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A Study On Functional And Radiological Outcome Of Acetabular Fracture Treated By Open Reduction And Internal Fixation.

S Mageswaran¹, Prabu Aloy^{2*}, and V James Sundar Singh³.

¹Associate Professor, Department Of Orthopaedics, Government Thoothukudi Medical College &Hospital, Thoothukudi, Tamil Nadu, India.

^{2,3}Assistant Professor, Department Of Orthopaedics, Government Thoothukudi Medical College &Hospital, Thoothukudi, Tamil Nadu, India.

ABSTRACT

The incidence of acetabular fractures is on the rise with the increase in the high velocity road traffic accidents. The goal of the surgical management of acetabular fractures is pain free motion and stability to permit vocational and day to day activities without the propensity for future degenerative changes. Aim of the study was to prospectively analyze the functional and radiological outcome and complications of Surgically Managed Acetabular Fractures. Study was carried out at Department of Orthopaedics, Government Thoothukudi Medical College and Hospital, Thoothukudi, Tamil Nadu, India January 2021- September 2022. A total of 20 patients were enrolled for the study. A minimum follow-up period of 6 months was required for these patients. At the end of the study only 13 patients were available for assessment/evaluation. Majority (46.2%) of the patients in our study were young adult between the age group of 18-30 years. 76.9% of the patients were operated within 7 days of injury. Incidence of both elementary (53.8) and associated types (46.2) of fracture was almost equal. Posterior dislocation was present in 3(23.1%) patients. 11(84.6%) had excellent functional out come as per criteria described by Matta Harris hip score at 6 months. 9 patient (69.2%) had near anatomical reduction after reduction. Relationship between Score and reduction was statistically significant. ($p = 0.04$). The goal of the surgical treatment was to produce a functional mobile painless joint that continues to function till the rest of life for the patient which is best achieved by anatomical reduction of fractures and stable fixation, the most important factor that determines the outcome.

Keywords: Acetabular fracture, Harris hip score, Matta criteria

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**Corresponding author*

INTRODUCTION

Acetabular fracture are still difficult fracture to manage and is a challenge to many Orthopedic surgeon. The incidence of acetabular fracture goes on increasing due to high velocity road traffic accident .In early days Acetabular fracture management had many difficulties [1]. Literature from 1950 – 1960 offered conflicting recommendation regarding optimal care for a fracture acetabulum . There was a confusion in management recommendation. Previously there was no accepted fracture classification and fracture evaluation was tough with poor radiological knowledge [2]. Acetabular fractures comprise 10% of pelvic injuries. Posterior wall fractures are more common, containing approximately 25%; high-velocity trauma is the prime cause in younger individuals [3]. Treating acetabular fractures is a challenging task that is continually updated and needs a concrete learning curve. Acetabular fractures are usually related to other pelvis injuries, long bones, spine and visceral organs, which may impact treatment methods, surgical approach and clinical outcomes [4]. Patient's age, comorbidities, fracture and osteoporosis stability may influence decision-making. The treatment aims for early mobilization and anatomic restoration of articulating surface. Surgical fixation of acetabular fractures aims to get a precise reduction to restore joint congruence, prevent displacement, and faster rehabilitation. Internal fixation by open surgery is the benchmark method for displaced fractures. Open reduction may increase morbidity, causing nerve injury, vascular injury, blood loss, heterotrophic ossification, infection and delayed wound healing. The anatomical reduction with a gap of about 2mm is a good predictor of joint function and decreased risk of post-traumatic arthritis [5]. Percutaneous screw fixation is associated with fewer complications than open methods. But acetabular anatomy makes percutaneous screw insertion a challenging technique The percutaneous technique is a recommended treatment option for patients with un-displaced or minimally displaced fractures who are morbidly. obese, osteoporotic, or older and for whom total joint replacement is difficult. It can also be an effective treatment option for displaced acetabular fractures that are challenging to manage with traditional methods [6]. By percutaneous methods, it is easy to fix minimally displaced fractures by restoring the joint surfaces completely and getting enough stability for early hip movement [7]. The management of simple acetabulum fractures is well-known and studied. Treatment of complex Acetabular fractures is difficult for reduction and fixation as both columns of the acetabulum have to be manipulated and fixed. Thus, the study aims to evaluate the functional outcome of patients with acetabular fractures treated by percutaneous screw fixation.

