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Original Research Article

Outcome of Surgical Management of Intercondylar Fractures of Distal End of Femur Using Dual Plating: An Experimental Study from Tertiary Care Centre

Milind Kulkarni[1], Shekhar Malve[2], Pranit Pavaskar[3], Sujay Kulkarni[3], Prashant Dhamoji[4], Zafer Satvilkar[5]

[1]Professor and Head, Department of Orthopaedics, Dr GS Kulkarni Fracture and Orthopaedic Hospital, Extension Area, Miraj, Maharashtra

[2]Associate Professor, Department of Orthopaedics, Dr GS Kulkarni Fracture and Orthopaedic Hospital, Extension Area, Miraj, Maharashtra

[3]Assistant Professor, Department of Orthopaedics, Dr GS Kulkarni Fracture and Orthopaedic Hospital, Extension Area, Miraj, Maharashtra

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Corresponding Author: Dr. Pranit Pavaskar

Conflict of interest: Nil

Abstract:

Introduction: Due to the inconsistently bad results of different distal femur fracture geometries, disputed care strategies and their techniques are invoked, with varying results. When under axial, bending, or twisting loads, the distal femur's transition flare is most vulnerable to fracture in car accidents and sports injuries. Strong quadriceps shorten the limb in these fractures while even stronger hamstrings pull the distal part posteriorly. Due to muscular bracing and the rarity of intraoperative dorsal neurovascular systems being at danger, reduction is made significantly more challenging in coronal rather than sagittal fractures.

Objective: To evaluate the end result of surgical management of intercondylar fractures of distal end of femur using dual plating with respect to: bony union, functional outcome and range of movements.

Methodology: The present prospective study was done to evaluate the functional outcome of parallel plating technique in treatment of distal femur fractures and to analyse the results at Tertiary Care Hospital during the study period.

Results: Age ranged from 21 to 50 years of age with mean age of 35.50 years. Male cases were predominantly higher than female cases with M:F ratio of 6.5:1. 46.67% cases were observed with C3 type fracture. 157 minutes mean operative time was observed during the study period. 23.33% cases were observed with knee stiffness where 3.33% each case was observed with implant loosening and infection respectively. 33.33% cases were observed with good outcome, 30% cases were observed with excellent outcome, 26.67% cases were observed with fair outcome where 10% cases were observed with poor outcome.

Conclusion: Double plating is one of the better options to achieve bony union and a better functional outcome in severely comminuted distal femur fractures, even though there were complications and an increase in operating time in our study. Locking compression plates are a crucial component of the treatment armament for knee fractures, particularly when the fracture is substantially comminuted and there are signs of osteoporosis.

Keywords: Outcome, surgical management, intercondylar fractures of distal end of femur using dual plating.

Introduction

Due to the inconsistently bad results of different distal femur fracture geometries, disputed care strategies and their techniques are invoked, with varying results. These complex fractures were categorized by Muller as simple fracture types. The distal 7.6 cm to 15 cm of space are known as the supracondylar region in various literatures. When under axial, bending, or twisting loads, the distal femur's transition flare is most vulnerable to fracture in car accidents and sports injuries. Strong quadriceps shorten the limb in these fractures while even stronger hamstrings pull the distal part posteriorly. Due to muscular bracing and the rarity of intraoperative dorsal neurovascular systems being at danger, reduction is made significantly more challenging in coronal rather than sagittal fractures. [1] AO researchers firmly feel that internal fixation and open reduction are the best treatments for these challenging but treatable fractures. After a thorough grasp of how to preserve the periosteal blood supply and achieve positive results, biological fixation techniques developed within a short period of time.

Due to advancements in technology, research, and surgeons' improved learning goal abilities, periarticular locking plates are becoming more popular as an alternative to intramedullary nails, condylar buttress plates, and dynamic condylar screws. [2]

Across this study, we proved the functional success of locking plates in a broad age range, regardless of gender, and with significant distal femur fracture involvement.

Objective: To evaluate the end result of surgical management of intercondylar fractures of distal end of femur using dual plating with respect to: bony union, functional outcome and range of movements.

Material and Methods

A prospective study was done to evaluate the functional outcome of parallel plating technique in treatment of distal femur fractures and to analyse the results.

