

**Original Research Article****Locking Vs Buttress Plating in Management of Fracture Upper End of Tibia**

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Email: [sawhneygirish@gmail.com](mailto:sawhneygirish@gmail.com)**ABSTRACT**

**Introduction-** Fractures of proximal tibia involves a major weight bearing joint i.e knee joint and are serious injuries that frequently result in functional impairment. To preserve normal knee function surgeon must try to maintain joint congruity, preserve the normal mechanical axis, ensure joint stability and restoring full range of motion.

**Aim-** the goal of study was to compare the restoration of articular congruity, axial alignment, joint stability and functional motion.

**Material and Methods-** A study was conducted on 30 patients of fracture of upper end tibia in adults out of which 15 cases were treated by locking plate and the rest 15 cases were treated by buttress plating

**Results-** Road side accidents were the cause in more in 90% of patients. According to AO classification 14 cases were type A, 5 cases were type B and 11 cases were type C. Intra articular fractures were commonly Schatzker type VI. Duration of surgery and rate of complications were more in buttress plate group. Radiological union occurred earlier in patients treated with locking plate. One case that went into non union was seen in buttress plate group. Early mobility and better functional outcome was seen in those treated with locking plate than those with buttress plate.

**Conclusions-** Our study concluded that proximal tibial fractures can be treated more effectively with lateral locking plate.

**Keywords:-** tibia, buttress plate, locking plate, fracture, non union.

**INTRODUCTION**

High velocity traffic in this modern age has resulted in broken bones in different patterns. By its very location, the tibia is exposed to frequent injury, it is the most common fractured long bone. Because most of tibial surface is subcutaneous throughout its length, open fractures are more common in the tibia than in any other major long bones. Furthermore, the blood supply to tibia is

more precarious than that of bone enclosed by heavy muscles.<sup>1</sup> Higher speed injuries in younger patients from sports or similar mechanism can cause split fracture or rim avulsion fractures associated with ligament injuries. Motor vehicle accidents and fall from heights<sup>2-7</sup> and pedestrian struck injuries often produce more severe patterns, which may involve both condyles and have a high risk for associated neurovascular injury,

compartment syndrome, and communicating open wounds.<sup>8,9</sup>

The Schatzker classification system focuses on standard tibial plateau fractures. However, higher Schatzker fracture rankings may represent fracture-dislocations and are predictive of significant associated soft-tissue injury.

The Schatzker classification is based on the idea that “certain pathoanatomic and etiological factors as well as therapeutic features demand that certain injury types be grouped together”.<sup>[10,11]</sup> In the Schatzker classification, each increasing numeric fracture category indicates increasing severity, reflecting not only increased energy imparted to the bone at the time of injury but also an increasingly worse prognosis. Therefore, orthopedic surgeons find the Schatzker classification useful in assessing the initial injury, planning management, and predicting prognosis. The Schatzker classification system divides tibial plateau fractures into six types: lateral tibial plateau fracture without depression (I), lateral tibial plateau fracture with depression (II), compression fracture of the lateral (IIIA) or central (IIIB) tibial plateau, medial tibial plateau fracture (IV), bicondylar tibial plateau fracture (V), and tibial plateau fracture with diaphyseal discontinuity (VI). The first three types (I, II, and III) are typically the result of low-energy injury.<sup>[12,13]</sup> The second three types (IV, V, and VI) are typically the result of high-energy injury. However, relatively low-energy trauma to osteoporotic bones may produce fracture patterns similar to those of high-velocity injuries.<sup>[14]</sup> The magnitude of the force determines both the degree of fragmentation and the degree of displacement. Fractures of proximal tibia involve a major weight bearing joint i.e knee joint and are serious injuries that frequently result in functional impairment. To preserve normal knee function surgeon must try to maintain joint congruity, preserve the normal mechanical axis, ensure joint stability and restoring full range of motion. There are two categories of proximal tibia fractures articular and non articular . Articular fractures,

termed tibial plateau or tibial condylar fractures, affecting knee alignment stability and movement. Non-Articular fractures affect knee alignment, stability and strength.<sup>15</sup> The aim of surgical treatment of proximal tibia is to restore and preserve normal knee function.

The majority of tibial plateau fractures are secondary to high speed The motor vehicle accidents and fall from heights. The proximal tibia is most likely to be subjected to a valgus force because of the normal 5 to 7 degrees of valgus alignment of the knee and because of propensity to be struck from lateral side. A combination of valgus and axial compression produces lateral side depression, split depression or less commonly, lateral split or total lateral condyle fracture<sup>16</sup>. Knee flexion, varus and internal rotation of medial femoral condyle produces posteromedial shearing fractures of medial plateau as isolated split fractures or as bicondylar fracture<sup>17</sup>.

