AUDIT

Outcome of percutaneous screw fixation of posterior pelvic ring injuries

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Abstract

Objective: To evaluate the clinical outcome of percutaneous fixation for unstable pelvic ring injury.

Methods: This retrospective study was conducted at orthopaedics section of Aga Khan University Hospital Karachi, Pakistan from July 2015 to December 2018. Data was retrieved from trauma registry from July 2015 till December 2018, including all patients who underwent percutaneous fixation for pelvic ring injury. Majeed pelvic score was used to determine the functional outcome.

Results: A total number of 30 patients were included, 27(90.0%) adults, and 3(10.0%) paediatrics patients. There were 21(70.0%) males and 9(30.0%)females. . Mean age of patients was 37.1±16.1 years. Post op mean Majeed functional pelvic Score was 85.8. Of the 30 patients, 18 (60.0%) had Excellent, 10 (33.3%) good and 02(6.7%) fair scoring.

Conclusion: Percutaneous fixation of posterior ring injuries has excellent functional outcome, with minimal blood loss and no soft tissue striping.

Keywords: Percutaneous fixation, posterior pelvic ring injuries, Majeed Pelvic score, Polytrauma.

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Introduction

Motorisation has made life easier but at the same time there are complications associated with it. Road traffic accident is a major public health problem due to the mortality and morbidity associated with it. According to the World Health Organization (WHO), approximately 1.35 million people die per year secondary to RTAs.[1,2]

Most of pelvic injuries are associated with high energy trauma; road traffic accidents, fall from heights or blunt trauma. Mortality rate associated with pelvic injury is 10 to 20%, which is mostly secondary to haemorrhage or associated thoracic injury or head injury.[3] It is estimated that 15 to 45% of pelvic injuries involve the sacrum or there is sacro-iliac joint disruption.[4,5] Posterior pelvic injury is critically important in pelvic injuries, which may involve fracture of the ilium, sacrum or sacro-iliac joint disruption. Different options for management of posterior ring injuries are conservative management, open reduction internal fixation with plating, sacral bar and triangular fixation systems or percutaneous fixation with cannulated screws.[6]

Open reduction internal fixation is done in prone position and requires extensive dissection of the soft tissue which leads to an increased chance of wound infection (up to 25%) and anaesthesia complications.

Percutaneous fixation of posterior ring injuries was described by Routte et al in 1993.[3,7] As compared to open reduction and internal fixation, percutaneous fixation has the advantage of less soft tissue exposure, no associated risk of wound infection, less blood loss and can be performed in supine position in a poly traumatized patient.[6]

The outcome of pelvic injury management depends on early intervention, anatomic reduction and stable fixation which in term results in early mobilization and pain management. There has been evolution in the management of pelvis fixation with time, for posterior pelvic injuries percutaneous fixation is considered to be the choice of treatment.[8]

The purpose of this study was to evaluate the clinical outcome of percutaneous fixation for unstable posterior pelvic ring injuries.

Methods

The retrospective study was conducted at Section of Orthopaedics, Department of Surgery, Aga Khan University Hospital, Karachi, Pakistan from July 2015 to December 2018 with a minimum follow up of 10 months. Data was retrieved from the trauma registry. All patients who underwent percutaneous fixation with ilio-sacral screws for posterior pelvic rings injuries in the study period, were included. No formal sample size was calculated. Patients undergoing open reduction internal fixation with plate or managed conservatively were excluded.

Post operatively patients were evaluated with Majeed

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Pelvic Score.[9] The most common mechanism of injury observed was road traffic accident, car roll over followed by motor bike accidents. Total 31 patients met the inclusion criteria, 1 patient was excluded (patient died post operatively during same admission due to haemorrhagic shock). The hospital charts were reviewed for mechanism of injury, pre and post op Radiology and results of CT scans.

Surgery was performed under general anaesthesia in supine position for all patients on a radiolucent table. Bowel preparation was done for patients and before surgery. Pelvis antero-posterior, inlet, outlet and lateral views were obtained to confirm proper position of the patient using fluoroscopy.

External fixator was applied where required to help in reduction. Initially closed reduction with help of manipulation of the external fixator or traction was achieved and confirmed under image intensifier. Once reduction was confirmed then guide wire was passed from lateral aspect of ilium in the safety zone into sacrum, perpendicular to the fracture line, confirming its position in AP, inlet, outlet and lateral view in fluoroscopy as shown in Image-1. Once confirmed under image intensifier, the position of the guide wire then reaming was determined. Cannulated screws of size 73 mm were inserted (implant photograph shown in Image-2). If required, second and third cannulated screws were also used for fixation using the same method. Post operatively patients were monitored for bleeding, vitals and distal neurological status.

Majeed Score[9] was used to assess clinical outcome post operatively on follow up visits. Majeed Score is used specifically for assessment of pelvic injury functional outcome and it includes seven items, severity of pain, working capabilities, sitting, sexual intercourse, standing and gait without support and walking distance.

