

**ORIGINAL RESEARCH**

# Assessment of functional outcome of pelvic fractures treated with external fixator

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**ABSTRACT**

**Background:** Pelvic fractures involve the breaking of one or more bones in the pelvis, which includes the ilium, ischium, pubis, and sacrum. Numerous methods for stabilizing pelvic fractures have been proposed; nevertheless, external fixation has revolutionized the way poly trauma sufferers are managed. External fixation is not the only resuscitation technique that significantly changes the survival rate. Given that stabilizing pelvic fractures lessens bleeding. **Aim and Objectives:** The present study was conducted to assess functional outcome of pelvic fractures treated with external fixator. **Materials and Methods:** The present observational study was conducted on 80 patients with pelvic fractures of both genders and managed with external fixator. Parameters such as time since injury, type of fracture, associated injuries, complications and functional outcome were recorded. **Results:** Out of 80 patients, males were 52 and females were 28. Type of fracture was type A in 55 and type B in 25. Time since injury was 1-2 hrs in 62, 2-4 hrs in 14 and 4-6 hrs in 4 cases. Associated injuries were liver laceration in 5, rt patella tendon rupture in 8 and urethral injury in 2 cases. Functional outcome was excellent in 48, good in 30, and fair in 2 cases. The difference was significant ( $P < 0.05$ ). **Conclusion:** External fixator for fracture pelvis is a simple and minimally invasive method and can be readily applied even under local anesthesia.

**Keywords:** Pelvic fractures, external fixator, Functional outcome.

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**INTRODUCTION**

Pelvic fractures involve the breaking of one or more bones in the pelvis, which includes the ilium, ischium, pubis, and sacrum.<sup>1</sup> These fractures can range from minor, stable fractures to severe, unstable injuries that can be life-threatening due to associated complications.<sup>2</sup> Causes are high-energy trauma such as car accidents, falls from significant heights, or crush injuries, low-energy trauma are common in elderly individuals with osteoporosis, often resulting from a simple fall, pathologic fractures due to underlying conditions like metastatic cancer or bone diseases.<sup>3</sup> According to Tile classification of pelvic fractures, Type A pelvic fracture is Stable (posterior arch intact) and Type B is rotationally unstable and vertically stable; i.e., Partially stable (incomplete disruption of the posterior arch)<sup>4</sup>.

Even in the most advanced trauma facilities, managing these patients continues to be difficult for the trauma surgeon.<sup>5</sup> A trauma surgeon should be well-versed in the biomechanics of these complex fractures, as well as have extensive experience managing shock, bleeding, electrolyte imbalance, and

injuries to the bowel and urogenital tract.<sup>6</sup> This is because general management of poly trauma patients has advanced significantly. Numerous methods for stabilizing pelvic fractures have been proposed; nevertheless, external fixation has revolutionized the way poly trauma sufferers are managed. External fixation is not the only resuscitation technique that significantly changes the survival rate. Given that stabilizing pelvic fractures lessens bleeding.<sup>7</sup>

**AIM AND OBJECTIVES**

The present study was conducted to assess functional outcome of pelvic fractures treated with external fixator.

**MATERIALS AND METHODS**

The present observational study was conducted on 80 patients with pelvic fractures of both genders. The present study was conducted on those who met the specified criteria for inclusion and exclusion at the Department of Orthopedics, Major S.D. Singh Medical College & Hospital, Farrukhabad, Uttar Pradesh, India, for a period of six months (January

2014– December 2014). All were informed regarding the study and their written consent was obtained. The Institutional Ethics Committee gave the study its approval.

Data such as name, age, gender etc. was recorded. All patients were managed with external fixator. Parameters such as time since injury, type of fracture, associated injuries, complications and functional outcome were recorded.

#### INCLUSION CRITERIA

- Patients to give written informed consent.
- Patient's age between 20-60 years.
- All stable and partially stable pelvic fractures (Type A& Type B).
- Available for follow up.

#### EXCLUSION CRITERIA

- Patients not give written informed consent.
- Unstable pelvic fractures, associated head injury.
- Patients with immunocompromised status and patients on chemotherapy or steroid treatment.
- Those unable to attend follow-up.

**Technique of External Fixation:** Under anaesthesia, the patient is placed in a supine position. The anterior superior iliac spines and the inner and outer tables of the iliac crest were identified by palpation. Under aseptic precautions with the use of a hand drill, two or three threaded Schanz screws are inserted between the anterior superior iliac spine and iliac tubercle, with a space of about 2 cm between each pin, and the pins are directed inferomedially. A straight rod is employed to bridge the pins. The same procedure is repeated on the other side of the pelvis. Then traction is given to correct the migration, and compression is applied to reduce the diastasis. Supportive treatment with adequate intravenous fluids and blood transfusions was given to restore hemodynamic status. General surgical and urological consultations and interventions were given when required.

