



Original Research Article

To study the outcome of sacro-iliac percutaneous screw fixation in unstable fractures of pelvic injuries

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ARTICLE INFO

Article history:

Received 30-07-2021

Accepted 30-12-2021

Available online 07-04-2023

Keywords:

Sacroiliac Joint Disruption

Pelvic Ring Injuries

Iliosacral screw

Percutaneous fixation

ABSTRACT

Introduction: Percutaneous fixation of sacroiliac joint fractures and closed reduction gives advantages of limited blood loss, minimal invasion of compromised soft tissue, decreased infection rates and reduced operation time. The purpose of this study is to determine the outcome of sacroiliac percutaneous screw fixation of pelvic injuries in unstable fractures.

Materials and Methods: This study was conducted at Tirunelveli medical college hospital from 2017 to 2019 in patients underwent sacro-iliac percutaneous screw fixation in unstable fractures of pelvic injuries. Functional assessment of patients with Pelvic fractures was assessed by Majeed Score Scale. Patients follow up was taken at 4, 8, 12 weeks, 6 months and 1 year.

Results: The study included 22 patients with ages ranged from 16-70 years with the mean age range of 39 years with 16 males and 6 females. Mode of injury was a road traffic accident in 86.36% of cases and fall from height in 13.64%. As per the Majeed scoring system all patients were clinically evaluated. The overall Majeed score was excellent in 77.27%, while good in 13.63% and poor in 9.09% of cases. As per Matta and Tornetta postoperative radiological evaluation was carried out.

Conclusion: Percutaneous iliosacral screw fixation and anatomic reduction give better stability in unstable sacroiliac joint injuries allowing good functional outcomes and early mobility. For sacral fracture and sacroiliac, joint injury with C arm guidance percutaneous iliosacral screw fixation is a minimally invasive and safe technique.

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1. Introduction

Pelvic ring fractures are becoming more common as the number of road traffic accidents increases. Stable fracture patterns are observed in injuries with low velocity. A high energy pelvic fracture generally causes unstable pelvic ring injuries which are generally managed operatively and the method of treatment depends upon the degree of pelvic stability. Sacral fractures or sacroiliac disruptions are usually consequences of unstable pelvic injuries.¹ For pelvic fractures management multidisciplinary approach is required in which hemodynamic stability should be the

primary goal.² Usually, bowel, urethral and associated bladder injuries are present in patients. Because of compound pelvic fractures and internal degloving injuries treatment is complicated.² At the level of greater trochanter wrapping a bedsheet around the pelvis or circumferential pelvic binder, the application is the primary treatment for unstable pelvic injuries resulting in decrease pelvic volume, producing a tamponade effect and stabilizing the raw surface.³ External fixator application to the pelvis allows access to the perineum and abdomen. Prolonged immobilisation is provided in conservative treatment and the patient can have increased dependency, sleep loss, chronic pain and decreased mobility.⁴

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Providing a stable pelvic ring to the patient, allowing ideal weight transmission to the limbs is the main aim of the surgical procedure. When compared to non-operative treatment surgical fixation of unstable pelvic injuries facilitates early weight-bearing and mobilization, improved fracture reduction, superior functional outcomes and shorter hospital stays. Under C-arm guidance, either one or two screws is used providing minimum invasive technique in percutaneous sacroiliac screw fixation.² As compared to conventional open techniques, percutaneous sacroiliac screw fixation firstly introduced by Routt steadily received popularity having advantages of decreased infection rates, limited blood loss and minimal invasion to compromised soft tissue.¹ After surgery, achieving functional and optimal anatomical restoration along with the survival of the patient are the main goals of treatment. For obtaining such configuration in depth 3-dimensional anatomical knowledge is required. Before planning for surgery as per the individual pelvic morphology anatomical variations should be taken into account. Preoperatively it is a must to evaluate inlet views, pelvis AP views, High-Resolution CT scan with 3D reconstruction and Outlet views in radiological evaluation.⁵

2. Aim

To study the functional and radiological outcome of percutaneous sacroiliac screw fixation of pelvic ring injuries in unstable fractures.

3. Materials and Methods

3.1. Study place

Tirunelveli medical college hospital.

3.2. Study type

Prospective study.

3.3. Sample size

22.

3.4. Study period

2017-2019.

3.5. Inclusion criteria

Pelvic fractures of Tile type B (rotationally unstable), Closed pelvic fractures, pelvic fractures of Tile type C (vertically and rotationally unstable), Denis zone 1 and zone 2 sacral fractures, Sacroiliac joint disruption more than 1 cm.

