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## Comparison between midline tendon splitting and lateral parapatellar approach for intramedullary nailing of tibia

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### Abstract

**Introduction:** Tibial fracture unites well with classical midline tendon splitting approach but are associated with complications. So fractures stabilization with IMILN via lateral parapatellar approach is useful to prevent complications.

**Methods:** In our comparative study 30 patients in each MTS and LP approach, underwent IMILN.

**Main Outcome Measurements:** Anterior knee pain based on a visual analog scale and functional outcomes based on Lysholm knee score.

**Results:** Results were excellent in 20% of patients, good in 80% of patients in lateral parapatellar approach. Whereas, in midline tendon splitting approach results were excellent in 7% of patients, good in 67% of patients, fair in 27% patients at 1 year, according to LKS. The descending order of the activities with respect to severity of knee pain was kneeling, squatting, running, and stair ascending. VAS analysis revealed that the LP group had significantly less severe pain for all eight activities examined than the MTS group. However, at 1 yr both are comparable.

**Conclusion:** IMILN with lateral parapatellar approach has good functional outcome and is better than midline tendon splitting approach.

**Keywords:** IMILN – intramedullary interlocking nailing, MTS - midline tendon splitting, LP - lateral parapatellar, LKS - Lysholm knee score, ROM - range of motion, VAS – visual analogue scale

### Introduction

Tibial diaphyseal shaft fracture is one of the most common types of long bone fractures in orthopaedic practice. The preferred management for most tibial shaft fractures is intramedullary nailing, which generally yields a high rate of union, low complication rates, and good functional outcomes [1].

In contrast to the rest of appendicular skeleton, tibia has precarious blood supply due to inadequate muscular envelop. Tibial fractures may be associated with compartment syndrome, vascular or neural injury. The presence of hinge joints at the Knee and the ankle, allows no adjustment for rotatory deformity after fracture. Because of the high prevalence of complications associated with fractures, management often is difficult, and the optimum method of treatment remains a subject of controversy

Various routes have been developed for intramedullary nailing of tibia, most common of which is the infrapatellar (including transtendinous, medial paratendinous, lateral paratendinous) route. A major side effect of tibial nailing after transtendinous route is postoperative anterior knee pain, with a mean incidence of 47% after 2 year [2]. In particular, postoperative knee pain seems to be a limiting factor during the recovery process [3]. Even removal of the nail often does not improve this complication. While the exact aetiology of this knee pain is unknown. Several anatomic structures around the knee are prone to injury during nail insertion, including the patellar tendon [4], menisci, articular cartilage, the infrapatellar branch of the saphenous nerve and the infrapatellar fat pad [5]. Additionally, the presence of prominent hardware, surgical approach relative to the patellar tendon and muscle weakness has

been described as causative factors for knee pain [6]. Insertion of the nail through the patella tendon in transpatellar approach was associated with a higher incidence of knee pain compared to the paratendon site of nail insertion [7]. This is due to the incision through the tendon in transpatellar approach causing retro-tendinous fat pad-injury, which is highly innervated. When parapatellar approach is used, the patellar tendon, the retropatellar fat pad and the tissues are retracted and, theoretically there would be no tissue injury [8, 10].

Recent advances in nail design and reduction techniques have expanded the indications for intramedullary nail fixation to more proximal as well as more distal tibia fractures involving the metaphyseal area. Techniques have been developed to insert the nail through a lateral parapatellar approach to facilitate intraoperative imaging, allow easier access to starting site position, and counter deforming forces.

## Aims and Objective

### Aims

To compare the midline tendon splitting and lateral parapatellar approach for intramedullary nailing of tibia using the VAS and The LKS questionnaire with a follow up period of 1 year.

### Objective

- To compare knee pain.
- To compare range of motion between both the approaches.

## Material and Methods

**Study design:** Observational, comparative, longitudinal study.

**Sample size:** 60 patients

**Study group:** This study was conducted in Sri Guru Ram Das charitable hospital attached to Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar who have isolated Tibial shaft fracture fulfilling the inclusion criteria.

**Method –** After taking the informed written consent of each patient, detailed clinical history was recorded and general physical, local examination was done. All patients were be prospectively followed for isolated tibial shaft fracture after surgical treatment for a period of one year with visual analog scale and The Lysholm Knee Scale (LKS) questionnaire.

**Allocation of groups -** Out of 60, thirty patients were selected in group LP and were operated by semi-extended lateral parapatellar approach and thirty patients were in group MTS, they were operated by hyper flexion patellar tendon splitting approach.

**Follow up -** The patients were radiographically and clinically analysed at 3,6,12 months.

The standard radiographic evaluation included a standing antero-posterior and lateral view of full-length tibia with knee and ankle joint.

The results were statistically analyzed and P value of less than .05 was considered to be significant.

## Inclusion Criteria

1. All skeletally mature patients more than 20 yrs of age having:
2. Closed fractures of tibia,
3. Open fractures of Gustilo Anderson (GA) Type I and II.

## Exclusion Criteria

1. Patients with blood diseases, systemic and metabolic,

immunodeficiency, hepatitis B or C, HIV-positive status, infection and septicemia, local infection, compromised vascularity of limb, any comorbid illness.

2. Tibial intra articular fractures around knee and ankle.
3. Tibial fractures of proximal 1/3.
4. Malignancy (primary or metastatic tumor).
5. Open fractures with comminution (GA type III)

## Procedure

All nailing procedures were performed under spinal anaesthesia and image intensifier.

