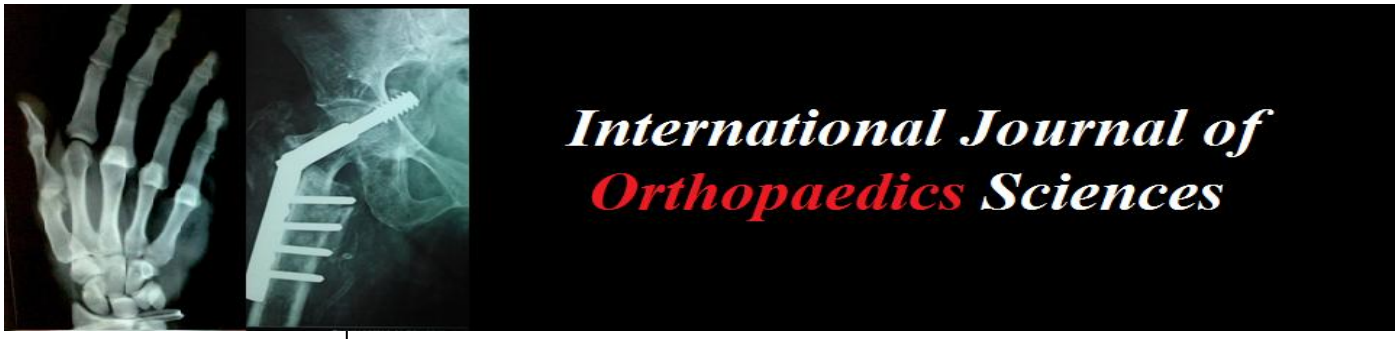

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Result of laterally based locking plate in fracture tibial plateau in rural hospital Ambajogai

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Abstract
Introduction: Tibial plateau fractures constitute 1% of all fractures and 8% in elderly. These are difficult to treat due to involvement of articular surface. Inadequate and inappropriate treatment may result in significant functional loss. These fractures can be treated with different nonsurgical and surgical methods with each having some advantages and disadvantages. Precontoured locking plates have been introduced which offer stable fixation with minimal soft tissue compromise. This study was carried out to evaluate the results of periarticular laterally based locking plate system for proximal tibial fractures in Indian population
Materials and Methods: Study involved 32 patients (21 male and 11 females) operated between year 2012 and 2016 in SRTR Medical college and rural hospital Ambajogai, age group between 18-70 year (mean 45 year) was selected for the study. There were 24 simple fractures and six had open injury (6 with Gustillo1 and 2 with Gustillo 2). Fractures were classified according the Schatzker classification. These fractures treated with periarticular locking plates were reviewed with a minimum six months follow up. Data related to demographics, mechanism of injury, complications, progress of union, joint stiffness, clinical and functional outcome were collected during the period of hospital stay and follow up visits.
Results: Male to female ratio was 3:1.RTA was leading cause of injury in about 77% cases. Most of patients showed radiological union and painless weight bearing between 16 to 24 wks. Most patients achieve good ROM of knee with mean flexion of 110 degrees. Only 2 pts showed superficial infection and only one pt. showed varus mal union. About 65% pts. had no knee pain at final follow up. No patients had mal union and implant failure.
Conclusion: Tibial plateau fractures are increasing due to increase in road traffic accidents. Fracture pattern and soft tissue status should be analyzed before surgery. These fracture require perfect anatomical reconstruction of articular surface, stable fixation, early ROM physiotherapy, and rehabilitation for good functional outcome. We conclude that laterally based locking condylar plate gives excellent functional and anatomical results without the need for additional medial stabilization as it restore articular surface with better biomechanical stability, increases range of motion, decreases complications like infections, non-union and provides early rehabilitation.

Keywords: Locking plate, tibial plateau, fracture

Introduction
Fractures of proximal tibia are common injuries involving weight bearing joint surface of the knee. If not treated well, it results in significant functional impairment [1]. The tibial plateau fractures are usually caused by motor vehicular accidents or bumper strike injuries, hence called bumper fractures [2]. Sport injuries, falls and less violent trauma also caused them, especially in elderly with osteoporosis [3]. These are caused by both high and low energy trauma. High energy fractures are associated with complex fractures patterns, intra-articular involvement, severe comminution and displacement where as wedge depression and pure depression type are seen in the low energy group [4, 5]. The tibial plateau fractures produced by high energy mechanisms may be associated with neurological and vascular injury, compartment syndrome, deep vein thrombosis, contusion, crush injury to the soft tissues or open wounds [6]. These fractures constitute about 1% of all fractures and 8% of fractures in elderly [7]. Tibial plateau fracture affect knee function and stability. Tibial plateau fractures represent a wide spectrum of severity which ranges from simple injuries to complex fracture patterns that challenge even the most experienced surgeons [8].

