and pain in the buttocks and lower limb. The period between the initial injury and the surgical treatment ranged from 2.5 months to 3 years. Palsy was not improved, but pain and gait ability was improved in all patients.

Résumé Les auteurs rapportent 4 cas de fracture ancienne du bassin pour lesquels les situations d'urgence mettant en jeu le pronostic vital n'avaient pas permis initialement un traitement correct. Il s'agit de quatre patients dont l'âge s'échelonne de 24 à 51 ans. La gêne fonctionnelle était représentée par une boiterie, des douleurs dans les fesses et les membres inférieurs. Le délai entre l'accident et l'intervention était de 2,5 à 3 ans. Les douleurs et la capacité de marche ont été améliorées chez tous les patients mais une paralysie n'a pas pu être améliorée.

Introduction

Recently there has been great progress in the classifications [2,12,15] and principles of the management of pelvic fractures. Surgical treatment aiming at early recovery, including anatomical reduction and strong fixation of unstable pelvic ring fractures showing displacement is now commonly performed within 3 weeks after injury. Open reduction and internal fixation of unstable pelvic ring fractures does not always provide good clinical results [1,3,5,6,8,11,13].

We have surgically treated patients with pelvic ring fractures in whom initial non-operative treatment was insufficient. In this paper we report on 4 such patients referred to our hospital more than 2 months after the initial injury.

Case 1

A 39-year-old male: The chief complaints were gait disturbance and pain from the lower back to the left lower limb. His injury was caused by falling from a height while working. He was found to have the central cord syndrome of the cervical spine without fractures, pelvic ring fracture and a left patellar fracture. For the central cord syndrome and the pelvic ring fracture conservative treatment was chosen while the patient was kept at rest in bed. The left patellar fracture was treated by open reduction and internal fixation. The central cord syndrome was improved so that he had only slight numbness of fingers in both hands. Pain in the lower back and the left lower limb became severe 2 months after injury, when the patient began walking exercises. When the patient was referred to our hospital 1 year and 8 months after injury, he had lower back pain, severe pain in the left lower limb and a left drop foot. Clinically, there was a lesion of the left L5 nerve root. Radiographs and 3-dimensional CT of the pelvis showed type C malunion of Malgaigne's fracture of according to Tile's classification [12](Fig. 1a,b). As a result, a fragment of the sacral bone was dislocated cranially and pushed up the transverse process of the left fifth lumbar vertebrae. The left L5 nerve root was examined by nerve root infiltration. The symptoms were reproducibly observed when a block needle was inserted, and pain completely disappeared for about 30 min after injection of a local anesthetic. Radiculography and computerized tomography (CT) scan revealed that the left L5 nerve root was pressed by the upward malunited sacral fragment at the outside of the intervertebral foramen (Fig. 1c,d). The left iliac bone was osteotomized on the cephalo-caudal side in the prone position, and the malunited sacral bone and the left L5 nerve root were exposed after opening of the osteotomized site. The sacral bone, which had pressed the left L5 nerve root, was shaved off for decompression. We performed only decompression of the nerve root, and did not correct the deformity of the pelvis, which was not involved in the symptoms (Fig. 1e,f). The osteotomized site was refixed with 2 plates. Lumbar radicular pain improved after surgery, although the left drop foot did not improve.

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Fig. 1a-f Case 1. **a,b** Antero-posterior radiography and 3-dimensional CT scan of pelvis on admission showing malunion of left alar fracture of sacrum and fractures of the left two pubic rami resulting from vertical sheering injury. **c** The L5 nerve root infiltration showing a complete block (arrow) at the outside of the left

L5-S1 intervertebral foramen. **d** Axial CT slice revealed that the left L5 nerve root (arrows) was pressed by the upward malunited sacral region at this level. **e** Antero-posterior radiography of pelvis 6 months after the surgery. **f** Axial CT slice after surgery showing the sacral bone shaved off for decompression of the nerve root

Case 2

A 30-year-old female: The chief complaints were pains in the right buttock and thigh causing difficulties in sitting and standing. Her injuries were caused by a traffic accident. She was in a condition of hemorrhagic shock at the accident and was diagnosed as having pelvic ring fracture, injury to the bladder, and fractures of the right humerus and radius. Treatment of the injury of the bladder was conservatively performed by an indwelling ureteral catheter. The

fractures of the right humerus and radius were treated by internal fixation using plates, and the pelvic ring fracture was treated by traction and pelvic suspension. She began sitting and standing 6 weeks after injury, but because of severe pain during walking, the patient was referred to our hospital 3 months after the injury. On admission, she could manage to walk on crutches, but pain from the right buttock to the thigh was very severe. Radiography and 3-dimensional CT of the pelvis revealed a nonunion of the right ilium and the right acetabulum, and malunion of the left pubic rami (Fig. 2a,b). Osteotomy, bone graft and internal fixation of

Fig. 2a-c Case 2. **a,b** Antero-posterior radiography and 3-dimensional CT of pelvis on admission showing nonunion of the right hemipelvis and malunion of the left two pubic rami resulting in lateral compression injury. **c** Antero-posterior radiography of pelvis 3 years after surgery showing solid bone union (arrows)

Fig. 3a-c Case 3. **a,b** Antero-posterior radiography and 3-dimensional CT of pelvis on admission showing all four pubic rami to be completely separated from the pelvic ring resulting in anteroposterior compression injury. **c** Antero-posterior radiography of pelvis 1 year and 1 month after surgery showing removal of plates and bone union

Fig. 4a-c Case 4. **a,b** Antero-posterior radiography and 3-dimensional CT of pelvis on admission showing malunion of the right hemi-pelvic fractures and cephalad and dorsal displacement of the right hip joint resulting in lateral compression injury. **c** Antero-posterior radiography of pelvis 4 years after surgery showing the proper position of the right hip joint

the ilium and of the acetabulum was performed. Bone union was successful, and she was able to walk without walking aids, although she had a limp because of a 2 cm difference in the leg lengths. The movement of the right hip joint was not limited (Fig. 2c).

