International Journal of Research in Orthopaedics
Patel NH et al. Int J Res Orthop. 2022 Nov;8(6):619-622
http://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20222377

Original Research Article

Study of outcomes of suprapatellar approach for tibia intramedullary nailing in patients coming to rural medical college, Loni

Nevish H. Patel, Prafulla G. Herode*, Het R. Patel

Department of Orthopaedics, Rural Medical College, Loni, Maharashtra, India

Received: 15 August 2022
Revised: 13 September 2022
Accepted: 14 September 2022

***Correspondence:**
Dr. Prafulla G. Herode,
E-mail: pgherode@yahoo.co.in

ABSTRACT

Background: Tibia shaft fractures are most common lower limb long bone fractures. In approximately 80% of patients, tibia fracture occurs in diaphysis region. The procedure of intramedullary interlocking nailing is done by positioning the injured extremity at minimum of 90 degree of flexion in the knee joint to achieve optimal exposure of correct entry point. The tension of quadriceps tendon causes a typical apex anterior angulation of proximal fragment. Supra patellar nailing is done with knee in semi extended position, reducing the anterior angulation. The aim of this study is to study outcomes of supra patellar access of intramedullary nailing for tibia fractures.
Methods: It is a descriptive longitudinal study which was carried out from October 2019 to September 2021 in Dr. Balasaheb Vikhe Patil rural medical college, Loni, Ahmednagar. In this study 60 case of closed shaft tibia fractures were treated by supra-patellar nailing technique.
Results: In our study we selected, 60 patients with tibia fracture admitting in our institute. All patients underwent operative procedure in the form of intramedullary interlocking tibia nail which was done with suprapatellar approach. Out of all the 60 patients treated with suprapatellar approach, excellent results with good range of movements with excellent lower extremity functional scale score.
Conclusions: Supra-patellar approach was found to provide excellent outcome for proximal 1/3rd of tibia fracture.

Keywords: Suprapatellar nailing, Shaft tibia fractures, Intramedullary nailing

INTRODUCTION

Tibia shaft fractures are most common lower limb long bone fractures. Incidence of this both bone (along with fibula) fractures are more than 18.7 per one lakh population per year.[1] There are various mechanisms of injury associated with tibial fracture. In approximately 80% of patients, tibia fracture occurs in diaphysis region and most of them are associated with fibula fracture. Most commonly this fracture is seen in age group of 20 to 40 years. In young patients there are high chances of compound fractures due to high energy trauma.

There are many treatment modalities for shaft tibia fractures which depends on the site and type of fracture and associated injuries. A long back immobilization of fracture with different splints and objects was the only treatment known. In 16th century De Sahagun witnessed Aztec surgeons were using wooden sticks into medullary canals of long bone non unions.

In most of the shaft fractures intramedullary interlocking nail is the treatment of choice. Different surgical approach for nailing are-1) Parapatellar approach, 2) Patellar tendon split approach, 3) Suprapatellar approach. Intramedullary nailing of tibia fracture is generally performed through an infra patellar approach. The infra patellar approach for the nail insertion has been considered the standard `procedure since long time, however high incidence of anterior knee pain (2), ranging from 10 to 80% has been reported, it can be cautiously used for proximal 1/3 shaft tibia fractures.[3,4] Recently usage of intramedullary interlocking nail in

proximal and distal shaft tibia fractures is increased owing to new design of nails availability and good reduction techniques.

