



ISSN (P): 2521-3466
ISSN (E): 2521-3474
© Clinical Orthopaedics
www.orthoresearchjournal.com
2020; 4(1): 39-43
Received: 21-11-2019
Accepted: 25-12-2019

Dr. Haresh Rana
3rd Year Resident, Department
of Orthopaedics, B.J. Medical
College, Ahmedabad, Gujarat,
India

Dr. Kerul Ninama
2nd Year Resident, Department
of Orthopaedics, B.J. Medical
College, Ahmedabad, Gujarat,
India

Dr. Abhishek Chavda
1st Year Resident, Department of
Orthopaedics, B.J. Medical
College, Ahmedabad, Gujarat,
India

Dr. Rahul Meena
1st Year Resident, Department of
Orthopaedics, B.J. Medical
College, Ahmedabad, Gujarat,
India

Correspondence
Dr. Haresh Rana
3rd Year Resident, Department
of Orthopaedics, B.J. Medical
College, Ahmedabad, Gujarat,
India

Surgical management of tibial condyle fractures using locking compression plate

Dr. Haresh Rana, Dr. Kerul Ninama, Dr. Abhishek Chavda and Dr. Rahul Meena

DOI: <https://doi.org/10.33545/orthor.2020.v4.i1a.199>

Abstract

Background and Objective: Incidence of fracture of the tibial condyle are increasing regularly due to RTA. Being one of the major weight bearing joint of the body fracture around it will be of paramount importance. The recent development of LCP has revolutionized the treatment by overcoming the few drawback's of conventional buttress plate. The LCP is an internal fixation system which is an hybrid of LC-DCP and LISS. The LCP can be applied in three different way a) As compression plate b) As combining compression and bridge plating c) As pure internal fixation (bridge plating).

Methods: We studied 21 patients involving tibial condyle fracture among which 5 patients were treated with MIPO technique and 16 patients with ORIF technique.

Results: We followed up all the patients until union of fractures ranged from 16- 24 weeks. The average time for union of fracture was 18 weeks ranged from 16-24 weeks, those plate bridge with the MIPO technique healed even earlier.

We had total 6 complications include 2 knee joint stiffness, 1 post operative loss of reduction, 1 infection, 1 varus deformity and 1 case of knee instability. We had no case of any purely implant related complication like screw loosening, screw breakage plate failure.

Interpretation and Conclusion: The patient sample approximately reflected the regular trauma patients encountered at our setup, fracture treated with bridge plating and combined principle of conventional and internal fixation (bridge plating) healed rapidly by secondary fracture union and hence achieving strong union across the fracture at a much earlier time compared to LCP as conventional plate. The MIPO type of reduction and fixation was less time consuming, less soft tissue injury so preserve the bone blood supply subsequently helps in healing of both soft tissue and bone faster.

Keywords: Surgical management, tibial condyle, compression plate

Introduction

The knee joint is one of three major weight bearing joints in the lower extremity. The tibial condyle fractures are one of the commonest intraarticular fractures generally these injuries falls into two broad categories, high energy fractures and low energy fractures.

The majority of tibial condyle fractures are secondary to high speed velocity accidents and fall from height¹ where fractures results from direct axial compression, usually with a valgus (more common) or varus moment and indirect shear forces^[2]. Older patients with osteopenic bone are more likely to sustain depression type fracture because their subchondral bone is less likely to resist axial directed loads^[3].

The aim of surgical treatment of tibial condyle fracture is to restore congruent articular surfaces of the tibial condyles maintaining the mechanical axis and restoring ligamentous stability eventually can achieve functional painless and good range of motion in the knee joint^[4]. The various clinical studies established that bone beneath a rigid conventional plate are thin and atropic which are prone for secondary displacement due to insufficient buttressing and secondary fractures after removal of plate, fracture site take longer period to osteosynthesis due to interruption of vascular supply to bone due to soft tissue and periosteal stripping.

So there was the births of a new concept of biological fixation using the plates, otherwise called minimally invasive plate osteosynthesis (MIPO). But this was difficult as conventional plates needed to be accurately contoured to achieve good fixation, osteoporosis also posed the same problem of poor fixation with conventional plates^[5].

