



"RESULTS OF CONSERVATIVE MANAGEMENT OF FRACTURE ACETABULUM."

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ABSTRACT

In today's era of high energy trauma, the incidence of high velocity injuries and poly-trauma are on the rise and involvement of the acetabulum with central fracture-dislocation of the hip are encountered.

Aims and objectives: present study aims to evaluate radiological and functional outcome in non-operatively treated central fracture-dislocations of the hip.

Material and method: 25 patients with central fracture-dislocation of the hip were taken up for the study. Cases with fracture pelvis not involving the acetabulum were excluded. Threaded pin was applied over the trochanteric base for lateral traction; lateral traction was applied with 15Kg weight for an average built patient X-rays were evaluated for reduction by Tear drop, Iliopsopectineal line, C E angle of Wiberg on AP view and pubic symphysis (mid line) to femoral head distance as compared to the normal side.

Monthly follow up was done for three months and evaluated radiologically and clinically. The clinical outcome is assessed by using the Modified Merle D' Abigne and Postel clinical grading system.

Results: 80% patients were of age group 21-50 years. RTA is main cause of trauma. Average final score was less in patients with high initial displacement and score was greater in patients with low initial displacement ($P=0.0001$).

Patients with low residual displacement had high clinical score and good results and vice-versa ($P=0.0001$). 64 %patients had correction in the immediate check X-ray in the range of 51-60 %.

There is correlation between pattern of injury and final clinical score ($P=0.0001$) and average residual displacement ($P=0.0001$). patients with low final follow up LLD had higher average clinical score and better results and vice-versa ($P=0.0001$). The good and very good category cases were group together came out to be 76%. All patients with satisfactory results had less residual displacement. Patients with unsatisfactory results had high residual displacement.

Conclusions: Traction treatment is a safe, effective and practically feasible modality of managing central fracture-dislocation of acetabulum.

KEYWORDS : Fracture, Acetabulum, Conservative, Treatment

INTRODUCTION:-

In today's era of high energy trauma, the incidence of high velocity injuries and poly-trauma are on the rise and involvement of the acetabulum with central fracture-dislocation of the hip are encountered.

The re-establishment and maintenance of congruity between the acetabular weight bearing surface and the head of femur were regarded as the key goals of closed treatment.

Certain centres in developed countries also favour traction treatment. Since 1970 the treatment of choice for central fracture-dislocation of the hip at the University of California, Davis and the Sacramento Medical Centre has been closed reduction.¹

Our choice of treatment evolved from the experience that open reduction of these injuries often is not only difficult but also ineffective in improving the end result.

Aims & objectives :- The present study aims to evaluate radiological and functional outcome in non-operatively treated central fracture-dislocations of the hip.

Material and methods:-All the patients reporting to the hospital with suspected pelvi-acetabular injuries were assessed in detail and underwent anterior-posterior (AP) view of the pelvis after stabilization of vitals (airways, breathing, circulation). Cases with fracture pelvis not involving the acetabulum were excluded.

- 25 patients with central fracture-dislocation of the hip were taken up for the study.

- All those cases in which C.E. angle of Wiberg on AP view, tear drop and iliopsopectineal line are disturbed as compared to the normal side with central fracture-dislocation of hip were included in the study.
- After evaluation, the patients were transferred to indoor wards and booked for bedside pin application.

Implant selected was a threaded Shanz pin with one end already bent into a hook, available in the local market. Length of implant is 25cm with thread diameter of 6.5mm and length 32mm.

If patient went to another ward due to other injuries, the procedure was done there.

