

Complicated Tibial Plateau Fractures In Young Patients: Functional Outcome With Dual Plating Via Two Incision Technique

Abdul Qadir¹, Muhammad Muzzammil¹, Muhammad Tahir Lakho¹, Maratib Ali²

Abstract

Objective: Motorbike accidents contribute one of the most important factors of tibial plateau fracture among young populations in Karachi Pakistan. Most surgeons feel challenging to treatment complicated bicondylar fractures of the tibial plateau. This prospective study was designed to evaluate the functional outcomes of dual plating via a 2-incisions technique for the fixation of complicated bicondylar tibial plateau fractures in young patients in Karachi Pakistan.

Method: This prospective study include 94 cases of Type V and VI tibial plateau fractures of young patients age range from 15-45 years, operated between January 2014 and Dec 2016 conducted in two public sector hospital of Karachi Pakistan (Jinnah Post Graduate Medical Center, Civil Hospital Karachi). Exclusion criteria include patients with multiple fracture on same side or same bone, age more than 45 years, open contaminated fracture, open fracture and patients with head injuries. All cases were operated either by lateral locking plate fixation by anterolateral approach or dual plating through double incisions. These all cases were followed for a minimum of 24 months radiologically and clinically. The statistical analysis was performed using software SPSS 20.0 to analyze the data.

Results: A total of 94 patients (45 Single Plating and 49 Dual Plating) were operated during the study period of two years. However, 4 patients (4 Single Plating and 0 Dual Plating) were lost during follow up who could not be tracked. Both groups were somewhat similar in relation to the age, mechanism of injury, fracture pattern and soft tissue injury. Peroperatively, there was a significant increase in surgical time with the Dual Plating group; however, the mean time of reduction between the two groups was not significant. Decision to put bone graft was at the choice of the operating surgeon and was an intraoperative decision with 74 (78.7%) patients receiving bone graft. Postoperatively, there was no immediate difference in between the groups considering the malalignment and reduction. It took approximately 4 to 5 months for the fractures to get united. There was no malunion, nonunion or implant failure seen among those patients. There were 10 cases with superficial infection in wounds of Dual Plating group which were treated with culture sensitive Antibiotics for average two weeks, healed subsequently. There were 3 patients found having incidence of deep infection in a double plating group, where in 2 patients were positive with Staphylococcus aureus and 1 patient with E-coli was isolated. Extensive wound irrigation and lavage with antibiotic cement beads was given. Repeated irrigation and lavage was done again after 2 weeks with removal of beads followed by prolonged course of antibiotic therapy for 6 weeks after which the infection resolved. A total of 38 (77%) patients in a double plating group regained full flexion (135°) and full extension (0°) with a good alignment and no pain and instability as compared to single plating group, seen in 30 (66%) patients at follow-up.

Conclusion: Dual plating by two incision method resulted in better functional outcome regarding limb alignment and range of movements at knee joint with an acceptable soft tissue complication rate in young patients.

Keywords: Complicated Tibial plateau fracture, young patients, double incision, dual plating

Introduction

Road-side accidents are leading reason for deaths each year in Islamic Republic of Pakistan. The mishandling of motor bikes among youngsters by freestyle races in busy roads dodging each other has become a trend rather using it as a mode of transport. In step with range of Studies its established that pedestrians and motorcyclists have the

best rates of injury [1,2], largely includes long bone fracture common in Asia. In West Pakistan incidence of injuries as a result of road traffic were 15.0 per one thousand persons per year including major and minor injuries [3]. The old out dated motor bikes with un-trained riders and speed hikers and even increasing range of motor vehicles becomes the significant reason of major accidents in developing country like Pakistan. The bike riders injuries are sometimes severe should be thought of as unprotected vehicle users as a result of this transport is extremely unsafe [4]. The proximal tibia is involved in weight transmission through the knee joint and leg, it plays an important role within the hinge joint function and stability [5]. Operative treatment of the leg bone head fracture is technically demanding. Tibial head fractures used to be chiefly a results of a high-energy trauma, sometimes sports connected in active, young patients or as a results of road traffic accidents. The bulk of tibial plateau fractures are secondary to high speed

¹Dept. Of orthopaedic surgery, Dr. Ruth K.M Pfau Civil Hospital Karachi – Pakistan.