This leads to the development of the internal fixators. PC-fix I later PC fix II.

As more and more concepts about biological fixation become clearer the innovation of plates progressed lead to development of less invasive stabilizing system (LISS). Research to combine these two methods has lead to the development of the AO locking compression plate (LCP) [6].

This new system has been regarded as technically mature. It offers numerous fixation possibilities and has proven to worth in complex fracture situations and in osteoporosis.

Objectives

To study the functional outcome of the fracture of tibial condyle and to study the duration of union in tibial condyle fracture treated with LCP.

Methodology

The study was carried out between September 2017 to September 2018 at B.J. Medical college, Ahmedabad. The total number of cases studied were 21 with the youngest 18 years and oldest 65 years.

The intention of this dissertation was to study the treatment of tibial condyle fracture with locking compression plate to obtain a stable, painfree, mobile joint, to prevent the development of osteoarthritis.

Adult patients (aged over 18 yrs) both male and female were included in the study. The patients falling into the following exclusion criteria were not included in the study: Patient aged below 18 yrs and patients with Type II and III compound fractures

On admission, demographic data was recorded and thorough history and clinical examination was done. We assessed the soft tissue injuries even in the closed fractures followed by radiological assessment of the fracture with Schatzker's classification.

We treated 5 patients with minimally invasive plate osteosynthesis and 16 patients with open reduction and internal fixation. The approach was either anteromedial parapatellar or anterolateral parapatellar incision. In our series, all fractures were reduced with traction in fracture table with C-arm guidance.

The primary difference with the locking compression plate is the method of locking head screw insertion. Here since the locking head of the screw must get locked in the locking part of the combi hole, the direction of the drilling must be perfect. Hence drilling for all locking head screws was done after fixing the screw in drill sleeve.

We also made sure that whenever using the non-locking regular screw in the fixation. They were inserted prior to the insertion of the locking screws.

Postoperative

In the immediate postoperative period. Care was given to the general condition, fluid balance, IV antibiotic and analgesics as per the protocol. This helped us to mobilize the patient faster.

Mobilization:

Whenever stable internal fixation was achieved, the patient was mobilized after 48 hrs after removal of the drains, for 2-3 days the range of motion allowed was 0-200 from the 5th day the range of motion was gradually allowed to be increased to 900 more after suture removal full range of movement was allowed. Whenever there was doubt about the stable fixation, external splinting in the form of plaster of Paris slab was given for

support and advised to do static quadriceps exercises. Continue passive motion exercise (CPM) were done daily with temporarily removal of slab under carefully supervision and splint reapplied. Partial weight bearing was delayed until 6 weeks and full weight bearing allowed after 12-16 weeks.

Follow up:

The first follow up was usually between 6-8 weeks and later patients were followed up at regular interval of 6-8 weeks till complete fracture union.

During follow up, the course of fracture healing was documented radiologically with minimum 6 weeks' interval. The moment of complete healing was defined as radiologically complete bone regeneration at fracture site. Evaluation of any possible loss of reduction was carried out. Assessment and analysis of any complication was done. Follow up of out-patients ranged from 16 weeks to 64 weeks.

Results

We studied 21 patients with 21 tibial condyle fractures who were treated with locking compression plate (buttress type).

Table 1: Age Distribution

Age group (year)	Number of patients	Percentage
18-20	3	14.3
21-30	3	14.3
31-40	6	28.6
41-50	5	23.8
51-60	3	14.3
> 60	1	4.7
Total	21	100.0

Most of the patients belong to 31-50 yrs of age group. who are more prone for RTA.

Table 2: Sex Distribution

Sex	Number of patients	Percentage
Male	17	80.95
Female	4	19.05
Total	21	100.0

Most of our patients were male. It reflects the general population which visit our both out-patient as well as the emergency trauma section.

