

To Assess the Functional Outcome of AO/ASIF A3 Distal Femoral Fractures

Fixed by Contour Locking Plate as Fixator Internee

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ABSTRACT

Objective: To evaluate the radiological and functional outcome of Association for Osteosynthesis (AO)/ Association for study of Internal Fixation (ASIF) A3 of distal femoral fractures treated with contour locking plates as fixator interneer.

Study Design: Descriptive case series study.

Place and Duration of Study: This study was conducted at the Mayo hospital Lahore from February 2018 to August 2019.

Materials and Methods: Patients with close intra articular commutated distal femoral fractures are admitted and operated with distal femoral contour locking plates by fixator interneer principle. Follow up visit were planned as, after 4th week, 6th week and then monthly for 08 months. Radiological union was noted and functional evaluation was done by using the modified Mize outcome criteria and which was graded 1 as excellent, 2 as good, 3 as fair and 4 as failure.

Results: 16 patients with mean age 40.43 years of age were operated. Male patients were 10 (62.5%) while female were 6 (37.5%). Patients were assessed with modified Mize criteria and excellent in 7 (43.75%), good in 4, (25%), Fair in 3 (18.7%) and failure in 2, (12.5%) patients. No implants failure was noted. NO nonunion was noted. Bone grafting (bone marrow aspiration) was done in 5 cases.

Conclusion: When locking plate is applied as fixator interneer, in intra articular comminuted fractures showed an excellent and good results radiological and functional results in AO/ASIFA3 complicated fractures in majority of the patients.

Key Words: AO/ASIF, A3, Fixator interneer, Distal femoral fracture, contour locking plate.

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INTRODUCTION

From all femur fractures about 6% fractures are distal femur fractures¹. These fractures are common in both male and females. Road traffic accidents, fall from a height and trauma during playing are the main reason of fractures in young adult's males. Usually the age limit is between 20 to 45 years. These fractures are very common in aged female usually above 60 years of age. Their bone is osteoporotic and minor insult leads to the fractures.^{2,3}

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These fractures are always very complex and problematic for treating surgeon. These fractures not only have comminution and but also have intra articular extension.

There are always complex soft tissues injuries around the knee joint. Sometimes quadriceps injury further add fire to fuel the problems⁴. These fractures are fixed by different implants. Every implant has its advantages and disadvantages. Commonly used implants are angle blade plate, and dynamic condylar screw. Sometimes intramedullary nails are used. External fixator may be used in some cases and some surgeon advocates early primary arthroplasty.^{5,6}

The commonly used implant are failed due to the nature of bone and injury. The bone at this area is very osteoporotic and there is much comminution with intra articular extension. Some surgeon advocates the use of retrograde nailing. These nail have the drawbacks of arthrotomy. Sometimes nail protrudes into the knee joint. Knee stiffness is very common complication of these procedures⁷. Now a day most commonality use implant is distal femur locking plate. These plates have many biomechanical advantages.^{3,8} Due to the many

biomechanical advantages the chances of implant failure are minimum at the same time the chances of implant failure in case of angled blade plate and retrograde nailing are maximum. Locking plates need much energy before they failed^{9,10}. Locking plates can be easily use as bridge plate The comminution area is bridged and screws are used to fix the fractures. By this way it acts like an internal fixator. This implant is a gold stander in osteoporotic fractures¹¹. Due to the biomechanical advantages resistance to plate pull out is equal to the sum of all locking screws resistance in case of locking plate. The most common complication reported in conventional plate and screws is collapse of the fracture in Varus position. This complication is prevented by The multiple fixed angle locking screws in locking plate.¹²

MATERIALS AND METHODS

This descriptive case series was conducted at Mayo Hospital Lahore from February 2018 to August 2019. All the patients with age between 16 to 50 years of either gender having AO/ASIF A3 supracondylar fractures were included in this study. The patients having pathological fracture polytrauma or evidence of osteomyelitis were excluded from the study. Modified Mize outcome Criteria was used to assess the outcome. Total 16 patients were included in the study, Patients were admitted throughout patients and emergency department. After admission routine investigations are done .X-rays of respective joint in AP and Lateral views are done in all cases.3D CT scan was done as a routine Skin traction was applied in all patients. After test dose parenteral antibiotics were started. Informed written consent was mandatory in all cases. During history and examination, special attention was given to the soft tissues and neuro vascular status. All fractures were operated on next few days.

