



A Case series of Percutaneous screw fixation for sacroiliac joint results and outcome SHANMUGARAJA M

Department of Orthopaedic Surgery, MADRAS MEDICAL COLLEGE AND GOVERNMENT GENERAL HOSPITAL

Abstract : Aim The aim of this study is to present clinical and radiological results of patients treated with closed reduction and percutaneous sacroiliac screw fixation for unstable pelvic ring fractures. METHODS A retrospective study of six patients who had undergone percutaneous sacroiliac fixation between 2014 and 2015 in our institution. RESULTS All patients had a satisfactory initial reduction. No cases of screw misplacement or neurological deficit were found. Patients were followed up for minimum of 6 months. Functional outcome was assessed using majeed pelvic scoring system. Four patients had excellent and two patients had good outcome. One patient had associated facial injury which was treated conservatively. CONCLUSION The use of percutaneous sacroiliac screws provides a safe and effective technique for the management of unstable posterior pelvic ring injuries.

Keyword : unstable pelvic ring injuries, sacroiliac joint disruption.

Introduction:

The increase in high energy trauma has led to an increase in the number of unstable pelvis injuries. Unstable pelvic ring injuries usually occur in polytrauma patients and are associated with high mortality and morbidity rates(1,2). Percutaneous screw fixation of sacroiliac joint dislocations, fracture-dislocations and sacral fractures has gained increased popularity in recent times. The high reported complication rates of pelvic fractures are not only related to the injuries. High morbidity rates are also related to the traditional methods of open reduction and internal fixation used to achieve and maintain the desired anatomical reduction. These complications are mostly related to wound breakdown. Large extensile approaches through attenuated soft tissues have in the past led to wound-related complications as high as 27%(3). The pelvic haematoma can also be disturbed which can lead to secondary blood loss. Because of these complications, surgery was often delayed to allow the soft tissues to settle down and the pelvic haematoma to mature. The work of Judet and Letournel has led to the gradual development of pelvic surgery over the years (4,5). A reduction in the size of the operative approach

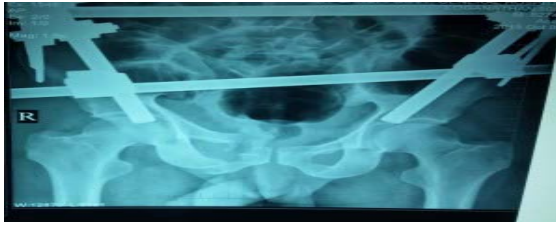
for pelvic surgery is desirable. Percutaneous fixation of pelvic injuries was first described by Routt in 1993(6). This method is biomechanically comparable to open reduction and internal fixation with plates and screws but offers the advantages of minimally invasive surgical techniques. According to the studies by Comstock et al (7), Gorczyca JT et al(8), Krapinger et al(9), Shaw JA et al(10) there is no biomechanical advantage of sacroiliac plating over sacroiliac screw fixation. The rate of screw misplacement and hardware failure is around 2-10 percent.

Materials and methods.

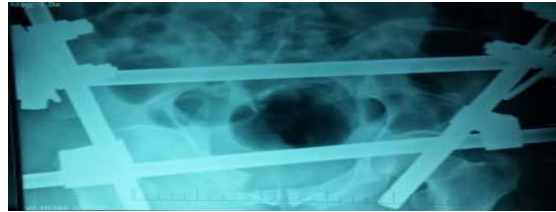
A retrospective study of six patients who had percutaneous sacroiliac fixation between 2014 and 2015 in our institution. The average age of the patients was 30.66 years (range 16 to 50 years). The average time delay in surgery was 12 days. The patients were followed up for minimum period of six months. Placement of the percutaneous screws is performed under fluoroscopic guidance. The C-arm is positioned opposite the side of the pelvis to be fixed. We use a radiolucent orthopaedic table and the patient is positioned such that the C-arm can clear the base of the table to allow inlet and outlet view. All patients receive bowel preparation the day before surgery to enable fluoroscopic visualisation of the radiographic landmarks. We perform the procedure in the supine position and reduction is achieved by closed means and checked under screening. Closed reduction is achieved by IRTOTLE technique(11) (internal rotation and taping to the lower extremity) and by a sheet wrapped around the pelvis(12) with hole for iliosacral screw placement and then the entry point is determined on the lateral view in the S1 segment just below the iliac cortical density. Once the entry point has been established, inlet and outlet views taken to ensure the safe advancement of the screw. The inlet projection is helpful for orienting the path of the screw towards the anterior aspect of the promontory, the outlet projection ensures that the screw is above the S1 foramen heading toward the superior endplate of S1. Sacroiliac screw's trajectory for Sacroiliac dislocation should be perpendicular to the plane of the SI joint. From posterior to anterior and from inferior to superior as the screw travels medially. We used partially threaded 6.5mm cannulated screws to stabilize sacroiliac joint.