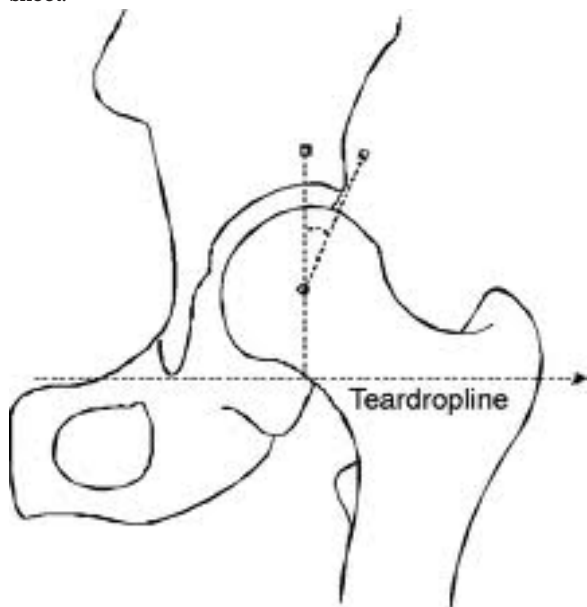
Procedure : Threaded pin was applied over the trochanteric base for lateral traction. The patient was taken in the supine position. Under all aseptic precautions, local anaesthetic was infiltrated over the trochanteric base region after palpating the greater trochanter after sensitivity testing for lignocaine. Procedure was done in presence of anaesthetist.

A small stab incision was made with blade no. 11 in the lateral midline at the level of the trochanteric base. The trochanteric base was then drilled with a 4.5mm drill bit along the direction of the opposite anterior superior iliac spine. The threaded pin was inserted along the track made by the drill bit. The length of the pin to be inserted was measured by the templating on the plain X-ray of the pelvis. A heavy lateral traction weight about 15Kg for an average built patient was applied^{2,3}. Dressing was done at the site of entry of the threaded pin with povidone-iodine gauze. A bedside check X-ray of the pelvis with both hip-AP view was done on the same day. X-rays were

repeated on the next day and on the 3rd day. Later on bed side check X-rays was done at weekly intervals⁴.

Check X-rays were evaluated for reduction and reduction assessed by -Tear drop, Iliopectineal line, CE angle of Wiberg on AP view and pubic symphysis (mid line) to femoral head distance as compared to the normal side.

The CE (center-edge) angle of Wiberg formed by a line drawn from the center the of femoral head to the outer edge of the acetabular roof, and a vertical line drawn through the center of the femoral head. The center of the femoral head is found with the aid of printed concentric circles on a transparent sheet.



CE angle of Wiberg

Sustained traction was maintained for six weeks^{5,3}. Bed side hip raising and quadriceps and calf exercise were explained to the patients, to be done at frequent intervals. Pin site would be checked every two days for sepsis and sealed with sterile dressing.

After six weeks the threaded pin was removed and patients discharged after radiological and clinical evaluation. Patients were advised regular bed side non weight bearing exercises in the form of suspension sling and manually assisted hip exercises in bed for at least 1 month done at least six times a day³.

Follow up :-

- Patients were asked to come for monthly follow up for three months.
- Patients were evaluated radiologically(for healing and correction of displacement) and clinically(for range of movement).
- Patients were advised toe touching non weight bearing mobilisation on four-point walker at first follow up stage (two and a half month from date of trauma).^{3,6,7,8}
- At three months from discharge, full weight bearing will be allowed^{3,6,7,8} after final clinical and radiological evaluation, which was done as follows:- CE angle of Wiberg, tear drop, Iliopectineal line and Pubic symphysis (mid line) to femoral head distance as compared to normal side was evaluated on follow up X-rays.
- Final follow up radiograph 3 months after discharge was graded according to the criteria developed by Matta et al.^{9,10,11}. Excellent denotes a normal-appearing hip joint, good as mild changes with minimal sclerosis and joint

narrowing, fair indicates intermediate changes with moderate sclerosis and joint narrowing (<50%), and poor signifies advanced changes. X-rays are checked to see a congruent reduction, which is defined as presence of parallelism between joint surfaces of the acetabulum and the femoral head. To attain the best results, hip joint congruity and stability must be accompanied by anatomic reduction of displaced articular surfaces (defined as less than 2mm of residual displacement). On the AP view of the pelvis, the medial roof arc angle obtain by, drawn the first line is a vertical line through the center of the femoral head and the second line is drawn from the center of the femoral head to the fracture location at the articular surface.

- The functional/clinical outcome is assessed by using the Modified Merle D' Abigne and Postel clinical grading system^{4,12}.

