

## ORIGINAL ARTICLE

## COMPARATIVE ANALYSIS OF ANTERIOR KNEE PAIN IN TRANSPATELLAR AND MEDIAL PARAPATELLAR TENDON APPROACHES IN TIBIAL INTERLOCKING NAILING

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**Background:** Anterior knee pain is the most common complaint after intramedullary nail of the tibia. The incidence of anterior knee pain ranges from 10–86% and the exact ethology is unclear. Transpatellar tendon approach is commonly used for tibial intramedullary interlocking nailing but it can also be done through medial parapatellar tendon approach. The objective of the study was to compare post-operative anterior knee pain after intramedullary nailing technique by transpatellar approach compared to medial parapatellar approach. **Methods:** This randomized controlled trial was carried out in Department of Orthopaedic and Spine Surgery, Ghurki trust teaching hospital, Lahore from 20<sup>th</sup> February to 19<sup>th</sup> Nov 2015. Sixty patients who presented at emergency department for the treatment of simple tibial shaft fractures were included in the study. They were divided into two groups with 30 patients in each group, Group A containing patients operated through transpatellar tendon approach while group B containing patients operated through medial parapatellar tendon approach. **Results:** In Group A, 27 patients were male and 3 patients were female with a mean age of 28.667±9.63 while in Group B, 28 were male and 2 were female with a mean age of 34.63±15.82. The main causes of tibial shaft fractures were RTA followed by fall. In Group A mean anterior knee pain was 4.4 while in Group B, it was 2.5 with a *p*-value of .000. **Conclusion:** This study shows that medial parapatellar tendon approach causes less pain as compared to transpatellar approach.

**Keywords:** Tibial shaft fractures; Transpatellar Approach; Medial parapatellar Approach; Intra-medullary nailing

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### INTRODUCTION

Tibial shaft fracture is one of the most common bone fractured especially due to road traffic accident.<sup>1</sup> Mostly these fractures are sustained during high energy trauma, such as motorcycle accidents, pedestrian accidents, fall from height, motor vehicle accidents and rarely gunshot injuries. The incidence of tibia fracture in US is 109 per 100,000 per year.<sup>2</sup> Intramedullary interlocking nailing is the standard treatment for tibial shaft fracture.<sup>3</sup> Intra-medullary interlocking nailing is done in most of the type I, Type II and type IIIA open tibial shaft and closed tibial shaft fracture.<sup>1,4,8</sup>

The advantage of Intramedullary nailing of tibia is that it preserve the soft tissue sleeve surrounding the fracture site, acts as internal splint and allows early weight bearing.<sup>4,5</sup> In the intramedullary interlocking nail both proximal and distal locking is done which provides control of length, alignment and rotation in unstable fracture.<sup>4</sup> In Tibial shaft fracture treated with intramedullary interlocking nail union can be expected in over 95% of cases.<sup>8</sup> Main complications of intramedullary interlocking nail are superficial wound infection, deep wound infection, compartment syndrome, deep vein thrombosis, anterior knee pain, delayed union, non-union and implant failure.<sup>5</sup> Nailing is not done in patient with open physes, anatomical

deformity, burns over the portal entry and most of the type IIIC fracture.

Intramedullary interlocking nail was developed by Grosse and Kempf in 1970.<sup>4</sup> For intramedullary interlocking nail entry is made in the proximal tibia just medial to the lateral tibial spine on the AP view and immediately adjacent and anterior to the articular surface on the lateral view. Then a guide wire is passed in the medullary canal and reaming is done. After reaming nail diameter 1.0–1.5 mm smaller than the last reamer is inserted over the guide wire.

