MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.36478/makrjms.2024.12.163.137

OPEN ACCESS

Key Words
LCP condylar plate, comminuted distal femoral fractures, neer score, metaphyseal collapse

Corresponding Author
T. Zeeshan Muzahid,
Department of Orthopaedics, Bhaskar Medical College and General Hospital Yenkapally (V) Moinabad (M)-500075, India
pangeriraj@gmail.com

Author Designation
[1,3]Assistant Professor
[2]Associate Professor
[4]Professor

Received: 12 August 2024
Accepted: 19 September 2024
Published: 28 October 2024

Citation: P. Raja Sekhar, T. Zeeshan Muzahid, N. Frank David and G.V.S. Moorthy, 2024. Study of Treatment with Locking Compression Plate for Distal Femur Fractures and its Functional Outcome. Res. J. Med. Sci., 18: 163-167, doi: 10.36478/makrjms.2024.12.163.137

Study of Treatment with Locking Compression Plate for Distal Femur Fractures and its Functional Outcome

[1]P. Raja Sekhar, [2]T. Zeeshan Muzahid, [3]N. Frank David and [4]G.V.S. Moorthy

[1-4]Department of Orthopaedics, Bhaskar Medical College and General Hospital Yenkapally(V) Moinabad (M)-500075, India

ABSTRACT
Distal femur fractures are most complex injuries causing long term disability. In recent years AO blade plate, dynamic condylar screw intra medullary, supra condylar nail and locking compression plate showing good results. Present study was aimed to study treatment with locking compression plate for distal femur fractures and its functional outcome. Present study was prospective, observational study, conducted in patients above 18 years age, presenting with distal femoral fractures with or without osteoporotic changes, managed surgically with locking compression plate. In our study of the 30 patients, 18 were Males, 12 were Females. Males and females were almost in equal number. Highest number of patients were in their 4th decade (26.6). Most of the patients, reported within 1st week of injury to the hospital. All patients had closed injury. Type A1 muller's fracture was the most common fracture type 8 out of 30 patients (26.6%) along with Type C2. Overall results were excellent in 7 (23.3%) out of 30 cases and were satisfactory in 22 (73.3%) cases and one had an unsatisfactory result. The overall average knee score in our study was 81.4%. We can Observe that all the Excellent results were from Type A Fracture and satisfactory results were seen in Type A, B, C. Early complications were encountered in 5 patients and these were superficial wound infection, delayed wound healing (wound gaping), pin tract infection Late complications were observed like mal-union with varus in 2 patients, Plate breakage in 1 patient, knee stiffness in 2 patients. The LCP condylar plate is the treatment of choice in the management of comminuted distal femoral fractures especially Type A fractures where we have found higher Neer scores.

INTRODUCTION

Distal femur fractures are most complex injuries causing long term disability. Accounting for 6% of all femur fractures, 31% if hip fractures excluded, nearly 50% of intra articular distal femur fractures are open type. Bimodal distribution of supracondylar fractures of femur has been proved by studies[1,2]. Many young lives have been crippled due to marked increase in RTA and fall from height (construction site injuries). Osteoporosis is main cause in older patients especially women. Until 1960's there was high incidence of infection, malunion, nonunion, there was great unwillingness to operative management of distal femur fractures. Watson Jones and John Charnley advocated in that era conservative and traditional management by cast, manipulation of fracture, external immobilization, skeletal traction. Complications raised like deformity, shortening, prolonged bed rest, knee stiffness, angulation, malunion, nonunion, wasting of quadriceps, instability of knee and other post traumatic complication[3]. In recent years AO blade plate, dynamic condylar screw intra medullary, supra condylar nail and locking compression plate showing good results. So, trend of open reduction and internal fixation has become more popular and evident. Locking compression plate has advantage in osteoporotic and elderly patients, as these conditions add difficulty in articular fractures, these conditions may cause loss of stable fixation[4]. Present study was aimed to study treatment with locking compression plate for distal femur fractures and its functional outcome.

MATERIALS AND METHODS

Present study was prospective, observational study, conducted in department of orthopedic surgery, at Bhaskara Medical College and General Hospital, Moinabad, Ranga Reddy, India. Study period was from September 2019 to March 2022. Study was approved by institutional ethical committee.

Inclusion Criteria:

- Patients above 18 years age, presenting with distal femoral fractures with or without osteoporosis changes, managed surgically with locking compression plate, willing to participate in present study.