The Modified Merle D' Aubigne and Postel clinical grading system (the system of Letournel & Judet, with modification from Matta and Moed et al.)¹² is as follows:

Table:1

| Parameter | Point |
|---|-------|
| Pain | |
| • None | 6 |
| • Slight or intermittent | 5 |
| • After walking but resolves | 4 |
| • Moderately severe but patient is able to walk | 3 |
| • Severe preventing walking | 2 |
| Walking | |
| • Normal | 6 |
| • No cane but slight limp | 5 |
| • Long distance with cane or crutch | 4 |
| • Limited even with support | 3 |
| • Very limited | 2 |
| • Unable to walk | 1 |
| Range of Motion | |
| • 95 to 100% | 6 |
| • 80 to 94% | 5 |
| • 70 to 79% | 4 |
| • 60 to 69% | 3 |
| • 50 to 59% | 2 |
| • <50% | 1 |

Range of movement is expressed as the percentage of value obtained from the normal contra-lateral hip.

Final results were graded as follows:

| Clinical score | Points |
|----------------|----------|
| Excellent | 18 |
| Very Good | 17 |
| Good | 15 or 16 |
| Fair | 13 or 14 |
| Poor | <13 |

Results:- In this study the majority of patients (80%) were of age group 21-50 years. it was found that most of patient were male (24 out of 25).

Road traffic accidents are the main cause of injury (19 out of 25 patient) followed by fall from a height(4 out of 25 patients).

It was found that majority of patients (84%) had up to 60% initial displacement. It was found that average final score was less in patients with high initial displacement and score was greater in patients with low initial displacement (P=0.0001).

It was found that majority of patients (84%) had residual displacement up to 20 %. It was found that patients with low residual displacement had high clinical score and good results and vice-versa (P=0.0001). Two patients had residual displacement in the range of 41-50 % and had poor final results.

It was found that majority of patients (64 %) had correction in the immediate check X-ray in the range of 51-60 %.

There was a correlation between pattern of injury and final clinical score ($P=0.0001$) and average residual displacement ($P = 0.0001$). It was found that patients with fracture of the floor of the acetabulum or transverse acetabular fracture and fracture of the posterior wall with small fragments had high average final score as well as less residual displacement and better results. Patients with fracture of the posterior wall with large fragment and double column pattern of injury had a high residual displacement and poor result ($P=0.0001$).

It was found that patients with low final follow up LLD had higher average clinical score and better results and vice-versa(0.0001).

Functional grading of results using Modified Merle D' Abigne and Postel Clinical Grading System¹².-The good and very good category cases were group together came out to be 76%. This group was considered as the "satisfactory" results group. Considering the poor and fair results group together, the cases were 24% and this was considered the "unsatisfactory" results group.

It was found that all patients with satisfactory results had less residual displacement and categorized as mild and moderate residual displacement.

It was found that patients with unsatisfactory results had high residual displacement (severe and very severe residual displacement), some with moderate residual displacement.

It signifies that all patients with satisfactory results had low residual displacement but some patients with unsatisfactory results also had low residual displacement (moderate).

Majority of patients(76%) had good and excellent radiological outcome with congruent reduction and it was found that fair and poor radiological results were achieved in 24 % patient in whom reduction was incongruent.

DISCUSSION:-

Regarding the results of surgery it has been noted that in spite of the best reconstruction, the complication of osteoarthritis could not be prevented and down with time and the incidence of degenerative osteo-arthritis rises, ultimately requiring total hip replacement. In 1980, Pennal et al. treated 103 fractures of the acetabulum and at 5 year follow up 72% of cases of poor reduction developed osteoarthritis but 30% of the cases with good reduction also developed osteoarthritis¹³. Study of Armstrong, J.R. showed the incidence of post traumatic arthritis to be as high as 100%¹⁴. During total hip replacement in patients with post traumatic arthritis, those who had open reduction and internal fixation of their acetabular fracture had a significantly longer index procedure ($P = .01$), greater blood loss ($P = .008$), and a higher transfusion requirement ($P = .049$) than those in whom the fracture had been treated by closed methods.

