

## Treatment of Open Book Pelvic Fractures: Comparison between Internal and External Fixation

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### ABSTRACT

The objective of this study was to compare two different techniques of pelvic fracture stabilization i.e. external and internal fixation. A prospective randomized study was done in Department of Orthopaedic surgery, Mayo Hospital Lahore. In about 24 months (2008 to 2010), open book pelvic fractures, according to Tile's classification were treated with two different techniques, NA external pelvic fixator and internal fixation using tension band wiring. Data was collected according to protocol of a Performa and analyzed using SPSS software & chi square test. 20 cases with open book were recruited for the study. These patients were grouped into A and B equally. 10 patients in group A were treated with NA external fixator and 10 with O.R.I.F. using tension band wiring in group B. The total duration of follow up was 6 months for each group. Patients were followed up clinically and radiologically using patient satisfaction and Majeed pelvic score. In Group A, there was 1 excellent result, 2 good, 3 fair and 4 poor results while in Group B, 6 excellent, 4 good, 0 each for fair and poor results. Our study shows better results in management of Open Book pelvic fractures treated with Open Reduction and Internal Fixation with Tension Band Wiring technique.

**Key words:** Pelvic fracture, external fixation, tension band wiring

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### INTRODUCTION

The pelvic fractures account for 3% of all fractures<sup>1</sup>. The fractures of adult pelvis are generally classified into stable and unstable. Stable fractures result from low energy trauma such as falls in elderly patients and are managed symptomatically with crutches or walker assisted ambulation. Unstable fractures are caused by high energy trauma and result in significant morbidity and mortality. High energy trauma is commonly caused by motor vehicle accidents and falls. Unstable fractures are extremely difficult injuries to manage; mortality rate is about 50%.

The pelvis is a basin-shaped bony structure that supports the spinal column and protects the abdominal organs. Like other bones, Pelvis is also exposed to trauma. It may be fractured due to high-energy forces such as motor vehicle crash or fall from a height. Incidence of the pelvic fracture is increasing day by day. These fractures are associated with a high mortality rate of 25%. The predominant cause of mortality is retroperitoneal hemorrhage<sup>2</sup>. Approximately 5% patients of pelvic fractures require hospital admission and among them 5–16% die in spite of treatment<sup>3</sup>.

Tile classified the pelvic fracture into three types (A, B & C). The relative occurrence of Type "A" stable pelvic fracture is 16%, Type "B" rotationally unstable

pelvic fracture is 49% and Type "C" vertically and rotationally unstable is 35%<sup>4</sup>. Type B fracture is also known as an 'open book' fracture. In this kind of injury, the left and right halves of the pelvis are separated at front and rear. The front opening is more than the rear, i.e., like opening a book. Type B fracture is further divided into three subtypes i.e. B1, B2, and B3. In type B1, open book symphyseal diastasis is less than 2.5 cm. In type B2, open book symphyseal diastasis is greater than 2.5 cm and in B3, there is lateral compression.

The unstable type B2 pelvic fractures almost always require reduction and stable fixation in early post traumatic phase, thus minimizing mortality and morbidity. Two techniques are most commonly in practice for the management of this type of unstable pelvic fractures. One is close reduction & external fixation and the other is open reduction and internal fixation<sup>5</sup>.

In Pakistan the incidence of unstable pelvic fracture is increasing day by day due to high energy trauma like road side and industrial accident, which is a challenging problem for orthopaedic surgeons. To solve this problem this study was carried out during 2008 to 2010 at Department of Orthopaedic Surgery, King Edward Medical University / Mayo Hospital Lahore to determine the most appropriate method of treatment of unstable pelvic fractures, Tile type B-2 in our circumstances.

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## MATERIAL AND METHOD

This prospective randomized study was carried out in the Department of Orthopedics Mayo Hospital, Lahore from July 2008 to July 2010. Total 20 patients were divided in two groups using systematic sampling, Group A: NA Fixator group and Group B: TBW technique. All patients having open book fracture; of either sex aged between 16 to 50 years presenting within one week of injury were included in the study. Patients under 15 years and over 50 years old patients, open pelvic fractures, Tile's type A and C, Patients with metabolic bone disease and rheumatoid and other inflammatory arthritis were excluded.

**Data Collection Procedure:** This prospective study was conducted on 20 patients meeting the inclusion criteria. All patients were admitted directly through Accident and Emergency Department. Following initial fluid resuscitation, all patients were evaluated for skeletal and visceral injuries by x-rays, USG & CT scan. Analgesics, i/v antibiotics and prophylaxis against D.V.T were provided. All patients were provided external pelvic support in the form of pelvic binders and prepared for definitive surgical procedure.

**GROUP A:** In this group 10 patients were included. The pelvic fixation was done with external fixation named NA external fixator. After aseptic measures Schanz screws were inserted on each side, these screws were held by a rod and external compression device. Pelvic diastasis was reduced and confirmed by image intensifier per operatively and then transferred to recovery room for immediate post-op care. Patients were mobilized with partial weight bearing with walker and discharged on 3<sup>rd</sup> post-op day and advised pin site care.

**GROUP B:** A total 10 patients were studied in this group. Internal fixation was used for pelvic stabilization through a low transverse (Modified Pfannenstiel) incision. Dissection was carried down to the symphyseal separation and subperiosteally the superior and medial aspects of the pubic bones were exposed. The pubic diastasis was reduced completely and fixed with tension band wiring looped over the cortical screws.

