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Short term functional outcome of single percutaneous Ilio-sacral screw fixation in posterior pelvic ring injuries

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Abstract

Objective: To evaluate functional outcome of single percutaneous iliosacral screw fixation in posterior pelvic ring injuries.

Materials and Methods: 20 adult patients of either sex with partially or completely unstable posterior pelvic ring injuries with or without anterior ring injuries admitted between October 2016 to November 2018 were treated with single percutaneous iliosacral screw fixation. The patients were followed clinically and radiologically at four, ten, sixteen and twenty four weeks and assessed with Majeed Pelvic Score.

Results: There were 15 male and 5 female with mean average age of 38.1 with 60% being Tiles Type C and 40% being Tiles type B injuries. Out of 20 patients 17 patients (85%) were found to have excellent functional outcome 2 patients (10%) had Good and 1 patient (5%) had fair functional outcome based on clinical grade of Majeed Pelvic score. 1 patient had screw breakage. No patient had Neurological deficit. No case of infection was reported.

Conclusion: The results obtained in our study compare well with other studies undertaken in the past and shows that single percutaneous iliosacral screw fixation is safe and efficacious procedure for fixation of sacral fracture and sacroiliac disruption.

Keywords: percutaneous iliosacral fixation, majeed score, unstable posterior pelvic injuries

Introduction

The posterior pelvic injury is regarded as more Critical one, requiring an accurate reduction and maintaining it with stable fixation. If there is complete instability of the posterior ring, anterior fixation can neither maintain posterior reduction nor restore stability^[1].

Historical studies describing the non-operative treatment of displaced pelvic fractures (Tile Type B and C) with traction or a pelvic sling have shown disappointing results. In most of these reports of these injuries, nearly half of patients had moderate to severe pain after non operative treatment. The significant morbidity associated with non-operative treatment of displaced, unstable pelvis fractures has led to a more aggressive operative approach^[2].

Stabilisation of the posterior ring probably causes the most angst among surgeons because of the potential Neurovascular structures at risk during surgical intervention^[1] For Sacral and Sacroiliac joint disruptions, image intensifier directed percutaneous screw fixation has been recommended nowadays^[2].

Along with many advantages this Technique also risks damage to the L5 and S1 Nerve roots and Iliac Vessels anterior to the body of the sacrum and the sacral nerve roots within its bony confines and it requires excellent radiographic technique and a thorough understanding of the 3D anatomy of the Pelvis^[2].

Outcome of pelvic ring fractures have been difficult to evaluate because of the heterogeneity in existing studies and classification schemes. As is the case with many trauma outcome scores, many patients are multiply injured and thus it is a challenge for the functional evaluation to relate the outcome to a particular injury types^[1].

Hence there is a need to Study the functional outcome of percutaneous iliosacral screw fixation in sacroiliac injuries.

Materials and Methods

It was a prospective study of 20 patients (aged above 18 years) with clinical and radiological diagnosis of partially and completely unstable posterior pelvic ring injuries. It was conducted during the period between November 2016 to October 2018 in the department of Orthopaedics, Bangalore Medical College and Research Institute, Bangalore- a tertiary care centre.

Patients with partially and completely unstable posterior pelvic ring injuries with or without anterior pelvic ring injury were operated percutaneously with one Partially/Fully threaded Canulated cancellous Iliosacral Screw after closed reduction with manual traction.

Inclusion criteria under the study

1. Partially and completely unstable posterior ring injuries- Type B and C Tile's Classification confirmed on Antero-posterior and lateral X rays.
2. Skeletally Mature patients of either sex.
3. Patients willing to give written informed consent.