Tibial plateau fractures can be classified according to severity of comminution, soft tissue disruption, articular depression, condylar displacement, metadiaphyseal fracture extension, open wounds, and extensive closed degloving injuries [4, 5]. The Schatzker classification is most widely used for preoperative planning [9, 10]. The tibial plateau fractures have been studied and reported extensively and exhaustively but still controversy exists over their management, whether surgical or conservative. Various modalities of treatment are available but no ideal treatment has yet evolved. Intra-articular fractures of proximal tibia are difficult to treat [11]. The primary goal in the treatment is to attain fracture union with a stable knee joint with a functional painless range of motion [12]. Both conservative and operative treatments have achieved good results for tibial plateau fractures [13]. Conventional treatment modalities are non-operative modalities like cast, braces and traction; Conservative treatment is associated with various complications like prolonged immobilization, knee stiffness or mal union. Surgical management prevents these complications [14]. Surgical treatment is recommended for fractures with >5 mm displacement or >5º varus or valgus. The tibial plateau fractures are treated by a wide range of surgical methods depending on the fracture pattern, choice of the operating surgeon [15]. Some of the operative modalities include k-wires, screws, buttress plate, compression plate, and external fixators. which were used singly or in combination [14, 15]. Each of these methods has its limitations. The objectives of surgical management are precise reconstruction of the articular surfaces, stable fragment fixation, normal limb alignment, repair of all concomitant ligaments and other soft tissue lesions and early mobilization with functional range of knee motion [12].

The introduction of locking plates for treatment of complex tibial plateau fractures holds many potential advantages, Including increased holding power in osteopaenic bone, unicortical purchase in periarticular region and ability to successfully and stably bridge severely comminuted meta diaphyseal shaft areas [16, 17]. The purpose of this study was to evaluate the outcome of laterally based locking plates used in tibia plateau fractures in terms of union, complications and functional outcome of patients.

Material and methods

Study involved 32 patients (21 male and 11 females) operated between year 2012 and 2016 in SRTR Medical College and rural hospital Ambajogai, age group between 18-70 year (mean 45 year) was selected for the study. Male to female ratio was 3:1. There were 24 simple fractures and six had open injury (6 with Gustillo1 and 2 with Gustillo 2). Patients above 18 years of Tibial plateau fractures included in our study. Patients with active infection in the involved leg, extensive comminution, Gustillo and Anderson Type IIIC fractures excluded in our study. Patients with proximal tibia fractures managed with lateral locking plate were included in the study and they were followed up for a minimum of one year.

Preoperative management

History taking, general examination and local examination were conducted when pt. admitted. Antero posterior and lateral radiographs of the knee with tibia were taken to determine the fracture pattern. Computed tomography (CT) scan with or without 3D reconstruction was done in cases where more detailed fracture configuration needed. Fractures were classified according to the Schatzker classification. Local soft tissue condition assessed pre-operatively. Time of surgery was decided on the status of soft tissues and general condition of the patient. All surgeries were done under image control in supine position pneumatic tourniquet was applied after taking proper precautions. Antero lateral approach was used, fracture reduced, the articular surface was restored and bone fragments were secured with K-wire. Appropriate size precontoured lateral locking plate was selected. The plate position and fracture alignment was confirmed with image intensifier in both planes. Minimally invasive plate osteosynthesis (MIPO) was used wherever the fracture configuration and soft tissue condition permitted.

Postoperative management

Limb elevation was given and patient was immobilized with an above knee posterior slab. Intravenous antibiotics were given for first 3 days followed by oral antibiotics in closed fractures.

However in open fractures intravenous antibiotics were given till trauma wound showed signs of healing. Depending on the post-operative fracture stability and pain tolerance of the patient, quadriceps strengthening exercises, knee and ankle mobilization exercises and non-weight bearing-crutch walking were started. Progressive weight bearing allowed depending upon tolerance and radiographic evidence of fracture healing. Patients were discharged from the hospital as wound condition and general status permits. Patients were followed up clinically and radiologically in the outpatient clinic at monthly intervals till one year. Full weight bearing was permitted only after clinico-radiological evidence of union. Union was defined as pain-free full weight bearing in the absence of tenderness or movement at the fracture site with the presence of bridging callus across at least one cortex of fracture site on each of the antero posterior and lateral radiological views.

