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Sacroiliac screw fixation for pelvic ring fractures: A cross sectional study

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Abstract

Pelvic ring fractures are the most difficult to treat fractures in adults, with the increase in prevalence of road traffic accidents, the number of pelvic fractures is increasing over the period of time. The mortality in these pelvic fractures can reach up to 20%, despite the modern treatment modalities being available. Ilio-sacral screw fixation has been used frequently to treat unstable posterior pelvic ring fractures, where one or two screws are used.

Patients scheduled to undergo percutaneous sacroiliac screw fixation for pelvic ring fracture were included in the study. This study aims to find out the correlation of outcome based on Merle d' Aubigne' and Postel scoring of Patients treated with percutaneous sacroiliac screw fixation. The patients had mean hospital stay of 11-12 days.

The study had total of 23 patients of posterior pelvic ring fracture, out of which one patient had died. Amongst the remaining 22 patients, 87% had history of Road Traffic Accidents trauma. 78% patients had associated injuries. The study used Modified Merle d'Aubigne' & Postel Clinical Score to see for the functional outcome, which consisted of scoring based on pain, walking and range of motion, the study found significant association between score and associated injury with hip.

Keywords: Pelvic Ring Fractures, Modified Merle d'Aubigne' & Postel Clinical Score, Road Traffic Accidents, Sacroiliac Screw Fixation

Introduction

Fracturing of the pelvis with rupturing of posterior osteo-ligamentous structures and the sacroiliac joint is associated with high morbidity and mortality, due to lesions that cause hemodynamic instability and hypovolemic shock^[1, 2].

Most injuries to the pelvic ring are due to high-energy trauma. Despite the advances of modern medicine, such as external fixation, angiography and cardiopulmonary resuscitation, the mortality rate due to pelvic fractures may still reach up to 20% of the cases. Posterior lesions of the pelvis imply complications that are even more serious than those of the anterior region^[3, 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].

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.

The current study was taken up to study the correlation of outcome based on Merle d' Aubigne' and Postel scoring of Patients treated with percutaneous sacroiliac screw fixation.

Objective

To study the correlation of outcome based on Merle d' Aubigne' and Postel scoring of Patients treated with percutaneous sacroiliac screw fixation.

Methodology

A Prospective non-randomized study of patients scheduled to undergo percutaneous sacroiliac screw fixation for pelvic ring fracture. The study was conducted at Jehangir Hospital and other tertiary care hospitals in Pune, Maharashtra. All adult patients treated in our hospital and various other tertiary care hospitals in Pune were taken as study subjects. Considering prevalence of the posterior ring injuries at our tertiary care Centre from the previous data as 1.30%. Sample size of 21 was calculated. Patients were followed up after 6 months. Ethical approval was obtained from the institutional Ethics committee and patients willing to participate by giving written informed consent were included in the study.

Results

The study had total of 23 patients of posterior pelvic ring fracture. There was one death on the 5th postop day so the data is representative of 22 patients. Among the patients, the average age of the patients was 33.73 years. 43.4% patients were in the age group less than 30 years. Maximum number of patients (69.5%) were in the age group 21-40yrs, indicating the prevalence of the injuries in younger population due to their involvement in RTA/Trauma. These were studied and was found that 87 % of the patients had history of RTA indicating that posterior pelvis ring injuries are a result of high velocity trauma. Nearly 78 % patients had associated injuries involving upper and lower limb and also injuries of chest and abdomen. Out of 18 patients with injuries other than SI joint, 4 had associated hip injury (dislocation, anterior column fracture etc.).

The study used Modified Merle d'Aubigne' & Postel Clinical Score to see for the functional outcome, it consisted of scoring based on pain, walking and range of motion. Then this was graded into 3 grades of good, fair and poor. In our study 63.6 % patients had Good functional outcome based on Modified Merle d'Aubigne' & Postel Clinical Score while only 2 patients (9.1 %) had poor functional outcome.

The study also access any correlation between Modified Merle d'Aubigne' & Postel Clinical Score and age group, by using Fisher's exact test (Fig 1) the p-value was > 0.05, which suggested that there was no significant association between outcome with respect to score and age group (years).

The study used different number of screws to fix the fracture

when the association was seen between no. of screws used and Modified Merle d'Aubigne' & Postel Clinical Score (Table no 1), with p value of 0.198. There was also no association between functional outcome and the side affected (Table no 2).

The study had mean hospital stay of 11-12 days which was shorter than previous studies which had average 20-24 days of hospital stay⁷. There was no association found between stay in the hospital and Modified Merle d'Aubigne' & Postel Clinical Score (Table 3). (Table 4) the study also saw any Relation between Modified Merle d'Aubigne' & Postel Clinical Score and TIAS, there was no relationship seen ANOVA used to see the relation (p value 0.995).

In our study Compared to isolated SI joint injury, clinical outcome seen in patients with associated ipsilateral or contralateral pelvic injuries including acetabular fractures, hip dislocations were not good due to problems occurred during rehabilitation. And when we tried to see for correlation between Modified Merle d'Aubigne' & Postel Clinical Score and associated hip injury (Table 5 and Fig 2). The study found significant association between score and associated injury with hip p value was found to be <0.05.

In our study related to number of screws used for SI fixation there is no significant association between functional outcome with number of screw used and radiological outcome (p value >0.05). We have also found that it is better to limit the placement of iliosacral screws to the pedicles of S1, as those of S2 are narrow and difficult to visualize with conventional fluoroscopy.

Thus, in our study we have observed that the Radiological scores are directly proportional to anatomic reduction. The functional outcome was not heavily dependent on anatomical reduction due to other factors such as injuries to acetabulum, femur, tibia and ipsilateral upper limb.