Through lateral approach, two skin incision marked at the thigh under image intensifier, one distal and second proximal to the fracture site. We open the knee joint and make hole on the extensor expansion without opening the fracture hematoma. We slided the contour plate to proximal end of the fracture in between a plane bone and fascia lata. we used long plates. we made sure that proximal site of the distal screw should be at least 6 to 8 cm away from the fracture site. Under image intensifier, distal site of plate is fixed by one screw but screw did not lock., Then traction applied by an assistant in somewhat flexation position of knee. Care was taken to prevent sagging at the fracture site. Fracture geometry, length and rotation checked. Now proximal site of the fracture was opened Here plate is on or in the vastus lateralis muscle not on the bone, so there was a gap between the bone and plate .Now skin incision is made, fascia incised, palate identified ,two bone holder applies one near and second away from fracture site ,holding the bone and muscle. By

maintaining the traction one screw near the fracture and second away from the fracture applied. Screw is applied as, make a drill hole using sleeve, screw size measured, size is measured crossing plate muscle and bone. While fixing the screw, when the screws cross the bone, one artery forces is placed under the plate to stop the plate to push forward during locking. By this method plate will not sit on the bone but stay in the muscle mass showing a gap between the plate and bone . This is a GOLDEN key of this article. All screws then were locked. At least 5 to 6 screws should be at proximal fracture site and 4 to 6 at distal knee joint In case of open fracture (Now converted in close fracture) about 30 to 50cc bone marrow aspiration was taken from iliac crest and injected in the fracture site especially on the medial site of the fracture because this site is notorious for delay union or even nonunion. After putting suction drain wounds were closed in layers. Isosmotic knee and hip exercises were started whiten few days post-operatively. Intravenous antibiotic was started. We used available antibiotics in the hospital. After 24 hours’ drains were removed. Next day x-rays were done. Stitches were removed after 14 days as a policy. Follow up visits were planed after 4th., 6th., and after 8th weeks. Patients were called after every month. After 8th moth final follows up was completed and study closed. Radiological and functional outcome was evaluated through modified Mize outcome criteria¹⁷ and graded as excellent, good, fair and failure
Statistical analysis was done by using SPSS version 20. Categorical variables like fracture type and gender was represented as frequency and percentage while mean SD was calculated for numerical variables like age.

Modified Mize outcome Criteria

Excellent	All of the following: loss of flexion <10°; full extension no varus, valgus, or rotatory deformity no pain perfect joint congruency
Good	No more than any 1 of the following: loss of flexion >20° loss of extension >10° Varus deformity >5° valgus deformity >10° minimum pain
Fair	Any 2 of the criteria listed in the previous Category
Failure	Any of the following: flexion ≤90° Varus deformity >10° valgus deformity >15° joint in congruency disabling pain, irrespective of radiographic appearance

RESULTS

Total 16 patients were included in the study. Male were 10 (62.5%) and female were 6 (37.5%). The age range was from 20 to 50 years of age and Mean age was calculated as 33.63 ± 10.14 years of age. The average follow up was about 39.49 weeks. Mean time of union was 19.8 ± 4.13 weeks. In 10(62.5%) patients fractures were involved on right side, while in 6(37.5%) patient's fractures were on left side. 5(31.5%) patients have road traffic accidents, 4(25%) patients have a fall and 7(43.75%) patients received fire arm injuries. 9(56.25%) patients were with closed fractures and 7(43.75%) patients were of grade 1 open fracture. 10(62.5%) patients were given spinal anesthesia and 6(37.5%) patients received general anesthesia. 40 minutes was average operating time with a range from 30 to 60 minutes (range 30-60 minutes). 8 days was mean hospital stay time and this time of hospital stay was range from 4 to 15 days. (range 4 to 15 days). 16.3 weeks were average union time of fractures and it range from 12.2 to 24.5 weeks (range 12.2 to 24.5 weeks). In 5(31.25%) patients bone grafting was done through bone marrow aspiration.