MATERIALS AND METHODS

This prospective Study was carried out at Department of Orthopaedics, Government Thoothukudi Medical College &Hospital, Thoothukudi, Tamil Nadu, India January 2021- September 2022. A total of 20 patients were enrolled for the study. Among 20 patients' right side involvement is seen in 13 patients and left side involvement is seen in 7 patients. Mean follow up was done for 12 months. All the classification has been classified by Letournel and Judet classification. All the cases were followed up and were evaluated for radiological and functional outcome. X-ray pelvis is used for assessing the radiological outcome, AP view, Obturator Oblique view and Iliac oblique views were used for assessment [11]. For evaluating the functional outcome Merle D'Aubigne and Postel modified clinical grading system is used.

Inclusion Criteria

- An acetabular # with 2 mm or more of displacement in the dome of the acetabulum
- roof arc measurements < 45 degrees
- Posterior joint instability
- Irreducible #/ dislocation

Exclusion Criteria

- Age - <18 years and > 70 years
- Non displaced and minimally displaced fractures(<2mm displacement in the weight bearing dome)
- Roof arc angle> 45 degree (average roof arc angle in all 3 views)
- No femoral head subluxation on 3 views taken out of traction.
- Secondary congruence in displaced both column fractures.

For all the patients X- ray pelvis with both hips AP view, Obturator Oblique view and Iliac oblique view, Axial CT and 3D reconstruction were taken. Out of 20 patients 9 patients operated between 1 to 2 weeks, 7 patients were operated between 2 to 3 weeks. 4 patients operated between > 3 weeks. The mean time interval between injury and surgery was 10 days. After exposing the fracture site, the fracture configuration was verified with C – Arm. The fracture fragments were reduced using special clamps and ball tipped spikes. K-wires (1.6mm) were passed to maintain the reduction lag screw fixation with 3.5 mm cortical screws was done. Buttress plating was done using contoured 3.5 mm reconstruction plate or semi tubular plate. In case the lag screw fixation becomes impossible then the fracture was reduced and fixed with the contoured 3.5mm reconstruction plate or semi tubular plate. For all the patients prophylactic intravenous antibiotics were used for the first seven days. Also closed suction drain was used in all the patients, suction drain was removed on day 2 and EOT was done on day two. On 12th POD sutures were removed. In our study no prophylactic steps taken for Deep vein thrombosis. For the prophylaxis against Heterotopic ossification the following measures taken, they are supplementation of Indomethacin 25mg TDS from II POD to 6 weeks post operatively. The patients were mobilized as soon as tolerated. The patients were made to sit up on first day after post operative period and then they were made to perform physical therapy for muscle strengthening and active range of motion exercises. Patients are made for partial weight bearing by following steps, they are toe touch walking with walker / crutches was started at 6 weeks and was maintained up to 12 weeks. This was also dictated by other injuries of the patients. Full weight bearing was started after 3 months of time. Physical therapy was made to continue until range of motion and muscle strength regained. For the post – operative assessment plain X-rays AP view, obturator oblique view, and iliac oblique view were taken for all the patients. Serial radiographs (all the 3 standard views) were scheduled for 2 weeks, 3 months, 6 months and 1 year. Grading system of Merle D' Aubigne and Postel modified score were used for evaluating the final outcome. Matta criteria used for assessing the radiographs. The radiographs were assessed at the end of 6 months. A grade of Excellent signifies normal appearing hip joint: good denotes mild changes with minimal sclerosis and joint narrowing (<1 mm). fair signifies the intermediate changes moderate osteophytes moderate narrowing (less than 50%) of the joint and moderate sclerosis; and poor indicates advanced changes, large osteophytes, severe narrowing (more than 50 %) of the hip joint, collapse or wear of the femoral head and acetabular wear. For evaluating the reduction of fracture the residual post operative displacements on three plain radiographs should be measured. The reduction was graded as anatomical (0-1 mm displacement), imperfect (2-3 mm of displacement), or poor (>3mm displacement).

