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Short term functional results of fixation of bicolumnar acetabular fractures using single Kocher -Langenbeck approach

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ABSTRACT: Introduction: To study functional outcomes of bicolumnar acetabular fracture fixation using single(kocher- langenbeck)approach.
Methods: The study was conducted on 20 patients who underwent bicolumnar acetabular fracture fixation by single approach (kocher - langenbeck) using reconstruction plate for posterior column and lag screw fixation for anterior column posteriorly in Department of Orthopaedics ,GMCH Aurangabad from January 2018 to January 2021 .Patients were assessed clinically and functionally using Harris hip score,Visual analogue score(VAS),Mearle De-Aubuigne score,and radiological assessment at 3,6,12,18,24 and 36months.
Results: At 3 yr follow up of 20 patients,no loss of reduction or failure of implant was observed.Mean VAS was 0.9(range 0-3),mean Harris hip score was 85.6(range 81-90),mean Mearle De-Aubuigne score 15.7(range 0-18).We correlated our results with Matta's radiological fracture reduction criteria.All patients achieved union.Reduction achieved was anatomical in 60 percent cases,acceptable (imperfect) in 30 percent cases and poor in 10 percent cases.1 patient developed sciatic nerve palsy which recovered after 6 weeks of surgery and 1 patient developed superficial infection which was recovered by giving antibiotics.
Conclusion: Fixation of bicolumnar acetabular fracture by single approach(kocher-langenbeck) using plate osteosynthesis for posterior column and lag screw fixation for anterior column posteriorly is good alternative to combined approach.It makes procedure less invasive,shortens the operative time,minimizes blood loss and also reduces chances of infection with satisfactory outcome ,being simpler approach used by many orthopaedic surgeons.
Keywords: Acetabular fractures,kocher - langenbeck approach,bicolumnar

I. INTRODUCTION:

Acetabular fractures are nowadays increasing due to high incidence of road traffic accidents,trauma and increasing awareness among people towards their treatment.Basic principle of fracture treatment in lower extremity is anatomical reduction and early rehabilitation.Acetabular fractures should be managed aggresively by achieving stable anatomical reduction so as to prevent most common complication of secondary osteoarthritis in future.[1]Displaced fractures are best treated by anatomical reduction and stable internal fixation.[2-4]Most of the acetabular fractures (98%) involving both columns should be managed by single appropriate surgical approach.However ,adequate visualization and achieving anatomical reduction may require more than one surgical approaches like triradiate,extended iliofemoral,modified extensile approach and combined anterior and posterior approaches.[5-9]But there are certain disadvantages when more than one approach is used like increased rate of infection,heterotopic ossification,flap complications,increased operative time,blood loss and neurovascular complications (which is associated with use of anterior approach).[10]

In our study we used posterior approach (kocher -langenbeck) for all bicolumnar acetabular fracture using reconstruction plate fixation for posterior column fracture and lag screw fixation for anterior column fracture from posteriorly using same approach under c arm guidance.This approach has advantage of less operative time and less blood loss with decreased chances of infection with good stabilization of bicolumnar fracture.And we have achieved good results using single (kocher-langenbeck)approach for fixation of bicolumnar fractures.

II. MATERIALS AND METHODS:

Inclusion criteria:
1.Bicolumnar fractures of acetabulum.
2.Those patients operated within 2 weeks of injury having bicolumnar fracture.
3.Acute trauma cases having bicolumnar fractures.
Exclusion criteria:
1.Isolated fracture of anterior column and anterior wall.
2.Any patient of polytrauma having other associated fractures.

3.Any patient with bicolumnar fracture having significant head ,chest injury.

All patients admitted in Government Medical College, Aurangabad with bicolumnar acetabular fractures were evaluated for 36 months following fixation of fracture by single (kocher-langenbeck) approach.Clinical and functional evaluation was done using VAS ,Harris hip score,Mearle De-Aubuigne score .Routine radiographs include AP view of pelvis with both hip bones.Computed tomography scan helped to identify morphology and pattern of fracture and helped in operative fixation.

Surgical technique- surgical site was cleaned with betadine scrub and covered with sterile pad and bandaged night before surgery.Intravenous antibiotic (Third generation cephalosporins)was administered once the night before (12 hrs prior to surgery) and second dose was given 30 min prior to surgical incision.Hairs over skin over surgical site were removed 10 min prior to surgery.