Case

Pre op X rays



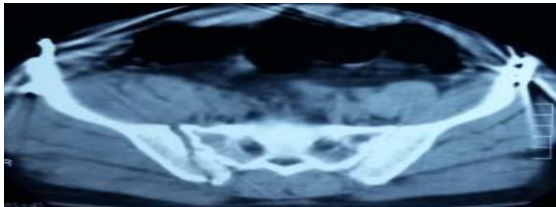
(fig 1 Pre operative AP view)



(fig 2 Pre operative inlet view)



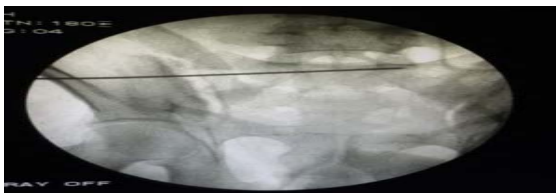
(fig 3 Pre operative outlet view)
Pre op CT Scan



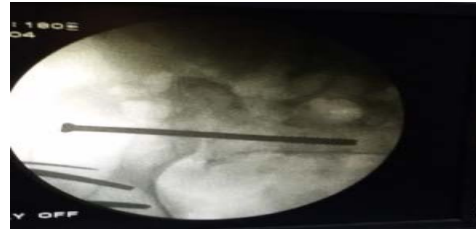
(fig 4 Preoperative CT Scan) Intraoperative pictures



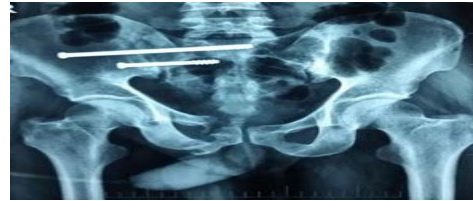
(fig 5 Intra operative clinical picture)



(fig 6 Intraoperative outlet view)



(fig 7 Intraoperative inlet view)
Post op X rays



(fig 8 Post operative AP view)



(fig 9 Post operative outlet view)



(fig 10 Post operative inlet view)

50 years old male patient who sustained injury due to fall from height . Patient had ilium fracture with sacroiliac joint disruption. Percutaneous sacroiliac fixation done for sacroiliac joint disruption. **Closed reduction is achieved by IRTOTLE technique(11) (internal rotation and taping to the lower extremity) and by a sheet wrapped around the pelvis(12) with hole for iliosacral screw placement.** Entry point is made by taking the lateral projection (fig 5). In the lateral projection guide wire is placed below iliac cortical density at the posterior cortex of the sacral body. Outlet projection taken to direct the guide wire in a cephalad direction above the S1 foramen toward the superior endplate (fig 6). Inlet projection taken to guide wire's trajectory directed towards the anterior aspect of the S1 body (sacral promontory) (fig 7). Guide wire advanced into the anterior aspect of the S1 vertebral body and promontory to a point just past the midline. Sacroiliac screw should be directed as close to the superior endplate and anterior aspect of S1 to stay as far from the S1 foramen as possible. A second Sacroiliac screw can be placed into S1 or S2. Biomechanical studies have shown increased stability with a second screw into the S2 vertebral body than into S1.

Results

All patients had a satisfactory initial reduction. No cases of screw misplacement or neurological deficit were found.

Patients were followed up for minimum of 6 months. Functional outcome was assessed using Majeed pelvic scoring system. Four patients had excellent and two patients had good outcome. One patient had associated facial injury which was treated conservatively.

Majeed pelvic scoring system	
Pain (30 points)	
Intense, continuous at rest	0-5
Intense with activity	10
Tolerable, but limits activity	15
With moderate activity, abolished by rest	20
Work(20 points)	
No regular work	0-4
Light work	8
Change of job	12
Same job, reduced performance	16
Same job, same performance	20
Sitting(10 points)	
Painful	0-4
Painful if prolonged or awkward	6
Uncomfortable	8
Free	10
Standing(36 points)	
A.Walking aids (12 points)	
Bedridden or almost	0-2
Wheelchair	4
Two crutches	6
Two sticks	8
One stick	10

No sticks	12
B.Gait unaided (12 points)	
Cannot walk or almost	0-2
Shuffling small steps	4
Gross limp	6
Moderate limp	8
Slight limp	10
Normal	12
C.Walking distance (12 points)	
Bedridden or few meters	0-2
Very limited time and distance	4
Limited with sticks, difficult without prolonged standing possible	6
One hour with a stick	8
One hour without a stick	10
Normal for age and general condition	12