The procedure of intramedullary interlocking nailing is done by positioning the injured extremity at minimum of 90 degree of flexion in the knee joint to achieve optimal exposure of correct entry point. The tension of quadriceps tendon causes a typical apex anterior angulation of proximal fragment. Anterior knee pain is a significant complication in intramedullary tibia nailing.[5,6]

Suprapatellar approach for tibia nailing is one of the new techniques, in which entry point is above the patella and knee is kept in semi extended position. This semi extended position is helpful in reducing the anterior angulation. The knee is positioned in 20-degree flexion to neutralise traction forces secondary to quadriceps muscle, thus preventing apex angulation of proximal fragment. Additional advantage of the technique is that it allows surgeon to avoid or to minimise further soft tissue damage because of the distance between the incision point and usual area of soft tissue damage along with improvement of reduction of the fracture and it reduces incidence of malalignment during proximal tibial fracture fixation. This method appeared to be safe with no greater rate of complications compared with traditional methods.[7] Especially in proximal metaphyseal fractures and fractures which have extension of fracture line to the posterior cortex the suprapatellar technique decreases the risk of posterior cortex perforation because the starting point is in line with the medullary canal. Additionally, in this approach surgeon is convenient to access through the safe zone on the tibial plateau. This method was also useful in patients who had any kind of wound in proximal tibia. Because with standard infrapatellar approach chances of infection becomes more. The main aim of the study is to study clinical, radiological outcome of shaft tibia fractures treated with intramedullary interlocking nail through suprapatellar approach in semi extended position of knee.

METHODS

It is a descriptive longitudinal study which was carried out from October 2019 to September 2021 in Pravara Rural hospital, Loni, Ahmednagar. In this study 60 case of closed shaft tibia fractures above 18 years of age were treated by suprapatellar nailing technique. Ethical committee approval was taken for the study before starting the study.

Inclusion criteria

Patient willing to give consent for the study, patients with shaft of tibia fractures, patients with age of more than 18 years of either male/ female gender were included in study.

Exclusion criteria

Patients not willing for participation in study, open fractures with severe contamination, intra articular fractures or plateau fractures and multiple fractures with and/or without head injury were excluded from the current study.

On admission from casualty detailed history was taken and was thoroughly assessed clinically. Vital parameters were checked and associated injuries were looked for. In patients where wound was present thorough wash with normal saline, hydrogen peroxide and betadine was given and IV antibiotics were added in addition to fluids and analgesics. All routine hematological and radio-logical investigations were done. Patients were posted for operative management after proper consent and fitness from anesthetist. In all the patients we took suprapatellar approach for tibia nailing. Post operatively limb elevation was given. IV antibiotics and analgesics were given for 5 days. Patients were usually discharged on postoperative day 5 with proper physiotherapy training like quadriceps strengthening, ankle pumps etc.

We kept regular follow up of the patients, but 6 patients were lost to follow up. In every follow up we did x-ray of tibia (anteroposterior and lateral views). We checked for signs of union, rehabilitation of patients and any long-term complications.

SYSTAT version 12 (made by Crane's software, Bangalore) was used to analyse the data.

RESULTS

In our study we selected, 60 patients all belonging to rural area near the hospital with tibia fracture admitting in our institute. All patients underwent operative procedure in the form of intramedullary interlocking tibia nail which was done with suprapatellar approach in semi extended position of knee. Out of 60 patients majority, 50 (83.33%) were male patients and more in age group from 31 to 50 years in 2 groups from 31-40 years and 41-50 years 14 cases (23.33%) in each group. Out of all the 60 patients treated with suprapatellar approach, excellent results with good range of movements with excellent lower extremity functional scale score. Knee flexion on postoperative day 14 in the patients with suprapatellar approach for tibia intramedullary nailing in our study showed 15 (25%) patients had 100-degree flexion by 14th day. Maximum patient 46 cases (76.6%) had less postoperative stay in hospital i.e., less than 5 days. The 45 cases (75%) were able to mobilized in short time period within 2-4 weeks duration. In all patients except 6 (lost to follow up) we found good union of fracture site. Although we had proper jig we faced one problem of postoperatively palpable screw over proximal leg. In that case proper size of nail was not available so we had to use one size longer nail and we took entry quite anteriorly. In postoperative period patient had complain of palpable screw over proximal aspect of leg so we had to remove it. We also had 3 patients with superficial wound infection which was controlled by IV antibiotics.

Table 1: Pain (VAS) at postoperative in the patients with suprapatellar approach for tibia intramedullary nailing.