Fibula influences anatomical behaviour of condylar fractures. Isolated fractures of lateral condyle with an intact fibula do not collapse further because of support of fibula. Conversely, fracture of lateral condyle with associated fibular fractures tend to collapse into valgus because of lack of fibular support. Bicondylar fractures do not collapse or angulate when proximal fibula is fractured and displaced, however if the fibula is intact, the medial condyle collapses producing varus deformity.<sup>18</sup>

Accurate reduction of articular surface is important aspect of treating displaced plateau fractures. Plate osteosynthesis is recognised as treatment of choice for these fractures. Locking plate system converts the shearing forces at implant into compressive forces at screw bone interface whereas contoured buttress plates rigidly hold the fractured fragments in place.

## MATERIAL AND METHODS

The present study was conducted on 30 patients between 18 to 70 years, of fracture of upper end tibia closed/ open Gustillo Anderson grade I and II<sup>19</sup>, 15 cases were treated by locking plate and rest

15 with buttress plate. Suitable X rays were done to assess the type of fractures, degree of displacement and involvement of articular surface. Fractures were approached with either anterolateral<sup>20</sup> or posteromedial<sup>21</sup> approaches, as the need be, under tourniquet control with or without bone grafting.

In Anterolateral approach patient was placed in semi lateral position and limb is exsanguinated. After clean and draping a longitudinal incision over the anterior edge of fibula the bone is exposed after superficial dissection. The fracture is reduced and provisionally fixed with k wires. Definite fixation with either buttress or locking plate is done. Wound closed in layers after obtaining hemostasis and in postero medial approach a longitudinal incision on lateral border of gastrocnemius was made of desired length and after superficial dissection the bone was exposed and fracture fragments reduced and provisionally fixed with k wires. Definite fixation with either buttress or locking plate is done. Wound closed in layers after obtaining haemostasis and ASD done. Partial weight bearing was allowed after 4-8 weeks depending on radiographic evidence of healing and graft incorporation. All the patients were followed for a minimum of 9 months with regular checkup done at 3 weeks, 6 weeks, 12 weeks, then monthly for 3 months and finally at 9<sup>th</sup> month. Result evaluation was done as per criteria laid down by Savoie et.al 1987.<sup>22</sup>

## RESULTS

In this study maximum patients i.e 14(46.66%) were in the age group of 31 to 50 years of age followed by 7(23.33%) patients in the age group of 21 to 30 years. 90% of the patients were males and right leg being involved in 66.66%. Road traffic accidents were major mode of injury accounting for 93.33% of total cases. 20 cases (66.66%) had closed fractures while 10 cases (33.33%) were of open fractures with majority (i.e. 6 cases) having puncture wounds and 4 cases had laceration > 1 cm. 14 cases were AO type A, 5 were type B and 11 were type C. Most of the

intraarticular fractures were Schatzker type VI. The mean duration of surgery for locking plate was 56.13 min(Range 42-85) and for buttress plating was 69.4 min s(Range 45-90). In locking plate group wound healing occurred primarily with healthy scar formation in 86.66% cases while in 13.33% there was superficial infections which healed with antibiotics. In buttress plate group wound healing occurred primarily in 66.66% cases, 20% cases showed superficial infections which healed with antibiotics while in 13.33% cases there was deep infection which healed after removal of implant. Full weight bearing was allowed to patients after duration of 15-26 weeks. In locking plate group most of the cases, weight bearing was possible at mean of 18.13 weeks. In buttress plating most of the cases weight bearing was possible at mean of 20.57 weeks.

Radiological union in locking plate group occurred between 13-16 weeks mean (16 weeks) in 66.66% cases while in buttress plating group at 15-18 mean (17.40 weeks) in 60 % cases. Loss of reduction (2 cases) and non-union (1 case) was seen more in buttress group, while none in locking plate. Malunion was seen in 1 case of locking plate and 2 cases of buttress plating. Zero degree extension gap to  $\geq 110^\circ$  flexion in Locking plate group was (66.66%) while in buttress plating was (46.66). 0-5° extension gap to 90-110° flexion in locking group was 26.66% while in buttress plating group was 33.33%. According to Savoie et.al<sup>11</sup> criteria 93.33% cases had excellent to good results in locking plate group while 80% in buttress plate group.

