Anterior knee pain following the lateral parapatellar approach for tibia nailing

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ABSTRACT

Anterior knee pain (AKP) is the most common complication after intramedullary nailing of tibia. Anterior knee pain following intramedullary nailing is more common in young and active patients. Twenty-five cases of closed tibial diaphyseal fractures were fixed with intramedullary interlock using the lateral parapatellar approach. The cases were followed up for a minimum period of six months for evaluation of anterior knee pain using the Lysholm scale and clinicoradiological union of the fracture. Fractures in our study united in an average of 16 weeks. Different surgical approaches described for tibial intramedullary nailing are patellar tendon splitting or medial paratendinous. The lateral parapatellar approach has been used less frequently. Using this approach lead to low incidence of anterior knee pain in 20% patients as compared to other approaches of tibia nailing in which incidence of anterior knee pain was 51% in Paratendinous approach and 78% in Transtendinous approach.

Keywords: Anterior knee pain (AKP), Tibial diaphyseal fractures, Transtendinous approach (TTA), Paratendinous approach (PTA), Closed interlocked intramedullary nailing.

INTRODUCTION

Tibial diaphyseal shaft fracture is one of the most common types of long bone fractures in orthopaedic practice.

Intramedullary nailing has become the treatment of choice for most tibial diaphyseal fractures. Tibial nailing is associated with low incidence of non-union, malunion, infection, and compartment syndrome.

Anterior knee pain (AKP) is most commonly reported problem. Reports, regarding prevalence of anterior knee pain after intramedullary nailing, range between 10-86% of cases. The exact etiology of AKP after intramedullary nailing remains unknown.

Toivanen et al and Court-Brown et al studied Anterior knee pain (AKP) in different daily activities such as kneeling, squatting, sitting, walking, running, jumping, stair climbing, ladder climbing and resting position.

Keating et al compared knee pain after parapatellar (which are medial and lateral) and patellar tendon splitting approaches. They found that 77% of patients developed knee pain after a tendon splitting incision, whereas only 50% developed pain with a parapatellar approach. This led to abandoning of tendon splitting incision. In their series, there was no correlation between nail protrusion and knee pain, suggesting that it is secondary to tissue disruption during nail insertion.

Potential advantages of lateral parapatellar approach for tibial nailing are avoidance of injury to certain anatomical structures such as infrapatellar fat pad and infrapatellar branch of saphenous nerve. The incidence of knee pain using a lateral parapatellar approach is unknown. However, it is hypothesized that lateral parapatellar approach, with meticulous preservation, elevation and medial retraction of infrapatellar fat pad, would lead to a lower incidence of postoperative knee pain compared to previously reported techniques.

MATERIAL AND METHODS

The present study was conducted on twenty-five cases of closed tibial diaphyseal fracture admitted in Department of Orthopaedics, Sri Guru Ram Das institute of medical sciences,
Sri Amritsar using closed interlock nailing of tibia through lateral parapatellar approach.

Young and active patients between 20-50 yrs of age having:

(i) Closed fractures of tibia,
(ii) Open fractures of GustiloAnderson (GA) Type I and II, were included.

**Exclusion criteria**

1. Tibial intraarticular fractures around knee.
2. Tibial fractures of proximal 1/3rd.
3. Intraarticular fractures of distal 1/3rd of tibia near ankle joint.
4. Tibial fractures of distal 1/3rd.
5. Local or systemic infection or compromised vascularity of the limb.
6. Children in period of growth.
7. Malignancy(primary or metastatic tumor).
8. Open fractures with comminution (GA type III).

**OPERATIVE TECHNIQUE**

(Tornetta P 3rd, Riina J, Geller J, Purban W (1999))

Patient was placed on a radiolucent operating table. A thigh tourniquet was placed but not inflated and extremity was draped free. 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 at the lateral edge of the tendon. The infrapatellar fat pad was identified and its insertion into the proximal tibia was sharply incised transversely from lateral to medial, allowing its retraction superiorly for exposure of the proximal tibial ridge. Using the tibial tubercle as a landmark for the entry point in the coronal plane, a sharp awl was used to perforate the proximal tibia. The curvature of the awl was used to bring it in line with the tibial medullary canal in the sagittal plane. Radiographically, the entry point is 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. Reduction was assisted by manual manipulation and pointed reduction clamps when necessary. A ball-tipped guide wire was then passed with the fracture reduced. Sequential reaming and nailing was done with the knee in a semi-extended position, followed by placement of proximal and distal interlocking screws. The number of interlocking screws is dependent on fracture pattern.

Postoperative management included restricted weight bearing for six weeks, followed by progression to weight bearing as tolerated. Supervised physical therapy was initiated for thigh muscle strengthening and knee range of motion exercises.

**Follow-up and Evaluation**

The patient was usually followed up at four weeks, eight weeks, 16 weeks, 20 weeks, and 6 months. Check X-rays were taken at every visit and patient was assessed clinically for fracture union.

**RESULTS**

In our study , the youngest patient was twenty years and eldest was fifty years. Majority of patients were in 2nd decade with 48 %(20-30 years) followed by 4th and 5th decade with 40%(40-50 years). There were 23 males(92%) and 2 females (8%). 20(80%) of patients had tibia fracture because of road traffic accident, 3(12%) had it by fall from height, 2(8%) had it by slipping on floor. Out of cases included in our study, 15(60%) patients had closed fractures. Among compound fractures Grade I-Gustilo’s 7(28%), while Grade - II Gustilo’s were 3(12%).