Hypotensive spinal -epidural anaesthesia was given and blood pressure was maintained at 90/60 mm Hg throughout the surgery.

All patients were prepared and draped in floppy lateral position with affected hip uppermost.Incision begun over greater trochanter and extended proximally to within 6 cm of posterior superior iliac spine.Fascia lata divided in line with skin incision and gluteus maximus split in line with its muscle fibres for a distance of not more than 7 cm.protecting branch of inferior gluteal nerve to anterosuperior portion of gluteus maximus to avoid denervating that part of muscle .Sciatic nerve identified and protected overlying quadratus femoris.Short external rotators and their tendinous insertions were excised from greater trochanter and reflected medially to protect sciatic nerve additionally.Quadratus femoris and obturator externus were kept intact to protect underlying ascending branch of medial circumflex femoral artery.Tendinous insertions of gluteus maximus on femur can be incised to increase exposure.

Gluteus medius and minimus were elevated subperiosteally from posterior and lateral ileum and fracture site of posterior column was reached.Retraction of these muscles is maintained by inserting two smooth k wires of 3.5 mm each into ileum above greater sciatic notch.Exposure and identification of posterior wall fragment and posterior column fragment is done by traction over femur.Loose pieces of bone were removed by giving joint lavage and wash using 20 CC syringe from acetabular cavity with one assistant maintaining continuous traction to visualise joint cavity properly.Provisional fixation of posterior wall fragment is done by passing small k wires of 2.5 mm diameter from superior to inferior direction and stability of hip is assessed.Then 2-3 ,4 mm cannulated cancellous screws of appropriate size inserted to stabilize posterior wall and again stability of hip is reassessed .Then posterior column is identified and 4.5 mm schanz pin is inserted in ischial tuberosity to lift it up as it acts as a lever to achieve reduction of posterior column.So the first aim is to achieve congruent acetabular cavity then go towards reduction of acetabular columns.Then spike is inserted beneath the posterior column in sciatic notch to protect neurovascular structures and reduction of anterior column is achieved by putting lag screws from posterior to anterior direction to hold anterior column.Then precontoured 3.5 mm non locking reconstruction plate is applied spanning the posterior wall of acetabulum from ischial tuberosity to iliac blade posteriorly in neutralization mode which gives additional stability to posterior column.Rotation of ischiopubic fragment was assessed by inserting index finger through greater sciatic notch and any displacement if observed was simultaneously corrected .Reduction was confirmed under image intensifier.

Closure was done in layers over close suction drain.

Post-op protocol-Intravenous third generation cephalosporins were given for 48 hrs postoperatively and oral antibiotics were given for further 3 days.Drain was removed after 48 hrs.suture removal was done on post op day 14.Post op skin traction was applied with 2-3 kg weight for a period of 6 weeks for prevention of chondrolysis of cartilage over femoral head.Active assisted and pain free passive range of motion exercises in all planes were advised.partial weight bearing was permitted after 6 weeks and full weight bearing with single crutch or cane after 10-12 weeks.unprotected weight bearing was advised after complete healing of fracture.

Patient had undergone clinical and radiological evaluation at 3 months ,6 months ,12 months ,18 months, 24 months and 36 months after surgery.According to criteria developed by Matta ,post-op reduction is graded as anatomical (0-1 mm displacement),imperfect(2-3 mm displacement),and poor(more than 3 mm displacement).Final follow up radiographs were graded according to criteria developed by Matta.

At each follow up ,range of hip motion,Harris hip score and visual analogue scores

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were noted.Outcomes of Harris hip score were classified as excellent(91-100 percent),good(81-90percent),fair(71-80percent),and poor(<70 percent).VAS score was classified as No pain(0),mild pain(1-3),moderate pain(4-6),severe pain(7-9),and unbearable pain (10).

III. RESULTS:

Age group of patients selected for study was from 25 to 65 yrs in which males were 80%and females were 20%(Table 1 and 2).Total no.of patients included in study were 20 and they were followed up for a period of 36 months.

Table 1: Age distribution of patients

Sr.no.	Age group	No.of cases	Percentage
1	25-35	4	20%
2	36-45	8	40%
3	46-55	6	30%
4	56-65	2	10%

Table 2: sex distribution of patients

Sr.no.	Sex of patient	No.of cases	Percentage
1	Male	16	80%
2	Female	4	20%

Patients were clinically and functionally evaluated using visual analogue score(VAS),Harris hip score,Mearle De-Aubuigne score,And Matta's radiological criteria.

