

Supraacetabular External Fixation for Pain Control in Geriatric Type B Pelvic Injuries

Supraacetabulární zevní fixace pro ovlivnění bolesti u geriatrických zlomenin pánve typu B

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ABSTRACT

PURPOSE OF THE STUDY

Pelvic ring fractures in the geriatric population are of increasing frequency. Often insufficiency fractures or occult fractures are described. With a classical injury mechanism the majority of these injuries are the result of a low energy trauma, typically a fall from standing or during walking. Clinically, many patients report immediate anterior groin pain but detailed clinical examination often shows significant posterior pelvic pain. CT evaluation often reveals posterior pelvic ring injury, in the majority of cases a sacral compression fracture. Despite adequate diagnostics, many of these patients suffer from persistent pain, which can be observed up to 8 weeks after injury. To assess the role of external fixator in pain relief and early mobilisation in this group of patients the study was performed.

MATERIAL AND METHODS

From the database of all patients with pelvic ring and acetabular injuries 25 patients ≥ 65 years with type B injuries stabilized by a supraacetabular external fixator were analyzed. Prospectively demographic data including sex, patient age, cause of injury, frequency and type of concomitant injuries and diseases, injury severity, fracture type and complications were recorded. For evaluation of the pain course, the visual analog scale was used. Preoperative and postoperative mobility and the type of post-treatment were evaluated.

RESULTS

Stabilizing the pelvic ring with a simple external fixation procedure (supraacetabular one pin external fixator) allows immediate relief of pain, which allows early and successful mobilization of these patients. Normally, adequate mobilization is possible immediately after application of the fixator.

CONCLUSIONS

This simple operative procedure, therefore, can be used for pain control and sufficient mobilization to avoid secondary medical complications.

Key words: pelvic injury B-type, external fixator, geriatric fractures.

INTRODUCTION

Fractures of the pelvic ring in the elderly are of increasing importance (11, 12). In many cases these are „occult“ fractures or insufficiency fractures of the pelvis on the basis of non-traumatic diseases, such as osteoporosis (29).

The incidence of osteoporotic fractures is expected to increase due to higher life expectancy (11, 12). In contrast to „classical“ fractures of the pelvic ring a high percentage of these fractures can be diagnosed as insufficiency fractures or „occult“ fractures characterized by no typical injury mechanism, and spontaneous pain without trauma.

This is a classic example of so-called type B injuries of the pelvic ring with partial disruption of the posterior pelvic ring (21) with most of the ante-

rior pelvic ring fractures present in combination with a compression fracture of the sacrum (B2-injury). Often, lateral compression fractures can be observed (9), caused by simple falls while walking, as typical type B2-injuries with only partial disruption of the posterior pelvic ring (21). The typical fracture type is a combination of an anterior ramus fracture combined with a lateral compression fracture of the sacrum.

In general, treatment of type B pelvic injuries is performed by anterior techniques. The type B2 injury is most commonly stabilized using external fixation techniques (5, 22).

Application of an external fixator is the most commonly used treatment concept for emergency surgical

stabilization of pelvic ring injuries (3, 4, 7, 13, 16, 18). It appears advantageous due to relatively easy handling and availability in most hospitals. In type B injuries, sufficient holding forces of external fixators were measured.

As a holding power and a better soft tissue coverage of the Schanz screws is available in the supraacetabular bone compared to iliac crest placement (14) supraacetabular Schanz screw placement is preferred (20, 24).

In contrast, only a small proportion of type B injuries must be surgically stabilized (23). Classical indications are the „open book“ injury and other unstable type B injuries. The majority of compression injuries heal with conservative treatment within 3–4 weeks due to the good soft tissue coverage around the obturator foramen by the obliquus externus et internus muscles, and the strong periosteum of the superior pubic ligament.

Elderly patients (age ≥ 65 years) show a similar course, but mobilization is often limited due to persistent pain (10, 19). This leads to longer duration of hospital stay up to 3–4 weeks (19).

The present study examines whether geriatric patients with type B injuries benefit from supraacetabular external fixation in terms of pain and mobility.

MATERIAL AND METHODS

Our pelvic database includes all patients with pelvic ring and acetabular injuries. From this database, 25 patients ≥ 65 years with type B injuries stabilized by a supraacetabular external fixator in a standardized technique (5) were analyzed.