Grading of Majeed Pelvic scoring system		
Working before injury	Not working before injury	Grade
>85	>70	Excellent
70 to 84	55 to 69	Good
55 to 69	45 to 54	Fair
< 55	<45	Poor

Discussion:

With the increase in high energy trauma, there is increase in the amount of pelvic trauma. Initially many of these injuries have been treated by open procedures. The methods of fixation include anterior and posterior plating, trans-sacral bars and tension band plating. Open treatment of these injuries allows direct visualisation and therefore anatomical reduction of the fractures. The extensive exposures used for these procedures however lead to wound-related problems. In some instances the complications of the fixation have been more severe than the complications related to conservative management. Open procedures can also lead to disturbance of the pelvic haematoma and secondary haemorrhage. This has led to increasing interest in percutaneous methods of fixation as described by Routt et al. in 1995. The major advantages of performing percutaneous procedures are decreased surgical time and surgical exposure. **According to the studies by Comstock et al(7) , Gorczyca JT et al(8) , Krapinger et al(9) , Shaw JA et al (10) there is no biomechanical advantage of sacroiliac plating**

over sacroiliac screw fixation. The rate of screw misplacement and hardware failure is around 2-10 percent. This leads to a major decrease in blood loss during surgery, and the smaller exposure leads to far fewer soft tissue complications. A number of different intra-operative imaging modalities have been used to place sacroiliac screws. Previously described techniques include fluoroscopy, sonography, CT scan and computer assisted placement. Fluoroscopy is the imaging technique used in our unit. Relative contra-indications to percutaneous fixation are sacral dysplasia or other anatomical dysmorphism of the pelvis. These anatomical abnormalities may decrease the size of the safe zone for placement of sacroiliac joint screws. **The limitations of our study are less number of patients ,Less follow up period and there is no comparison with other methods of sacroiliac fixation.** Poor intra-operative visualisation necessitates the abandonment of percutaneous fixation and warrants conversion to open fixation.

Limitations:

The limitations of our study are less number of patients ,Less follow up period and there is no comparison with other methods of sacroiliac fixation.

Conclusion:

Percutaneous iliosacral screw fixation is a rapid, safe and definitive treatment for an unstable pelvic ring injury.

References:

1. Tile M. Pelvic ring fractures: Should they be fixed? J Bone Joint Surg 1988;70B:1-12.
2. Rommens P. Is there a role for percutaneous pelvic and acetabular reconstruction? Injury Int J Care Injured 2007; 38:463-77.
3. Schweitzer D, Zylberberg A, Co'rdova M, Gonzalez J. Closed reduction and iliosacral percutaneous fixation of unstable pelvic ring fractures. Injury Int J Care Injured 2008;39: 869-74.
4. Judet R, Judet J, Letournel E. Fractures of the acetabulum: classification and surgical approaches for open reduction: preliminary report. J Bone Joint Surg Am 1964;46-A:1615-46.
5. Giannoudis P, Tzioupis C, Pape H, Roberts C. Percutaneous fixation of the pelvic ring. J Bone Joint Surg Br 2007;89-B:145-54.
6. Routt M, Meier M, Kregor P. Percutaneous iliosacral screws with the patient supine technique. Oper Techn Orthop 1993;3:35-45.
7. comstock CP , van der meulen MCH , Goodman SB. Biomechanical comparison of posterior internal fixation technique for unstable pelvic fracture J Orthop Trauma. 1996;10(8):517-522
8. Gorczyca JT , Varga E et al. The strength of iliosacral lag screws and trans iliac bars in the fixation of vertically unstable pelvic injuries with sacral fractures Injury.1996;27:561-564.
9. Krappinger D , Larndorfer R , Struve Pet al. Minimally invasive transiliac plate osteosynthesis for type C injuries of the pelvic ring: A clinical and radiological follow up. J Orthop Trauma. 2007;21:595- 602.
10. Shaw JA, Mino DE, Werner FW, et al. Posterior stabilization of pelvic fractures by use of threaded compression rods. Case reports and mechanical testing. Clin Orthop Relat Res 1985;192:240-254.
11. Gardner MJ , Prasad S , Routt MLC Jr. Internal rotation and taping of the lower extremities for closed pelvic reduction. J Orthop Trauma. 2009;23:361-364
12. Gardner MJ , Osgood G, Molnar R et al. Percutaneous pelvic fixation using working portals in a circumferential pelvic antishock sheet. J Orthop Trauma. 2009; 23:668-674.

