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Radiological analysis, operative management and functional outcome of open book pelvic lesions: A 13-year cohort study

Pieter Van Loon, Sebastian Kuhn, Alexander Hofmann, Martin H. Hessmann, Pol M. Rommens *

Department of Trauma Surgery, Center for Muskuloskeletal Surgery, University Medical Center, Johannes Gutenberg-University, D-55101 Mainz, Germany

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During the preparation of this article, Pieter Van Loon died after a short illness at the age of 29. We dedicate this paper to his parents and many friends.

ABSTRACT

We present the clinical and radiological outcome of a 13-year cohort study of 38 open book pelvic lesions. All patients were treated in one Level I Trauma centre. In the posterior pelvis, sacro-iliac diastasis was seen in 31 patients, sacral fracture in 7. In all patients with sacro-iliac diastasis, the pubic bone was inferiorly displaced on the primary ap pelvic overview on the side of injury. All but one patient was treated with open reduction and internal fixation of the symphysis pubis. Additional stabilization of the posterior pelvis was done in 9 patients. 32 patients were seen after a median follow up of 84 months. Majeed score and SF-36 questionnaire were used. Functional outcome was excellent with a mean Majeed score of 95.7. Comparing our data with the SF-36 score of the normal German population, the mean value of the 'role-physical' and the 'physical function' categories was significantly lower for patients treated with an open book lesion. There was a tendency towards a better outcome in open book lesions with sacral fracture. There was a tendency towards worse outcome for the patients with additional dorsal stabilization. Male impotence was the single most important lesion of neurological origin which persisted two years after open book lesion.

Conclusion: Functional outcome after surgical treatment of open book pelvic lesions is good. External rotation and accompanying inferior displacement of the ipsilateral hemipelvis may be a sign of partial lesion of the posterior sacroiliac complex. Identification of patients who need additional posterior stabilization remains difficult.

Introduction

Pelvic ring lesions are rare, with an incidence between 0.3–8.2% of all fractures.[6,19] In recent years many data were published on treatment results of pelvic ring injuries.[27,29,31] Most publications use the Tile classification, adapted by the AO/ASIF, in which pelvic ring fractures are distinguished into three categories.[1] B-type lesions are defined as partially rotationally unstable. Radiological distinction between partially unstable lesions of the dorsal pelvic ring (B-type lesions) and vertically unstable lesions (C-type lesions) remains difficult in many cases. There are obvious differences in outcome between B- and C-type injuries.[18,20,24,26] The outcome of open book lesions (type B1) is similar to that of vertically unstable lesions (type C).[21]

Our objective was to analyse specific characteristics of open book pelvic lesions, such as injury pattern, surgical therapy, radiological results and long-term functional outcome and to compare them with data of similar series and of the normal population.

Materials and methods

A chart review of all patients with an open book pelvic lesion (Tile type B1) who were admitted to our Level I Trauma centre between 1 January 1996 and 31 December 2008 was performed. Open book lesions were divided into Type B1.1 (anterior sacroiliac diastasis) and Type B1.2 (sacral fracture) lesions.

For all eligible patients, general demographics including age, trauma mechanism, concomitant lesions, injury severity score (ISS), trauma mechanism, method of treatment, postoperative complications, secondary surgery, length of hospital stay and anatomic results were recorded. A SF-36 questionnaire was send to all of our patients. All patients were invited for a clinical and radiological control examination. A clinical examination of the pelvis and lower extremities was performed and the Majeed score[11] (a numerical system developed by Majeed in 1989 in which five factors (pain, standing, sitting, sexual intercourse and work performance) were assessed and scored allowing comparison between early and late results and between various methods of treatment) was determined. Radiological examination of the pelvis was performed in patients who complained of persistent pain in the pelvic region and was suggested to all patients if the last radiological examination was longer than two years ago.

* Corresponding author. Tel.: +49 6131 17 7292; fax: +49 6131 17 4043.
E-mail address: pol.rommens@unimedizin-mainz.de (Pol M. Rommens).