## RESULTS

**Table I Distribution of patients**

Total- 80		
Gender	Male	Female
Number	52	28

Table I shows that out of 80 patients, males were 52 and females were 28.

**Table II Assessment of parameters**

Parameters	Variables	Number	P value
Type of fracture	Type A	55	0.01
	Type B	25	
Time since injury	1-2 hrs	62	0.02
	2-4 hrs	14	
	4-6 hrs	4	
Associated injuries	Liver laceration	5	0.05
	Rt patella tendon rupture	8	

**Post-Operative Management:** On the day after external fixation, the patient is encouraged to turn side to side for nursing purposes and to adapt to an upright position in bed. Adjustments in the alignments are undertaken as and when necessary. Routine pin-trick care is initiated. Rotationally unstable pelvic injuries with a significant limb-length discrepancy of more than 1.5 cm. A 3.5-mm reconstruction plate was advocated for open reduction and internal fixation. Out of ten patients, three were treated with open reduction and internal fixation by using a reconstructive plate, and in seven patients, an anterior external fixator was used as a definitive treatment. One patient, who had liver laceration, underwent an emergency laparotomy with peritoneal lavage and omental plugging. Patella tendon repair was carried out in one patient who had a complete rupture of the patella tendon in the right limb. One patient had an associated fracture of the shaft and neck of the left femur, for which a recon nail was applied. Patients with the posterior complex intact and without other major soft tissue injuries are allowed to sit in the first week and to walk with partial weight bearing from six weeks onwards. Patients with posterior complex disruption are given delayed weight bearing between 10 and 12 weeks. Fixators were removed 6–8 weeks after the union of the fracture, which was confirmed by clinical and radiological assessment. Vigorous, active exercises for the hips were encouraged.

At the follow-up at the sixth month, all patients were evaluated for functional outcome using Majeed's scoring system<sup>7</sup>, modified by Lindahlet al.<sup>12</sup>. Majeed's score includes four clinical grades based on a score out of 100 points. The outcome was graded as excellent (score > 85), good (score 70–84), fair (score 55–69), and poor (score < 55).

#### STATISTICAL ANALYSIS

The data obtained was subjected to statistical analysis using a Microsoft Excel spread sheet and analysed using SPSS. Chi-squared and Student's t-test were used as the tests of significance to assess the statistical significance. A p-value less than 0.05 was deemed significant.

	Urethral injury	2	
Functional outcome	Excellent	48	0.04
	Good	30	
	Fair	2	
	Poor	0	

