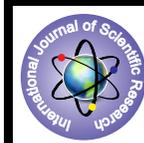# Correlation Of Anterior Knee Pain And Consequential Functional Outcome After Interlock Intramedullary Nailing Of Tibial Shaft Fractures

Medical science

RAHUL AGARWAL — Assistant Professor, Dept. of Orthopaedics , RAMA Medical College and hospital, Hapur

ANAND SHARMA — Associate Professor, Dept. of Orthopaedics , Mahatma Gandhi Medical College and hospital ,Jaipur

ABSTRACT

Background -Intramedullary tibial nail needs to give a careful thought. Its correlation with chronic anterior knee pain seems to be crucial factor.

Objectives & Aims – To establish the incidence, severity, clinical effects of anterior knee pain & evaluate the functional outcomes after intramedullary nailing of tibia.

Methods & Material- This was a prospective study of 30 patients with tibial shaft fractures treated with intramedullary interlocking nail approachusing either transtendinous or medial paratendinous followed for minimum 12 months.

Results- Anterior knee pain developed in 20 (67%) out of 30 patients. 80 % developed it within 6 months of surgery. 55% had mild pain, 25% moderate & 20% severe, with 90% patients experiencing pain on kneeling and 25% even at rest. .

Conclusion – chronic anterior knee pain is the most common & significant postoperative complication after intramedullary nailing in tibial shaft fractures. The protrusion of nail in acceptable limits, does not have any bearing on anterior knee pain.

Introduction:

Locked intramedullary nailing currently is considered the treatment of choice for most type I, type II, and type IIIA open and most of the closed tibial shaft fractures, especially useful for segmental and bilateral tibial fractures. [1]

There has been a growing concern about the tibial nailing being accompanied by an increase in the incidence of anterior knee pain.

Suggested contributing factors include younger, more active patients, nail prominence above the proximal tibial cortex, meniscal tear, unrecognized articular injury, increased contact pressure in the patellofemoral articulation, damage to the infrapatellar nerve, and surgically induced scar formation. Some authors have suggested that a transtendinous approach is associated with more frequent anterior knee pain than is a medial paratendinous approach. The cause of this knee pain is still unclear. [1]

Anterior knee pain not only causes restriction of patients' mobility but also is associated with an increased incidence of nail removal.

The present study was carried out to establish the incidence, severity, and clinical effects, probable risk factors of anterior knee pain & evaluate the consequential functional outcomes after intramedullary nailing of tibial shaft fractures.

Subjects, Materials and Methods:

This was an Observational prospective analysis of a consecutive series of patients presenting to our hospital emergency room with tibial shaft fractures who underwent tibia nailing.

Patients age 18 years or more, with fracture shaft of Tibia, with fracture line not extending up to the knee or ankle joint, whose fracture was fixed with an interlock nail were included. Patients with any major co morbid illness or associated fracture of ipsilateral lower extremity were excluded.

Patients who were reluctant to come for regular follow up were excluded from the study.

For the purposes of the study, anterior knee pain was defined as pain at or around the nail entry site.

All patients were questioned & examined. A detailed analysis of each fracture as well as the incidence and severity of knee pain and its effect on a number of routine daily activities was carried out.

Minimum follow-up period was 12 months (range 12 – 16 months).

Following parameters were recorded:

- Age, sex, mechanism of injury

-Classifications: AO, Winquist & Hansen, Gustilo/Anderson & Tscherne classification

-Approach (Transtendinous / Medial Paratendinous),

- Nail length and diameter, reamed/unreamed

- Additional fixation, intra-operative, post-operative complications

- Time of onset of anterior knee pain.

- CDC criteria to define the infections as superficial / deep.

- Additional post-operative procedures.

Nail-Apex distance (NAD), measured on lateral radiographs.

A good quality lateral radiograph of the knee was used to determine the proximal position of the nail. All the measurements were done on the digital radiographs with zero magnification. A line drawn level with the tibial plateau, and the distance to the top of the nail measured in millimetres was done to measure the nail protrusion beyond tibial plateau. To assess the protrusion of the nail from anterior cortex, a tangential line was drawn to the anterior tibial cortex just above the level of the tibial tuberosity. The perpendicular distance of the most proximal point of the nail to this line expressed in millimetres was taken as a positive value if the nail protruded beyond the cortex and a negative value if it was deep to the cortex.