Table 3: The Relationship of Fracture to Different Occupation

Occupation	Number of patients	Percentage
Agriculturist	6	28.57
Businessman	4	19.07
House wife	3	14.28
Labourer	5	23.80
Students	3	14.28
Total	21	100.0

The tabular column clearly shown that the major preponderance of tibial condyle fracture is seen in people with a high level of activity. Who indulge themselves in traveling because majority of the morbidity is due to RTA.

Few of them sustain fracture through fall from height when they climbing up ladder or stool to pick up object from the shelves.

Table 4: Laterality of Fracture

Laterality of fracture	Number of patients	Percentage
Right	12	57.14
Left	09	42.86
Total	21	100.0

In our series, there is a slight right sided predominance compared to the left side.

Table 5: Type of fracture and percentage of Cases: Schatzker' s Classification

Type of fracture	Number of patients	Percentage
I. Pure cleavage	3	14.29
II. Cleavage with depression	-	-
III. Central depression	-	-
IV. Medial Condyle fracture	6	28.57
V. Bicondylar fracture	5	23.80
VI. Metaphysio diaphyseal dissociation	7	33.34
Total	21	100

In our series the majority of the fractures were found to be of type IV, V and VI fracture types which are usually associated with high velocity road traffic accident.

Table 6: Method of Reduction and Fixation

Method of reduction	Number of patients	Percentage
ORIF	16	76.19
MIPO	5	23.81
Total	21	100.0

We used MIPO technique in 5 patients both duration of procedure and soft tissue injuries are less compare to ORIF technique.

Wound healing also better and faster compare to ORIF technique. It demands more surgical techniques and we found as the study progressed that the operative time need for MIPO decreased as we matured more in this technique.

Table 7: Principle of Fixation

Principle	Number of patients	Percentage
Compression	4	19.04
Bridging	7	33.33
Combined	10	47.63
Total	21	100.0

We used compression type for 4 patients were both rigid fixation and buttress effect were needed. We used bridging type for 7 patients with fracture extending into metaphysial region and lack of purchase to the screw due to communitation in metaphysial region. Combined type was used in 10 patients were articular reconstruction is essential and need protection from collapsing in postoperative period.

Table 8: Surgical Approach

Side	Number of patients	Percentage
Anteromedial	11	52.38
Anterolateral	10	47.62
Total	21	100.0

We preferred anteromedial approach for 11 patients for fractures with medial condylar displacements and MIPO technique of reduction and fixation is essential. This approach need less soft tissue stripping from bone and can contour plate appropriately. Anterolateral approach was done for 10 patients with lateral condylar displacement fractures and soft tissue injuries on medial side of tibial condyle.

Table 9: Complications

Complication	Number of patients
Knee joint stiffness	2
Postoperative loss of reduction	1
Infection	1
Varus deformity	1
Knee instability	1
Total	6

We had no cases of any purely implant related complication like screw loosening screw breakage, plate failure. Average time for union of fracture was 18 weeks (range from 16-24 weeks). cOne patient with knee joint stiffness is due to associated with ipsilateral inter condylar fracture of femur. Another patient with knee joint stiffness is due to lack of postoperative mobilization. One patient with knee instability due to associated anterior cruciate ligament injury. One patient developed deep infection of operative site were plate removed and treated with antibiotic and above knee pop cast applied later, fracture united at 24 weeks. One patient developed varus deformity due to collapse of medial condyle post operatively. One patient medial condyle collapse occurred in post operative period due to toggling of cancellus screw applied to condyles.

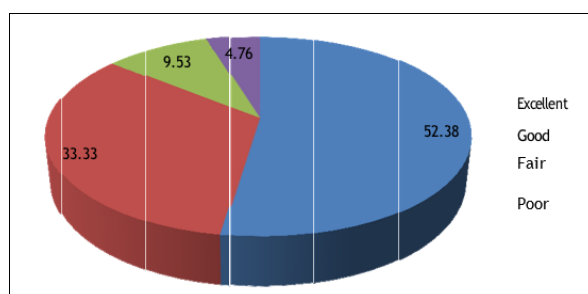
Associated Injuries

Ipsilateral intercondylar fracture femur treated with dynamic condylar screw plate. Left humerus shaft fracture treated with ORIF with dynamic compression plate. Left supra condylar femur fracture treated with ORIF with cobra plate. Medial collateral ligament in one patient treated conservatively with cast immobilization. Lateral collateral ligament in one patient were managed conservatively with cast immobilization. Anterior cruciate ligament injury in one patient advised to undergo ACL reconstruction after 6 months of the definitive fracture surgery.