Follow-up & data collection

Data related to demographics, mechanism of injury, details of trauma, hospitalization detail, postoperative rehabilitation, complications, progress of union, joint stiffness, clinical and functional outcome were collected during the period of hospital stay and follow up visits. Minimum follow up of six months was ensured for all cases.

Results

Patient demographics

Total 31 pts. included in our study. Patients age ranged from 18 -75 years (mean 45). Majority (20) of the patients were in the age group 30-50. The male to female ratio was 3:1(23 Males; 8 females).

Mechanism of Injury

Road Traffic Accidents was leading cause of fractures in 24 pts (about 77%) while, due to fall in 5 pts, and due to assault in 2pts.

Fracture patterns

-There were 24 simple fractures and 7 had open injury (5 with Gustillo1 and 2 with Gustillo 2).

-as per Schatzker classification type 1-5pts., type2-5pts, type3-6pts, type4-5pts, type5-3pts and type6 found in 7 pts.

Duration of surgery

Most of the pts. operated within 5 days of surgery.

The surgical duration ranged from 45 to 180 min.

Post operative hospital stay
The duration of post operation stay in hospital ranged from 3–7 days.

Partial weight bearing
Majority of patients (80%) could partially bear weight on crutches between 6-12 weeks. While 15% of case PWB was seen in 4 to 6 wks, remaining 5% cases pt took more than 12 wks.

Painless weight bearing in weeks
- Minimum: 12 weeks
- Maximum: 24 weeks
- Mean: 16 weeks

Most of the pts. (88%) had painless wt. bearing between 14 to 20 weeks.

Radiological evidence of healing
Most of the pt. shows radiological union between 16-24 weeks.

Knee range of motion
Most of the pt. had good range of movement with mean flexion of 110 degree.
At final follow up most of the pt. achieve knee flexion more than 90% (ROM-90 to 160%).
Only 3 cases have extension lag but not more than 20 degree.
The average range of motion in our study was from two degrees (range 0° – 20°) to 120° (range 60° – 160°).

Complications
1. Infection--Infection rate was minimal. Only 2 pt. with compound fracture tibia had superficial infection which was healed with antibiotics and dressing. While no patient shown evidence of deep infection.
2. Implant failure-no pt. had faced the problem of implant failure.
3. Implant removal-2pts. had required removal of implant due to hardware prominence and painful hardware.
4. Malunion and varus deformity-one pt. with type 6 fracture had varus malunion with knee stiffness (ROM-10-80).
5. Nonunion-no pt. had found non-union.
6. Articular malreduction-articular depression or split more than 2mm found in 2pts.
7. Knee pain at final followup-65% pt. had no pain, 31%pt had occasional pain and about 4% cases had moderate pain.
8. Intraop complications-There were no intra operative complications noted in our study.

Discussion
Fractures of the tibial plateau make up 1% of all the fractures [7]. The proximal tibial fractures are increasing day by day mainly due to the ever increasing road traffic accidents. Fractures of the tibia plateau are challenging for orthopaedic surgeons. These fractures are difficult to treat because of their intra-articular nature, cancellous bone involvement, and proximity to a major weight bearing joint and are prone to develops wound complications and infections [18]. Early diagnosis, soft tissue monitoring, anatomical reduction, stable internal fixation and early joint motion are important to gain good result [19, 20]. With the introduction of locking plates, many limitations of conventional plating have been overcome. The angle stable locking screws allow secure fixation of the opposite condyle with a single plate thus avoiding extensive soft tissue dissection [16]. Contact area between the plate and the bone is minimal thus preserving periosteal blood supply. Unilateral plate fixation for treatment of bicondylar fractures as well as split depression fracture seems to offer advantages in particular concerning infection rate and implant failure [16, 17]. The use of more modern implants with locking screws and pre-contoured locking plates provide better stability and may further improve outcome, particularly for the elderly [16, 17, 21]. Keeping these points in mind, the present study was carried out with the purpose to assess the functional outcome of surgical treatment in different types of Tibial plateau fractures with lateral locking plate and to compare our results with literature. Tibial plateau fracture commonly seen in active age group. 67% cases in our study had age group between 30-50yrs. This is comparable to study by Kulwinder sing [22], Mahajan N. [23], Ricci WM. [24]. males are more affected than females due to more outdoor activities. In our study 74% population was male, this is similar to study by Kulwinder sing [22]. RTA was most common cause of injury in our study (about 77%), this is study by Kulwinder Sing [22] and Niravkumar M. [25] who also had RTA as cause of injury in 93% and 76% cases. In our study most of pt. had partial weight bearing in 6-12 wks. And full weight bearing in 14-20 wks. This is comparable to study by Jain R [26] whose study shows mean time of 9.8wks for partial weight bearing and 17.5 wks for full weight bearing. In our study most of the pts. Shows radiological union between 16-24wks, and this is comparable to other studies with locking plate by Selhi HS [28], Lee JA [29], Haidukewych G [30]. majority of pt. In our study able to achieve good range of knee motion(average-2 degree to 120 degree), this result are comparable to study by Jain R [26], Selhi HS [28]. infection rate was minimum in our study, that is only in about 6% cases. These results are similar to infection rate reported by Gosling *et al* (6%), Selhi (6%), Lee *et al* (8%) and Stannard *et al* (5.9%) [21, 28, 29, 30]. only 3pts. In our study shows extensor lag and that was less than 20degree only.this results are similar to study by Kulwinder Singh [22], Niravkumar M [25]. Only one case has malunion and knee stiffness, no case has non union. This results are comparable to study by Kulwinder Singh [22], Niravkumar M [25]. only 2 pts. (6%) In our study require implant removal due to hardware prominence. study by Niravkumar M [25] on tibial plating also shows only 6% cases of implant failure.65%pt. had no knee pain at final follow up and only 31%pt had occasional pain and about 4% cases had moderate pain in our study. These results are also comparable to study by Kulwinder Singh [22]. There are some limitations in our study like small sample size and limited time follow up.

