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Operative management and radiological outcome of sacroiliac joint fractures and dislocation: A cross sectional study

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Abstract

Pelvic ring fractures are the most unstable fractures because of the posterior ring disruption. Motor vehicle accidents lead to high-energy pelvic ring fractures, which leads to the sacroiliac joint disruption with complete or incomplete posterior ring disruption. Surgical correction of unstable pelvic fractures is must for better functional outcomes. This study was conducted to assess the short term functional and radiological outcome of the percutaneous sacroiliac screw fixation for sacral fractures and sacroiliac fracture dislocations based on scoring system suggested by Merle d' Aubigne' and Postel.

All adult patients in the age group 15 to 70yrs presenting with sacral fractures and sacroiliac dislocations treated with percutaneous sacroiliac screw fixation were included in the study. 23 patients satisfying the inclusion criteria were included, and followed up over a period of 6 months. 47.8% of the patients required one screw during the surgery. 77% patients had good union of fractures, 18% had malunion and one patient had delayed union. There was no significant association between number of screws used and radiological outcome. There was significant association between radiological outcomes with associated injury with hip.

Keywords: Pelvic ring fractures, Sacroiliac joint disruption, Hip Injury.

Introduction

Pelvic injuries account for 3% of all skeletal fractures [1] and about 40% are unstable because of posterior ring disruption [2]. High-energy pelvic fractures result most commonly from motor vehicle accidents, falls, motorcycle accidents, automobile-pedestrian encounters, and industrial crush injuries [3].

Sacroiliac joint disruption is commonly associated with high energy pelvic ring fractures when a vertical shear force, the lateral compression or anteroposterior compression force were the mechanism of injury. Disruption of the sacroiliac joint could be associated with incomplete or complete posterior ligamentous disruption, the mechanism of injury and its severity decide whether the injury is rotationally unstable or rotationally and vertically unstable [4].

Surgical fixation of unstable pelvic injuries provides improved fracture reduction, early weight bearing and mobilization, lower mortalities, shorter hospital stays, and superior functional outcomes compared to non-operative treatment [5, 6].

Earlier classical method of surgical management of SI joint fracture dislocation consisted of open reduction and internal fixation by sacral bars or plates. These implants carried a substantial risk of larger dissection, prominent implants, infection, iatrogenic injuries and excessive blood loss [7].

Ilio-sacral screw fixation has become a popular technique for treating unstable injuries of the pelvis that involve the posterior ring. In this procedure, one or two large screws (6.5–7.3 mm diameter) are inserted under fluoroscopic guidance through the ilium, across the sacroiliac articulation, and into the superior sacral vertebral bodies using percutaneous technique.

This study is formulated to assess the short term functional and radiological outcome of the percutaneous sacroiliac screw fixation for sacral fractures and sacroiliac fracture dislocations based on scoring system suggested by Merle d' Aubigne' and Postel.

Materials and Methods

Study Site: Jehangir Hospital and other tertiary care hospitals in Pune, Maharashtra.

Study Design: Cross sectional study

Duration of Study: Duration of study 1st July 2014 to 31st December 2015.

Study Population: All patients with following inclusion and exclusion criteria in our hospital and various tertiary care hospitals in Pune were included.

Criteria for Inclusion

- All adult patients both male and female in the age group 15 to 70yrs presenting with Sacral fractures and sacroiliac dislocations treated with percutaneous sacroiliac screw fixation.
- All patients radiologically diagnosed to be having unstable pelvic ring fractures requiring stabilization.

Criteria for Exclusion

- Patient population explicitly consisting of infants and adolescents.
- Patients treated by conservative methods.
- Patients treated by methods other than percutaneous sacroiliac screw fixation.
- Patients of polytrauma with Hemodynamic instability and patients who are bedridden for long term due to other injuries like head injury, spinal injury etc.
- Patients who could not be followed up for 6 months post-surgery.
- Patients with sacral dysmorphism and other unusual pelvic anatomical variations.
- Patients with Renal, Hepatic and Cardiac dysfunctions.
- Patients with neurologic/ urologic injury.

Ethical approval was obtained from the institutional Ethics committee and patients willing to participate by giving written informed consent were included in the study.

Sample size: This sample size has been selected after taking into consideration the prevalence of the disease, previous studies and number of cases presenting to various tertiary level hospitals in past years.