### Lateral Parapatellar Approach

In lateral parapatellar approach a 3 cm longitudinal incision was made from the inferior pole of the patella just medial to the lateral edge of the patellar tendon, and extended distally. The retinacular layer was identified and incised just to the lateral edge of the tendon. The portal of entry is approached by retracting the patellar tendon medially.

The infrapatellar fat pad was Identified and its insertion into the proximal tibia will be Sharply incised transversely from lateral to medial, allowing its retraction superiorly for exposure of the proximal tibial ridge. Extremity was then placed in semiextended position.



Fig 1



Fig 2

### Midline Patellar Splitting Approach

In the transtendinous approach midline incision 3.5 cm was made over skin after palpating the patellar tendon. Then knee is hyperflexed.



Fig 3



Fig 4

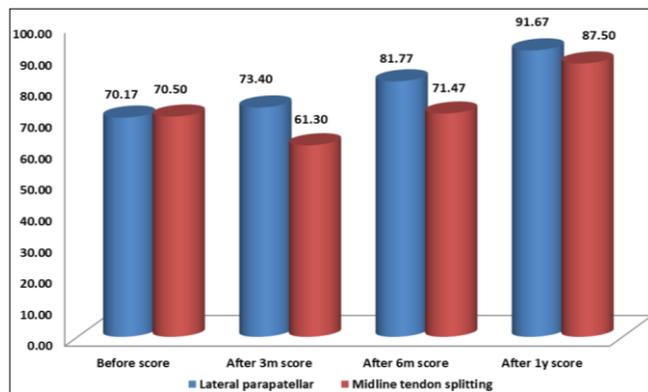
In both the techniques, Radiographically, the entry point was at the medial edge of the lateral tibial spine on the AP view and on the anterior border of the articular surface on the lateral view. Entry point made with awl. Fracture realigned and beaded guide wire passed under c-arm. Serial reaming done. After exchanging beaded guide wire with simple wire appropriate size nail put. Distal locking followed by proximal locking done after back hammering to prevent diastasis. Under aseptic conditions wound washed and stitched in layers. Aseptic dressing applied and limb is elevated.

**Results**

In all 60 patients, total females were 27 compared to 33 males. Right tibia was fractured in 53% cases compared to 47% in left. Mean age in LP group was 40.97 yr and in MTS group was 47.90 yr. Mean VAS score (table 1) had no significant difference at 1 yr (MTS 0.43 & LP 0.40) but at 3 month and 6 month it was 5.17 and 2.17 for MTS and 4.60 and 1.97 for LP group respectively. most of the patients complain of anterior knee pain Mean ROM at knee joint is comparable at 1 yr. (MTS 127° & LP 128°) 69% patients had more than 125° of ROM at 6 months. Total score of LKS (graph 1) at 1 yr was MTS 87.50± 5.02 and LP 91.67± 3.59, with total mean difference of 4.17± 1.13. However, at 3 month and 6-month total mean difference was 12.10 and 10.30 respectively.

**Table 1:** Showing comparison of mean VAS sore between midline tendon splitting and lateral parapatellar approaches.

VAS	Lateral parapatellar	Midline tendon splitting
Before treatment	8.80 ± 0.92	8.87 ± 0.97
After 3 months	4.60 ± 0.89	5.17 ± 0.77
After 6 months	1.97 ± 1.22	2.17 ± 1.23
After 1 year	0.40 ± 0.50	0.43 ± 0.50



**Graph 1:** Showing total LKS score comparison between both approaches at 3month, 6month and 1 year.

**Discussion**

Closed intramedullary interlocking nailing using midline tendon splitting and lateral parapatellar approach is a well-established standard procedure for treatment of tibial shaft fractures. Patients operated with IMILN using lateral parapatellar technique had less anterior knee pain and had slightly better arc of motion at knee compared to patients operated with IMILN using midline transpatellar technique, thus decreasing the morbidity and facilitate early rehabilitation However it is comparable with midline tendon splitting approach after 1 year.

In a prospective study comparing external fixation to IM nailing for tibial fractures, no knee pain was found in the former compared to 64% of the patients treated with a nail. The reported incidence in the literature varies, but most agree that postoperative knee pain occurs in approximately 50–60% of cases [11]. Our data indicate that using a lateral parapatellar approach, with atraumatic elevation of the infrapatellar fat pad may decrease the incidence of knee compared to other techniques. Possible explanations for post-nailing anterior knee pain are numerous and include injury to the patellar tendon, intraarticular structures, Prominent hardware and excessive knee flexion. Using the technique described, extreme care was taken to avoid injury to these structures while nailing the tibia in the semi extended position. Radiographic analysis demonstrated that no protruding hardware was found, which might have favorably biased our results. Finally, the laterally based incision avoids the area of the knee in contact with the ground during kneeling, as opposed to medial or anterior incisions. This is in concordance with the recommendations of a recent metaanalysis [11]. The majority of our patients did not have any difficulty kneeling down and also had a near normal range of motion. However, we feel that the other etiologies mentioned above are also contributory to the lower incidence of knee pain observed in our study.

Using a lateral parapatellar incision with preservation of the infrapatellar fat pad may decrease the incidence of post-nailing anterior knee pain. Larger, randomized prospective studies are needed to obtain a higher level of evidence regarding the incidence of knee pain using this approach.

**Conclusion**

In present study it was concluded that lateral parapatellar intramedullary approach is better than midline tendon splitting approach. A significant advantage of lateral parapatellar interlocking approach is, early joint motion, early weight bearing, technically simple, theoretically strong and has less knee pain which allows patient to return to work

earlier. However, after 1 year both approaches were comparable and no significant difference between them in terms of range of motion and knee pain were noted.

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