Place of study: Tertiary Care Hospital

Duration of study: 24 months

Inclusion criteria:

- AO/OTA classification type A, B & C
- Gustillo Andersson type I
- Skeletally mature patients
- fractures of distal FEMUR
- Age >18 years
- Consenting to study

Exclusion criteria

- Gustillo Anderson type II, III
- Periprosthetic fractures
- Old malunited fractures
- Associated tibial condyles/patella fracture

Detailed procedure of study conduct: After approval from Ethical Committee and obtaining consent form from the patients, patients were clinically and radiologically were examined, further fracture assessment with CT scan patients with AO/OTA B3 with coronal fracture geometry was done.

All patients were operated in supine position under spinal anesthesia without tourniquet under adequate provision of blood transfusion. Broad spectrum IV antibiotics administered before incision. Standard lateral approach was taken in patients. Swashbuckler approach was taken in patients of AO/OTA B3 type. Intra-articular fracture assessment shows chondral and patellofemoral articular fragments fracture lines which was addressed initially held with smooth 1.6 mm Kirschner wires. Hoffa fragments was held with blunt c-clamp and provisionally fixed with 2mm Kirschner wires and fixed with 6.5mm cannulated cancellous screws or 5mm locking head screws.

Intercondylar fractures was held with large patella holding clamps and fixed with 6.5mm CCS following epicondylar axis and blummensaat line. Supracondylar extensions of fracture lines was addressed with femoral clamps and held temporarily with 18G SS wires or 4.5 cortical lag screws. Locking plates of working length calibrated by working length of fracture spanning four to five locking or cortical compression units of the plate. Reduction was achieved by any means are fixed with locking compression screws distally reaching medial condylar cortices with due care of collateral ligaments. Closure was done of iliotibial band with continuous fashion with no 0 vicryl OS 6. Keeping negative suction drainage wound closed with standard fashion. Above knee posterior plaster slab was applied in each case.

Postoperative standard protocols were followed routinely. Physiotherapy of quadriceps muscles and ankle pump was started immediately on day one. Negative drain was removed on day two postoperatively with X rays. Assisted knee bending was started in all patients on day three to four under pain control medications.

Dressing was done on day two and on day five. Patients was discharged after 7 to 10 days with brace support. Follow up after 2 weeks, 4 weeks and 6 weeks for clinical evaluation with X-rays at 6 weeks and 3 months to evaluate radiological union status was done. Patient's movement and other parameters was evaluated with American knee society score system.

Statistical analysis: IBM SPSS Version 21 was used for descriptive statistics. Microsoft Excel book 2019 was used to prepare tables and graphs.

Results

Table 1: Demographic information

Age	**No of cases**	**Percentage (%)**
21 – 30	10	33.33
31 – 40	11	36.67
41 – 50	9	30.00
Total	30	100.00
Mean ± S.D	**35.50±8.28**	
Gender	**No of cases**	**Percentage (%)**
Male	26	86.67
Female	4	13.33
Total	30	100.00

In the present study age ranged from 21 to 50 years of age with mean age of 35.50 years. 36.67% cases were observed having age from 31 to 40 years of age, 33.33% cases were observed having age from 21 to 30 years of age where 30% cases were observed having age from 41 to 60 years of age. Male cases were predominantly higher than female cases with M:F ratio of 6.5:1. 86.67% cases were male cases where 13.33% cases were female cases.

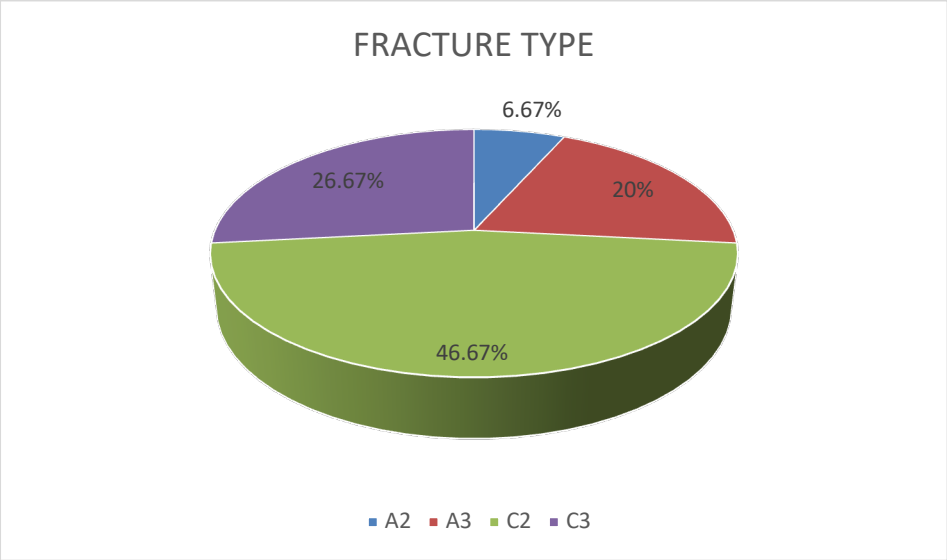

Figure 1: Distribution according to type of fracture

In the present study 46.67% cases were observed with C3 type fracture followed by 26.67% cases with C3 type fracture, 20% cases were observed with A3 type fracture and 6.67% cases were observed with A2 type of fracture