²Dept. Of orthopaedic surgery, Jinnah Postgraduate Medical Center, Karachi Pakistan.

Address of Correspondence

Dr. Abdul Qadir,
Orthopedic surgeon Dr. Ruth K.M Pfau civil hospital Dow university of health sciences Karachi Pakistan
Email : capricornious1@hotmail.com

road traffic accidents (RTA) and fall from height and were initial delineate as automobile bumper fractures[6,7]. These fractures resulted from direct axial compression, sometimes with a valgus (more common) or varus moment and indirect shear forces[8]. The tibial highland fractures, particularly in high-energy trauma, sets therapeutic dilemma[9]. There are various choices for fixation of fracture once both condyles are involved [10,11]. buttress or fixation of both the medial and the lateral cortices with twin plates has been indicated to prevent medial collapse and resultant varus deformity[12,13]. The purpose of this retrospective study was to conclude the clinical and functional outcomes of twin plating via a 2-incision technique for fixing complicated bicondylarTibial highland fractures by comparing it with single incision approach. Goal of the surgical treatment ought to be the tissue preserving accomplishment of a stable, functioning and pain free knee – as soon as possible. Frequent complications are wound necrosis, inflammation and knee inflammatory disease. The infection rate is highly elevated within the treatment of bicondylartibial head fractures, wherever double-plate osteosynthesis is needed. Surgical treatment is gold standard for management of such fractures. This was done by conservative measures like cast bracing, traction, immobilization to surgical intervention for better results. Though these standard methods achieved satisfactory results, it absolutely was still associated with shortcomings like massive incisions, additional blood loss and infection, hardware complications besides having some functional and alignment issues. Dual plating via a 2-incision technique has received recent support as it permits for direct visualization of the articular reduction whereas minimizing the requirement of stripping the soft tissues in the fracture space, particularly when significant displacement within the posteromedial fragment or articular depression of the medial plateau exists. As fixed-angle implants, locking plates are largely utilized in metaphyseal fractures. we assumed that locking plates might be able to reduce secondary loss of reduction in bicondylartibial plateau fractures; so, locking plates in combination with buttress plates were wont to fix bicondylarTibial plateau fractures in some of our patients in a dual-plating technique. The two-incision approach theoretically permits the surgeon to sufficiently visualize and each reduce tibial condyles and apply dual plates if desired, avoiding the soft tissue complications related to anterior midline exposures[14,15]. The purpose of this study was to check the clinical results in single locked plating (Single Plate) versus dual plate using two-incision approaches. Our hypothesis was that dual plating led to less collapse and change in alignment at followup compared with single plating.

Methods

This planned review grasp ninety four instances of type V and VI tibial plateau cracks of youthful patients age change from 15-45 years, worked between Jan 2014 and Dec 2016 led in 2 open division healing center of urban focus pakistan (Jinnah Post Graduate medicinal focus, Civil Hospital Karachi). Patients worked inside three weeks of injury, Exclusion criteria incorporate patients with various break on same perspective or same bone, age over 45 years, vascular damage, open polluted fractures and patients with head wounds or intr-abdominal and thoracic injury requiring multidisciplinary management. On affirmation, patients were placed in an above knee splintage where in surgery was performed around the same time or following day. At whatever point surgical postponement past 48 h was expected calcaneal skeletal traction was applied over a Bohler Braun splint.

preoperative biplanar radiographs were screened in all patients. All cases were operated either by lateral locking plate fixation by anterolateral approach or twin plating through double incisions. In patients with Single Plate, an antero-lateral exposure through L formed incision and a 3.5 periarticular proximal tibial locking plate was embedded underneath the tibialis anterior muscle. In Double Plate builds, the medial condyle was first settled through a posteromedial approach utilizing a re-construct plate or 3.5 DCP in a buttress mode and along the side by the 3.5 periarticular proximal tibial locking plate. The position of the plate was balanced under fluoroscopic control. Iliac crest bone auto-graft was utilized to bolster the metaphyseal void after height articular piece at whatever point required. Postoperatively patients were placed in a long knee prop for two weeks. Isometric quadriceps activities and knee range of movement was given from 3rd day relying upon patient's pain threshold. Patients did non-weight bearing prop strolling for no less than 12 weeks with partial weight bearing after that. Full weight bearing permitted simply after radiological mending of the fracture. Follow-up visits were done at 6 week's interim until fracture recuperating was seen and later at 3 months till 1-year and at regular intervals until no less than 2 years. These all cases were taken after for at least 24 months radiologically and clinically. The factual examination was performed utilizing programming SPSS 20.0 to break down the information.