3.6. Exclusion criteria

Pelvic fractures Tile type A, Compound pelvic fractures, Zone 3 sacral fractures, Morel-Lavallée lesions.

3.7. Preoperative evaluation

1. Hemodynamically stabilized patients and followed ATLS protocol.
2. Primary and secondary survey to screen for any accompanying injuries.
3. Radiographic evaluation of pelvis (Inlet and Outlet views, anteroposterior view).
4. For understanding the pattern of fracture and its management CT pelvis with 3D reconstruction was studied.

3.8. Percutaneous iliosacral screw fixation

To reduce patient's morbidity, simultaneously maintaining an anatomic reduction, a percutaneous sacroiliac screw fixation technique is introduced. With recent advances in imaging technology, intraoperative assessment of fracture reduction and a better understanding of sacral anatomy, it is possible to carry out percutaneous insertion of sacroiliac screws. As the position of the patient is supine, from the nipple line distally entire lower abdomen was draped, including the leg involved if traction is needed. For lifting the buttock off the bed a radiolucent bump is used and better entry point access was achieved. OT table was positioned as such that lateral, anteroposterior, outlet and inlet views for radiographic evaluation are possible. On lateral view of the pelvis by tracing out sacrum ventral and dorsal aspects along with the superior border, the entry point was identified. Mark on the skin and Iliocortical density (ICD) was recognised. Two iliocortical densities superimpose and the greater sciatic notches are the true lateral view.⁶

3.9. Follow up

Patients follow up was taken at 4, 8, 12 weeks, 6 months and 1 year. The patient was subjected to the following evaluation on every visit.

1. Sacroiliac joint stress test (Faber's and Ganselon's test).
2. Patient's functional ability (history).
3. Assessment of implants (radiographs) for Infection, loosening, sacroiliac joint radiographic assessment, failure, AP view, outlet view, inlet view, patients functional outcome with pelvic outcome scale (Majeed scoring), all patients mean follow up was 15 months.

4. Results

Unstable pelvic fractures (Sacral fractures and sacroiliac joint disruptions) in 22 patients (Table 1) were surgically

treated and analyzed with 15 months follow up the average (range 4- 24 months). The patient's age was ranged from 16 to 70 years (Table 2). 39 years was the mean age. In this study, the predominance of male patients was observed with a male to female ratio of 16:6. Road traffic accidents were the most common cause followed by falls from height (Table 3). In this study, 11 patients (52.4%) were having correlated soft tissue and/or skeletal injuries (Table 4). The associated acetabular fracture was observed in 4 patients and 2 patients were suffering from multiple associated injuries. Nerve palsy (L5 root) was observed in 1 patient with associated sacral fracture which after surgery was recovered. Between surgery and injury, the average time delay was 4.3 days (range 1-12 days). 53 minutes (range 28-155) was the average surgical time. To obtain an anatomical reduction in 2 patients initially fixation applied externally then insertion of the percutaneous sacroiliac screw was carried out. According to the pelvic outcome scale by Majeed scoring the functional outcome of patients was excellent for 17 patients, in 3 patients it was good and fair in 2 patients (Table 5). Also, 13 patients were suffering from type C injury and 9 from type B out of 22 patients (Table 6).

Table 1: Type of unstable pelvic fractures

Type of injury	Number of patients
Sacroiliac disruption	7
Sacral Fractures	15

Table 2: Age of patients

Age in years	No. of patients	Percentage
<20	1	4.5
21-30	6	27.2
31-40	8	36.3
41-50	4	18.1
51-60	4	18.1
61-70	3	13.6
Total	22	100

Table 3: Mode of injury in patients

Mode of injury	No. of patients	Percentage
RTA	19	86.36
Fall from height	3	13.64

5. Discussion

Studies on pelvic fractures (sacral fractures and sacroiliac joint disruptions) and their natural history proved that in acute stage high mortality whereas in the long term chronic morbidity is observed with unstable pelvic fractures.⁷ Even with aggressive resuscitation which includes the application

Table 4: Associated injury with unstable pelvic fractures in patients

Injury associated	No. of patients
Shaft of humerus fracture	1
Distal radius fracture	1
Clavicle fracture	2
Shaft of femur fracture	1
Shaft of tibia fracture	2
Acetabulum fracture	4
Nerve injury (L5 root)	1
Urethral injury	2
Urinary bladder injury	1
Head injury	3
Chest injury	4