Pain (VAS)	Post-operative	
	N	%
0	0	0
1	0	0
2	0	0
5	10	16.67
6	23	38.33
7	18	30
8	8	13.33
9	1	1.67
Total	60	100
Mean ± SD	6.45±0.98	

Table 2: Knee flexion on postoperative day 14 in the patients with suprapatellar approach for tibia intramedullary nailing.

Knee flexion on postoperative day 14	Number	Percentage (%)
60°	3	5
70°	6	10
80°	11	18.33
90°	14	23.33
100°	15	25
110°	1	1.67
120°	10	16.67
Total	60	100
Mean ± SD	92.50°±16.83°	

Patients achieved average of 92.50 degrees of flexion which shows that post operative knee stiffness were noticed in less patients.

Table 3: Visible deformity in the patients with suprapatellar approach for tibia intramedullary nailing.

Visible deformity	Number	Percentage (%)
Present	5	8.33
Absent	55	91.67
Total	60	100

Table 4: Complication in the patients with suprapatellar approach for tibia intramedullary nailing.

Complications	Number	Percentage (%)
Present	12	20
Absent	48	80
Total	60	100

Complications were absent in 48 (80%) of cases. While some form of the complications occurred in 12 (20%) cases.

Table 5: Postoperative hospital stays in the patients with suprapatellar approach for tibia intramedullary nailing.

Postoperative hospital stays (days)	Number	Percentage (%)
Normal stay (up to 5)	46	76.67
Extended stay (>5)	14	23.33
Total	60	100
Mean ± SD	5.98±3.63 days	

Patients had average stay of up to 5 days postoperatively in 46 (76.67%) cases. Only 14 (23.33%) patients had to stay for long time postoperatively.

Table 6: Time to start mobilization (weeks) in the patients with suprapatellar approach for tibia intramedullary nailing.

Time to start mobilization (weeks)	Number	Percentage (%)
Short term (2-4)	45	75
Long term (>4)	15	25
Total	60	100
Mean ± SD	3.75±2.69 weeks	

The 75% of patients started mobilization early within 2-4 weeks. In 25% patients' mobilization was delayed i.e., >4-week time period.

DISCUSSION

In our study no patient suffered from postoperative anterior knee pain because we have used proper instrumentation set like protective sleeve, jig, proper entry point which protects chondral surface of patellofemoral joint. In this approach we found one problem that there is potential damage to the patellar and trochlear chondral surface. Although suprapatellar approach transverses the patellofemoral joint, the entry sleeve is in the place at all times, which protects the chondral surface during reaming. In addition to it the sleeve will easily collect the bone debridement that would be rapidly suctioned out.

Brink et al studied 25 patients operated with supra-patellar nailing for tibia fractures.[7] Study shows that the technique of supra-patellar nailing was used for selected proximal fractures, distal tibia fractures and also on shaft fractures. The method appeared to be safe with no greater rate of complications compared with tradition methods.

Fu et al studied locking intramedullary nailing for tibia fractures via suprapatellar approach for 23 patients.[8] The Biggest advantage of Suprapatellar approach was the extension of knee during the operation, which was useful in the treatment for complex metaphyeal and diaphysial tibial fractures. In this study all patients with tibial metaphyseal fractures, tibial multi-segmental fractures and even cases of ipsilateral femoral fractures obtained satisfactory reduction and good recovery outcomes with

no loss of reduction and aggravating displacement in the follow up except for one case of proximal tibial fractures with 5 degree angulation.