Results

A total of 94 patients (45 Single Plating and 49 Dual Plating) were operated during the study period of two years. However, 4 patients (4 Single Plating and 0 Dual Plating) were lost during follow up who could not be tracked. Both groups were somewhat similar in relation to the age, mechanism of injury, fracture pattern and soft tissue injury. Peroperatively, there was a significant increase in surgical time with the Dual Plating group; however, the mean time of reduction between the two groups was not significant. Decision to put bone graft was at the choice of the operating surgeon and was an intraoperative decision with 74 (78.7%) patients receiving bone graft. Postoperatively, there was no immediate difference in between the groups considering the malalignment and reduction. It took approximately 4 to 5 months for the fractures to get united. There was no malunion, nonunion or implant failure seen among those patients. There were 10 cases with superficial infection in wounds of Dual Plating group which were treated with culture sensitive Antibiotics for average two weeks, healed subsequently. There were 3 patients found having incidence of deep infection in a double plating group, where in 2 patients were positive with *Staphylococcus aureus* and 1 patient with *E-coli* was isolated. Extensive wound irrigation and lavage with antibiotic cement beads was given. Repeated irrigation and lavage was done again after 2 weeks with removal of beads followed by prolonged course of antibiotic therapy for 6 weeks after which the infection resolved. A total of 38 (77%) patients in a double plating group regained full flexion (135°) and full extension (0°) with a good alignment and no pain and instability as compared to single plating group, seen in 30 (66%) patients at follow-up.

Discussion

The expanding RTA has brought about not just increment in frequency of proximal tibial fractures additionally the multifaceted nature of cracks as high speed guide affect prompts to more complications. Fractures around weight bearing joint are vital as this can bring about

huge horribleness and prompts to bargained personal satisfaction. Additionally, such breaks are frequently connected with various difficulties which makes its administration a testing undertaking for surgeon [16,17]. This review was led to look at the subsequent average crumple and change in arrangement in a bicondylar tibial level break balanced out either by Single Plate or Dual Plating. The approach must be chosen and connected in an way to control and reduce complications, permits early knee range of movement and is stronger and more grounded enough to keep up the articular lessening all through the periods of bone healing [18]. We rolled out hypothesis that collapse and change in arrangement is less after Double Plate and this have turned out to be valid in this study. The normal length of follow up in our study was 24 months. Along these lines, in light of this review, it is unrealistic to investigate the result on long haul. In any case, since fracture union happened by around 4 months, independent of technique connected (Single Plate and Double Plate), and as fracture renovating is finished by 2 years we trust that the adjustment in arrangement optional to agent strategy and technique per say ought not to happen after that. Hypothetically, there is a change of creating varus deformity in arrangement because of osteoarthritis that we have not investigated. With horizontal Single Plating through single incision, a factually noteworthy contrast in surgical time was found between the two groups. Be that as it may, no significant contrast in time required for fracture reduction is watched. The advantages of Single Plate/LISS obsession incorporate one-sided fixation and utilization of self-drilling and self-tapping screws, may hypothetically shortened the operative time. In any case, however, strategies for reduction of fragments and restoration of alignment for bicondylar fractures through one lateral incision are technically demanding and this counterbalance any decreases in operative time during fracture fixation [19]. A noteworthy worry inside the treatment of bicondylar tibial plateau fractures with plates is the delicate tissue inconveniences. Analysis has revealed the profound injury contamination of 23-88% with Double Plate through single extensile incision [20,21]. With the 2 entry point Double Plate method, the occurrence drops down to 4.7-8.4% [21,22]. With LISS obsession, it's believed to be in differ from 0.33 to 22% [23]. In a study by Jiang et al. [19] had a lower rate of profound contamination, 4.7% in Double Plate amass and 7.3% in LISS bunch. Zhang et al. [24] had a profound contamination rate of 3.8% that was tantamount to 3.12% seen in our review. furthermore to this, 4 patients (12.5%) in our review created shallow injury contamination. No life form was confined and patients reacted to anti-infection agents for two weeks. Among these four, two patients had Tscherne C III, and 2 with Gustilo Grade two open break. Every one of them were worked inside five days of accepting injury. In this way, delicate treatment of the delicate tissues with a non traumatic procedure and an arranged surgery brings about mending of traded off delicate tissue before conclusive obsession, which brings about decrease of delicate tissue complexities and contamination rate. It's wanted to oversee such breaks at first with skeletal footing (transcaneal) or partner outside fixator for 5-14 days all through the essential stage. This not exclusively reestablishes leg arrangement and keep up delicate tissue length, however conjointly encourages recuperating and keeps extra delicate tissue damage. Malalignment wasn't exceptional. Malalignment seen in quick surgical sum and deferred loss of arrangement were found in 10.34 and 17.24% severally in Single Plate bunch and six. 25% and third in an exceedingly twofold plating bunch in our review. This complexity related with arrangement has likewise been reportable at a noteworthy rate in