Prospectively demographic data including sex, patient age, cause of injury, frequency and type of concomitant injuries and diseases, injury severity according to the Injury Severity Score (ISS) (2), fracture type according to the AO/OTA-classification (21) and complications were recorded.

Additionally, type of narcosis, operation time and the exact time management regarding time of admission, date of external fixation, date of demission and follow-up time were analyzed.

For evaluation of the pain course, the visual analog scale was used preoperatively, directly postoperatively at day 1 or 2 after initial mobilisation and at follow-up after removing the external fixator.

Preoperative and postoperative mobility and the type of post-treatment were evaluated.

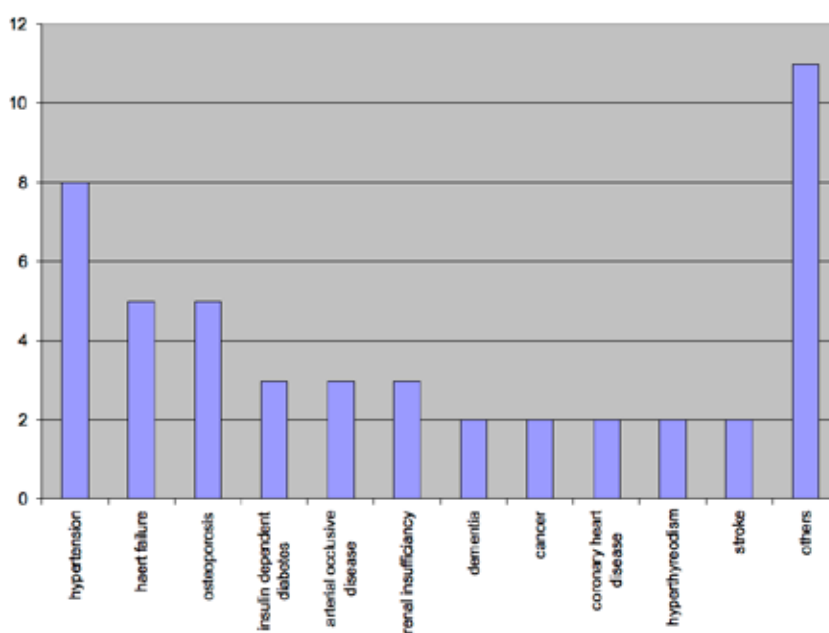


Fig. 1. Frequency of comorbidities. „Others“ summarize comorbidities which were observed one time (hypothyroidism, epilepsy, sarcoidosis, pneumonia, urinary incontinence, hepatitis C, hyperuricaemia, polymyalgia, amaurosis, glaucoma, atrial fibrillation).

Management concept

Application of the external fixator was performed in a standardized manner with, each with one Schanz screw supraacetabular on each side connected with one curved carbon rod or two straight carbon rods in a „tube-to-tube“ technique (5). Postoperatively, partial weight bearing was allowed on the side with posterior pelvic involvement.

After discharge, the patients were typically re-assessed after 3 weeks. A follow-up a. p. pelvic x-ray was performed and thereafter the transverse rod was removed, while allowing full weight bearing.

If not pain in the groin area or at the posterior pelvic ring was reported, the Schanz screws were removed usually without anesthesia (25, 28). In case of pain in the groin area or at the posterior pelvic ring, the connecting rod was re-fixated for another week. Then the same procedure is carried out with definitive removal of the external fixator. A longer duration of the fixator is atypical because of the rapid fracture healing in the area of the anterior pelvic ring (28).

RESULTS

Demographics and injury severity

The majority of patients were female. Only two patients were male (8%). The average age was 79.3 ± 9.9 years (66–99 years).

All patients sustained a low-energy injury. The cause of accident was a simple fall from a standing or walking in 88% ($n = 22$). Two patients fell from a bike and one patient fell while riding a motorcycle at about 16 mph.

22 patients fell directly onto a hemipelvis, the other three patients suffered an axial trauma by falling on the buttocks.

Except of four patients with additional injuries, all others had an isolated pelvic trauma. Concomitant injuries were a distal radius fracture and a minor head injury in each two. The ISS was 9.5 ± 1.3 points (9–13 points) on average.

Comorbidities

Comorbidities were common. 19 patients (76%) had at least one significant co-morbidity. On average, all patients showed two concomitant diseases. The majority of patients had hypertension, chronic heart disease or osteoporosis. The exact distribution is shown in Figure 1.