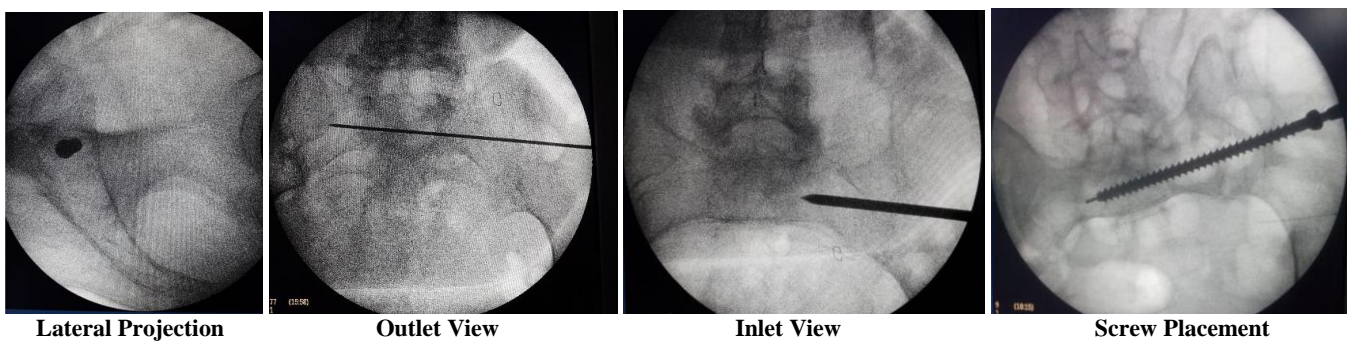
Exclusion criteria under the study

1. Patient with comorbidities such as uncontrolled hypertension and uncontrolled diabetes.
2. Morbidly obese.
3. Concomitant long bone Injuries.

Surgical technique: After obtaining institutional ethics committee clearance and written informed consent, patients getting admitted through casualty of Orthopaedics department, satisfying the inclusion/ exclusion criteria, were enrolled in the study. Based on Tile Classification, the radiological classification of pelvis fracture was done for each patient. Patients with Tile B and Tile C pelvic injury were selected and after primary stabilisation were taken to Operation Theatre. In few cases where the surgical intervention was delayed in view of poor general condition the patient was put on 15 kg of heavy skeletal traction to the limb in which ipsilateral hemipelvis is proximally migrated. The patient was put in supine position with a 10cm height ×20

cm width block placed beneath the sacrum.

Posterior ring injury viz Sacral fracture and sacro-iliac disruption was then assessed and indirect reduction was achieved by traction to the limb confirmed under C arm under three views- AP, inlet and outlet. After draping and painting first true lateral view of the sacrum is achieved by taking references of sciatic notch and acetabulum. The C arm is adjusted till both sciatic notches overlaps, both ICD overlaps and both acetabulum shadows overlaps. Stab incision taken on the proposed site and 4.5mm width steinman pin is used to make the entry point. Entry point in true lateral view should be anterior in S1 and inferior to the iliac cortical density (ICD), which parallels the sacral alar slope, usually slightly caudal and posterior. Steinman pin was tapped in the entry point with angulation towards sacral promontory. When steinmann pin was tapped for 1 cm, the placement was confirmed in inlet and outlet view. The desired trajectory is within but close to the anterior alar cortex on the inlet view. And cranial to the 1st sacral nerve root foramen. When a safe trajectory for the steinmann pin was confirmed, it was further advanced to the contralateral lateral border of the first sacral body. Steinman pin is then removed and a guide wire was passed through the same way and drilled. A suitable length Canulated cancellous screw is inserted along the guide wire. Fully threaded was used in case of sacral fracture and partially threaded in case of sacroiliac disruption. In patients with associated anterior ring injuries, anterior ring was then internally fixed with Screws/plates. Post operatively x rays were taken to confirm the reduction and placement of screw. The patient was kept on strict bed rest for 2 weeks followed by sitting after 2 weeks. Based on fracture reduction and associated fractures in the pelvic ring the patient was advised to weight bear partially, in case of isolated sacral fracture after 6 weeks and in case of associated anterior ring injuries after 12 weeks. Follow up- All patients in the study were followed up at 6 weeks, 10 weeks, 16 weeks and 24 weeks. At follow-up, a repeat of patient's Brief Clinical History, Clinical Examination, Radiograph of pelvis, and Documentation of Pelvic Majeed Score was done.