Table 10: Clinical Results

Clinical result	No. of cases	Percentage
Excellent	11	52.38
Good	7	33.33
Fair	02	9.53
Poor	01	4.76
Total	21	100

Out of 21 cases treated, 11 cases gave excellent result 7 cases came out with good result, fair in 2 cases, and 01 case of poor results.



Graph 1: Clinical results

Discussion

Tibial condyle fractures, one of the commonest intra articular fractures, incidence of this fractures are increasing regularly due to RTA and at the same time surgical treatment options for the same are also being modified continuously. Any fracture around the weight bearing joint like knee joint is of paramount importance as would result in significant morbidity and quality of life.

Hence the treatment of tibial condyle fractures has become a challenge for the orthopaedic surgeons.

To overcome this difficulties and to early restoration of strength of bone and function of knee joint with minimal injury to soft tissue the innovators developed new technologies called MIPO and locking compression plate system.

Keeping our aims of the study at high, we presented the clinical study of surgical treatment of 21 tibial condyle fractures. The analysis of the results were made in terms of age of patients, sex distribution. Occupation of patient, laterality of fracture, mode of violence, analysis of the types, method of reduction and fixation, principle of LCP fixation, surgical approach and complications.

The majority of fracture occur between the age of 18-65 yrs with maximum incidence being involving the productive age group 31-50 yrs (52%). Boune in 1981 also found that the majority of the patients are aged between 15- 55 yrs with an average of 38.5 years. Correlated well with the study, Seppo also showed age incidence 20-60 years with an average of 39.8 years which correlates with the present study.

In our series majority of the patients were males 80%, this can be attributed to our Indian setup where the female population largely work indoor and do not travel much.

Occupationally tibial condyle fractures were seen in people with high level of activity, movement and travel. It is most commonly seen with people who travel more like businessmen, agriculturist. In our series majority were agriculturists 28.57% followed by labourer 23.80%. Businessman 19.04% students and house wife 14.28% respectively.

In our study the commonest mode of injury being the road traffic accident 76% other being fall from height 24%. There was not much difference in the laterality of the fracture. The right tibia was affected in 57% and left tibia in 43% of cases.

In this series we studied 21 cases of out of them most of the patients fall into type IV, type V and type VI schatzker's classification. Different authors use different criteria for the surgical management of these fractures. SEppo E. Honkonen conducted 130 tibial plateau fractures taking into consideration of -

- Condylar widening of > 5mm.
- Lateral condyle step off > 3mm
- All medial condylar fracture

In our series the indications for the surgery were the same standard indications as for the tibial plateau fractures. 3mm depression was considered as an indications for surgery in our series [7].

Table: Type of depression

Name of the authors	Year	Amount of depression
Burri [8]	1979	1mm
Hohl [9]	1979	5mm
David Segal [10]	1991	5mm
Seppo E [11]	1993	3mm
Our series	2012	3mm

In our series we used MIPO technique for reduction and fixation in 5 patients 23%. In which both duration of procedure and soft tissue injuries are less compare to ORIF technique, wound healing also better and faster compare to ORIF technique but it demands more surgical techniques.

In our series we used combined principle of fixation in 10 patients 47.6% and achieved good articular reconstruction and protection from collapsing during post operative period. We used bridging type of principle of fixation in 7 patients 33.33% in metapyseal comminution fractures and osteoporotic patient where bone graft was needed we have not done bone graft in these patient as LCP implant system provide good fixation and prevent collapse of fracture during postoperative period.

We used compression type principle of fixation in 4 patients 19.04% were both rigid fixation and buttress effect were needed, but postoperatively due to toggling of condylar screws (non locking screws) there was an collapse of condyle in two patients.