Image-1: Intra-operative fluoroscopic image showing lateral view of the sacrum. Screws are visible within the zone of safety.

Image-2: Photograph of titanium partially threaded cannulated cancellous screws and washers.

Majeed score of 80 - 100 is considered as best. Patients who worked before injury are graded as excellent with a score >85, good with a score of 70-84, fair with a score of 55-69 and poor with a score <55.[9-13]

All data was analyzed by statistical package for the social sciences (SPSS software) version 21. Continuous variables were recorded as means with standard deviation and categorical variables were expressed as frequencies and percentages.

Results

Total 31 patients met the inclusion criteria. Of them one was excluded due to mortality on 1st post op day secondary to haemorrhagic shock. Out of 30 patients 21 (70.0%) were male and 9 (30.0 %) were female. Overall mean age was 37.1±16.1 years. Twenty-seven (90.0%) were adult patients and 3 (10.0%) were from the paediatric group. Patients were further divided into three groups according to age, the percentage of patients in

Table-1: Distribution of different mechanisms of injury causing the pelvic ring injuries in the patients.

Mechanism	Number of patients	Percentage
Car roll over	13	43.3 %
Motor bike accident	10	33.3 %
Fall of heavy object/ blunt trauma	03	10.0 %
Fall from height	02	6.7 %
Run over injuries	02	6.7 %

Table-2: Other associated injuries in patients with posterior pelvic ring injuries.

Associated injury	Number of patients
Orthopaedic Injuries	
Acetabulum fracture	06 (20%)
Femur shaft fracture	03 (10%)
Tibia shaft fracture	03 (10%)
Tibial Plateau Fracture	02 (6.67%)
Neck of femur Fracture	02 (6.67%)
Humerus fracture	03 (10%)
Distal radius fracture	02 (6.67%)
Ilium blade fracture	01 (3.33%)
Non-Orthopaedic Injuries	
Pneumothorax and ribs fracture	06 (20%)
Lung contusion without pneumothorax	03 (10%)
Urological injury	03 (10%)
Facial bones fracture	02 (6.67%)
Abdominal viscera injury (spleen/liver/kidney)	02 (6.67%)
Head injury (sub-Dural haematoma, temporal bone fracture, scalp haematoma)	02 (6.67%)

each group is shown in Figure-1.

Different mechanisms of injury were Car roll over, motor bike accidents, fall of heavy object/ blunt trauma, fall from height, and run over injuries details shown in Table-1.

Other associated orthopaedic injuries in these patients were, acetabulum fracture, femur shaft fracture, tibia shaft fracture, tibia plateau fracture, neck of femur fracture, humerus fracture, distal radius fracture, and ilium blade fracture, details are shown in Table-2.

Patients with poly trauma who had other systems involved were initially admitted under trauma team and once stabilized then operated for orthopaedic injuries. Non-orthopaedics injuries present in patients were, chest injuries (pneumothorax, lung contusion without pneumothorax), Urological injuries (bladder injury, urethral injury) (two out of them underwent urethral

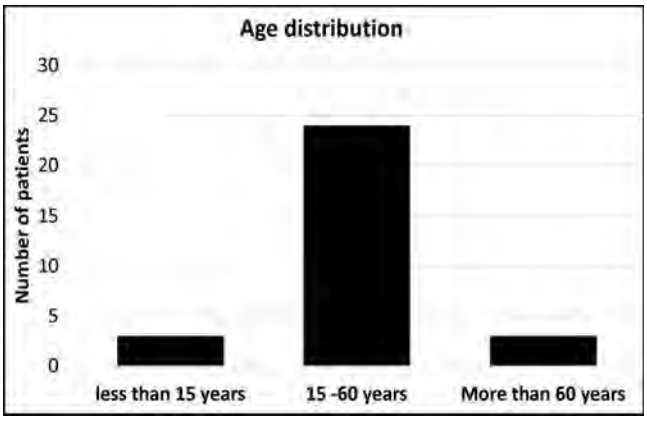

Figure-1: Distribution of patients according to age group.

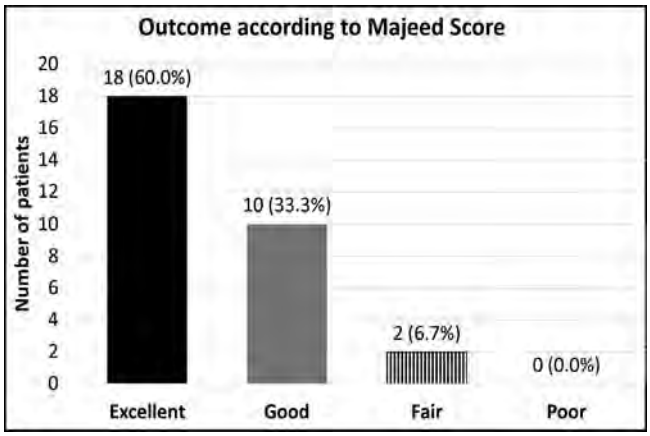

Figure-2: Frequency distribution of Majeed Pelvic score.

stricture dilatation later) facial bones fracture, abdominal viscera injury (spleen, liver, kidneys), and head injury (sub-dural haematoma, temporal bone fracture, scalp haematoma) as presented in Table-2.