Conclusion
Tibial plateau fractures are increasing due to increase in road traffic accidents. Fracture pattern and soft tissue status should be analyzed before surgery. These fracture require perfect anatomical reconstruction of articular surface, stable fixation, early ROM physiotherapy, and rehabilitation for good functional outcome. We conclude that laterally based locking condylar plate gives excellent functional and anatomical results without the need for additional medial stabilization as it restore articular surface with better biomechanical stability, increases range of motion, decreases complications like infections, non-union and provides early rehabilitation.

Fig 1: preoperative xray

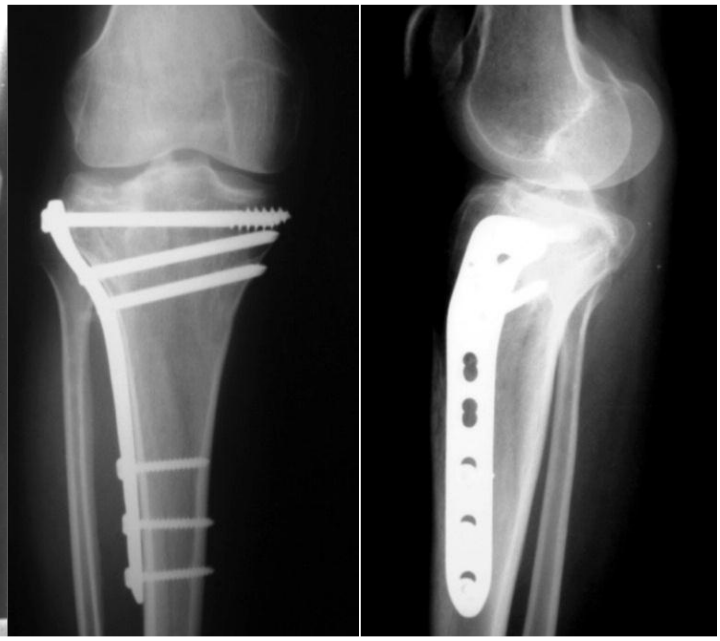

Fig 2: post op. At 6month followup

References

1. Egol KA, Koval KJ. Fractures of the proximal tibia. In: Bucholz RW, editor. Rockwood and Green's fractures in adults. Philadelphia: Lippincott Williams & Wilkins. 2006, 1999-2029.
2. Cotton FB. Fender fracture of the tibia at the knee. N Engl J Med. 1929; 201:989.
3. Segal D, Mallik AR, Wetzler MJ, Franchi AV, Whitelaw GP. Early weight bearing of lateral tibial plateau fractures. Clin Orthop Relat Res. 1993; 294:232-7.
4. Berkson EM, Virkus WW. High-energy tibial plateau fractures. J Am Acad Orthop Surg. 2006; 14:20-31.
5. Watson JT. High-energy fractures of the tibial plateau. Orthop Clin North Am. 1994; 25:723-52.
6. Rudloff MI. Fractures of the lower extremity. In: Canale ST, Beaty JH, editors. Campbell;s operative orthopaedics.12th ed. Philadelphia: Elsevier Mosby. 2013, 2668-73.
7. Soames RW. Skeletal system. In: Bannister LH, Berry MM, Collins P, Dyson M, Dussek JE, Fergusson MWJ, editors. Gray's anatomy. 38th ed. Edinburgh: Churchill Livingstone. 2000, 697-704.
8. Marsh JL. Tibial plateau fractures. In: Bucholz RW, Heckman JD, Court-Brown CM, Tornetta P, McQueen MM, Ricci WM, editors. Rockwood and Green's fractures in adults. 7th ed. Philadelphia: Lippincott Williams & Wilkins. 2010, 1780-831.
9. Dirschl DR, Dawson PA. Injury severity assessment in tibial plateau fractures. Clin Orthop Relat Res. 2004; 423:85-92.
10. Watson J, Schatzker J. Tibial plateau fractures. In: Browner DB, editor. Skeletal trauma. Philadelphia: Saunders. 2008, 2074-130.
11. Tscherne H, Lobenhoffer P. Tibial plateau fractures. Management and expected results. Clin Orthop Relat Res. 1993; 292(7):87-100.
12. Shrestha BK, Bijukachhe B, Rajbhandary T, Uprety S, Banskota AK. Tibial plateau fractures, four years review at B&B Hospital. Kathmandu University Med J. 2004; 2(8):315-16.
13. DeCoster TA, Nepola JV, el-Khoury GY. Cast brace treatment of proximal tibia fractures. A ten-year follow-up study. Clin Orthop Relat Res. 1988; 231:196-204.