In our series we approached with antero medial incision in 11 patients this approach need less soft tissue stripping from bone can contour plate to bone appropriately and easy to perform MIPPO technique and we preferred antero lateral approach in 10 patients with lateral condylar displacement fracture and soft tissue injury on medial side of tibial condyle.

In our series we had no cases of any purely implant related complications and average time for union of fracture was 18 weeks.

In our series one patient develop knee stiffness due to associated ipsilateral fracture of femoral condyle treated with physiotherapy and regain 700 of flexion another patient present with knee joint stiffness at end of 6 months of postoperative period he was treated with physiotherapy and he regained an range of movement from complete extension to 900 of flexion.

In our series one patient develop deep infection by 7th postoperative day secondary to uncontrolled diabetes and skin infection in thigh region, he was treated with IV antibiotics (ceftriaxone and amikacin), implant removal and above knee pop cast application, subsequently infection was controlled and fracture union occurred at an end of 24 weeks postoperatively.

In our series one patient developed loss of reduction with collapse of medial condyle at end of 08 weeks of postoperative period treated with above knee pop cast for 12 weeks subsequently fracture united with minimal depression of medial condyle. Another patient developed varus deformity due to collapse of medial condyle at 09 weeks of postoperative period due to early weight bearing he was treated with application of above knee pop cast for 2 weeks and advised to wear knee brace while walking.

In our series one patient had associated anterior crutiate ligament injury he was treated with above knee pop cast till fracture unite and to wear knee support while walking and to undergo ACL repair in subsequent days.

The period of immobilization was again individualized depending on the security of stable fixation. The benefits of early knee motion include reduce of knee stiffness and improved cartilage healing (regeneration) and promote good callus formation and remodeling.

Inspite of all these complications we are able to achieve 52.38% excellent result and 33.33% good result (over all 85.7%, acceptable results) with our standard surgical care. In addition we have 9.5% fair and 4.7% poor results in term of functional outcome. These results are comparable and on par with other documented standard studies.

Table: Type of %

Rambold 1992	93% acceptable
Seppo E 1993	85% satisfactory
Joseph Schatzkar 1986	85% satisfactory
Our study 2012	85% satisfactory

In one patient, we removed implant after 1 yr of fracture union.

Conclusion

At the end of our study, we conclude that the locking compression plate system with its various type of fixation act as a good biological fixation including difficult fracture situations. But this also involve the risk that may occur unless properly planned preoperatively and follow guided principles intraoperatively.

References

- Schulak DJ, Gunn DR. Fracture of the tibial plateaus. Clin Orthop. 1975; 109:166-177.
- Koval KJ, Hulth DL. Tibial plateau fracture: evaluation and treatment. J Am Acad Orthop Surg. 1995; 3(2):86-94.
- Biyani A, Reddy NS, Chaudhary *et al.* The results of surgical management of displaced tibial plateau fracture in the elderly. Injury. 1995; 26(5):291-297.
- Wagner M. General principles for the clinical use of the LCP. Injury. 2003; 34(2):B31-42.
- Sommer C, Gautier E, Muller M. For clinical application of the LCP. Injury. 2003; 34(2):B43-54.
- Stoffel K, Dietaru. Biomechanical testing of the LCP how can stability in locked internal fixator be controlled. Injury. 2003; 34(2):B11-9.
- Krupp RJ, Malkani AL, Roberts CS, Seligson D, Craford CH, Smith LBS. Treatment of Bicondylar Tibia Plateau Fractures Using Locked Plating Versus External Fixation. Orthop. 2009; 32(8):559.
- Burri G, Bartzke J, Coldewey J, Mugglar E. Fracture of the tibial plateau. Clin Orthop. 1979; 138:64.
- Moore TM, Harvey JP. Roentgenographic measurement of tibial plateau depression due to fracture. J Bone & Joint Surg. 1974; 56(AM):155.
- Bowes DN, Hohl M. Tibial condylar fractures evaluation of treatment and outcome. Clin Orthop. 1982; 171:105-108.
- Honkonen SE. Indications for surgical treatment of tibial condyle fractures. Clin Orthop. 1994; 302:199-2005.