A similar opinion is also supported by: (1) study of Heeg M, Oostvogel HS, Klasen HJ¹⁵ - who concluded that conservative treatment of acetabular fractures can be very successful even in fractures crossing the weight bearing dome, provided that congruence is preserved during the period of traction, (2) study of Amravati RS et al.⁵ highlights the study of Schatzker J, Tile M: who showed that even in expert hands, depending on the type of fracture and severity of the fracture, anatomical reduction was achieved only in 70 % of cases and the surgical outcome may be disappointing¹³. (3) In the largest study by far, Ochs BG et al.¹⁶ in an analysis of 1266 cases treated by German Pelvic Multicenter Study Group support the

conservative treatment for acetabular fracture. They stated that despite change in the chosen approaches and an increased surgical frequency, the operative treatment of acetabular fractures of the last 15 years did not lead to an increased reduction quality.

A long term study by Peter G, Carnesale et al.¹⁷ at the Campbell clinic in an average follow up of 8.6 years, found more or less similar end results in patients either treated operatively or conservatively. They stated that in general, that the simplest method likely to yield a good result is the best.

Conservative treatment also avoids complications related to operative treatment, such as iatrogenic nerve palsies, wound infection, deep vein thrombosis / pulmonary embolism. Arthrosis, necrosis of femoral head and heterotopic ossification tend to decline the outcome of acetabular fractures despite good fracture reduction achieved after surgery^{18,19}.

In the present study it was found that the average age was 39.04(range-13 to 68) and the majority of patients(80%) were of age group 21 to 50 with male predominance. Regarding site of injury, the left to right ratio was 3:2. Regarding etiological factors of injury, it was found that road traffic accidents are the main cause of injury(in 76%) followed by fall from a height(in 16%). These findings correspond similar to a recent study on conservative treatment of acetabular fractures by Narender Kumar Magu et al.⁷² In their study, the average age was 38.6 years(range 20-65) with male predominance(male-55,female-14); the right hip was involved in 36 and the left hip in 35 patients and 74% patients suffered injuries in road traffic accidents followed by fall from a height(26% patients). The study of Tipton et al.², on non operative management of central fracture- dislocations of the hip had an average age group of 45 years, the range being from 15 to 73. A long term study by Peter G. Carnesale et al.¹⁷ showed that 75 % patients had road traffic accidents followed by 18% having fall from a height and their ages ranged from 15 to 75 and left to right injury side ratio was 7:4(left predominance) with a male predominance.

The age group of 21-50 is the adult working age group and consequently has more mobility, and is more liable to have road traffic accidents and other injuries.

The average final score was less in patients with a high initial displacement and greater in patients with a low initial displacement($P=0.0001$). This is similar to the results of study of Amravati et al.⁵ There was an exception of one patient in whom despite a high initial displacement of 65% (of normal), the final score(17) was high. It seems to be due to high molding and remodeling capacity of the joint of younger age group(patient's age was 13 years) of this particular patient.

Correlation between percent residual displacement with the average final score is understandable because the incongruity would correlate directly with the joint instability and consequent disturbance in joint function and painful movements. One of these two patients(case no.10) had a fracture of the posterior wall with a large fragment and the reason for a high residual displacement seems to be that the fragment could not be brought to a satisfactory position by traction there by resulting in a deficient acetabulum posteriorly. Such cases show a normally reduced head in the bed side X-rays but finally when traction is removed the head drops back into the deficient area resulting in a subluxated head.

Conservative treatment enables biologic healing by preserving soft tissue, and preserving the viability of bone and decreasing the chances of nonunion. The 2nd patient(case no.3) had fracture of both columns with injury of abdomen which leads to delayed management of pelvic injury. This

patient had least correction in the immediate post procedure X-ray.

Functional outcome after operative treatment in fractures of more than 3 weeks duration was reported as fair or poor in 38.4-40.6% patients^{20,21}. These results are similar to studies of Johnson EE, Matta JM et al.⁴.

