

Original Article  
Orthopaedics

# FUNCTIONAL OUTCOME OF PROXIMAL TIBIA EXTR-ARTICULAR FRACTURES TREATED WITH LOCKING COMPRESSION PLATING

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**Abstract:**

**Introduction:** As traditionally used IM nails have proven to be challenging in fixation of proximal tibia extra-articular fractures, The Locking compression plates are a newer modality which are minimal invasive and provide anatomical fixation.

**Objectives:** To study the functional outcome of the extra-articular fracture of proximal tibia after 4, 12 and 24 weeks.

**Material and Methods:** The material for the present study was obtained from the patients admitted in Dr. D.Y. Patil hospital with diagnosis of proximal Tibia Extra-articular fractures in adult age group (more than 18yrs) from August 2014 to July 2016. Final outcome was evaluated by Lysholym knee score.

**Results:** All cases showed union. Most of the fracture union (80%) occurred between 12-16 weeks, followed by 15% of the fracture union in more than 16 weeks. 65% patients had range of motion greater than 120, 25% patients had range of motion between 90-120 and 10% patients had range of motion lesser than 90. According to Lysholym Knee Score 50% of the patients in the study group showed excellent results while 20% patients reported Good to Excellent result.

**Key words:** Proximal tibia, extra-articular fracture,  
locking plates

**Introduction**

Proximal tibia fractures (AO/OTA type 41-A2 & A3) with diaphyseal involvement are serious injuries and present treatment challenges.<sup>1</sup> The management of high-energy proximal tibial fractures requires the surgeon to take very good care of the soft-tissue envelope as the anteromedial surface of the tibia is covered only with skin and subcutaneous tissues<sup>2</sup>. Poor bone quality and comminuted fracture patterns create difficulty in achieving stable fixation. Any surgical strategy for fracture fixation should demand the minor infection rates and high union rates without bone grafting and recover the good functional outcome.

As more and more concepts about biological fixation became clearer the innovation of the plates progressed lead to the 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). Hence the present study was done in our institution to establish the importance of using LCP in Proximal tibia extra-articular fractures and improving the fracture fixation technique in these kind of fractures.

**Material And Methods**

Study site: D. Y. PATIL HOSPITAL, KOLHAPUR, under D. Y. PATIL UNIVERSITY, KOLHAPUR.

Study Population: In this study, the 20 cases of fracture proximal extra-articular tibia, admitted under Orthopaedic department, treated with locking compression plate was studied. During the period from August 2014 to July 2016.

Case selection was done in the criteria of history, clinical examination and radiological (X-ray) examination. Soon after the admission, clinical data

was recorded as per the proforma. Final outcome was evaluated by Lysholym knee score.

**Inclusion Criteria**

- Simple closed fractures of proximal tibia extraarticular
- Adult patients (age more than 18 years)
- Metaphyseal fractures with diaphyseal extension.

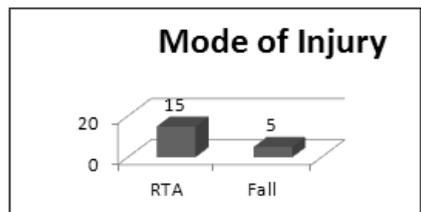
**Exclusion Criteria**

- Intra-articular proximal tibia Fractures
- Pathological fracture of proximal tibia
- Distal neurovascular deficit
- Severe soft tissue injury
- Compound injury
- Patients on Immunosuppressive therapy
- Patients with manifested infection
- Patients with high anaesthetic risk

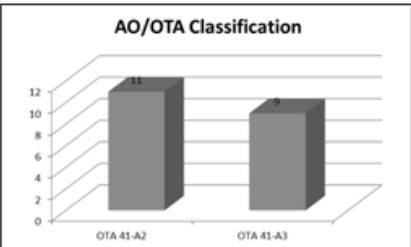
The diagnosis was mainly based on clinical examination and was supported by radiological (X-ray) examination.

**Results**

1. The mean age of patients in the study group was 33.75 years
2. Majority of the patients (70%) were male
3. Road Traffic Accident in 75% patients was the main cause of fracture.