Statistical Analysis

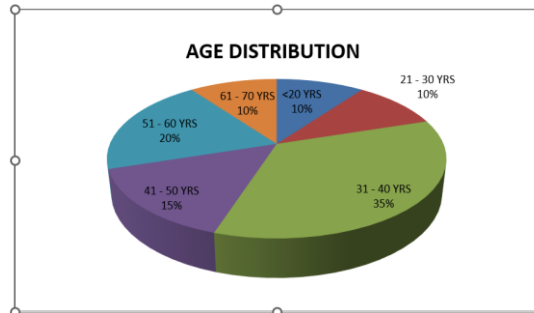
The radiographs were assessed by the criteria described by Matta. The reduction of the fracture was evaluated by measuring the residual post-operative displacements on the three plain radiographs. The reduction was graded as anatomical (0-1mm displacement, imperfect (2-3 mm of Displacement), or poor (>3 mm of displacement). Using SPSS ver 19 software range, frequencies, percentages, means, standard deviations, chi square and student t test and 'p' values were calculated. A 'p' value less than 0.05 denotes significant relationship.

RESULTS

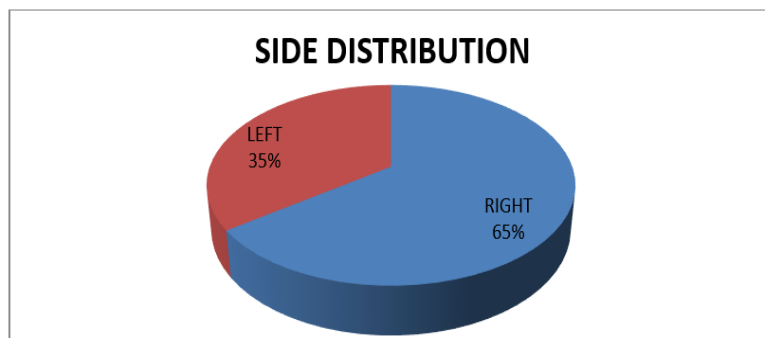
20 patients with acetabular fractures were treated surgically and analysed with average follow up of 12 months ranging from 6 months to 18 months. 70% belongs to less than 50 years of age. Males dominated in our study group with 80%. Road traffic accident contributed to the injury in 90% of our patients and rest sustained by fall from height. Anterior column acetabular fracture, posterior wall fracture were the most common type in our study, posterior column with posterior wall is the least common type. Ten patients had associated skeletal injuries. Most of the patients were operated by Kocherlangenbeck approach (9 patients). 6 patients were operated by Ilioinguinal approach, 3 patients with combined Kocherlangenbeck and Ilioinguinal approach and 2 patients were treated by Stoppa approach. In our study the average surgical time delay was 12 days ranging from 7 days to 24 days. The average surgical time was 164 minutes ranging from 120 mins to 230 mins and average blood loss is 1312ml. No patients have encountered intraoperative complications. According to Matta's criteria, 8 patients had anatomical reduction, 8 patients had satisfactory reduction and 4 patients had poor reduction (>3mm gap). Out of 20 patients, 5 patients had excellent, 3 patients very good, 6 patients good, 3 patients fair, 3 patients had poor results. 70% of the patients are having near normal life and 10% patients are having satisfactory result in our study. Functional outcome score for the patients ranged from 11 – 18, (maximum score – 18). The poor result (score – 8,9) in 3 patients was due to post traumatic

arthritis ,improper post op mobilisation due to poly trauma. All patients with anterior column fracture, posterior wall had excellent or good result except one patient who had fair result due to Heterotopic ossification. Three patients with fair outcome had minor wound infections treated with antibiotics and it healed.