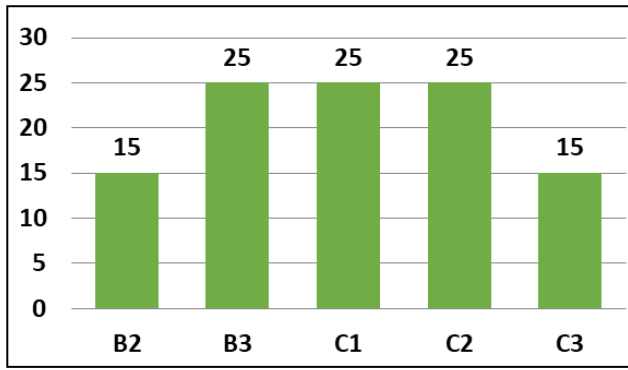
Result

Data entry was done in Microsoft Excel spreadsheet and all the statistical analysis was performed in SPSS version 17.0. Age was presented as mean (standard deviation) and later categorized into five age categories. Gender and classification of fractures were presented as percentages. Majeed Pelvic Score at different time points was expressed as mean and standard deviation. Clinical Grade based on Pelvic Majeed Score was presented as percentages.

Mean age was found to be 38.1years and standard deviation was 15 years. There were 15 males (75%) and 5 females

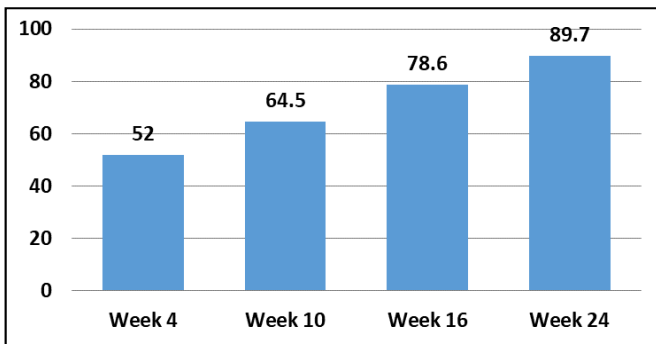
(25%). The patient fracture pattern found is depicted in table below. Mean Majeed score was calculated in every follow up in 4th, 10th, 16th and 24th week.

The majeed score in different follow up is depicted in tables below. The mean score at 24th week was found as 89.7. There was one case of screw breakage. The patient which went on to screw breakage had actually weight beared early within 20 days against advise. There was no case of infection, neurological deficits. Two case had persistant limp at 6 month.

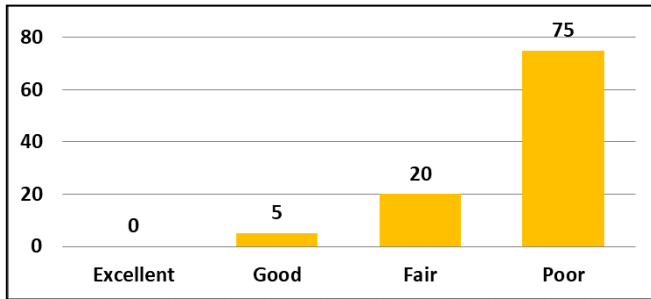


Classification

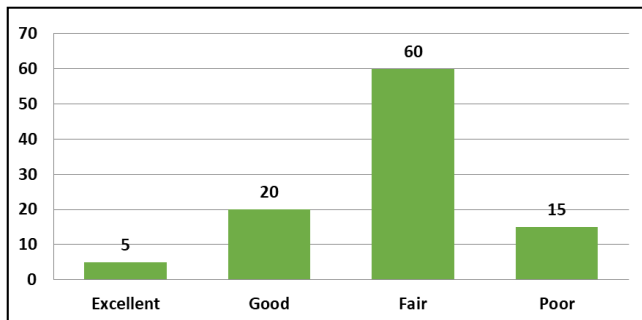
Time in weeks	Mean	SD	Range
Week 4	52	10.9	32-74
Week 10	64.5	10.0	43-86
Week 16	78.6	8.7	62-96
Week 24	89.7	9.2	63-100