Our mean VAS score was 0.9(range 0-3) (Table 3),mean Harris hip score was 85.6 (range 81-90) (Table 4),Mearle De-Aubuigne score was 15.7(range 0-18) (Table 5).

Table 3:VAS score:

Sr.No.	Pain	Score
1	No pain	0
2	Mild	1-3
3	Moderate	4-6
4	Severe	7-9
5	Unbearable	10

Table 4:Harris Hip Score:

Sr. no.	Score	Result
1	<70	Poor
2	71-80	Fair
3	81-90	Good
4	91-100	Excellent

Table5:Mearle De-Aubuigne score:

Sr.no.	Criteria	Score
1	Pain	0-6
2	Mobility	0-6
3	Ability to walk	0-6

Radiological assessment using Matta's criteria showed anatomical reduction in 60 percent cases,acceptable reduction in 30 percent cases and poor reduction in 10 percent cases.

Results of our study were outstanding and we're in favour of using single kocher-langenbeck approach for fixation of bicolumnar acetabular fracture using reconstruction plate for posterior column and lag screw fixation for anterior column through same approach posteriorly.

Complications:

At follow up no other complications like failure of implant or loss of reduction was found.

One patient developed sciatic nerve palsy (neuropraxia)on post op day one which recovered after 6 weeks by neurotropic drugs and physiotherapy.one patient developed superficial infection after 1 week of surgery which was cured by using IV antibiotics.Our study was short term to

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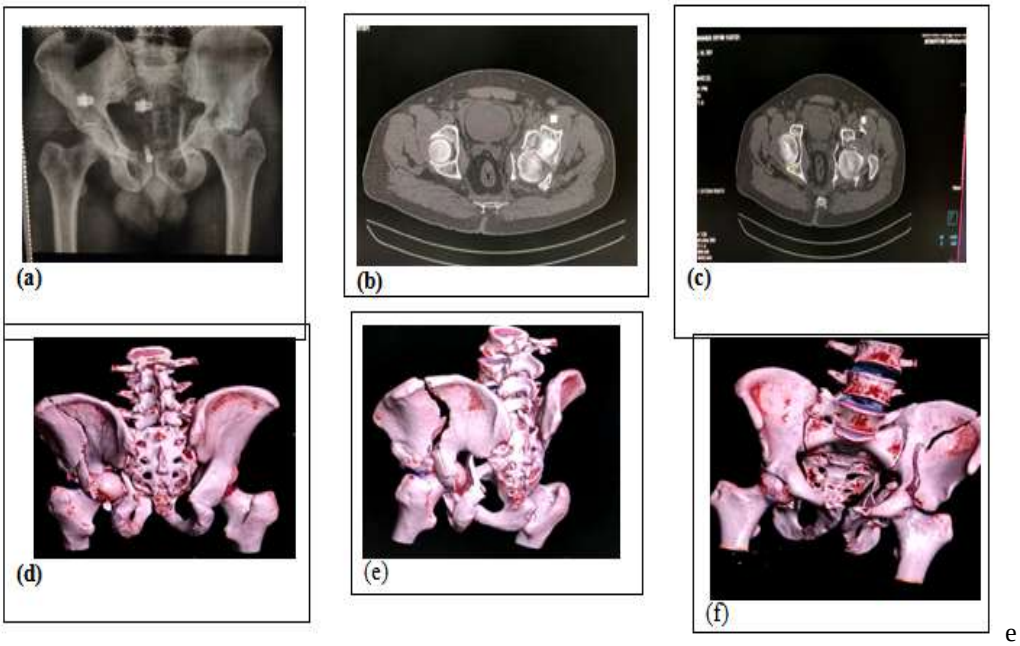
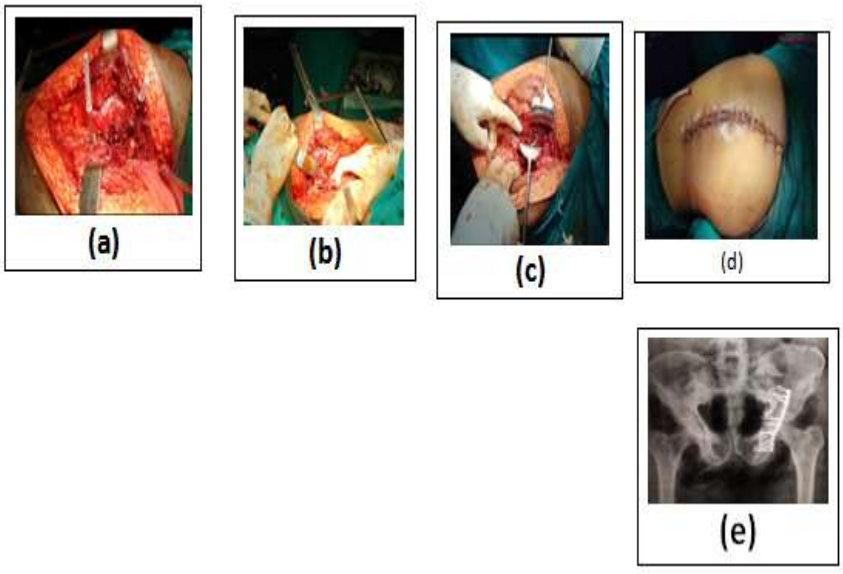
assess for development of secondary arthritis and avascular necrosis of femoral head in a period of 2-3 yrs.