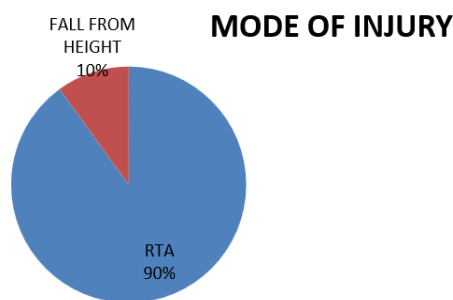
Graph 1: Age Distribution



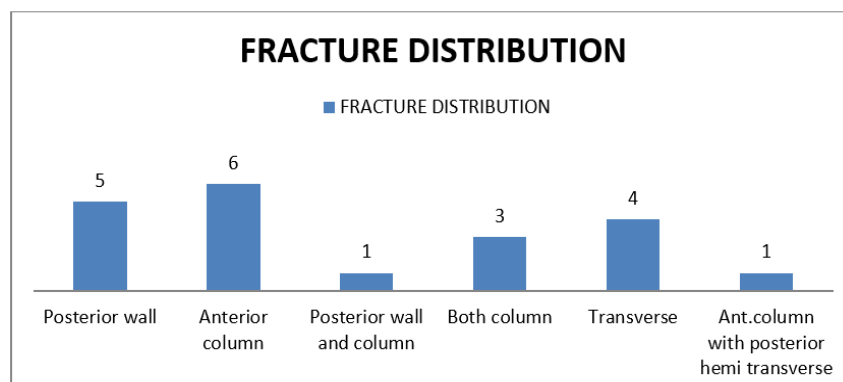
Graph 2: Side Distribution



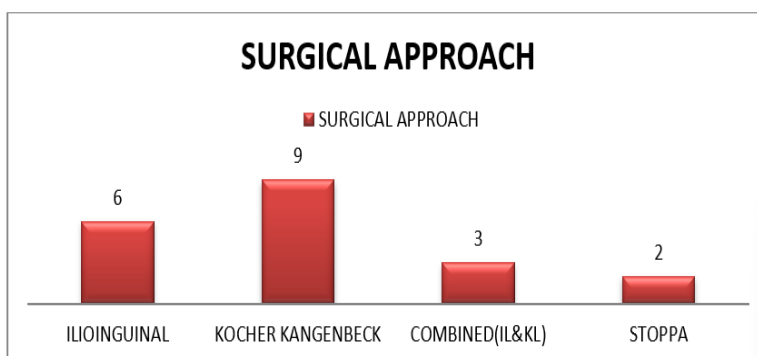
Graph 3: Mode Of Injury



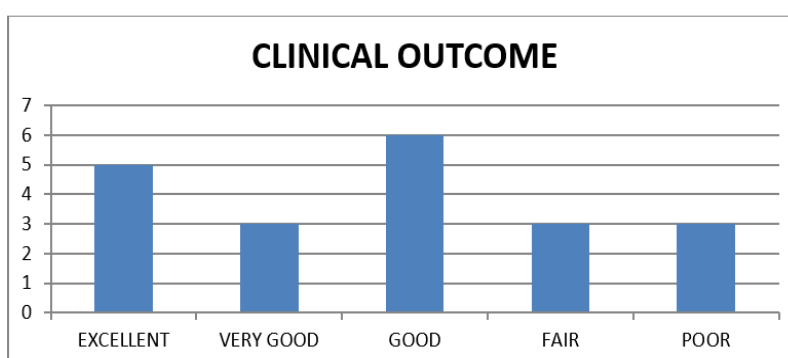
Graph 4: Fracture Distribution



Graph 5: Fracture Distribution



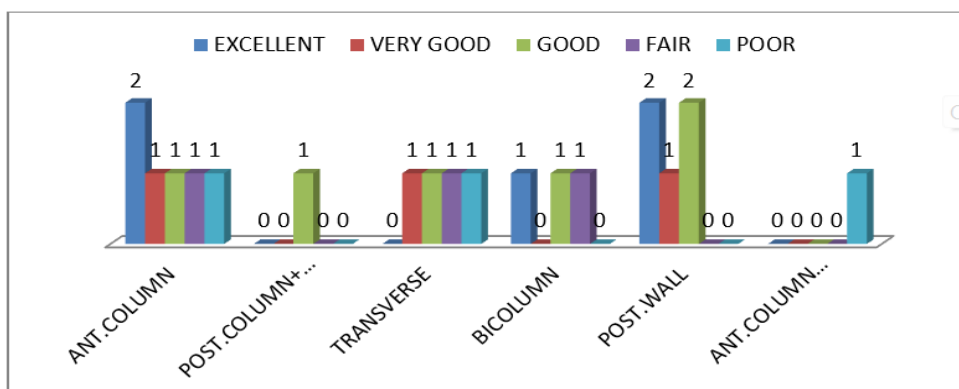
Graph 6: Clinical Outcome : Merle D'aubigne And Postal Clinical Grading System