**Table no. 1** Showing Time When Full Weight Bearing Was Allowed

FWB (weeks)	LOCKING PLATE		BUTRESS PLATE	
	No.	Percentage (%)	No.	Percentage (%)
10-15	2	13.33	0	0.0
16-20	11	73.33	10	66.66
20-25	2	13.33	2	13.33
>25	0	0.0	2	13.33
Non-union	0	1	1	06.66
Total	15	100.0	15	100.0

**Table no. 2.** Showing Time Taken For Radiological Union

Periods of weeks	Locking plate		Buttress plate	
	No.	Percentage(%)	No.	Percentage(%)
11-14	5	33.33	3	20.00
15-16	5	33.33	3	20.00
17-18	3	20.00	6	40.00
>18	2	13.33	3	20.00
Total	15	100.0	15	100.0

**Table no 3.** Showing Complications

Wound healing	Locking plate		Buttress plate	
	No.	Percentage	No.	Percentage
Malunion	1	06.66	2	13.33
Non – union	0	0.0	1	06.66
Loss of reduction	0	0.0	2	13.33
Shortening> 2 cm	1	06.66	1	06.66

## DISCUSSION

Operative intervention is treatment of choice for fractures involving upper end tibia in order to attain anatomical reduction and joint congruity with the goal to achieve a stable and painless joint with a normal range of motion and function. Various studies and literature compare the locking plate and buttress plate in the treatment of this fracture but controversy still exist. The Locking plate system consists of a pre-contoured, anatomically shaped plate that can be inserted with a minimally invasive technique and of screws that can be locked within the plate. Biomechanical testing has shown that these plates demonstrate elastic deformation equal to that of conventional plates (lateral buttress and medial antiglide constructions). These plates can also simultaneously achieve fixation of an associated metaphyseal/diaphyseal component of the fracture with a minimal approach.

In our study average age of these patients was 41.06 years showing that these fractures affect adults in the prime of their productive life. Men were commonly involved because of their outdoor activity and majority of motor vehicles are driven by males. Right limb affection merely reflects a coincidence depending upon the position of limb at the time of injury. 93.33% of cases were due to

road accidents which is due to increased vehicular traffic worldwide. Most of the intraarticular fractures were type Schatzker type VI<sup>23</sup> because of high velocity trauma. The difference between mean duration of surgery for locking and buttress plating was not statistically significant but comparable (p value is 0.99 by unpaired t test. Sharma et al).<sup>24</sup> Less intra operative time for locking plate is due to less time spent for plate contouring. More complications and deep infections were seen in buttress plate group due to extensive soft tissue dissection and medial placement of plate directly beneath the skin. The difference between the time taken for radiological union in both the groups were statistically insignificant (p value is 0.94. egol et al 2004.<sup>25</sup> however less time in locking group was because of less tissue dissection needed and due to indirect reduction technique, the fracture biology is maintained. Loss of reduction and, non union, malunion was higher in buttress plate group while 100% union was achieved in locking plate group. incidence of knee stiffness was higher in buttress plate group due to delayed start of postop rehabilitation due to longer incision and more soft tissue dissection. Early post op complication like superficial infection, deep infection, hardware pain and skin slough more in buttress plate group (13.33% with locking plate where as 33.33% with buttress plate.) Probably due to extensive soft tissue dissection and medial placement of plate directly beneath the skin. (p value is 0.76 by unpaired t test). Various studies done by lee et al<sup>[26]</sup>, moore<sup>[27]</sup> and gosling et al<sup>[28]</sup>, all have substantiated these facts..

Excellent to good results were obtained in 93.33% cases in locking plate group and in 80% cases in buttress plate group. Thus, locking plate technique is a better technique compared to traditional plating as it involves smaller incision, lesser soft tissue dissection and a much stronger construct. This in turn leads to lesser complications with early functional recovery.



**Functional movements after union**



Case 2 Locking Plate (Post Operative)



**Buttress Plate**

## CONCLUSION

we have observed from above findings that in locking plate healing occurred primarily with healthy scar formation in 86.66% cases while in 13.33% there was superficial infections only, while in buttress plate group wound healing occurred primarily in 66.66% cases, 20% cases showed superficial infections, while in 13.33% cases there was deep infection which healed after removal of implant. In locking plate group most of the cases, weight bearing was possible at mean of 18.13 weeks. In buttress plating most of the cases weight bearing was possible at mean of 20.57 weeks. Radiological union in locking plate group occurred between 13-16 weeks mean (16 weeks) in 66.66% cases while in buttress plating group at 15-18 mean (17.40 weeks) in 60% cases. From our study, we observed that proximal tibia fractures can be better and more effectively treated with lateral locking plate as compared to buttress plate. Early rehabilitation, fewer complications, early radiological union and early

weight bearing with better and near complete functional recovery is seen with locking plate.

Our study concludes that locking plate is better implant than buttress plate in management of proximal tibia fractures.

**Ethical approval:** study is in accordance with the ethical standards of the institute.

**Informed consent:** was obtained.

**Conflict of interest:-** nil.

**Source of funding:-** nil.

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