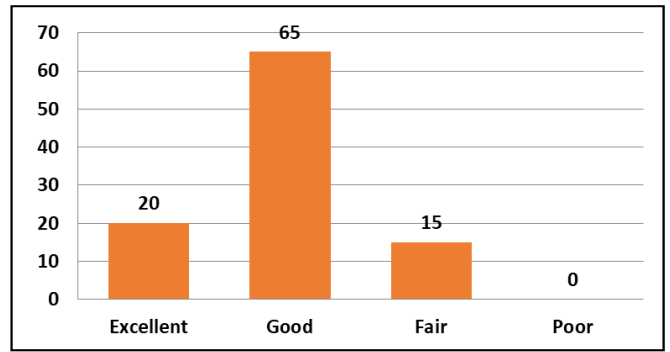
Mean Majeed Pelvic Score



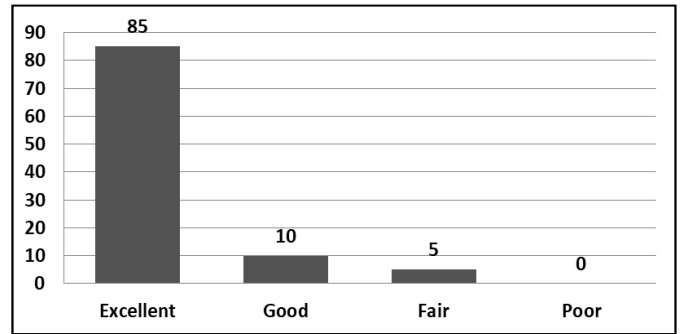
Clinical grade based on pelvic majeed score at week 4



Clinical Grade based on Pelvic Majeed Score at week 10



Clinical Grade based on Pelvic Majeed Score at week 16



Clinical grade based on pelvic majeed score at week 24



Pre op x ray



4 weeks post op x ray



10 Weeks post op x ray



16 Weeks post op x ray



24 Weeks post op x ray

A case with Tile's type C1 fracture operated with single screw

Discussion

Unstable fractures of the pelvic ring injuries are serious, associated with a high rate of morbidity and mortality³. Early surgical stabilization showed a reduction in pain, early mobilization of the patient, and in the end ensures good functional recovery in the long term^[4].

Conservative treatment does not offer precise reduction and confines the patient to bed with all possible complications⁵ like persistence of pain, limp and work disability. The purpose of this study was to use the technique of percutaneous sacroiliac screw in unstable pelvic fractures; using conventional fluoroscopy and evaluate the perioperative complications and radiological results. Routt^[6] was the first to describe the technique of stabilizing the sacroiliac dislocation in the supine position under fluoroscopy. He demonstrated that it is a reliable and reproducible technique that can significantly reduce complications observed in the open techniques without sacrificing stability. Mears *et al.*^[7] have shown in vitro that mechanically a single screw offers the same biomechanical stability than an intact basin. Yinger K and Van Zwiene CM^[8,9], in their two comparative studies indicate a high biomechanical stability with double sacroiliac screw in fractures with vertical instability. The crucial element in the placement of screws is obtaining a good reduction of the fracture or sacroiliac joint and then confirming the ideal position of the sacroiliac screw intraoperatively by 2D fluoroscopy as was described by Routt. The successful use of an SI screw is predicated on successful closed reduction of the SI joint.

The technique is very demanding, even in expert hands. Misdirected screws into the sacral foramina although a rare occurrence can result in significant morbidity. Thorough understanding of the anatomy of posterior pelvis and their fluoroscopic correlations is always necessary to reduce the complication rate.

The earlier studies of the percutaneous technique were of the opinion that the direct reduction is impossible. However Postoperative reduction was good to excellent in most cases (80%). Similar results were previously published^[10]. Previous studies report a secondary displacement rate of 3% to 5% and nerve damage from 0 to 8%^[7]. Hence many authors including us advise to achieve anatomical reduction for getting a good to excellent outcome.