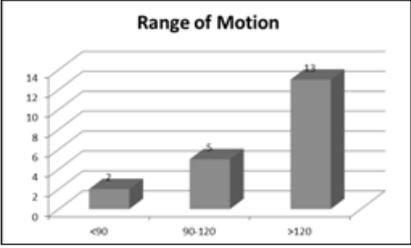
4. 55% of the fractures were found to be OTA 41-A2 followed by OTA 41-A3 (45%).



5. The mean operative time was 89.51 hours, while the mean hospital stay was 6.6 days
6. Most of the fracture union (80%) occurred between 12-16 weeks, followed by 15% of the fracture union in more than 16 weeks.



7. 65% patients had range of motion greater than 120, 25% patients had range of motion between 90-120 and 10% patients had range of motion lesser than 90.



8. According to Lysholym knee score 50% of the patients in the study group showed excellent results while 20% patients reported Good to Excellent result.
9. 5% patient each reported knee stiffness and knee instability and 90% patients had no complications.

## Discussion

Proximal tibia being involved in body weight transmission through knee joint and leg, plays a vital role in knee function and stability. Fractures of proximal tibia have historically been difficult to treat because of its subcutaneous location of the anteromedial surface of the tibia. Severe bone and soft tissue injuries are not infrequent and there is high incidence of open fracture compared with other long bones. Extra-articular proximal tibial fractures are often the result of high-energy trauma with displacement and comminution. They lead to complex tissue injuries involving bone and surrounding soft tissues<sup>26</sup>.

Complications of treatment and associated injuries with this fracture have led to several approaches and mode of fixation with little consensus on optimal management. Conventional Arbeitsgemeinschaft für Osteosynthesfragen (AO) plating needs fracture exposure and extensive soft-tissue dissection, thus carrying the risks of bleeding, infection and soft-tissue healing problem.

Although the soft-tissue healing problem and deep infection can be largely avoided with a hybrid fixator, it carries the risks of nonunion, malunion rotational deformity, or stiffness of adjacent joints<sup>27,28</sup>; patient dissatisfaction is also a major limit of this procedure. With the introduction of the locking plate (LCP) in the fracture fixation, the fixation of proximal tibia fracture has undergone a revolutionary change.

The present study was conducted to evaluate the functional outcome of proximal tibia extra-articular fractures treated with locking compression plating. The mean age of patients in the study group was 33.75 years.

It was observed that majority of the patients (70%) were male and Road Traffic Accident in 75% patients was the main cause of fracture. 60% of the fractures were on the right side. This is in concordant to the study of Naik MA et al<sup>31</sup>.

The study of Naik MA et al<sup>31</sup> was a prospective cohort study in which all patients with extra-articular proximal tibial fracture were treated with percutaneous locked plating (PLP). 91.5% patients were male and 8.5% patients were female. The mean age of the patients was 42 years.

Among modes of injury road traffic accidents are the most common (93.3%) with more (73.3%) fractures on right side.

55% of the fractures in this study were found to be OTA 41-A2 followed by OTA 41-A3 (45%). This correlates to the findings in the studies of Naik MA et al<sup>31</sup>, Reddy JPK et al<sup>35</sup> and Meena RC et al<sup>29</sup>.

Naik MA et al<sup>31</sup> had observed in their study that the mode of injury in 41 (87%) patients was because of high-velocity road-traffic accident whereas 6 (13%) were due to fall from a height. The study of Reddy JPK et al<sup>35</sup> had 30 patients classified according to AO classification system. 3.3% of the patients were type A1, 13.3% type A2, 30% type A3, 16.7% type C1, 30% type C2 and 6.7% type C3.

In the study of Meena RC et al<sup>29</sup>, 40% of the fractures were found to be OTA 41-A2 and 60% fractures were OTA 41-A3 (45%).