Post op Majeed score was calculated and out of 30 patients 18 (60.0%) patients had excellent, 10 (33.3%) had good and 02 (6.7%) had fair results. The details are shown in Figure-2.

Three of our patients had complications post op. one patient died on 1st post op day due to haemorrhagic shock and was excluded from the study, 2 had implants failure.

One had back out of SI screws and the other had loosening of symphysis pubic plate, so revision surgery was done for symphysis pubic fixation and also ilio-sacral screws were revised.

Discussion

Unstable pelvic ring fracture management has been challenging for orthopaedic/pelvic surgeons. Injuries of the posterior pelvic ring which include sacroiliac joint disruption, sacro-iliac joint fracture dislocation or sacrum fracture leads to posterior ring instability. The goal of the treatment is to save life and achieve stable fixation after reduction and return to functional life.

There has been gradual evolution in the management of pelvic ring injuries over time, initially conservative management, application of external fixator, open reduction internal fixation and then closed reduction and internal fixation with cannulated screws.

Open reduction and internal fixation of SI joint with screw was first performed by Letournel in 1978. With advancement in radiology and development of better imaging modalities Ebrahim et al in 1987 and Routt et al

in 1993 described percutaneous fixation of SI joint under fluoroscopy in supine position.[14,15]

Studies have shown that patients with pelvic injuries have poor functional out come when treated conservatively.[16-19] Operative management of pelvic injuries have better functional outcome.[20]

Results of the present study supported Majeed Pelvic Score as a tool for evaluation of pelvic injuries. In our study the mean age of patients was 37 years. Out of 30 patients, 21 (70%) were males and male predominance in pelvic injury cases has been reported previously by Ayoub MA et al,[1] Amin et al,[4] and Po Han Chen et al.[22] Only one study showed female predominance conducted by Ayvaz M et al at Hacettepe University, Ankara, Turkey.[23] However, our study reported, the post op mean Majeed Pelvic score as 85.76 on follow up. Out of 30 patients 18 (64%) were in excellent, 10(29%) in good and 2(7%) in fair group. Our study suggested promising outcomes in patients with Percutaneous fixation of posterior ring injuries with cannulated screws, which showed excellent functional outcome, with minimal blood loss and avoiding soft tissue striping.

Results of the previous studies from literature review were as follows;

Zaki et al showed excellent, good and fair outcome in 50%, 30% and 15% patients with stabilization of sacroiliac joint by plates and screws.[24]

Ayvaz M et al, conducted a study in 2011 at Turkey, a retrospective review of 20 cases with 2 years follow up, 19 showed excellent Majeed pelvic score and 1 patient was in good group. One ilio-sacral screw was changed for treatment of pseudoarthrosis. No fixation failures were reported.[23]

Ayoub AM et al, conducted a retrospective study in Egypt (March 2002 to January 2009) with 1 year follow up. Including 42 patients [Male: 33 (78.6 %) and Female: 09 (21.4%)]. Their results were; 18 patients in Excellent group, 13 in good, 05 in Fair and 06 in poor group, according to Majeed pelvic score.[21]

Amin et al, conducted a prospective study in Pakistan (March 2008 to June 2014) with 1 year follow up including 50 patients (Male 66%, female 34 %). Their results were excellent in 26(52%) cases, good in 17(34%) and fair in 5(10%) cases. Besides, 2(4%) patients had poor Majeed pelvic grade.[6]

Po Han Chen et al, conducted a retrospective analysis of 32 consecutive patients with unstable pelvic ring in Taiwan (January 2002 to September 2009). Their study showed better outcome with percutaneous fixation for posterior pelvic ring injuries. Out of 15 patients, 8 were in excellent group, 4 in good, 2 in fair and 1 in poor group.[22]

Conclusion

Stabilization and fixation of posterior ring injuries with percutaneous screw fixation is a better option with reduced blood loss, better stability without stripping off of soft tissue and avoiding wound infection and early mobility.

Limitations

Limitations of our study were a small sample size and a retrospective design. It was an audit so all those patients who met the inclusion criteria were included and there was no need of sample size calculation.

Recommendations

Further studies with larger sample size are needed. Our recommendation is posterior pelvic injuries should be managed with percutaneous fixation with cannulated screws, as it avoids extensive exposure for open fixation, less wound complications and reduced blood loss. Combined with fixation of anterior ring when indicated for stable fixation and better functional outcome.

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Conflict of Interest: None.

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