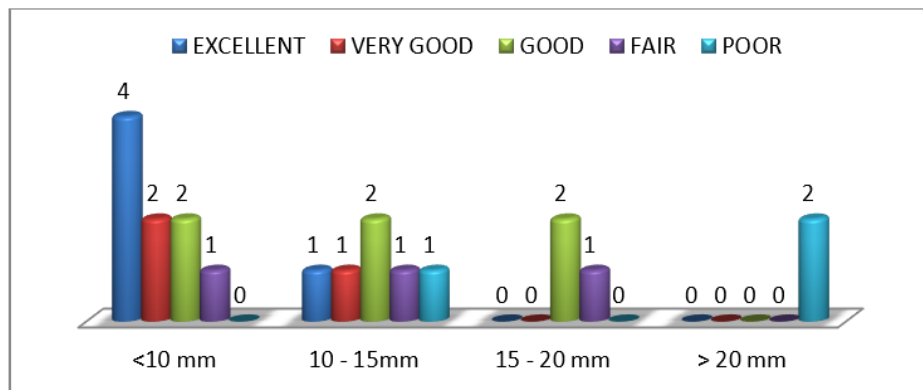
Graph 7: Time Of Surgery And Its Clinical Outcome



Graph 8: Type Of Fracture And Its Clinical Outcome:



Graph 9: Initial Displacement And Its Clinical Outcome



DISCUSSION

Treatment of acetabular fracture still remains a complex task for orthopedic surgeons due to lack of technical expertise and inadequate infrastructure [8]. Reduction of acetabular fracture is difficult because if it involves both column, the visualization and reduction of both column by single approach is difficult and needs a double approach. There are certain variables such as initial displacement of fracture fragment, time delay to surgery, difficult fracture pattern which makes fracture pattern a difficult task. It was proved in our study that open reduction and internal fixation after attaining anatomic reduction followed by early mobilization will keep the joint function as described by Matta [9]. A good quality of clinical result was achieved with accurate anatomical reduction. An ideal approach is needed to allow visualization of both column and joint surface with minimal morbidity. In our study we use Kocherlangenbeck approach in 9 patients and Ilioinguinal approach in 6 patients and in 3 patients due to inadequate exposure we used combined approach [10]. We are able to achieve satisfactory reduction in 65% cases using a single approach including both simple and complex fractures. In our study the infective rate is 10% which may be due to longer duration of surgery and is comparable with 5.6%. Another factors (ie) initial displacement of fracture fragment, patient with <10 mm of displacement had better reduction and good radiological result than the other patients. Age of the patient did not have any effect in the outcome of the study. We use single exposure in 90% of patients and reduced the opposite column by indirect method which reduced the morbidity of our patient to a greater extent [11]. Four of our patient went for post traumatic arthritis and one among them was operated for total hip replacement. In our study anterior column, posterior wall fractures has better outcome and transverse fractures have poor outcome, but according to Marwin M Tile transvers fracture has best functional outcome [12]. We observed that length of follow up is critical and with longer follow up, arthritis is more likely to develop even in perfectly reduced fractures. 77.8% of the patients who had earlier surgery had good anatomical reduction and functional outcome [13]. When operated within 7 days fracture reduction manipulation were easier as less reactive callus formation and soft tissue adherence [14]. From 7-14 days 3 patients were operated, this delay was due to other systemic injuries like perivascular hematoma, abdominal, chest trauma and head injury which were given priority over acetabular fracture fixation. When more than 15 days delay this factor such as fracture stickiness, soft tissue adherence may impart difficulty in anatomical reduction [15]. A percutaneous screw should compress the compression site in the anterior column. We have done percutaneous screw fixation for anterior and posterior columns in one case. In two cases, we have done sacroiliac joint screw fixation and anterior column screw fixation. In our study, none of the patients have operative site infections [16]. One of the patients has heterotopic ossification. We have done posterior wall plating and percutaneous screw fixation for the anterior column [17]. One patient had an associated abdominal injury or urethral injury, two patients had chest wall injury, three patients had a head injury, and four patients had associated other long bone fractures [18]. We have taken this case for surgery only after appropriate resuscitation and hemodynamic stabilization. Most cases were operated within seven days of admission. None of the cases in our study had been taken up for surgery after 14 days [19,20].