For locking two screws are inserted proximally and two distally under image intensifier. An inappropriate entry point can cause misalignments of fracture reduction, difficulty in nail insertion or iatrogenic fracture.<sup>6</sup> The optimal entry point should be in the line of the tibial medullary canal and should not damage the articular cartilage of the knee joint and patellar ligament.<sup>2</sup>

For entry two approaches can be used, transpatellar tendon approach and medial parapatellar approach. In transpatellar tendon approach incision is given over the patellar tendon and patellar tendon is split. In medial parapatellar tendon approach incision is given along the medial border of the patellar tendon. Anterior knee pain is the most common complaint after intramedullary nail of the tibia.<sup>6,7</sup> Alireza *et al*

showed that mean anterior knee pain score after 3 months on Visual analogue score was  $2.20 \pm 2.31$  and  $0.72 \pm 1.21$  for transpatellar and medial parapatellar tendon approach.<sup>1</sup> Tahririan *et al* stated that there is no statistically significant difference in terms of knee pain between transpatellar tendon and medial parapatellar tendon approach.<sup>9</sup>

The incidence of anterior knee pain ranges from 10–86% and the exact ethology is unclear.<sup>9</sup> Alireza *et al* shows that anterior knee pain after intramedullary interlocking nail of tibia is related to approach (Transpatellar tendon and medial parapatellar tendon).<sup>1</sup> Tahririan *et al* shows that there is no relation of anterior knee pain after intramedullary interlocking nail to approach.<sup>9</sup> So the Literature shows controversy regarding approach transpatellar tendon and medial parapatellar tendon approach related to anterior knee pain after intramedullary interlocking nail.

The rationale of this study was to solve the controversy whether there is any relationship between approach (transpatellar tendon and medial parapatellar tendon) after intramedullary interlocking nail in terms of anterior knee pain on the basis of visual analogue score. Moreover other causes of Anterior knee pain like osteoarthritis, iatrogenic injury to knee and post-operative prominent nail (nail above the level of fibular head on post-operative X-ray) are the major confounding factors which were not excluded in literature.<sup>1,9</sup> This study exclude the above mentioned causes of anterior knee pain to get the reliable results.

## MATERIAL AND METHODS

This randomized controlled trial was carried out in Department of Orthopaedic and Spine Surgery, Ghurki trust teaching hospital, Lahore from 20<sup>th</sup> February to 19<sup>th</sup> August 2015. Patients of either sex between age 18 and 60 years who presented to the emergency department with closed extra articular tibial shaft fractures were included in the study while patients having polytrauma, open tibial fractures, knee osteoarthritis and co-morbidities were excluded from the study.

All the patients were informed about the procedures and objectives of the study and informed written consent were taken. The patients were divided into two groups by lottery method, group A containing patients operated through transpatellar tendon approach while group B containing patients operated through medial parapatellar tendon approach. Every patient was investigated with blood profile, Antero- posterior and lateral views of X-rays. Following hospitalization a well-padded long leg plaster was given; analgesics and other supportive measures

were administered as required. Nailing was done at the earliest opportunity after getting clearance from the anaesthesia department. At follow ups patients were asked about the severity of pain. Patients were specifically asked whether they had knee pain. If patients complained of knee pain they were asked to localize the pain. Only pain over the anterior portion of the knee was taken as a positive response for knee pain. If the patients specifically points to pain over fracture site or screw head it was excluded.

Patients were asked to grade the pain as per VAS scale, a 10 visual-analogue scale, with 0 denoting no pain and 10 denoting the worst pain that the patient could imagine. Anterior Knee Pain was assessed by visual analogue score after 3 months of surgery in both groups. The collected data was entered and analysed by using SPSS version 17.

## RESULTS

This study include 60 patients were divided into two groups by lottery method, group A containing patients operated through transpatellar tendon approach while group B containing patients operated through medial parapatellar tendon approach. In Group A, 27 patients were male and 3 patients were female and in Group B, 28 were male patients and 2 female patients.

Both Group A and Group B shows no statistical difference in terms of age (Table-1). 50% of patients having right tibia fracture, 38.33% having left tibia fracture while remaining 11.67% having bilateral tibia involvement.