Exclusion Criteria:

- Patients with associated tibial plateau fractures.
- Children with distal femoral fractures or in whom, growth plate is still open or <18 years of age.
- Patient with pathological distal femur fractures other than osteoporosis.
- Patients lost in follow-up.
- Patients managed conservatively for other medical reasons.
- Distal femoral fractures with neurovascular compromise.

Study was explained to participants in local language and written informed consent was taken. In patients with fracture lower end of femur on arrival, after history taking (age, sex, mode of trauma, period between injury and arrival), general and systemic examination as well as local examination of the patient was done. Thorough assessment of patient was done to rule out head/chest/abdominal/spinal or pelvic injury/associated fractures. Stabilization of patient was done with intravenous fluids, oxygen and blood transfusion as and when required. Radiological assessment was done as Anteroposterior and true lateral views of injured limb including complete knee joint, Pelvis and involved femur. Preoperative investigations such as Hemogram, Blood sugar level, Blood urea level, Serum creatinine level, Electrolytes, Blood group and Rh typing, Bleeding time, clotting time and prothrombin time were done in all patients. Chest X-ray postero-anterior view, electrocardiography, 2D Echo and other investigations done in patients as required during anaesthetic evaluation. Under appropriate anaesthesia, we used the standard lateral approach to distal femur, with patient in supine position and a sand bag was kept below the operating knee and one below the ipsilateral hip. Fracture reduced and temporarily secured the articular fragments with pointed reduction forceps and/or K wires. If a posterior Hoffa fragment is present, it was reduced and provisionally stabilized with K wire inserted from anterior to posterior. Secured the condyles with 6.5mm cancellous screws. A condylar plate guide or plate itself held laterally on the condyle to select an area, where screws will not interfere with plate placement. Placed a K wire across the femoral condyle, at the level of the knee, to indicate the joint axis and place a second K wire across the patello-femoral joint on the trochlear surface. Using anatomic landmarks and C-arm imaging, mount the plate on the intact/reconstructed condyle without attempting to reduce the proximal portion of the fracture. It is easier to thread the wire guides into the plate prior to placing the plate on the bone. Once reduction is satisfactory, the plate loaded in tension using articulated tension device. The plate shaft fixed with appropriate cortical screws after confirming final reduction of the fractures. Non-weight bearing with crutches or walker support was initiated in 1st week, for stable fixation. Sutures are removed between 10th-12th postoperative days. Partial weight bearing is allowed after 3rd week. Full weight bearing is allowed after radiological evidence of healing. (6-12 weeks). Patients with inter condylar fractures and A-0. types B and C fractures are not allowed full weight bearing for at least 12 weeks. All patients were followed at regular intervals (i.e., once

in a month for the first 3 months and once every 3 months thereafter). Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS AND DISCUSSIONS

In our study of the 30 patients, 18 were Males, 12 were Females. Males and females were almost in equal number. Highest number of patients were in their 4th decade (26.6). Road traffic accident was the most common mode of injury (60%). There was not a single case with bilateral fractures. 1 patient had associated facial injuries, 1 patient had ipsilateral metatarsal and 1 patient with ipsilateral metacarpal and phalangeal bones fracture, one patient had Ipsilateral humeral shaft fracture, one clavicle fracture making a total of 6 patients (20%) with associated fractures.

Table 1: General Characteristics

Characteristics	No. of subjects	Percentage
Age group (in years)		
0-20	2	6.67
21-30	6	20
31-40	5	16.67
41-50	8	26.67
51-60	4	13.33
61-70	3	10
71-80	0	0
81-90	2	6.67
Gender		0
Male	18	60
Female	12	40
Side		0
RIGHT LIMB	14	46.67
LEFT LIMB	16	53.33
Associated Injuries		0
Metacarpal and phalanges fracture	1	3.33
Face injuries	1	3.33
Metatarsal fractures	2	6.67
Humerus fracture	1	3.33
Clavicle fracture	1	3.33

Most of the patients, reported within 1st week of injury to the hospital. All patients had closed injury. Type A1 muller's fracture was the most common fracture type 8 out of 30 patients (26.6%) along with Type C2.

Table 2: General Characteristics

Fracture Classification (OTA)	No. of subjects	Percentage
C2	8	26.67
C1	4	13.33
B1	3	10
A1	8	26.67
A2	6	20
A3	1	3.33

Neer's Functional Scoring was used to assess the outcome of surgery, for adult distal femoral fractures. In our observation, 9 out of 30 patients had no pain (30%), 15 patients had intermittent pain due to knee stiffness (50%), 6 patients had pain with fatigue. (20%) In our study, 4 out of 30 (13.3%) patients were able to return to their function as before injury. Mild restriction was noted in rest of 20 (66.6%) patients, restriction with stair climbing in 6 (20%) patients.