7(43.75%) patients achieved excellent results, 4(25%) patients received good results, 3 (18.75%) patients received fair results and 2 (12.5%) patients received poor results as assessed with modified Mize outcome criteria. In 3(18.75%) patients' superficial infection was noted and in 1(6.25%) patient deep infection was noted. Superficial infection was treated with antibiotics and deep infection was resolved after removal of implant. Implant removal was done after union. Limb shortening was not noted in any case. There was no any mal union and nonunion. All implant was stable through the study so there was no implant failure. Hospital mortality was not reported of any case.

In 4(25%) patients' removal of implant was done. The main reason of implant removal was deep infection in one patient and pain in 2 patients. In one patient implant removal was done on request. Re-fracture was not reported after implant removal up to 3 month. 7 months was mean follow up time and it range from 6 to 8 month (range 6 to 9 months).

DISCUSSION

7(43.75%) patients got excellent result, 4(25%) patients got good result, 3(18.75%) patients got fair and results achieved in 2(12.5%) patients were failure. Gupta¹⁸ reported in 34 (85%) patient's excellent results, 4(10%) patients' good results and in 2(5%) patients result was failure. Distal femoral locking plates were used for the treatment of condylar fractures in all patients.

He reported in 8(32%) patients' excellent results found, in 8(32%) patients' results were satisfactory, in 3(12%) patients' results were unsatisfactory and in 6(24%) patients he reported failure results. Trivedi⁴ used locking plates in his study for treatment of AO type fractures in 25 patients.

Rajaiah³ reported in 7(35%) patient results were excellent, good outcome in (40%) patients' results were good fair in 4(20%) results were fair and in 1(5%) patients' poor outcome was reported, when he used a distal locking plates while treating 20 patients'

Saini¹⁹ and colleagues did much work on distal femur fractures with distal locking plates and reported in 21(62%) excellent results were found, in 11(32%) patients satisfactory results were found and in 2(6%) patients unsatisfactory results were found. Neer scoring system was used in their study for functional assessment while we used Modified Mize outcome Criteria.

We reported in 3(18.75%) patients' superficial infection and in 1(6.25%) patients' deep infection was found. Patient with Gustilo Anderson type I fracture had deep infection one patient with Type I fracture also got superficial infection. Close fractures were found in other 2 patients with close superficial infection.

Rajaiah³ 2(10%) patients were found to be infected, Trivedi⁴ found infection in his 2(8%) and Poole⁵ infection to be present in his 2(2%) patients.

In our study we did not find Nonunion in literature Reddy² 2(3.3%) patients got nonunion, Trivedi⁴ reported nonunion in his 1(4%) patient, Poole⁵ found infection in his 4(3%) patients and Toro²⁰ reported rate was about 2(16.6%) in his cases. Toro and colleagues found 1(8.3%) patient got implant failure. In their study Short plates with inadequate number of screws were responsible for implants failure. Ricci²¹ reported that after working on 335 distal femur fractures which he treated with locking plate and nonunion were found in his 64(19.1%) patients. He documented that many problems from patients are very important in failure rate. Diabetes, smoking, obesity, open fractures and inadequate length of plate are main factors for failure of fixation.

Rodriguez et al²² had the same opinion as Ricci and 9.8% infection rate was reported in total 283 patients with distal femoral fractures. In their nonunion he reported the main factors involved were infection, obesity, open fracture and stainless-steel plates Another pointed out that nonunion was found in his 41% patients with stainless steel plates he used and is about 10 % when he used titanium locking plates.

Henderson⁸ also pointed out that after reviewing 23 articles and reported that in (0% to 32%) patients' complication of healing was noted, in 0% to 15% patients delayed union were noted and in 0% to 19%

patients nonunion were reported and in 0% to 20% implant failure was found. Poole⁵. reported very high mortality rate after working 12 months. Relatively higher mean age (72.8 years) was the main reason of this problem. Stainless steel locking plate and titanium plates are not compared in our study. The following factor are not discussed in our study like obesity, diabetes, smoking, plate length and other possible risk factors for infection, non-union and implant failure. On large scale randomized trials should be conducted to address these issues.

CONCLUSION

We recommend that in comminuted extra articular fractures of distal femur fixator interneer with locking plate is best option.

Author's Contribution:

Concept & Design of Study:	Muhammad Khalid Syed
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