various arrangement. the principles set for malalignment have shifted among the scientists and along these lines the nature of radiographs and in this manner the dependability of the estimation methods make it difficult to check the different series [25]. Most regular example of malalignment was varus fall. Osteoporotic bone and server comminution were the components that prompted to obsession not more grounded enough to give soundness to the proximal tibia, owing to the very reality that most noteworthy quality bone is near the subchondral area [25]. A study conducted by Barei and collagues 22 in CT based review have announced the event of a posteromedial section in roughly 33% of AO/Orthopedic Trauma Association C-sort bicondylar tibial level breaks. this can be noteworthy clinically thus of horizontally connected mounted point plate/screw gadgets that are usual settle bicondylar tibial level breaks may not adequately kill this osteoarticular section and require some substitute or supplemental exposures alongside obsession ways [18,22]. Gosling et al. [26] evaluated the result of the LISS utilized alone to treat 69 bicondylar tibial level breaks and uncovered that 16 patients had a noteworthy malreduction and nine patients had lost decrease, out of those, 3 had posteromedial part not bought by locking screw. With foreordained directions in respect to plate, there is failure of locking screws to connect with the posteromedial part. The 3.5 mm periarticular plate utilized as a part of our patients had four veering screw proximally, which could bolster the subchondral bone and to connect with the posteromedial piece. In any case, to keep up the articular congruity and arrangement is requesting and is not generally recreated 19 regardless we had 4 of our seven cases with malarrangement with a different posteromedial part. As per biomechanical and cadaveric reviews, double plate obsession permits less subsidence in this bi-condylar tibial level cadaveric model when contrasted and segregated, bolted horizontal plates [18,27]. Zhang et al. [24] contrasted twofold brace plating build and another develop of blend of horizontal bolted plate and average support, with results demonstrating no huge distinction in two gatherings as far as optional loss of decrease and arrangement. In spite of the fact that, for the treatment of type C bi-condylar tibial level fracture, laterally applied fixed angle implants, have picked up prevalence, the consequences of our review have shown that Double Plate through two cuts brings about better results as far as appendage arrangement and joint reduction with a worthy delicate tissue confusion rate.

Limitation

Our review has a few impediments. Out of which the principle purpose of shortcoming is that no earlier power investigation was made. At the season of surgery in Double Plate bunch, two plates of various make were utilized which is not prescribed. The ideal opportunity for assessment at follow-up assessment was just 24 months after the surgery. It is conceivable that, with time, a large number of these patients may create osteoarthritic (post-traumatic) changes in the knee as the support of articular congruity and rebuilding of arrangement were not flawless in all patients

Conclusion

Dual plating by two incision method resulted in better functional outcome regarding limb alignment and range of movements at knee joint with an acceptable soft tissue complication rate especially in young patients.