In our observation, 15 out of 30 (50%) patients gained knee flexion of 100° or more, 5 out of 30 (16.6%) patient upto 90°, 6 out of 30 (20%) patients gained upto 80° and Remaining 3 patient (10%) regained a knee flexion of 70°, 1 patient regained flexion of 60°. In our observation, 15 (50%) patients worked as before injury, 12 (40%) patients with mild handicap and 3 (10%) patients shifted to alter work. In our study, 3 (10%) patients developed mild varus angulation of 10° and another 6 (20%) patients had 5 mm shortening, and the remaining 21 (70%) patients had thickening only. Out of 30, 27 patients (90%) had near normal radiographs, 3 (10%) had 10 degrees angulation. Overall results were excellent in 7 (23.3%) out of 30 cases and were satisfactory in 22 (73.3%) cases and one had an unsatisfactory result. The overall average knee score in our study was 81.4%. We can Observe that all the Excellent results were from Type A Fracture and satisfactory results were seen in Type A, B, C.

Table 3: Fracture Type and Outcome

Outcome	Excellent	Satisfactory	Unsatisfactory
Type A	6	9	
Type B		3	
Type C	1	9	2
Total	7	21	2

Early complications were encountered in 5 patients and these were superficial wound infection, delayed wound healing (wound gaping), pin tract infection Late complications were observed like mal-union with varus in 2 patients, Plate breakage in 1 patient, knee stiffness in 2 patients.

Table 4: Complications

Characteristics	No. of subjects	Percentage
Early complications		
Superficial wound infection	1	3.33
Delayed wound healing	3	10
Tibial Pin tract infection	1	3.33
Late Complications		
Malunion with varus	2	6.67
Plate breakage	1	3.33
Knee stiffness	1	3.33

The good outcome seen in our study can be attributed to more of Type A fractures, which usually show favorable results. Most of the series above have equal or higher number of Type C fractures. We had two cases of varus collapse one was due to early weight bearing in one case and other case is due to gross communition. One case had an implant failure (Plate breakage) due to early weight bearing Earlier, fixation of these fractures with a lateral plate alone has historically been associated with non-union and /or malunion with varus collapse. Prior to advent of locking plates, these problems were addressed with dual plating methods. Though this prevented varus collapse, extensive soft tissue stripping and medial incision increased the chance of extensor lag. With the

introduction of plates with option of locked screws, the results are encouraging, as it increases the rigidity of fixation in osteoporotic bone and in presence of peri articular or juxta-articular comminution[5,6]. The LCP condylar plates provide multiple points of fixed plate to screws contact, generating greater stability and thereby reducing the tendency of varus collapse. LISS plating allows minimally invasive approach by sub muscular insertion of plates and thereby preservation of vascularity to the lateral cortex[7,8]. In our study, 3 (10%) patients developed mild varus angulation of 10° and another 6 (20%) patients had 5 mm shortening and the remaining 21 (70%) patients had thickening only. To prevent this early mobilization and weight bearing is not recommended. In our study, radiological union was seen at an average of 16 weeks which is comparable to study of LCP by Ahmad[7] that averages 15 weeks. Overall results were excellent in 7 out of 30 cases and were satisfactory in remaining cases. The overall average knee score in our study was 80, as opposed to by Schandelmaier[7]. Christopher[10] in a systematic review comparing traditional plating, intra medullary nails and locking plates found no observed differences between implants in the rate of nonunion, infection, fixation failure, or revision surgery. However, subgroup analyses suggested an increased risk of fixation failure and revision surgery with locking plates compared to conventional plates but a reduced infection rate. Hierholzer[11] concluded both retrograde IM nailing and LISS plating may be adequate treatment options for distal femur fractures. No differences in outcome between implants regarding fracture healing, nonunion and infection were found. Locked plating may be utilized for all distal femur fractures including complex type C fractures, periprosthetic fractures, as well as osteoporosis fractures. IM nailing may provide favorable IM stability, may promote formation of circular and stable callus and may be successfully implanted in bilateral or multi segmented fractures of the lower extremity as well as in extra-articular and type C1 fractures. However, both systems require precise preoperative planning and advanced surgical experience to reduce the risk of revision surgery. Clinical outcome may largely depend on surgical technique and rather than on the choice of implant. Findings of study by Muckley[12] support the concept that, for intra medullary nails, the kind of distal interlocking pattern affects the stabilization of distal femoral fractures. Four-screw distal locking provides the highest axial stability and nearly comparable torsional stability to that of the angular stable plate., the four-screw distal interlocking construct was found to have the best combined (torsional and axial) biomechanical stability. The problems in fixing distal femoral fractures with osteoporosis, extensive commination and revision surgeries following failed implant can be addressed effectively using locking condylar plate. We believe that locking plates represent a valuable advancement in fracture treatment. However, the limitations of this new technology and indications for its use have not been completely elucidated and the long-term results are awaited. However, the locking plates can fail when physiological loads are outside plate-design parameters. The locked screws can dis-engage from the plate secondary to failure of the screw to seat into the plate properly, as a result of cross-threading or when insufficient screw torque is used to engage the screw threads into the plate threads. This technique has a lesser chance of complications like plate or screw breakage, but careful selection of patients and strict adherence to the basic principles of fracture fixation will go a long way in reducing the complications of fracture fixation using locking compression plates. Though this study is only Level III evidence, a larger number of Randomized control trial with higher statistical significance needs to be done to know the efficacy and choice of implants in distal femur fractures.