14. Stokel EA, Sadasivan KK. Tibial plateau fractures: standardized evaluation of operative results. Orthopedics. 1991; 14:263-70.
15. Blokker CP, Rorabeck CH, Bourne RB. Tibial plateau fractures. An analysis of the results of treatment in 60 patients. Clin Orthop Relat Res. 1984; 182:193-9.
16. Egol KA, Kubiak EN, Fulkerson E, Kummer FJ, Koval KJ. Biomechanics of locked plates and screws. J Orthop Trauma. 2004; 18:488-93.
17. Higgins TF, Klatt J, Bachus KN. Biomechanical analysis of bicondylar tibial plateau fixation: how does lateral locking plate fixation compare to dual plate fixation?. J Orthop Trauma. 2007; 21:301-6.
18. Raikin S, Froimson MI. Combined limited internal fixation with circular frame external fixation of intraarticular tibial fractures; Orthopedics. 1999; 22(11):10:19-25.
19. Dirschl DR, Del Gaizo D. Staged management of tibial plateau fractures. Am J Orthop (Belle Mead NJ). 2007; 36:12-7.
20. Lachiewicz PF, Funcik T. Factors influencing the results of open reduction and internal fixation of tibial plateau fractures. Clin Orthop Relat Res. 1990, 210-5.
21. Gosling T, Schandelmaier P, Muller M, Hankemeier S, Wagner M, Krettek C. Single lateral locked screw plating of bicondylar tibial plateau fractures. Clin Orthop Relat Res. 2005; 439:207-14.
22. Dr. Kulwinder Singh, Dr. Manjeet Singh, Dr. Rakesh Gautam. Functional Outcome of Surgical Management of Tibial Plateau Fractures: Case Series of 30 Cases.
23. Mahajan N. Evaluation of results of various operative method in the management of tibial plateau fractures in adults. JK Science. 2009; 11(1):27-30.
24. Ricci WM, Rudzki J, Borrelli RJ. Treatment of complex proximal tibia fractures with the less invasive skeletal stabilization system. J Orthop Trauma. 2004; 18:521-7.
25. Dr. Niravkumar Moradiya, Dr. Tarun Desai V, Dr. Kalpesh Patel, Dr. Parth Gawatre. A study of tibia plateau fractures treated with locking tibia plate: A study of 63 cases.
26. Jain R. Prospective Case Study of Outcome of Tibial

Plateau Fractures Treated with Locking Condylar Plate
27. Department of Orthopaedics, Sanjay Gandhi Memorial Hospital, New Delhi, India.
28. Stannard JP, Wilson TC, Volgas DA, Alonso JE. The less invasive stabilization system in the treatment of complex fractures of the tibial plateau: Short-term results. J Orthop Trauma. 2004; 18(8):552-8.
29. Jain D, Selhi HS, Mahindra P, Kohli S, Yamin M. Results of proximal tibial fracture managed with periarticular locking plates.
30. Lee JA, Stamatios Papadakis A, Moon C, Zalavras CG. Tibial plateau fractures treated with the less invasive stabilisation system. Int Orthop. 2007; 31(3):415-18.
31. Haidukewych G, Sems SA, Huebner D, Horwitz D, Levy B. Results of polyaxial locked plate fixation of periarticular fracture of the knee. J Bone Joint Surg Am. 2007; 89:614-20.