**Follow-up:** Time frame and evaluation tools were same in both groups (A & B). Each patient was discharged 3-4 post operative days after the surgery. Each patient was advised to revisit at two weeks for removal of suture, followed by revisit every four weeks for 24 weeks. At each follow up visit the functional outcome was evaluated using Majeed pelvic scores (1989)<sup>6</sup>, clinically & radiologically.

- Pain: -30 Points.
- Work: -20 Points.

- Sitting: -10 points.
- Sexual Intercourse-4 Points.
- Standing - 36 Points.
  - A-Walking Aids: -12 Points
  - B-Gait Unaided:-12Points.
  - C-Walking Distance: - 12 Points

Clinical grades based on a score out of 100 points for working.

>85 Excellent, 70-84 Good, 55-69 Fair, <55 Poor

**Data Analysis:** Data was collected with the help of a performa. The data was analyzed by non-parametric chi square test using SPSS software (version 11.5). The outcome of treatment was analyzed according to Majeed pelvic score, which include the functional assessment of patients, i.e. pain, standing, sexual intercourse, if for any reason, sexual intercourse has not been attempted a score of four is given, more over performance at work or activities before trauma was also assessed. The maximum score was 100.

## RESULTS

In this study, the mean age of patients was 32.65 ± 9.746 with range 19-50 years. The age group 21-25 was most frequent among patients. Most of the patients were male (80%) in our study, rests of the 20% were females. The pelvic fracture was dependent of gender that was predominantly in males, p-value <0.007.

Overall, there were 7 excellent, 6 good, 3 fair and 4 poor results. Among 7 excellent there were 1 from group A and 6 from group B. From the total 6 good results there were 2 from group A and 4 from group B. Interestingly in group B there was no fair and poor results while in group A there were 3 fair and 4 poor results. This difference is statistically highly significant, the p-value is <0.002.

Fig 1: Radiograph of the patient at three months follow up in group A.



Fig 2: Radiograph of the patient at three months follow up in group B.



Table 1: Result of the two groups at final follow-up

Category	Group A	Group B
Excellent	1	6
Good	2	4
Fair	3	0
Poor	4	0

The injuries of bowel system were suspected in six cases (30%). The general surgeon was consulted and were treated conservatively. Pin tract infection rate was 30% in Group A and superficial wound infection 10% was in group B. In group A there were deep infection in three and breakage of Schanz screw in 1 case but there were no such infection in group B. Results were analyzed using patient satisfaction, radiographs and Majeed Pelvic score. One patient treated with external fixator developed chronic osteomyelitis. This was treated with curettage and systemic antibiotic therapy.

## DISCUSSION

The unstable pelvic disruptions are life threatening and their stabilization is one of the priorities<sup>7</sup>. In this study of 20 patients with unstable pelvic fractures, 10 patients were treated by pelvic NA External Fixator and remaining 10 patients were treated by open reduction and internal Fixation with tension band wiring for repair of pubic symphysis.

Mears 1980, treated unstable pelvic fracture with external fixator. At mean follow up of 5-6 years, 30 patients were excluded because of major acetabular involvement leaving 218 cases. 47.5% cases showed unsatisfactory results because of various problems

like leg length discrepancy 4%, non-union 35% and pain 40%<sup>8</sup>.

External fixation has been widely described for the definitive treatment of type B-2 fractures. Kellam (1989), obtained and maintained reduction in 83% for type B-2 injuries with use of external fixator and concluded that if an adequate reduction (<1cm displacement) was maintained, 100% of patients were functionally normal<sup>9</sup>.

Cole, et al (1996) reported the most of the problems associated with external fixation are related to a failure to achieve adequate stabilization of the posterior portion of the pelvic ring. As result, there have been reports of posterior pelvic pain, sitting imbalance attributed to a mal-aligned pelvis and decreased activity levels<sup>10</sup>. Lindahl, Bostaman in 1999 reviewed 110 patients with unstable fractures that had been treated with external fixator and noted that the rate of complications was high; with loss of reduction 57%. Mal-union 58%, non-union 5%, pin tract infection 24% and loosening of pins was 2%<sup>11</sup>.

In our study pin tract infection occurred in 3 patients in Group A and only one case in group B. In group A there was breakage of two Schanz screw in 1 case but there was no such breakage of implants in group B.

Tornetta et al 1996 reviewed 29 patients with rotationally unstable but vertically stable pelvic ring injuries treated with open reduction and internal fixation with more than 3 years of follow-up. The primary indication for surgery was symphyseal disruption. Follow-up evaluation revealed that 96% had no pain or pain only with strenuous activity. Seventy-six percent ambulated without assistance or limitations, and 76% returned to their preinjury occupation<sup>12</sup>.

Awais and Rizwan 1996 treated 10 cases unstable pelvic fracture with tension band wiring. They reported that this technique provides stable fixation in unstable pelvic fracture<sup>13</sup>.

Maru 2005 reported using Majeed Pelvic score, in a study conducted among 19 patients using open reduction & internal fixation with plate. There were 9 excellent, 8 good, 1 fair and 1 poor results so according to results internal fixation open reduction & internal fixation with plate gives the better results. He reported open reduction and internal fixation of the unstable pelvic fracture provides best stability of fixation and clinical outcome<sup>14</sup>.

In present study, there were 6 excellent results of open reduction and internal fixation out of total of 7 excellent results. Interestingly in group B there was no fair and poor results while in group A there were 3 fair and 4 poor results.

## CONCLUSION

After comparing effectiveness of treatment of type B-2 pelvic fractures of pelvis managed with external and internal fixation, it is concluded that open reduction and internal fixation using tension band wiring technique for repair of symphysis pubis is the most suitable method of treatment of these fractures as it is most effective, without much complications and more overdoes not require sophisticated instrumentation.

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