Table 2: Distribution according to operative time

Operative time (in minutes)	No of cases	Percentage (%)
110 – 150	18	60.00
160 – 200	5	16.67
> 200	7	23.33
Total	30	100.00
Mean ± S.D	157±39.58	

In the present study 60% cases were observed having operative time from 110 minutes to 150 minutes, 23.33% cases were observed having operative time more than 200 minutes where 16.67% cases were observed having operative time from 160 minutes to 200 minutes. 157 minutes mean operative time was observed during the study period.

Table 3: Distribution according to complications

Complications	No of cases	Percentage (%)
Implant loosening	1	3.33
Infection	1	3.33
Knee stiffness	7	23.33
No any	21	70
Total	30	100

In the present study 23.33% cases were observed with knee stiffness where 3.33% each case was observed with implant loosening and infection respectively. 70% cases were observed without any complications.

Table 4: Distribution according to healing time

Healing time (in weeks)	Mean ± SD
Clinically	20.73±2.43
Radiologically	17.73±2.43

In the present study Clinically 20.73 weeks mean healing time was observed where radiologically 17.73 weeks mean time was observed.

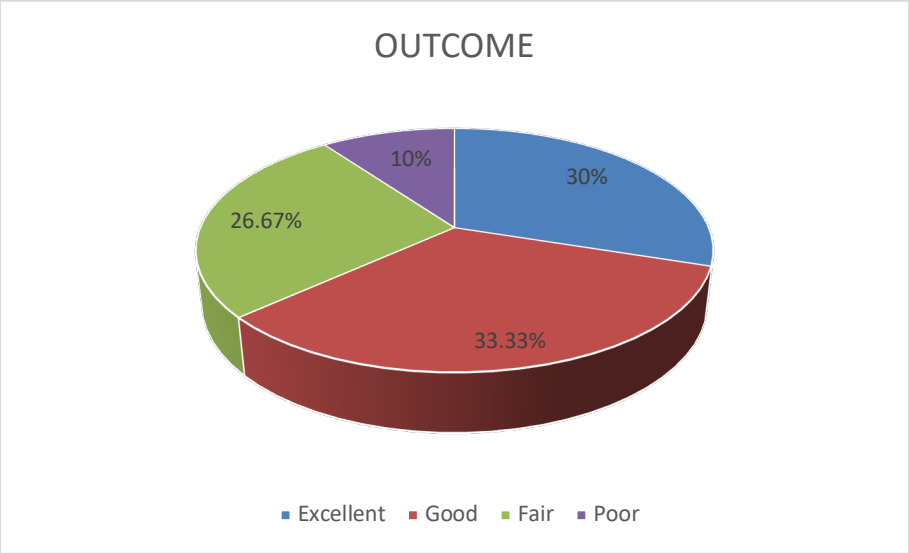

Figure 2: Distribution according to outcome

In the present study 33.33% cases were observed with good outcome, 30% cases were observed with excellent outcome, 26.67% cases were observed with fair outcome where 10% cases were observed with poor outcome due to complications after surgery. 73.93 mean score was observed among the study participants.

Discussion

Age: In the present study age ranged from 21 to 50 years of age with mean age of 35.50 years. 36.67% cases were observed having age from 31 to 40 years of age, 33.33% cases were observed having age from 21 to 30 years of age where 30% cases were observed having age from 41 to 60 years of age. In study conducted by Purushotham VJ and colleague et al3 (2021), 40% cases were observed having age from 40 to 50 years of age followed by 26.7% each case was observed having age from 51 to 60 and having age less than 40 years of age respectively, 6.7% cases were observed having age more than 60 years of age. 42.60 years mean age was observed. In study conducted by Imam MA et al [4] (2018), 36.0 years mean age was observed