Our study sample has mean age of 38 years which is similar to J Tonetti *et al.*^[11] of 38 years and Gao W *et al.*^[12] of 38.5 year.

There is a male predominance with 75:25 male female ratio which is little higher as compare to Abhishek SM *et al.*^[13] of 63:37 and Amin S *et al.*^[14] of 66:44 male female ratio.

Our study sample comprises 40% of Tile type B and 60% type C fracture which slightly differs when compare to Abhishek SM *et al.*^[13] sample which comprised 26.83 Type B and 73.17 type C Tile fracture.

Majeed Pelvic score average in our sample at 6 month follow up came to be as 95 which is similar to Li SG *et al.*^[15] of 95.65 and on long term follow up of Gao *et al.*^[12] of 100.

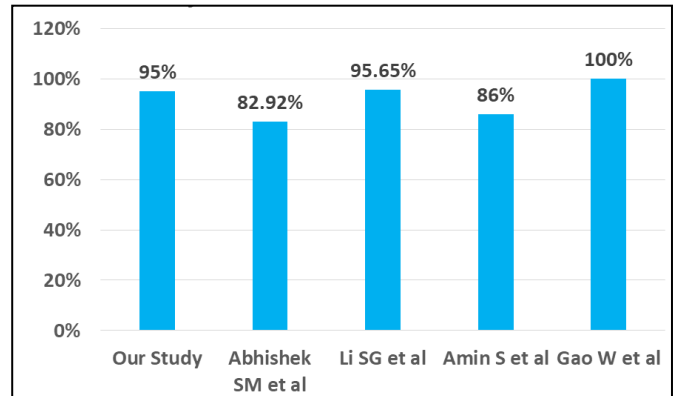
There was no post operative local infection and Neurological deficits which is similar to Li SG *et al.*^[15], Gao W *et al.*^[12] and Amin S *et al.*^[14]. There was one case of screw breakage which made 5% of sample size. This correlates well with the study of Gao W *et al.*^[12] with 6.67% of screw loosening.

The case of screw breakage was advised for implant removal but patient refused and hence managed conservatively with analgesics.

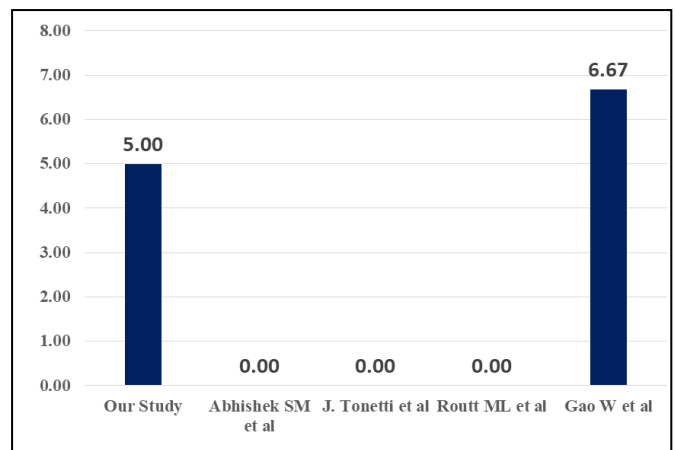
The functional results are often affected by the associated

skeletal or extra skeletal injuries as well as other variables. Simultaneous effects of these variables on the final outcome make it impossible to study each effect separately. A huge number of cases are needed to accomplish this task by choosing patients with only one variable at a time.

Limitations of the present study must be acknowledged. First, the study sample size was small. Second, the associated pelvic ring injury affected the outcome as was found in two patient with Majeed score being lower than the average value.



Clinical grade based on pelvic majeed score at week 24



Screw breakage

Conclusion

The results obtained in our study compare well with other studies undertaken in the past and shows that single percutaneous iliosacral screw fixation is safe and efficacious procedure for fixation of sacral fracture and sacroiliac disruption. But more number of randomised control trials with isolated posterior ring injuries need to be undertaken with larger sample size to establish the safety and efficacy of percutaneous iliosacral screw fixation.

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