Preoperative images:
Fig – 1
a – pre-op xray
b-c – Axial CT Cuts
d-e-f – 3DCT Cuts pre-op



e

Intraoperative & post Oprative Images : Fig - 2
a-b-c – intra oprative images
d – incision site
e – post op xray



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Clinical Follow- up images :

Fig3

IV. DISCUSSION:

Long term results of surgical treatment of acetabular fractures depends on many factors like type of fracture and/or dislocation,damage to femoral head,timings of surgery,quality of reduction,local complications and surgical approaches.[11]selection of appropriate approach is easier for simple fractures of acetabulum in Letournel classification but in case of complex fractures choice of approach depends on surgeons choice depending on his experience and training.Functional outcome of acetabular surgeries depends on accuracy of reduction which in turn depends on selection of best surgical approach depending on pattern of fracture.More than one approach may be required for accurate reduction of fracture depending on pattern of fracture.In our study we used single (kocher -langenbeck) approach for stabilization of bicolumnar acetabular fracture using reconstruction plate and screws for posterior column and lag screw fixation for anterior column through same approach posteriorly under guidance of image intensifier.This type of fixation of both columns through single approach has not been associated with secondary displacement and has been sufficient for resisting stresses of immediate active movement.[12]In our study using single approach we have achieved anatomical reduction in 60 percent cases and acceptable reduction in 30 percent cases.overall 90 percent patient in our study had good outcome which is comparable to studies by Chiu et al and Deo et al.

In our study infection rate was five percent.By using more than one approaches,infection rate is 5-12 %.[13]chances of injury to ascending branch of medial circumflex femoral artery and superior gluteal artery is eliminated.one patient in our series had iatrogenic sciatic nerve palsy which is known complication of posterior approach ,and was recovered in 6 weeks post operatively by neurotropic drugs and physiotherapy.Lag screw fixation for stabilization of anterior column is better option than using separate approach for stabilization of anterior column.[14]

Femoral head necrosis ,Arthrosis and heterotopic ossification tend to decline the final outcome of acetabular fractures despite good reduction.[15]In our series we used single posterior approach for fixation of bicolumnar fractures which lead to minimum soft tissue dissection,less operative time as well as less blood loss which avoided development of complications like infection,avascular necrosis of femoral head and heterotopic ossification .Disadvantage of more than one approaches is necessity of two surgical teams to be present for the technique to work well.Also simultaneous dual approaches can compromise exposure of fracture site and reduction possibilities of each approach.In single approach we have achieved good quality of reduction of both columns.

V. CONCLUSION:

From our study we conclude that fixation of bicolumnar acetabular fracture by single posterior (kocher-langenbeck)approach is good alternative to combined approach for individual column fixation.Using reconstruction plate and screw for fixation of posterior column and lag screw for anterior column posteriorly through same approach has achieved good results with better reduction of fracture and less chances of infection,less operative time including minimal intra operative and post -operative complications

like blood loss and heterotopic ossification including avascular necrosis of femoral head.

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