**Graph I Assessment of parameters**

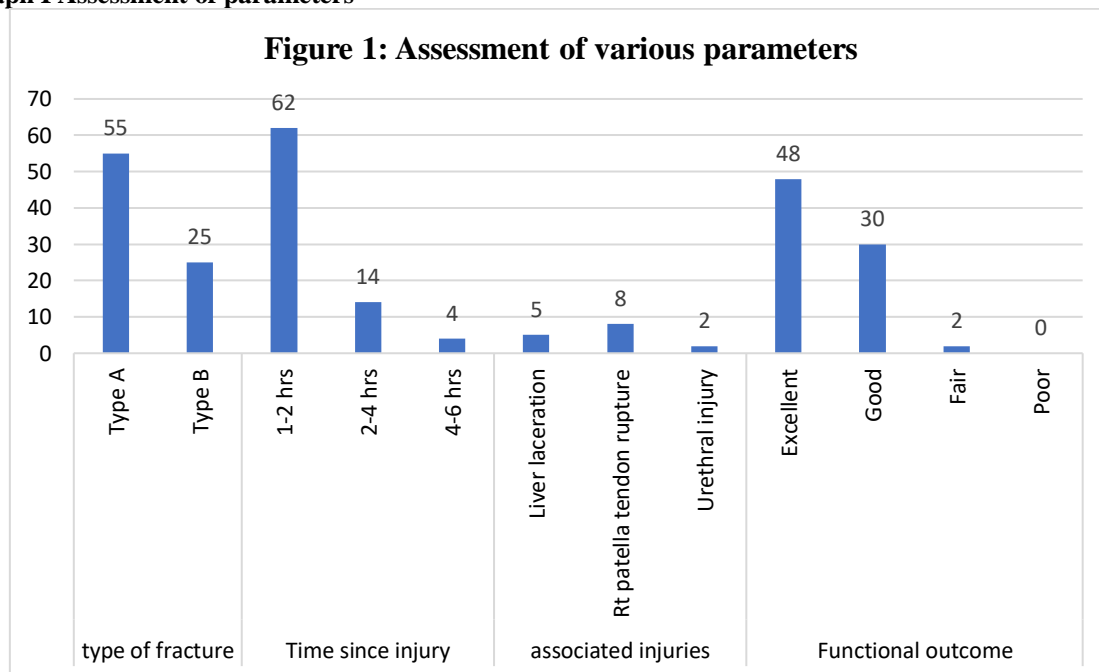


Table II and graph I shows that type of fracture was type A in 55 and type B in 25. Time since injury was 1-2 hrs in 62, 2-4 hrs in 14 and 4-6 hrs in 4 cases. Associated injuries were liver laceration in 5, rt patella tendon rupture in 8 and urethral injury in 2 cases. Functional outcome was excellent in 48, good in 30, and fair in 2 cases. The difference was significant ( $P < 0.05$ ).

**DISCUSSION**

Given that a pelvic fracture is a potentially fatal emergency, prompt and meticulous general examination as well as exact radiological studies are performed to ascertain the displacement and level of instability in order to plan the management.<sup>8</sup> Stabilization may be necessary in the acute phase of a type B1 open book injury to decrease the pelvic volume, and external fixation pins may help in the uncommon case of a type B lateral compression injury.<sup>9,10</sup> The present study was conducted to assess functional outcome of pelvic fractures treated with external fixator.

We found that out of 80 patients, males were 52 and females were 28. Lindahl J<sup>11</sup> evaluated reviewed 110 patients with an unstable fracture of the pelvic ring who had been treated with a trapezoidal external fixator after a mean follow-up of 4.1 years. There were eight open-book (type B1, B3-1) injuries, 62 lateral compression (type B2, B3-2) and 40 rotationally and vertically unstable (type C1-C3) injuries. The rate of complications was high with loss of reduction in 57%, malunion in 58%, nonunion in 5%, infection at the pin site in 24%, loosening of the pins in 2%, injury to the lateral femoral cutaneous nerve in 2%, and pressure sores in 3%. The external

fixator failed to give and maintain a proper reduction in six of the eight open-book injuries, in 20 of the 62 lateral compression injuries, and in 38 of the 40 type-C injuries. Poor functional results were usually associated with failure of reduction and an unsatisfactory radiological appearance. In type-C injuries more than 10 mm of residual vertical displacement of the injury to the posterior pelvic ring was significantly related to poor outcome. In 14 patients in this unsatisfactory group poor functional results were also affected by associated nerve injuries. In lateral compression injuries the degree of displacement of fractures of the pubic rami caused by internal rotation of the hemipelvis was an important prognostic factor.

We found that type of fracture was type A in 55 and type B in 25. Time since injury was 1-2 hrs in 62, 2-4 hrs in 14 and 4-6 hrs in 4 cases. Associated injuries were liver laceration in 5, rt patella tendon rupture in 8 and urethral injury in 2 cases. Functional outcome was excellent in 48, good in 30, and fair in 2 cases. Ghanayem et al<sup>12</sup> in their study unilateral open-book pelvic ring injuries were created in five fresh cadaveric specimens by directly disrupting the pubic symphysis, left sacroiliac joint, and sacrospinous and sacrotuberous ligaments. Pelvic volume was

determined using computerized axial tomography for the intact pelvis, disrupted pelvis with both a laparotomy incision opened and closed, and disrupted pelvis stabilized and reduced using an external fixator with the laparotomy incision opened. The average volume increase in the entire pelvis (from the top of the iliac crests to the bottom of the ischial tuberosities) between a nonstabilized injury with the abdomen closed and then subsequently opened was 15 +/- 5% (423 cc). The average increase in entire pelvic volume between a stabilized and reduced pelvis and nonstabilized pelvis, both with the abdomen open, was 26 +/- 5% (692 cc). The pubic diastasis increased from 3.9 to 9.3 cm in a nonstabilized pelvis with the abdomen closed and then subsequently opened. Application of a single-pin anterior-frame external fixator reduced the pubic diastasis anatomically and reduced the average entire and true (from the pelvic brim to the ischial tuberosities) pelvic volumes to within 3 +/- 4 and 8 +/- 6% of the initial volume, respectively.

#### LIMITATION OF THE STUDY

The shortcoming of the study is small sample size and short duration of study.

#### CONCLUSION

Authors found that external fixator for fracture pelvis is a simple and minimally invasive method and can be readily applied even under local anesthesia.

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