Clinical examination

All patients complained of pain in the pelvic area. 22 patients complained of groin pain, 17 patients had tenderness over the posterior pelvic ring. In 16 patients lateral pelvic compression caused pain, and 12 patients reported pain with internal or external hip rotation 8 patients had a groin pain when pressure was applied to the trochanteric area. Four patients complained of diffuse pelvic pain with axial pressure on the lower extremity.

Radiological diagnostics

All patients received a pelvic a. p. x-ray and a computed tomography (CT) of the pelvis with multiplanar reconstructions. In 80% of patients CT was performed directly on the day of admission, all others had CT-scan within 4 days. Sacral deformity (anterior cortical step) was ≤ 2 mm. The mean step at the sacrum was 0.9 mm in average.

At the anterior pelvic ring, the average maximum displacement was 2.4 mm (0–9 mm).

Fracture classification

All patients showed a typical fracture pattern with an associated sacral compression fracture and a anterior ring compression injury.

Except of one patient, all patients had a unilateral sacral compression fracture (OTA type 61.B 2.1). One patient had a bilateral sacral compression fracture (OTA type 61-B 3.3). 22 patients had a unilateral anterior pelvic ring fracture with fracture of the upper and/or inferior pubic ramus. One patient had a low anterior column fracture of the acetabulum (OTA 62-A 3.3). In two patients bilateral transpubic fractures were seen.

Operative data

Stabilization of the pelvis was performed after a mean of 3.6 ± 3.3 days (0–13 days). In 19 cases, stabilization was done in general anesthesia and in six cases with local anesthesia due to comorbidities. Application time was 19 ± 7.4 minutes (9–35 minutes) in average.

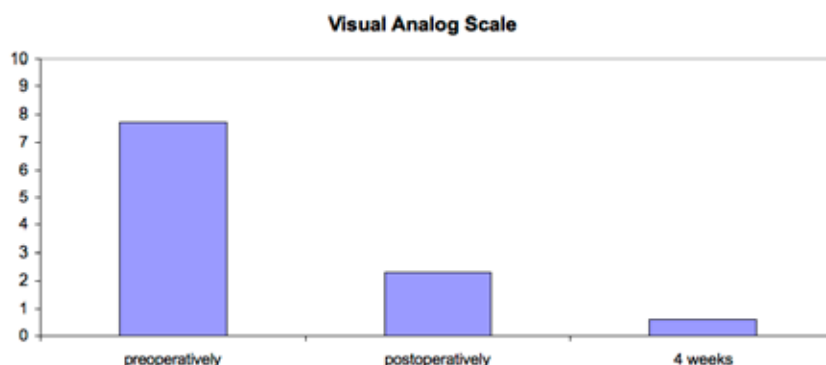


Fig. 2. Course of the subjective pain classification by the visual analog scale (T-Test).

The postoperative reduction was near anatomic with residual sacral displacement of 0.3 mm (0–1 mm) and anterior displacement of 1.4 mm (0–12 mm).

Surgery-related complications occurred in two patients. There were two patients with pin-infections that could be controlled using antibiotic therapy and local wound treatment. One of these patients had a pin-loosening.

Postoperative nerve lesions of the lateral cutaneous femoral nerve were not observed. Additionally, no pin perforations occurred.

Postoperative management and mobilization

Patients were discharged on average 11 ± 5.2 days after admission (4–24 days) and 7 ± 5.4 days postoperatively (1–18 days). Two-thirds of the patients (17 patients, 68%) were discharged to home environment. Seven patients were transferred to a geriatric rehabilitation center and one patient was transferred to another hospital due to medical comorbidities.

Removal of the external fixator was performed after an average of 4 ± 1.6 weeks (3–8 weeks). In the majority of patients removal was performed after 3 weeks (56%) or after 4 weeks (16%). In no patient it was necessary to reattach the fixator.

Mobility

Except of one patient, all patients were preoperatively mobilized with full weight bearing in their homes ($n = 21$) or in a rehabilitation unit ($n = 3$). Only one patient was mobile with a walker.

At the time of discharge, 14 patients (56%) were mobilized under full weight bearing. Four patients were mobilized with crutches with partial weight bearing on the affected sacral injury side. The remaining patients were mobilized with partial weight bearing ($n = 7$).

At the time of external fixation removal, 88% of patients had the same mobility as before the accident. Only three patients were still mobilized with partial weight bearing.