It was found that higher the correction at immediate check X-ray, the better was the average final score and good results and vice-versa(P=0.0001).

In the present study, a significant correlation between the pattern of injury and final clinical score was found(0.0001). There were 3 patients with a low final score. Two patients (case no.7 and 10) had fracture of the posterior wall with large fragments and one patient(case no. 3) had a double column fracture. The reason for unsatisfactory results in patients with fracture of the posterior wall with large fragments has been described previously. Delayed presentation seems to be more responsible a factor rather than double column involvement for an unsatisfactory result in case no.3. These three patients also had high residual displacements.

It was found that patients with fracture of the floor of the acetabulum or transverse acetabular fracture and fracture of the posterior wall with small fragments had a congruent reduction and a good radiological and functional outcome and less residual displacement(P=0.0001). In all these the weight bearing dome was not disrupted so the results were better. Weise et al.²² and Epstein²³ also observed similar results²². Similar findings have also been reported in various studies on conservative treatment^{24,25,26}. Lovric et al. preferred conservative treatment in transverse fractures²⁷.

Good functional and radiological outcome has been reported in 77.8 -100 % of patients with congruent reduction in other studies^{15,25}. Sen Veerappa also observed similar results.²⁵

Table: 3

| Conservative Studies | Results (%) | |
|---|--------------|----------------|
| | Satisfactory | Unsatisfactory |
| Present study | 76 | 24 |
| William W. Tipton, M.D.et al. ² | 58.3 | 41.7 |
| Peter G, Carnesale et al. ¹⁷ | 65.7 | 34.3 |
| Amravati RS, Phaneesha MS et al. ⁵ | 65.2 | 34.8 |
| Heeg M, Klasen HJ et al. ¹⁵ | 75 | 25 |
| Sen, Ramesh K. MS et al. ²⁵ | 56.3 | 43.7 |
| De Ridder, V.A.MD et al. ²⁸ | 76 | 24 |
| Narender Kumar Magu et al. ³ | 85.9 | 14.1 |

Table no. 3 shows the final results of the present study compared to other conservative studies. Comparable results were found with other published works.

Table: 4

| Operative Studies | Results (%) | |
|---|--------------|----------------|
| | Satisfactory | Unsatisfactory |
| Present study (conservative) | 76 | 24 |
| Peter G, Carnesale et al. ¹⁷ | 75 | 25 |
| Amravati RS, Phaneesha MS et al. ⁵ | 54.5 | 45.5 |
| Heeg M, Klasen HJ et al. ²⁹ | 61 | 39 |
| Liebergall, Meir MD et al. ³⁰ | 77.4 | 22.6 |
| De Ridder, V.A.MD et al. ²⁸ | 76 | 24 |
| PV. Giannoudis et al. ³¹ | 75-80 | 20-25 |