Table 1: Correlation between no. of screws used and Modified Merle d'Aubigne' & Postel Clinical Score.

| Number of screw used | Score group | | | Total | p-value |
|----------------------|-------------|------|------|-------|---------|
| | Good | Fair | Poor | | |
| 1 | 9 | 1 | 1 | 11 | 0.198 |
| 2 | 4 | 5 | 1 | 10 | |
| 3 | 1 | 0 | 0 | 1 | |
| Total | 14 | 6 | 2 | 22 | |

Table 2: Correlation between side affected and Modified Merle d'Aubigne' & Postel Clinical Score.

| Side affected | Modified Merle d'Aubigne' & Postel Clinical Score | | | Total | p-value |
|---------------|---|------|------|-------|---------|
| | Good | Fair | Poor | | |
| Right | 7 | 2 | 2 | 11 | 0.687 |
| Left | 6 | 3 | 0 | 9 | |
| Bilateral | 1 | 1 | 0 | 2 | |
| Total | 14 | 6 | 2 | 22 | |

Table 3: Correlation between Stay in the hospital and Modified Merle d'Aubigne' & Postel Clinical Score

| Modified Merle d'Aubigne' & Postel Clinical Score | Number of patients | Hospital stay (days) | | p-value |
|---|--------------------|----------------------|-----|---------|
| | | Mean | SD | |
| Good | 14 | 11.2 | 4.1 | 0.854 |
| Fair | 6 | 12.2 | 2.8 | |
| Poor | 2 | 11.0 | 1.4 | |

Table 4: Relation between Modified Merle d'Aubigne' & Postel Clinical Score and TIAS.

| Merle de Obigne and Postel's Score | Number of patients | TIAS | | p-value |
|------------------------------------|--------------------|------|-----|---------|
| | | Mean | SD | |
| Good | 14 | 4.6 | 2.4 | 0.995 |
| Fair | 6 | 4.7 | 1.9 | |
| Poor | 2 | 4.5 | 0.7 | |

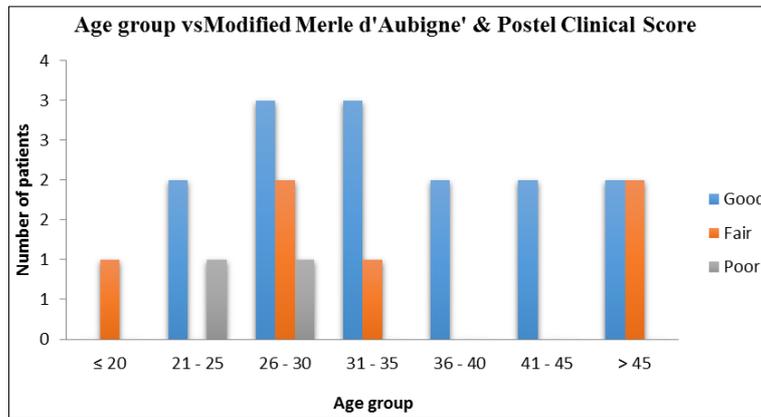


Fig 1: Modified Merle d'Aubigne' & Postel Clinical Score and age group correlation.

Table 5: Correlation between Modified Merle d'Aubigne' & Postel Clinical Score and associated hip injury

| Associated injury with hip | Modified Merle d'Aubigne' & Postel Clinical Score | | | Total | p-value |
|----------------------------|---|------|------|-------|---------|
| | Good | Fair | Poor | | |
| Yes | 0 | 4 | 0 | 4 | 0.004 |
| No | 14 | 2 | 2 | 18 | |
| Total | 14 | 6 | 2 | 22 | |

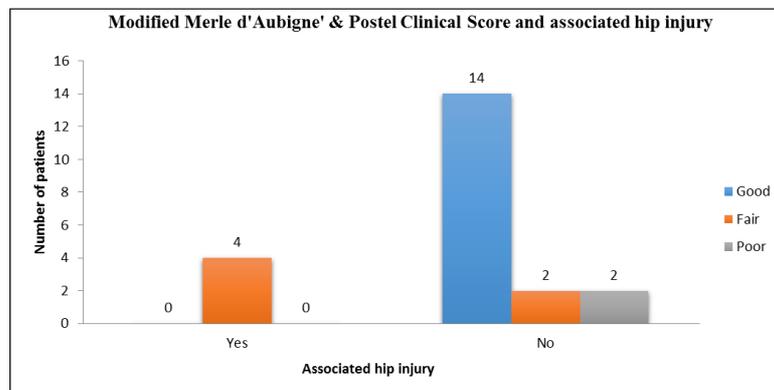


Fig 2: Correlation between Modified Merle d'Aubigne' & Postel Clinical Score and associated hip injury

Conclusion

In our study we have used percutaneous method of fixation of SI joint screw in 23 consecutive patients and studied the post-operative functional and radiological outcome. Maximum no. of patients were young active individuals, male patients were most common than female patients, male to female ratio is 2.4:1 in present study. 86.5% patients were under 40 years, mean age is 31 years. RTA was most common in causing ACL injuries followed by fall and sports injuries in present study. We have observed that the radiological outcome is directly proportional to the anatomic reduction achieved during the surgery. However Functional outcome is hugely dependent on many variables apart from anatomic reduction like associated hip injuries, femur and tibia fracture and injuries to upper limb which delay the rehabilitation program. Complications like neurological injuries, delayed union, implant failure, vascular injury etc. all these hugely influence the final functional and radiological outcome of the patient. There is no association between functional outcome and age, number of screws used and also duration of stay. There was also no correlation between the sides affected, but there is association of functional outcome and hip injury. If there is hip injury then the functional outcome is poor.

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