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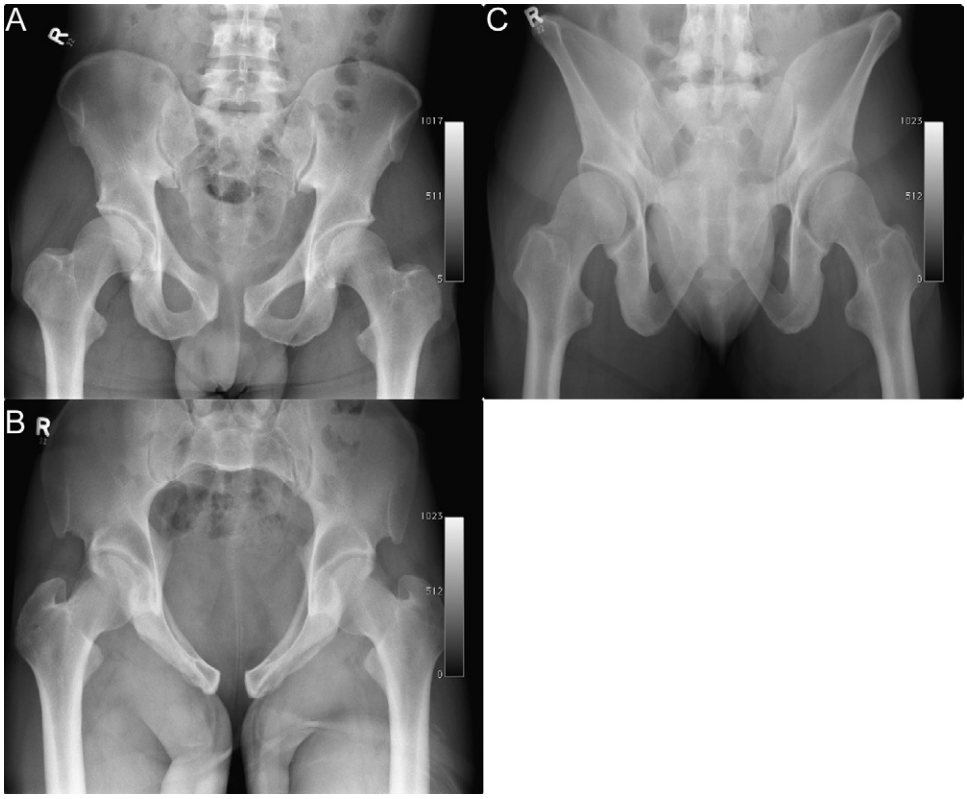

Fig. 1. Preoperative X-rays of an open book pelvic lesion (type B1.1) with an anterior symphyseal diastasis, an anterior diastasis of the left sacroiliac joint and a slight inferiorisation of the ipsilateral hemipelvis. A: Pelvic overview ap, B: Pelvic overview inlet, C: Pelvic overview outlet.

All continuous variables are presented as means ± SD or median values with interquartile ranges (IQR). Categorical variables are calculated as a percentage of frequency of occurrence. All data management and statistical analyses were performed on a personal computer using PASW Statistics version 18.0.

Results

Chart data

38 patients were included in our study. Patient demographics are summarised in Table 1. There was a predominance of male patients (34/38). Injuries were mainly due to high-energy trauma (18/38 traffic accidents, 10 thereof motorbike and 8 car accidents), 12/38 after a fall from great height. 8/38 of injuries arose after a minor trauma (3 after a fall from less than 2 m, 3 anteroposterior compression trauma's, one bull riding accident and one accidental yoga leg split). 16 patients were admitted primarily to our level I trauma centre, 22 patients were referred to our hospital after primary haemodynamic stabilisation in a peripheral hospital. Eight out of 16 patients primarily admitted in our institution received a full body CT-scan on admission, in five others a CT scan of the pelvis was performed, additionally to the standard X-ray imaging in AP, Inlet and Outlet views. In three cases only the standard X-ray imaging was performed preoperatively. In 6 out of 8 patients who did not receive a full body scan, a FAST was performed on admission.

Table 1
Patient demographics.

Included patients	38
Age (year, IQR)	44 (33–60)
Gender (m/f)	34/4
Fracture type (B1.1/B1.2)	31/7
ISS (IQR)	21 (16–32)
Hospital stay (days, IQR)	18 (13–34)

The working diagnosis of all of our patients was an open book pelvic lesion (B1 lesion after Tile). 37 patients presented with a symphyseal diastasis (mean symphyseal dehiscence of 28 mm) and only one patient presented with an obturator ring fracture without symphyseal diastasis. A partial (anterior) sacroiliac diastasis (Type B1.1) was seen in 31/38 patients and a sacral fracture (Type B1.2) in 7/38 patients (Figs. 1 and 2).

All seven sacral fractures were classified after Dennis.[3] There was a majority of lateral sacral fractures ($n = 5$), one patient had a transforaminal sacral fracture and one had a medial sacral fracture.

The median Injury Severity Score was 21 (16–52). Most important concomitant lesions were a trauma of the lower extremities ($n = 11$), a thoracic trauma (rib fractures, lung contusions and hemato- or pneumothorax) ($n = 8$), blunt abdominal trauma ($n = 8$) for which 5 laparotomies were performed, cranial trauma ($n = 7$) and trauma of the upper extremities ($n = 6$) (Table 2). 3 open book lesions had open soft tissue damage at the perineum.

In 17/38 lesions a large retroperitoneal haematoma was found. In three cases associated peripheral nerve lesions were diagnosed. One patient with a B1.1 lesion developed a progressive paresis of the sciatic nerve in the first two hours after his bull riding accident; one patient with a B1.2 (a horse fell on lying patient) complained about muscle weakness in knee extension and painful hip flexion as is seen in patients with a femoral nerve injury. One female patient with an obturator ring fracture was preoperatively diagnosed with a meralgia paresthetica.

In 4 out of 34 male patients a lesion of the urethra and in one male patient a lesion of the bladder and urethra was diagnosed with retrograde urethrography or computer tomography. In one female patient who performed an accidental yoga leg split a rupture of the vagina and urethra associated the B1.1 lesion (symphyseal diastasis of 25 mm).