Pain course (Fig. 2)

The average preoperative VAS score was 7.7 ± 1.4 (4–10). 84 % of patients had a value of at least 7.

Postoperatively, there was a significant reduction in pain with a mean VAS value of 2.3 ± 1.7 ($p < 0.0001$).

All patients had postoperative improvement in pain intensity. The average reduction of pain was 5.3 ± 2 (2–9) on the VAS scale. 20% of patients showed an improvement of 2 or 3 points on the VAS scale. Another 20% had an improvement of 4 points. Thus, 60% improved by at least 5 points.

At the time of fixator removal, the mean VAS score was 0.6 (0–5). There was a significant follow-up pain reduction ($p < 0.0003$).

21 patients (84%) were completely pain free. Three patients had mild residual pain (VAS 1–2). One patient had a VAS value of 5. This was an otherwise healthy patient (no comorbidities), who was the only one with worsening of the pain. The course of the VAS value of pre- and postoperatively according to the fixator reduction in this patient was 9–1–5.

The change between postoperative pain and pain at the time of implant removal was 1.8 ± 2.1 . In 10 patients no further change or just a change of one point on the VAS scale was observed. These 10 patients had, however, a pain score of 2 points.

The remaining patients showed a further improvement of 3.1 points.

DISCUSSION

Pelvic ring fractures in the older population is of major socio-economical relevance (11, 12).

It is well known that older patients are significantly limited in mobility by proximal femur and pelvic ring fractures for a longer period. In geriatric patients with pelvic ring injuries pain-dependent mobilization is often earliest possible after 1–3 weeks (8, 15, 19, 26).

Koval et al. showed that after isolated anterior pelvic ring fractures (type A injury) a hospital stay in average of two weeks was necessary, and 1/3 of patients were hospitalized for more than 2 weeks (15).

Morris et al. analyzed 148 patients ≥ 65 years who were admitted to a general medical or geriatric ward with pelvic ring fractures. 85% of these patients were female. 83% of patients sustained a low-energy trauma with a fall while walking. The mean hospital stay was three weeks. 47% of patients had isolated pubic fractures. Further 48% had multiple pelvic fractures. A classification was not made. No patient was able to walk unaided at the time of discharge. 93% of patients had significant osteoporosis with a Singh index ≤ 4 (19).

Especially in isolated transpubic fractures (type A injuries), often a discrepancy between the radiological outcome and fracture dislocation and clinical findings is observed (23). Thus, only 50–60% of patients with type A injuries were completely symptom-free after two years (23). These results could be confirmed by other research groups (17, 26).

Persistent symptoms are typically pain in the posterior pelvic ring area and a painful hip flexion (8, 17).

Toussonidis et al. reported on seven patients with persistent pain in the posterior pelvis where a change of

pelvic ring classification from type A to type B resulted after CT analysis of the pelvis (27). Secondary CT scan revealed primarily overlooked sacral fractures in these patients. The correct diagnosis was made after an average of 3 weeks (1–6 weeks). Treatment then consisted of application of a supraacetabular external fixator. The patients were reported to be immediately pain-free after surgery with immediate mobilization.

The present study shows that with early adequate clinical and radiological diagnosis by CT of the pelvis, the posterior pelvic ring injury was correctly determined.

The „natural“ clinical course of this injury is so far not adequately studied. Results from studies investigating insufficiency fractures of the sacrum show, that in these patients spontaneous pain without trauma occurs, which restrict the mobility of these patients (29), but despite comparable age groups, results cannot be transferred, due to concomitant diseases (1, 6, 30). Normal mobility of this latter group of patients was achieved after 2–3 months (1, 30), hospital stay was up to 8 weeks (6).

Early stabilization of the pelvic ring with external fixation in the present analysis resulted in early mobilization with a high rate of pain-free patients after an average of 4 weeks. The immediate profit by this low-risk surgical procedure is remarkable, especially for these older patients. 56% of these patients showed full mobilization at the time of discharge and almost 90% after 4 weeks. There was only one „treatment failure“ with persistent pain and even pain increase compared to the postoperative result.

CONCLUSION

Early stabilization of the pelvic ring in type B injuries in older age group (≥ 65 years) with a simple external fixation construct allows quick and painless mobilization of these patients with a low risk of surgery-related complications. Clinically, these patients suffer primarily from posterior pelvic pain and groin pain.

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