CONCLUSION

From our study we conclude that complex acetabular fractures treated by open reduction and internal fixation have satisfactory functional outcome-rays and CT imaging are essential in pre – operative evaluation of fractures. A good pre – operative planning is more important for selecting the surgical approach and reduction of fracture fragments. There should not be much delay in surgery since good fracture reduction could be attained if surgery is done within 10 – 14 days from injury. The functional outcome of fracture depends upon the accurate fracture reduction and stable fixation, because of which early rehabilitation is possible to produce a satisfactory outcome. The complications associated with surgical approaches such as Infections, Heterotrophic ossifications, DVT could be reduced by proper soft tissue handling, appropriate antibiotics and prophylactic treatment with Tab.Indomethacin, inj.low molecular weight heparin followed by warfarin for 6 weeks.

REFERENCES

- [1] Rao VS, Chandrasekhar P, Rao AL, Rao VB. Results of surgically treated displaced acetabular fractures among adults. *Clin Proc NIMS*.2008;17:2.
- [2] Ghaffar A, Hyder AA, Masud TI. The burden of road traffic injuries in developing countries: the 1st national injury survey of Pakistan. *Public Health* 2004; 118:211-217.
- [3] Khan SH, Ara I, Raza S, Sipra S. Functional outcome of surgery in patients with acetabular fractures. *J Ayub Med Coll Abbottabad* 2013; 25:60-63.
- [4] Pohlemann T, Gänsslen A, Stief CH. Complex injuries of the pelvis and acetabulum. *Orthopade* 1998; 27:32-44.
- [5] Glas PY, Fessy MH, Carret JP, Béjui-Hugues J. Surgical treatment of acetabular fractures: outcome in a series of 60 consecutive cases. *Rev Chir Orthop Reparatrice Appar Mot* 2001; 87:529-538.
- [6] Giannoudis PV, Bircher M, Pohlemann T. Advances in pelvic and acetabular surgery. *Injury* 2007; 38:395-396.
- [7] Letournel E. Acetabulum fractures: classification and management. *Clin Orthop Relat Res* 1980;(151):81-106.
- [8] 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; 46:1615-1646.
- [9] Matta JM. Fractures of the acetabulum: accuracy of reduction and clinical results in patients managed operatively within three weeks after the injury. *J Bone Joint Surg Am* 1996; 78:1632-1645
- [10] Matta JM, Mehne DK, Roffi R. Fractures of the acetabulum. Early results of a prospective study. *Clin Orthop Relat Res* 1986;(205):241-250.
- [11] Shrestha D, Dhoju D, Shrestha R, Sharma V. Acetabular fracture: Retrospective analysis of thirty three consecutive cases with operative management. *Kathmandu Univ Med J (KUMJ)* 2014; 12:279-287.
- [12] Gupta RK, Singh H, Dev B, Kansay R, Gupta P, Garg S. Results of operative treatment of acetabular fractures from the Third World--how local factors affect the outcome. *Int Orthop* 2009; 33:347-352
- [13] Magu NK, Rohilla R, Arora S. Conservatively treated acetabular fractures: A retrospective analysis. *Indian J Orthop* 2012; 46:36-45.
- [14] Marchetti P, Binazzi R, Vaccari V, et al. Long-term results with cementless Fitek (or Fitmore) cups. *J Arthroplasty* 2005; 20:730-737.
- [15] Kim HT, Ahn JM, Hur JO, Lee JS, Cheon SJ. Reconstruction of acetabular posterior wall fractures. *Clin Orthop Surg* 2011; 3:114-120.
- [16] Lehmann W, Hoffmann M, Fensky F, et al. What is the frequency of nerve injuries associated with acetabular fractures? *Clin Orthop Relat Res* 2014; 472:3395-3403.
- [17] Suzuki T, Morgan SJ, Smith WR, Stahel PF, Gillani SA, Hak DJ. Postoperative surgical site infection following acetabular fracture fixation. *Injury* 2010; 41:396-399.
- [18] Meena UK, Tripathy SK, Sen RK, Aggarwal S, Behera P. Predictors of postoperative outcome for acetabular fractures. *Orthop Traumatol Surg Res* 2013; 99:929-935.
- [19] O'Toole RV, Hui E, Chandra A, Nascone JW. How often does open reduction and internal fixation of geriatric acetabular fractures lead to hip arthroplasty? *J Orthop Trauma* 2014; 28:148-153.
- [20] Hussain KSA, Kancherla NR, Kanugula SK, Patnala C. Analysis of displaced acetabular fractures in adults treated with open reduction and internal fixation. *Int J Res Orthop* 2016; 2:99-103.