Courtney et al found that good radiographic reduction could be achieved in less fluoroscopic time in suprapatellar nailing.[9]

Jakma et al did research on the insertion of intramedullary nails from suprapatellar pouch for proximal shaft tibia fracture.[10] Suprapatellar intramedullary nailing was conducted in a 7-patient group. In all patient's postoperative radiograph showed adequate position of nail and screws. The nail was passing through the center of medullary canal. Five patients have progressed with good weight bearing, good healing of soft tissue with minimal cosmetic deficit from the procedure and good bone healing. In tibia nailing during entry the structures like anterior horn of medial and lateral meniscus and ligamentum transversum are at risk.[11] Making a good entry point is very important because that generates least risk to the intraarticular structures. Good entry point should be medial to the lateral tibial spine in AP view and anterior to the articular surface on lateral view.[12]

In this study we were not able to confirm the iatrogenic damage to intraarticular structures during nail insertion through suprapatellar pouch as arthroscopy needs to be done before and after the surgery which is both time bound and increases the burden of money on the patients which come from rural background and also increases the torniquet time during surgery.

CONCLUSION

Intramedullary interlocking nail remains the standard treatment for displaced shaft tibia fractures. This is an elaborative study on benefits of suprapatellar approach with surgical hints. Suprapatellar approach of intramedullary tibia nailing in semi extended position of knee offers an alternative to traditional infrapatellar approach. Specific instrumentation with protective sleeve allows for safe insertion of nail and minimize the risk of iatrogenic damage to intraarticular structures. The incidences of type 1 compound fracture of proximal 1/3 shaft tibia causes relatively less chances of infection in patients managed with suprapatellar approach. Another noted finding was that semi-extended position of knee helps with fracture reduction particularly in proximal third shaft tibia fracture and all diaphyseal tibial fractures. The preliminary data suggested a low rate of post operative anterior knee pain.

In the end the suprapatellar approach was found to provide excellent outcome for proximal 1/3rd of tibia fracture.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Weiss RJ, Montgomery SM, Ehlin A. Decreasing incidence of tibial shaft fractures between 1998 and 2004: information based on 10,627 Swedish inpatients. Acta Orthop. 2008;79:526-33.
2. Court-Brown CM, Gustillo T, Shaw AD. Knee pain after intramedullary nailing: its incidence, etiology, and outcome. J Orthop Trauma. 1997;11:103-5.
3. Katsoulis E, Court-Brown C, Giannoudis PV. Incidence and aetiology of anterior knee pain after intramedullary nailing of the femur and tibia. J Bone Joint Surg Br. 2006;88:576-80.
4. Lefaivre KA, Guy P, Chan H, Blachut PA. Long-term follow-up of tibial shaft fractures treated with intramedullary nailing. J Orthop Trauma. 2008;22:525-9.
5. Tornetta PI, Collins E. Semi-extended position of intra-inedullary nailing of the proximal tibia. Cl/n Orshop Re/at Rn. 1996;(328):l85-9.
6. Gaines RI, Rockwood J, Garland J. Comparison of insertional trauma between suprapatellar and infrapatellar portals for tibial nailing. Orthopedics. 2013;36:e1155-8.
7. Brink O. Suprapatellar nailing of tibial fractures: surgical hints. Curr Orthop Pract. 2016;27(1):107-12.
8. Fu B. Locked META intramedullary nailing fixation for tibial fractures via a suprapatellar approach, Indian J Orthop. 2016;50(3):283-9.
9. Courtney PM, Boniello A, Donegan D. Functional knee outcomes in infrapatellar and suprapatellar tibial nailing: does approach matter? Am J Orthop. 2015;44:E513-6.
10. Ryan SP, Steen B, Tornetta Pill. Semi-extended nailing of metaphyseal tibia fractures: alignment and incidence of postoperative knee pain. I Orthop Trauma. 2014;28:263-9.
11. McConnell T, Tometta Pill, Tilzey I, Casey D. Tibial portal placement: the radiographic correlate of the anatomic safe zone. I Orthop Trauma, 2001;15:207-9.
12. Eastman T, Le E, Li CS, Yo B, Lee M. Retropatellar technique for intramedullary nailing of proximal tibia fractures: a cadaveric assessment. I Orthop Trauma. 2010;24:672-6.

Cite this article as: Patel NH, Herode PG, Patel HR. Study of outcomes of suprapatellar approach for tibia intramedullary nailing in patients coming to rural medical college, Loni. Int J Res Orthop 2022;8:619-22.