Case 3

A 24-year-old male: The chief complaints were difficulty in sitting and standing incompetence. His injuries were caused by a traffic accident. He was diagnosed as having a pelvic ring fracture, an injury of the right internal iliac vein, and fractures of the right radius and ulna as well as of the right tibia. On the day of the accident, he underwent embolization, restoration of the bladder, traction and pelvic suspension, and internal fixation of the right radius and ulna, and the right tibia. Traction and pelvic suspension were changed to external fixation 5 days after the injury. He began rehabilitation 4 weeks after injury, but could not stand, and was referred to our hospital 2 months after the injury. On admission, radiographs and 3-dimensional CT of the pelvis showed four-pillar fracture, including fracture of all pubic rami (Fig. 3a,b), which were dislocated and completely separated from the pelvic ring. The surface of the right sacroiliac joint was slightly irregular. Two and a half months after injury, surgery was performed using Pfannenstiel's incision from the front and longitudinal incision of the inside of the attachment site of the pubic bone with the right adductors. The four-pillar fracture was ablated with difficulty, and fixation with plates was performed in the position of reversible reduction. Because of a post-surgical infection with methicillin resistant *Staphylococcus aureus* (MRSA), the plates were later exchanged. However, the MRSA infection recurred, and the plate was later removed after consolidation of the bone (Fig. 3c). The patient later recovered from the infection and can now walk using a walking stick.

Case 4

A 51-year-old female: The chief complaint was gait disturbance with pain in the limbs, buttocks, and inguinal region after walking 30 m. Her injuries were caused by a traffic accident. She had a skull fracture, a pelvic ring fracture, a fracture of the right femoral neck, a brain contusion and was unconscious for 2 weeks. The right femoral neck fracture was surgically treated, and the pelvic ring fracture was conservatively treated by traction and pelvic suspension. She started walking exercises 12 weeks after the injury, but had a limp with pains in the buttocks. She was referred to our hospital 3 years after the injury. Radiographs and 3-dimensional CT scan of the pelvis on admission showed malunion of a type B Malignant's fracture according to Tile's classification [12] (Fig. 4a,b). The right hip joint was positioned more dorsal and cephalad than usual, and she had a severe limp. We performed an osteotomy of 3 sites, added a bone graft to the osteotomized site of the ilium and internal fixation of the pubic region using a plate. She began to walk on crutches 3 weeks after surgery. Another bone graft had to be added due to nonunion in the iliac region. Bone union was finally achieved (Fig. 4c). She was then able to walk by herself without pain.

Discussion

As described in a number of reports, good prognoses have been obtained in cases of fresh pelvic fractures. The long-term prognosis of stable fractures is satisfactory. However, pain remains in some patients with pelvic fractures showing unstable dislocation [3]. Surgical treatment performed within 3 weeks after injury with anatomical reduction and fixation of such fractures has become common practice, and patients who receive such treatment recover and can return to work more quickly [1,6,13].

Pelvic fractures are frequently accompanied by severe complications that may be lethal [4,14]. In the present

study, other severe injuries were initially treated, and the treatment of the pelvic ring fractures were not systematically performed. Since pelvic fractures are often accompanied by injuries of important organs and multiple fractures, pelvic fractures are sometimes left untreated, resulting in malunion or nonunion. Nowadays, severely injured patients can be saved by high level medical care. Malunion or nonunion of pelvic fractures is then often recognized as a serious problem in the later stage of rehabilitation. Because of the varieties in conditions of old pelvic ring fractures, it is important to treat patients based on individual findings [7]. What is more important is to treat pelvic ring fractures as soon after injury as possible [8]. Obviously, lifesaving should be given priority, but this does not mean that treatment of pelvic fractures is unimportant. Like other injuries, pelvic fractures should be systematically and appropriately treated in an early stage after injury. As described above, the long-term prognosis of stable fractures is satisfactory. However, unstable fractures may often cause pain, and severe instability causes not only gait disturbance but also difficulties in sitting and standing as observed in the present study. According to Tile's classification [12], case 1 was type C, an unstable fracture caused by vertical shearing force, and cases 2, 3, and 4 were of type B, usually rotationally unstable and vertically stable fractures caused by anteroposterior or lateral compression force. Cases 2, 3, and 4 were initially treated by traction and pelvic suspension. However, in cases 2 and 4, this treatment might have exerted a force similar to that which caused the fracture, and may have made the dislocation more severe. If initial treatment of fractures is inappropriate even though they are relatively stable, the prognosis would be unsatisfactory. Therefore, it is important to be aware of pelvic fracture types in terms of the point of instability. We advocate open reduction and internal fixation of displaced and unstable pelvic ring fractures at an early stage after injury as the prevention of these late problems.

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