Table 5: Functional outcome of patients

Outcome	Percentage
Excellent	77%
Good	14%
Fair	9%
Poor	0%

Table 6: Classification of injuries in patients

Classification	No. of patients
B1	3
B2	5
B3	1
C1	7
C2	5
C3	1

of external fixators, morbidity and mortality are high (10-20%). This resulted in clinical trials on fixation of pelvic fractures internally and various clinical studies observed that early surgery and stable internal fixation increases survival chances and more importantly, the incidence of morbidity is reduced.⁸

Males are injured most often with the ratio of 16:6 (Male: Female). In our study, the most frequent road traffic accident (86.3%) mode of injury. 81% of road traffic accidents were reported in a prospective study of Sunny Brook Medical Centre.⁹ The major associated injury was skeletal injury (50%), in which extremities and acetabular fracture are frequent in our series. The major associated injury was head injury (38%) in the study carried out by Sunny Brook Medical Center whereas skeletal injuries were the most common associated injury reported by Cole et al.⁷

In 24 of 39 patients who suffered from associated skeletal injuries were suffering from vertically and rotationally unstable pelvic injuries according to a study by Tornetta et al.⁵ By using a CT scan and 3 standard views of X-ray (AP, outlet and inlet) radiological assessment was carried out. 13 patients were suffering from type C injury and 9 from type B out of 22 patients. The single most common subtype

observed (7 cases i.e. 31.8%) was Tile's type C1 (unilateral vertical shear) followed by C2 and B2 (each with 5 cases). The remaining B1, B2 and C3 consist of 1 case each. Tile's type C1 was reported in upto 75% of cases in a study of 64 vertically unstable injuries by Cole et al. On the other hand, 31 cases of type B and 24 cases of type C injuries were reported out of 80 patients by Miranda et al.¹⁰ In the present study, 2 patients were suffering from urethral injury and 1 from bladder injury amongst 22 patients as compared to a study done by Sunil et al who reported 17 patients having urogenital injuries commonest being an injury to the urethra (8 cases) out of 78 cases of pelvic fractures. In 15 out of 55 patients urological injury was observed with type B and C injuries by Miranda et al.¹⁰ Out of 64 cases of type C injury 18 patients showed injury to the urethra in a work by Cole et al.⁷ In the current study, DVT thromboprophylaxis was used in patients needing prolonged bed rest and associated injuries that warranted immobilization.

In this study L5, root palsy was observed in 1 patient on admission which in 9 months enhanced to a motor power of 4. Postoperative paresthesia in S1 dermatome was developed in 1 patient, which after 2 months was improved. However, in his series 19 cases of neurological injury were reported by Cole et al.⁷ Out of 48 unstable posterior pelvic ring disruptions 35% of significant neurological injuries were reported by Toreneta et al in his study.⁵ We operated on patients both in prone and supine positions. The supine position was preferred in patients with external fixator with unstable anterior pelvic ring needing traction for reduction. Prone position was used for patients suffering from isolated Posterior ring injuries. Almost in all patients single screw was needed except in 2 patients suffering from Tile-type C2 and C3 needed bilateral sacroiliac screw fixation. The supine position was preferred by us as it is having good radiographic orientation and more anatomical. Inlet and the outlet image changes in the prone position but good access to screw insertion were achieved by it.

In this study, percutaneous sacroiliac screw fixation and closed reduction were used to treat 22 patients. After internal fixation of sacroiliac joint disruptions, 86.3% of patients showed good results, suffered from pelvic outcome scale and Majeed scoring. Whereas in a study by Tornetta et al 48 patients suffering from unstable posterior pelvic injuries 67% of patients showed good functional results when treated with internal fixation and open reduction.⁵

6. Conclusion

There is a continuous rise in unstable pelvic injuries so their prompt aggressive and thoughtful treatment of the patients is a prerequisite for increasing quick survival and long term functional outcome. Percutaneous iliosacral screw fixation and anatomic reduction give better stability in unstable sacroiliac joint injuries allowing good functional outcomes and early mobility. Similar good results to internal fixation were observed with percutaneous sacroiliac screw fixation.

However, problems of achieving anatomical reduction were increased with delayed fixation. If anatomical reduction was achieved, a good functional outcome can also be achieved even with delayed fixation. For sacral fracture and sacroiliac, joint injury with C arm guidance percutaneous iliosacral screw fixation is a minimally invasive and safe technique. To avoid malpositioning of iatrogenic neurovascular injuries and screws accurate interpretation and clear images of CT scans, X-rays and preoperative images of the C arm are important.

7. Conflict of Interest

None.

8. Source of Funding

None.

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Cite this article: Eswarapandi S, G Balasubramanian, Herbert SA. To study the outcome of sacro-iliac percutaneous screw fixation in unstable fractures of pelvic injuries. *Panacea J Med Sci* 2023;13(1):171–174.