In the present study, the mean operative time was 89.51 hours, while the mean hospital stay was 6.6 days. Most of the fracture union (80%) occurred between 12-16 weeks, followed by 15% of the fracture union in more than 16 weeks. There were 13 (65%) patients with range of motion

greater than 120, 5 (25%) patients with range of motion between 90-120 and 2 (10%) patients with range of motion lesser than 90. This correlates to the study of Meena RC et al<sup>29</sup>.

Meena RC et al<sup>29</sup> observed that the mean operative time was 87.91 hours and mean hospital stay was 5.3 days. In extra-articular proximal tibial fractures treated with proximal tibial plating, time to full weight-bearing has ranged from 6 to 13 weeks depending on the fracture location, fracture pattern, and surgeon's preference. In the study of Meena RC et al<sup>29</sup>, the time required before full weight-bearing, which was done only after complete radiological union, was 22.84 weeks in Group B.

50% of the patients in the study group showed excellent results while 20% patients reported Good to Excellent result, 15% patients reported Fair to Good result and 10% patients reported Fair result. This is similar to the results of Kim JW et al<sup>32</sup>, Rambold<sup>36</sup>, Jensen D<sup>25</sup>, Chaix et al<sup>37</sup>, Lee et al<sup>38</sup> and Feng et al<sup>39</sup>.

Kim JW et al<sup>32</sup> did retrospective study on 30 patients with proximal tibia fracture treated with MIPO. Primary union was achieved in 24 patients and early bone grafting was performed in 6 patients. 23 patients achieved an excellent result and 7 achieved a good result.

Rambold<sup>36</sup> in 1960 reported that internal fixation of tibial plateau fractures and early mobilization contributes to good anatomical and functional results. Jensen D<sup>26</sup> in 1990 got good results by surgical treatment of proximal tibia fractures. Chaix et al<sup>36</sup> reported 86% good to excellent results by surgical means of treatment. Lee et al<sup>37</sup> reported good to excellent results by surgical means of less invasive stabilization system treatment. Feng

et al<sup>38</sup> reported good results when fixed with LCP in comparison with dynamic compression plate (DCP) with an additional benefit of minimally invasive surgery.

There was 1 (5%) patient each with knee stiffness and knee instability. 18 (90%) patients had no complications. This is agreeable to the findings of Sommer et al<sup>33</sup> and Gonzaleiz HY et al<sup>34</sup>.

Sommer et al<sup>33</sup> published the results of the first general study of various locking compression plates in 2003. In their prospective study, they treated 144 patients with 169 fractures involving tibia (57), humerus (45), radius (19), and femur (18) and assessed the patients for 1 year.

In 130 fractures the healing took place in the expected period without any complications. A total of 27 complications occurred (19 patients) including implant loosening / pull out (5 patients), Plate failure (4 patients) non-union (1 patient), secondary fractures immediately adjacent to implant after a subsequent injury (5 patients) and infection (2 patients).

Analysis by the experts concluded that the mechanical complications arose entirely from technical errors of application. No purely implant related complications occurred. They concluded that the LCP was a technically mature and has proven its worth in complex fracture situations and in revision operations after the failure of other implants.

Gonzaleiz HY et al<sup>34</sup> studied 122 injuries in 113 patients treated with the LCP and LISS. They found that despite the large number of open and comminuted fractures no serious complications such as deep infections, nonunions, vascular lesions or deep venous thrombosis were noted. Also they concluded that the proven value

of these systems (LCP and LISS) in complex fracture situations and revisions surgeries. They found the procedure to be safe and reliable.

### Conclusion

Extra-articular proximal tibial fractures are often the result of high-energy trauma with displacement and comminution. They lead to complex tissue injuries involving bone and surrounding soft tissues. Conservative management of these fractures has often resulted in malunion, nonunion, rotational deformity, or stiffness of adjacent joints, so there has been a shift towards operative management of these fractures.

Locking Compression plating in extra-articular proximal tibia fracture showed promising results. They provide rigid stability to the fracture site and prevent secondary fracture collapse. Locking Compression plating preserves the vascularity and hence decreases the risk of infection and wound breakdown. However, it is important for the surgeon to understand and respect the applied fixation principles, the specific anatomical considerations and the implant characteristics when using a locking plate.

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