By considering the prevalence of the posterior ring injuries at our tertiary care Centre from the previous data is 1.30%

We have calculated the sample size by using following formula

$$N = 4 * P * Q / L^2$$

Where,

P- Prevalence of disease

$$Q = 100 - P$$

L is experimental error (5%)

$$N = 20.52 = 21$$

Over the duration of study period we have studied 23 cases

Follow up time: 6 months.

Methodology

The prospective case series was carried out at different tertiary level hospitals in the city of Pune under a single surgeon. 23 consecutive patients were treated by percutaneous Sacroiliac screw fixation for pelvic fractures according to a standardized protocol. All patients with pelvic fracture returned for outpatient follow-up for a minimum of at least 6 months after surgery were evaluated with use of a Modified Merle d' Aubigne' and Postel clinical score. Detailed history and examination was carried out with the predesigned and pretested semi structured questionnaire. Patients were evaluated for radiological outcome at the end of 6 months.

Statistical analysis

Results were presented as per requirement in terms of frequencies and percentages, Chi square test was applied as per the requirement.

Results

1. Number of screws used:

Table 1: Number of screws used

Number of screw used	Number of patients	Percentage (%)
1	11	47.8
2	11	47.8
3	1	4.3
Total	23	100.0

Comments

Almost half of the patients (47.8%) required 1 screw, the other half required 2 screws while only 1 out of the total 23 patients required 3 screws for fixation.

2. Radiological outcome:

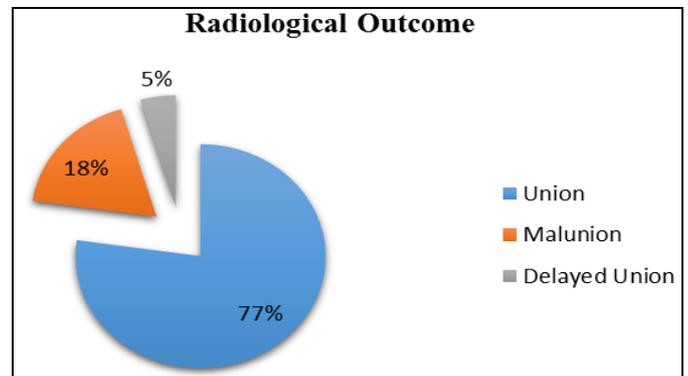


Fig: Radiological outcome

Comments

In 77% of the patients the fractures united; while in 18% there was malunion and in 1 patient there was delayed union. One patient was lost to follow up due to death of the patient.

3. Correlation between number of screws used and Radiological outcome

Table 2: Correlation between number of screws used and Radiological outcome

Number of screw used	Score group			Total	p-value
	Union	Malunion	Delayed Union		
1	9	1	1	11	0.297
2	8	2	0	10	
3	0	1	0	1	
Total	14	6	2	22	

Comments

By using Fisher's exact test p -value > 0.05 therefore there is no significant association between outcome with number of screw used and radiological outcome.

4. Correlation between Radiological outcome and associated Hip injury

Table 3: Correlation between Radiological outcome and associated Hip injury

Associated injury with hip	Radiological outcome			Total	p-value
	Union	Mal Union	Delayed Union		
Yes	1	3	0	4	0.010
No	16	1	1	18	
Total	17	4	1	22	

Comments

➤ By using Fisher's exact test p -value < 0.05 therefore there is significant association between radiological outcomes with associated injury with hip.

Conclusion and Discussion

- The purpose of this study was to evaluate the operative management and radiological results after the surgery for sacral fractures and sacroiliac fracture dislocations. We studied a consecutive series of 23 patients post-operatively with a follow-up time period of 6months. All the surgeries were performed by a single surgeon, with the help of assistant surgeons.
- Most of the patients either required one or two screws (47.8% each) while only 1 patient among all 23 required 3 screws for fixation.
- In 77.3 % of the patients, fractures united while in 4 patients (18.2 %) there was malalignment and in 1 patient had delayed union. This is similar to other studies in which the screw misplacement occurred in 2% - 15% of the patients^{8, 9 and 10}.
- The statistical analysis suggests that this poor radiological outcome was dependent on the fact whether patient had associated injuries like hip dislocation, acetabulum fracture or lower limb injury.

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