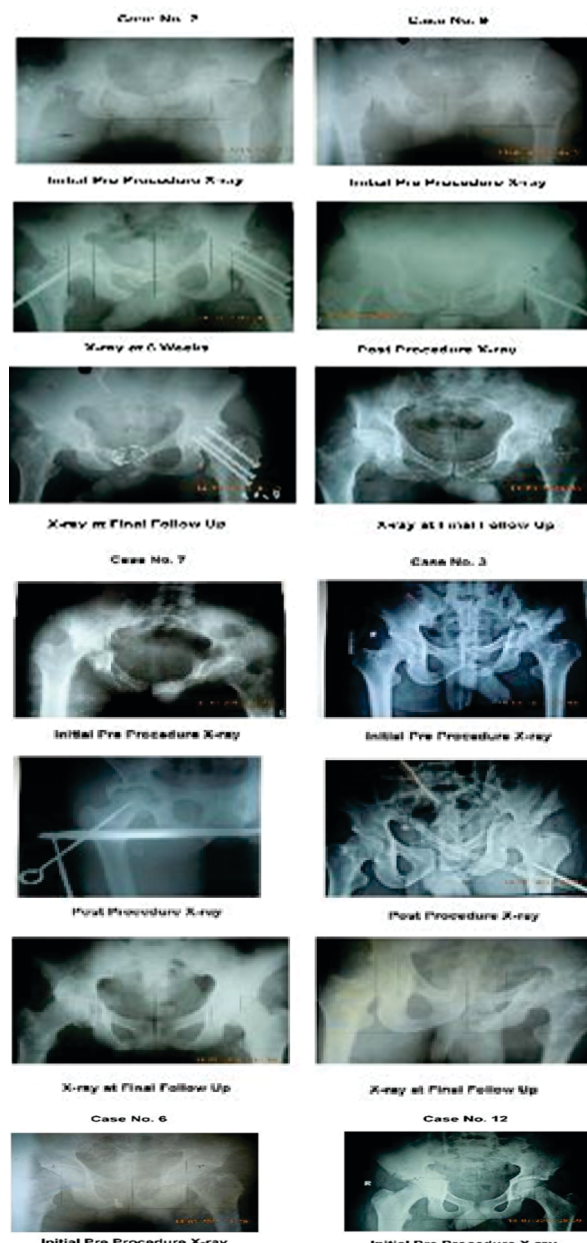
| | | |
|---|------|------|
| Matta JM. ³² | 71 | 29 |
| Elmali N, Ertem K et al. ³³ | 71.4 | 28.6 |
| Roetman B, Seybold D et al. ¹⁸ | 86 | 14 |
| Ravi K. Gupta, Harmeet Singh et al. ³⁴ | 74.6 | 25.4 |

Table no. 4 shows the final results of the present study against other operative studies. The results of operative studies were found comparable and more or less similar to the present conservative study. Therefore, the outcome of conservatively managed fractures is not bleak and operative treatment should be considered only for specific indications.

CONCLUSIONS:-

Traction treatment is a safe, effective and practically feasible modality of managing central fracture-dislocation of acetabulum which can be carried out even at primary and secondary level centres. Traction treatment is best indicated for reducing fragments who are attached to a larger part of the ilium eg. Posterior or anterior column.

Surgery is indicated only in specific indications, where a large free fragment creating a acetabular defect.





2006;131:188–93.

19. Wright R, Barrett K, Christie MJ, Johnson KD. Acetabular fractures: long-term follow up of open reduction and internal fixation. *J Orthop Trauma* 1994; 8(5):397-403.
20. Jing LY, Liu GY, Hu Y, Zhang F, Ruan YP, Xu RM. Operative treatment of old acetabular fractures. *Zhongguo Gu Shang*. 2010;23:386–8.
21. Wang MY, Wu XB, Zhu SW, Cao QY, Wu HH, Rong GW. Operative treatment of delayed acetabular fractures. *Zhonghua Wai Ke Za Zhi*. 2003;41:130–3.
22. Weise K, Maurer F, Schrade J. Hip dislocations and hip fractures—acetabular fractures. Indication, technique and results of conservative treatment. *Orthopade*. 1997;26:336–47.
23. Epstein HC. Posterior fracture dislocation of the hip. *J Bone Joint Surg* 1974; 56A:1103–1127).
24. Ylinen P, Santavirta S, Slatas P. Outcome of acetabular fractures: a 7-year follow-up. *Journal of Trauma-Injury Infection & Critical Care* 1989; 29(1):19–24.
25. Sen RK, Veerappa LA. Long-term outcome of conservatively managed displaced acetabular fractures. *J Trauma*. 2009;67:155–9.
26. Heeg H, Otter N, Klases HJ. Anterior column fractures of the column. *J Bone Joint Surg Br*. 1992;74:554–7.
27. Lovric I, Jovanovic S, Leksan I, Biuk E, Kristek J, Radic R. Functional status of hip joint after surgical and conservative treatment of acetabular fracture. *Coll Antropol*. 2007;31:285–9.
28. De Ridder VA, de Lange S, Kingma L, Hogervorst M. Results of 75 consecutive patients with an acetabular fracture. *Clin Orthop Relat Res*. 1994;305:53–7.
29. M Heeg; HJ Klases; and JD Visser: Operative treatment for acetabular fractures (JBJS 1990)
30. Liebergall M, Mosheiff R, Low J, Goldvirt M, Matan Y, Segal D: Acetabular fractures- clinical outcome of surgical treatment. *Clin Orthop*, 1999 Sep; (366): 205-16.
31. Giannoudis PV, Grotz MR, Papakostidis C, Dinopoulos H. Operative treatment of displaced fractures of the acetabulum. A meta-analysis. *J Bone Joint Surg Br*. 2005;87:2–9.
32. Malta 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* 1996; 78-A(11): 1632–1645.
33. Elmali N, Ertem K, Inan M, Ayan I, Denizhan Y. Clinical and radiologic results of surgically-treated acetabular fractures. *Acta Orthop Traumatol Turc*. 2003;37:97–101.
34. Ravi K. Gupta, Harmeet Singh, Bias Dev, Rajeev Kansay, Parmanand Gupta, and Sudhir Garg. Results of operative treatment of acetabular fractures from the Third World—how local factors affect the outcome; *Int Orthop*. 2009 April; 33(2): 347–352.