Gender: Male cases were predominantly higher than female cases with M: F ratio of 6.5:1. 86.67% cases were male cases where 13.33% cases were female cases. In study conducted by Purushotham VJ and colleague et al [3] (2021), 60% were male cases and 40% were female cases. In study conducted by Imam MA et al [4] (2018), 68.75% where male cases were 31.25% were female cases. In study conducted by Shenoy DA et al [5] (2020) they observed, out of 22 cases, 81.82% males and 18.18 female patients

Fracture type: In the present study 46.67% cases were observed with C3 type fracture followed by 26.67% cases with C3 type fracture, 20% cases were observed with A3 type fracture and 6.67% cases were observed with A2 type of fracture. In study conducted by Virk JS et al [6] they observed, age ranged from 21 to 70 years of age with mean age of 36.64 20% cases were observed with A1 fracture type, 4% cases with A2 type fracture, 20% cases with A3 fracture type, 12 cases with C1 type fracture and 44% cases were observed with C2 type fracture.

In study conducted by Shenoy DA et al [5] (2020) they observed, 4.55% was Muller's type A1, 27.27% were Muller's type A2, 18.18% were Muller's type A3, 4.55% was Muller's type C1, 27.27% were Muller's type C2 and remaining 18.18% were with Muller's type C3. In study conducted by Metwaly RG and colleague7 (2018), 56% cases were observed with C2 fracture type, 22% cases were observed with C3 type fracture, 13% cases were observed with A3 type fracture where 9% cases were observed with C1 type fracture.

Operative time: In the present study 60% cases were observed having operative time from 110 minutes to 150 minutes, 23.33% cases were observed having operative time more than 200 minutes where 16.67% cases were observed having operative time from 160 minutes to 200 minutes. 157 minutes mean operative time was observed during the study period.

In study conducted by Imam MA et al [4] (2018), 213.6 minutes mean operative time was observed.

Complications: In the present study 23.33% cases were observed with knee stiffness where 3.33% each case was observed with implant loosening and infection respectively. 70% cases were observed without any complications.

In study conducted by Purushotham VJ and colleague et al [3] (2021), 10% cases were observed

with complications like knee stiffness, peri implant fracture, superficial infection and delayed union.

In study conducted by Imam MA et al [4] (2018), 12.50% cases were observed with infection, 6.25% cases were observed with failure of implant and requirement of secondary procedure respectively. 75% cases were observed without any complications.

In study conducted by Virk JS et al [6] they observed, 8% cases were observed with superficial infection and 4% cases were observed with Malunion.

In study conducted by Metwaly RG and colleague et al7 (2018) they observed, Knee stiffness was common in in 48% of the cases; 7% cases with reduction loss, 8% cases with breakage of the locking screws and 22% cases with anterior knee pain were observed.

Outcome: In the present study 33.33% cases were observed with good outcome, 30% cases were observed with excellent outcome, 26.67% cases were observed with fair outcome where 10% cases were observed with poor outcome due to complications after surgery. 73.93 mean score was observed among the study participants.

In study conducted by Purushotham VJ and colleague et al [3] (2021), 50% cases were observed with excellent functional outcome, 36% cases with good functional outcome where 14% cases were observed with fair outcome.

In study conducted by Imam MA et al [4] (2018), 43.75% cases were observed with good functional outcome, 25% cases with excellent functional outcome, 18.75% cases with fair outcome and 12.50% cases were observed with poor functional outcome. In study conducted by Virk JS et al [6] they observed, 44% cases were observed with excellent functional outcome, 36% cases with good functional outcome where 20% cases were observed with fair functional outcome.

In study conducted by Shenoy DA et al [5] (2020) they observed, the outcome in form of regaining the knee function is assessed using NEER's scoring system. The median NEER's score in study was 94.5. Among 22 patients included, 54.55% patients showed excellent outcome, 27.27% with good and 18.18% with fair outcome at the follow-up

Conclusion

- Double plating is one of the better options to achieve bony union and a better functional outcome in severely comminuted distal femur fractures, even though there were complications and an increase in operating time in our study.
- There was no varus deformity or malunion, and functional range of motion was good in 40% of cases and excellent in 25% of cases.
- The use of LISS greatly reduces the amount of periosteal stripping and soft tissue exposure required for surgical exposure for the placement of plates compared to other procedures. The locking compression plate is a valuable procedure, but it necessitates attention to avoid difficulties, as orthopaedic surgeons with experience in locking compression plating will find.
- Locking compression plates are a crucial component of the treatment armament for knee fractures, particularly when the fracture is substantially comminuted and there are signs of osteoporosis.

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