The frequency of aetiology, 78.33% of patients having fracture due to road traffic accident, 15% due to fall and remaining due to some other cause.(Table 2)

In Group A, mean anterior knee pain was 4.4 ( $\pm 5.6324$ ) while mean anterior knee pain in Group B was 2.5 ( $\pm 5.7235$ ) with a *p*-value of .000. (Table-3).

**Table-1: Descriptive analysis of age of patients**

Groups	n	Mean	SD	<i>p</i> -value
Group A	30	28.8667	9.63017	.094
Group B	30	34.6333	15.82770	.094

**Table 2: Frequency of mechanism of injury;**

Mechanism	Number	Percent
RTA	47	78.33
Fall	9	15.00
Others	4	6.67
Total	60	100

**Table-3: Frequency of anterior knee pain**

Groups	n	Mean	SD	<i>p</i> -value
Group A	30	4.4000	.56324	.000
Group B	30	2.5000	.57235	.000

## DISCUSSION

Intramedullary nailing of tibial fractures has been evolved since 1940s. Because of advances in metallurgy and nail designs, the indication of the intramedullary interlocking nail in the management of fracture shaft of tibia has expanded. However the approach to tibia nailing remains the same, i.e., transpatellar tendon approach. Anterior knee pain is the most common complaint after tibia nailing, incidence ranges from 10–86% and the exact cause of anterior knee pain after intramedullary interlocking nail is unknown.<sup>9</sup> Transpatellar approach is more likely to associated with knee pain in the post-operative due to its incision through the tendon, to the 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.<sup>10,11,13</sup>

The main mechanisms of injury which lead to fractures all over the world are road traffic accidents. Similar findings were found in our study and in Gyneshwar study. But in our study the right tibia were mostly fractured while in Gyneshwar study the left tibia is mostly fractured.<sup>11</sup> Males are dominant in sustaining injury because of high outdoor activities and mostly the adults in their third and fourth decade. Almost all of the study's findings were similar to our study, i.e., male dominance in sustaining fractures and between 3<sup>rd</sup> and 4<sup>th</sup> decade.<sup>1,11,13,14</sup>

In Group A (transpatellar) mean anterior knee pain was  $4.4 \pm 0.5632$  while in Group B (medial parapatellar) was  $2.5 \pm 0.572$  which was statistically significant while in Alireza *et al* showed that mean anterior knee pain score after 3 months on Visual analogue score was  $2.20 \pm 2.31$  and  $0.72 \pm 1.21$  for transpatellar and medial parapatellar tendon approach.<sup>1</sup> While many other studies stated that there is no statistically significant difference in terms of knee pain between transpatellar tendon and medial parapatellar tendon approach.<sup>9,11,12,14</sup>

We correlate the anterior knee pain with the surgical approaches used for performing intramedullary nailing. Song and Darabos in their study concluded that the aetiology of anterior knee pain is multifactorial and it may be due to protrusion of the nail.<sup>15,16</sup> Leliveld MS linked anterior knee pain with damage to the infrapatellar branch of saphenous nerve.<sup>17</sup>

Labronici thought that using nails with oblique proximal lock causes injury in the proximal tibiofibular joint, what may be one of the causes of knee pain.<sup>18</sup> Andrija linked the anterior knee pain with damage to any intra articular structure.<sup>19</sup>

The main limitations in our study were short follow up of the patients and only comparison of the knee pain with surgical approaches. Anterior knee pain may be due to other causes. So, further studies needed to compare all the possible causes of anterior knee pain.

## CONCLUSION

Our study recommends that anterior knee pain is less in medial parapatellar tendon approach as compare to transpatellar tendon approach if other causes of anterior knee pain are avoided like prominent nail and damage to intra articular structures

## AUTHORS' CONTRIBUTION

SA: Main idea and data collection. AA: Data analysis. LK: Article writing. NA, RA: Supervision. SJ: Article Review. AA: Final Approval.

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