References

1. Suriyanwongpaisal, P., and Kanchanasut S, (2003), Road traffic injuries in Thailand: trends, selected underlying determinants and status of intervention. *Injury Control and Safety Promotion*.10:95–104.
2. 6. Yang, B. M., and Kim J., (2003), Road traffic accidents and policy interventions in Korea. • *Injury control and Safety Promotion*.10:89–93.
3. Ghaffar, A., Hyder A. A. and Masud, T. I., (2004), The burden of road traffic injuries in developing countries: the 1st National Injury Survey of Pakistan Public Health.
4. Chalya PL, Mabula JB, Ngayomela IH, Kanumba ES, Chandika AB, Giiti G, Mawala B, Balumuka DD: Motorcycle injuries as an emerging public health problem in Mwanza City, north-western Tanzania. *Tanzan J Health Res* 2010, 12:214-221.
5. Egol KA, Koval KJ. In: *Fracture of proximal tibia:chapter 50*, Rockwood and Green s "Fracture in Adults", Vol. 2, 6th edition, Lippincott Williams and Wilkins. 1999.
6. Schulak DJ, Gunn DR. Fracture of the tibial plateaus. *Clin Orthop*. 1975;109:166-77.
7. Cotton FB. Fender fracture of the tibia at the knee. *N Engl J Med*. 1929;201:989.
8. Koval KJ, Hulst DL. Tibial plateau fracture: evaluation and treatment. *J Am AcadOrthop Surg*. 1995;3(2):86-94.
9. Phisitkul P, McKinley TO, Nepola JV, Marsh JL. Complications of locking plate fixation in complex proximal tibia injuries. *J Orthop Trauma* 2007;21:83-91
10. Dendrinos GK, Kontos S, Katsenis D, Dalas A. Treatment of high-energy tibial plateau fractures by the Ilizarov circular fixator. *J Bone Joint Surg Br* 1996;78:710-7.
11. Young MJ, Barrack RL. Complications of internal fixation of tibial plateau fractures. *Orthop Rev* 1994;23:149-54
12. 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.
13. Horwitz DS, Bachus KN, Craig MA, Peters CL. A biomechanical analysis of internal fixation of complex tibial plateau fractures. *J Orthop Trauma* 1999;13:545-9)
14. Jiang R, Luo CF, Wang MC, Yang TY, Zeng BF. A comparative study of less invasive stabilization system (LISS) fixation and two-incision double plating for the treatment of bicondylar tibial plateau fractures. *Knee* 2008;15:139-43.
15. Barei DP, Nork SE, Mills WJ, Henley MB, Benirschke SK. Complications associated with internal fixation of high-energy bicondylar tibial plateau fractures utilizing a two-incision technique. *J Orthop Trauma* 2004;18:649-57.
16. Young MJ, Barrack RL. Complications of internal fixation of tibial plateau fractures. *Orthop Rev* 1994;23:149-54.
17. Papagelopoulos PJ, Partsinevelos AA, Themistocleous GS, et al. Complications after tibia plateau fracture surgery. *Injury*. 2006;37:475–484.
18. Yoo BJ, Beingessner DM, Barei DP. Stabilization of the posteromedial fragment in bicondylar tibial plateau fractures: A mechanical comparison of locking and nonlocking single and dual plating methods. *J Trauma* 2010;69:148-55.
19. Jiang R, Luo CF, Wang MC, Yang TY, Zeng BF. A comparative study of less invasive stabilization system (LISS) fixation and two-incision double plating for the treatment of bicondylar tibial plateau fractures. *Knee* 2008;15:139-43.
20. Moore TM, Patzakis MJ, Harvey JP. Tibial plateau fractures: Definition, demographics, treatment rationale, and long term results of closed traction management or operative reduction. *J Orthop Trauma* 1987;1:97-119.
21. Young MJ, Barrack RL. Complications of internal fixation of tibial plateau fractures. *Orthop Rev* 1994;23:149-54.
22. Barei DP, Nork SE, Mills WJ, Henley MB, Benirschke SK. Complications associated with internal fixation of high-energy bicondylar tibial plateau fractures utilizing a two-incision technique. *J Orthop Trauma* 2004;18:649-57.
23. Stevens DG, Beharry R, McKee MD, Waddell JP, Schemitsch EH. The long term functional outcome of operatively treated tibial plateau fractures. *J Orthop Trauma* 2001;15:312-20.
24. Zhang Y, Fan DG, Ma BA, Sun SG. Treatment of complicated tibial plateau fractures with dual plating via a 2-incision technique. *Orthopedics* 2012;35:e359-64.
25. Phisitkul P, McKinley TO, Nepola JV, Marsh JL. Complications of locking plate fixation in complex proximal tibia injuries. *J Orthop Trauma* 2007;21:83-91.
26. Gosling T, Schandelmaier P, Muller M, Hankemeier S, Wagner M, Krettek C. Single lateral locked screw plating of bicondylar tibial plateau fractures. *Clin OrthopRelat Res* 2005;439:207-14.
27. 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.

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