REFERENCES

1. Rowe CR, Lowell JD. Prognosis of fractures of the acetabulum. *J Bone Joint Surg* 1961; 43-A:130-59.
2. W W Tipton, R D D' Ambrosia and GP Ryle. Non-operative management of central fracture-dislocation of the hip. *J Bone Joint Surg Am*. 1975;57:888-893.
3. Narender Kumar Magu, Rajesh Rohilla, and Sanjay Arora. Conservatively treated acetabular fractures: A retrospective analysis. *Indian J Orthop*. 2012 Jan-Feb;46(1):36-45.
4. Rockwood- and Green's Fractures in Adults – 7th edition, sect. 4, chept. 45, p.1502-1504.
5. Amaravati RS, Phaneesha MS, Rajagopal HP, Reddy R. Treatment of acetabular fractures. *Indian J Orthop* 2005;39:26-9
6. Rosenthal RE, Coker WL. Posterior fracture-dislocations of the hip: An epidemiologic review. *J Trauma*. 1979;19:572–81.
7. Campbell's Operative Orthopaedics- 11th edition, vol. 3, chept. 53, p. 3318.
8. Watson-Jones; fracture and joint injuries- 7th edition, chept. 29, p. 822.
9. Matta JM, Anderson LM, Epstein HC, Hendricks P. Fractures of the acetabulum. A retrospective analysis. *Clin Orthop and Related Res* 1986; 205:230-240.
10. Matta JM, Mehne DK, Rofii R. Fractures of the acetabulum. Early results of a prospective study. *Clin Orthop and Related Res* 1986; 205(241-250).
11. Matta JM, Merritt PO. Displaced acetabular fractures. *Clin Orthop and Related Res* 1988; 230:83-97.
12. D'Aubigné RM, Postel M. Functional results of hip arthroplasty with acrylic prosthesis. *J Bone Joint Surg Am*. 1954;36:451–75.
13. Tile M. Fractures of the pelvis and acetabulum. Edited by Tile M. Baltimore Williams & Wilkins. 1995.
14. Armstrong JR. Traumatic dislocation of the hip joint. *JBL'S* 30B:430-445, Aug. 1948.
15. Heeg M, Oostvogel HJ, Klases HJ. Conservative treatment of acetabular fractures: The role of the weight bearing dome and anatomic reduction in the ultimate results. *J Trauma*. 1987;27:555–9.
16. Ochs B G, Marintshev I, Hoyer H, Rolauiffs B, Culemann U, Pohlemann T, Stuby F M. Changes in the treatment of acetabular fractures over 15 years: Analysis of 1266 cases treated by the German Pelvic Multicentre Study Group. April 2010.
17. Carnesale PG, Stewart MJ, Barnes SN. Acetabular disruption and central fracture dislocation of the hip. *J Bone Joint Surg* 1975; 57-A: 1054-1059.
18. Roetman B, Seybold D, Keil D, Muhr G, Mollenhoff G. Long-term results after acetabular fractures with respect to heterotopic ossifications. *Zentrabl Chir*.