The union of the fracture was assessed by standard radiological and clinical criteria (Edwards,15 1965; Court Brown et al 1990). Due to presence of nail we couldn’t stress the fracture site; hence loss of pain on walking was deemed a better clinical indicator of union (Bradford Henley,141989). No patient had wound infection. None of our patient reported joint pain and stiffness at the end of our study. 92% patients in our study had union of fracture within 16 weeks. Only two patients had delayed union, (where after waiting for about 16 weeks enough callus was not visible in the skiagram and the patient had persistent tenderness at the fracture site.)

In 15 patients of closed fracture, majority of patients had range of motion of equal to or more than 120 and 5 patients had 110 degrees of flexion of knee joint. In GA type I, 6 out of 7 had range of motion of 130 degrees flexion. In GA type II patients 2 out of 3 had flexion of 130 degrees. No patient had any extension deficit. Five patients (20%) complained of knee pain of any severity during the postoperative outpatient assessment. The group with knee pain had significantly poor Lysholm score when compared to the patients with no knee pain (p=0.03).

Average Lysholm score in our study was 97. In our study 92% patients had an excellent score, 4% had good and 4% reported fair score.
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Fig 1. Preoperative X-ray, Postoperative X-ray & X-ray at 16 weeks

Fig 2. Preoperative X-ray, Postoperative X-ray & X-ray at 16 weeks
DISCUSSION

Twenty five tibial shaft fractures were fixed using interlocking nail through lateral parapatellar approach and

(i) Anterior knee pain was evaluated using the lysholm knee scoring with the follow up of six months.

(ii) Union at fracture site was assessed clinicoradiologically

Fractures of the tibia are the commonest among the major long bone fractures. Very often, they are open owing to the subcutaneous location of the tibia. The commonest cause of the fracture being road traffic accidents. In our series, 80% of the fractures were due to road traffic accidents. In these accidents, a tremendous amount of energy is dissipated to the surrounding soft tissue thus causing severe damage. 12% patients had fall from height and 8% had fall on the floor.

Anterior knee pain is the commonest complication after interlocked tibial nailing. The aetiology of anterior knee pain after intramedullary tibial nailing is uncertain; although there may be a combination of factors responsible15.Different approaches for tibia nailing has been related with the anterior knee pain.

The classic technique that was recommended for years involves the use of the transtendinous approach (TTA) and the medial paratendinous approach (PTA)16. Considerable global variation occurs in the surgical approach amongst orthopaedic surgeons17.

The lateral parapatellar approach has been used less frequently18. Its main utilization has been for proximal third tibial fractures in order to provide a more lateral entry point prevent valgus malalignment19.

In one study where authors used the lateral parapatellar approach for tibia nailing. Low incidence of AKP in their series (18%) may have been because, there are other potential advantages to use this approach. With this approach, injury to certain anatomical structures such as the infrapatellar fat pad and the infrapatellar branch of saphenous nerve may be minimized20. In our study lateral parapatellar approach was used for fixation of tibial diaphyseal fractures which lead to anterior knee pain in five patients (20%). Other authors 20 found that, when a paratendinous approach had been used, 51% of their patients suffered anterior knee pain and with transtendinous approach, 78% developed subsequent anterior knee pain.
We also feel that decreased incidence of AKP may also be, partly, due to the fact that the insertion scar in our case, does not come in contact with the floor during kneeling, while it is so in case of Transtendinous and Paratendinous incisions. Another reason of AKP could be prominence of hardware, it was not there in any of our cases.  

The anterior knee pain in our study was assessed using the Lysholm score. In our study the average Lysholm score was 97. In comparison to our study, Yoram et al reported an average score was 86.3.

In some studies concluded that the overall mean time to union was 16.7 weeks irrespective of the type of fracture. In others, mean time of union was 19 weeks. Still others reported the mean time for union was 15.71 weeks in their study. As supported by other studies, the mean time for union in our study was within 16 weeks. Similar figure was quoted by other authors also.

We encountered two cases of delayed union. One patient had union at 20 weeks and the other patient had union at 22 weeks. In both these patients, nail dynamization was done. Similar results were reported by some authors who reported only one patient with delayed union.

In our study, one patient had superficial wound infection in GA type I fracture. Infection was only superficial which resolved with regular dressing and a course of oral antibiotics. No one developed deep infection. One team of authors had showed the incidence of infection as 1.8% in closed and Gustilo type I open fractures patients with tibial fractures treated by primary reamed nailing.

Average knee flexion in our patients was 120 degrees (Range 90-130). There was no extension deficit. All the patients could do extension at knee joint. This was comparable with Yoram et al, having 130 degrees flexion and all patients achieving full knee extension. Antti Alho et al also reported full and free knee movement in all the patients.

**CONCLUSION**

We conclude that:

1) Using lateral parapatellar approach for tibial nailing with preservation of infrapatellar fat pad decreases incidence of anterior knee pain. Also this approach avoids injury to the saphenous nerve and may decrease fibrosis, edema and nerve irritation so contributing to the low incidence of knee pain.

2) The laterally based incisions do not come in contact with the ground during kneeling as opposed to medial or anterior incisions.

3) Fracture union occurs in similar time frame whatever approach is used whether tendon splitting, medial/ lateral parapatellar approach.

**REFERENCES**