CONCLUSION

The LCP condylar plate is the treatment of choice in the management of comminuted distal femoral fractures especially Type A fractures where we have found higher Neer scores. LCP also prevents compression of periosteal vessels. It may not completely solve the age-old problems associated with any fracture like nonunion and malunion, but is a valuable technique in management of these fractures. But however, in type C fractures the outcome is poorer. But still LCP remains the implant of choice for type C fractures also, though there are complications like knee stiffness and extensor lag were encountered in a few cases, but they show better results than other modalities. This is ideal to prevent Metaphyseal collapse and to maintain limb length in severely comminuted fractures.

REFERENCES

1. Martinet, O., J. Cordey, Y. Harder, A. Maier, M. Bühler and G.E. Barraud, 2000. The epidemiology of fractures of the distal femur. Injury, 31: 62-63.
2. Thomas, P.R., E.B. Richard and G.M. Christopher., 2007. A O Principles of Fracture Managament. 2nd edition. Edn., A O Publishing, Switzerland, ISBN-24: €399.95, 9781588905567, Pages: 1106.
3. Cory, A.C. and A.W. Donald., 2009. Rockwood and Green Fracture in adults. 7th edition., Edn., LWW., Philadelphia,.
4. Stover, M., 2001. Distal femoral fractures: Current treatment, results and problems. Injury, 32: 3-13.
5. Zlowodzki, M., M. Bhandari, D.J. Marek, P.A. Cole and P.J. Kregor, 2006. Operative Treatment of Acute Distal Femur Fractures: Systematic Review of 2 Comparative Studies and 45 Case Series (1989 to 2005). J. Orthop. Trauma, 20: 366-371.

6. Vallier, H.A., T.A. Hennessey, J.K. Sontich and B.M. Patterson, 2006. Failure of LCP Condylar Plate Fixation in the Distal Part of the Femur: A Report of Six Cases. The J. Bone and Joint Surg., 88: 846-853.
7. Ahmad, M., R. Nanda, A.S. Bajwa, J. Candal-Couto, S. Green and A.C. Hui, 2007. Biomechanical testing of the locking compression plate: When does the distance between bone and implant significantly reduce construct stability? Injury, 38: 358-364.
8. Higgins, T.F., G. Pittman, J. Hines and K.N. Bachus, 2007. Biomechanical Analysis of Distal Femur Fracture Fixation: Fixed-Angle Screw-Plate Construct Versus Condylar Blade Plate. J. Orthop. Trauma, 21: 43-46.
9. Schandelmaier, P., A. Partenheimer, B. Koenemann, O.A. Grün and C. Krettek, 2001. Distal femoral fractures and LISS stabilization. Injury, 32: 55-63.
10. Henderson, C.E., T.J. Lujan, L.L. Kuhl, M. Bottlang, D.C. Fitzpatrick and J.L. Marsh, 2011. 2010 Mid-America Orthopaedic Association Physician in Training Award: Healing Complications Are Common After Locked Plating for Distal Femur Fractures. Clin. Orthop.s and Related Res., 469: 1757-1765.
11. Hierholzer, C., C. von Rüden, T. Pötzel, A. Woltmann and V. Bühren, 2011. Outcome analysis of retrograde nailing and less invasive stabilization system in distal femoral fractures: A retrospective analysis. Indian J. Orthop.s, 45: 243-250.
12. Mückley, T., D. Wähnert, K.L. Hoffmeier, G. von Oldenburg, R. Fröber and G.O. Hofmann, 2011. Internal Fixation of Type-C Distal Femoral Fractures in Osteoporotic Bone. J. Bone Joint Surg., 93: 40-53.