A 10 point Visual analogue score (VAS) was recorded at the scheduled follow up visits.

The patients were given Functional Knee Score questionnaires

devised by Werner et al. Patients were asked to rate their knee pain while doing 8 activities: kneeling, squatting, going downstairs, going upstairs, after sitting for 30 minutes, walking, running, and resting. The pain was rated on a 10-point scale: 1-2 (experience no pain), 2.1-4 (occasional pain but does not limit my activity), 4.1-6 (pain sometimes and only do this activity occasionally), 6.1-8 (almost always have pain and avoid this activity whenever possible), and 8.1-10 (cannot do this activity).

Outcome & Results:
A total of 30 patients were enrolled, 27 males and 3 females.

Out of 30 patients, 26 patients had an isolated tibial injury. Only 4 were polytrauma cases.

None of the patients were noted to have sustained ipsilateral injuries that might have contributed to the development of anterior knee pain.

There were: 12 (40%) AO type A, 9(30%) type B & 9(30%) type C injuries

20 patients (67%) in our study complained of anterior knee pain related to the nail entry site during the follow up.

80 % (16 of 20 in pain group) of the patients who developed knee pain had done so within 6 months of surgery.

Out of the 20 pain group patients, 11(55%) reported Mild pain (VAS 2.1 – 4), 5(25%) Moderate pain (VAS 4.1 – 6), 4(20%) reported severe pain (VAS > 6.1).

On analysis of functional knee score it was observed that the most common problem encountered was with kneeling, and 90% (18 of 20) of the patients experienced pain during this activity. Half of these patients could not kneel at all because of knee pain.

Squatting was the next, with 70% (14 of 20) of patients experiencing discomfort and one third of these patients finding the activity impossible.

In cases where medial paratendinous approach was used, 55 % (5 of 9) developed knee pain. Compared to 71 % (15 of 21) in patients undergoing nailing through transtendinous approach.

There were 20 open injuries, of which 9 were Gustilo grade I, 10 Grade II & one Grade IIIA. 14 out of these (70%) developed knee pain. While, 6 out of 10 (60%) patients with closed injuries developed it.

There were 8 cases (26%) with post op complications: 4 delayed unions, 2 malunions (varus/valgus >5º), 1 deep infection (CDC criteria), 1 nonunion

In 11 cases (36.6%) the nail was protruding. In 7 cases (23.3%) it protruded only beyond anterior cortex, In 3 cases (10%) it protruded beyond the plateau, In 1 case (3%) beyond both cortices. There was no significant difference in the incidence of pain in patients with protrusion of nail, as 7 out of 11 patients (64% as compared to overall 67%) developed pain.

Discussion:
Locked tibial nailing has been associated with excellent results and low complication rates in the management of closed tibial shaft fractures.[2,3,4,5]

Most published reports of locked nailing have carefully documented the usual clinical complications of infection, malunion, nonunion, and joint stiffness, but to date there has been limited attention given to the problem of anterior knee pain. In the present series it was the single most common complication.

In this study, 67% Patients developed troublesome knee pain in the vicinity of nail insertion site. 83% developed pain within 6 months of surgery, comparable to 83% reported by Keating et al.[6]

Other investigators have recognized that knee pain can be a frequent occurrence after tibial nailing. Keating et al.[6] reported knee pain in 57%. Alho et al [2] noted knee pain in 14 of 89 patients (16%), with closed tibial fractures at the time of follow-up. No other details were given. Court Brown et al.[4] reported an incidence of knee pain in 41% of their series of 125 closed and type I open injuries. Of the patients with knee pain, 65% required nail removal, but no information was given regarding the success rate of the operation in relieving pain. Matthew Catwright et al. reported a prevalence of 83% in comparison to 40% in the uninjured knee in same patient. Toivanen et al.[7] noted that knee pain was reported by 29 (69%) of 42 patients at an average of one and a half years after nail removal. In a study focusing on complications of tibial nailing, Koval et al. [8] reported 10 cases (22%) of what they termed patellar tendonitis. They noted that a patellar tendon splitting approach had been used in seven of the 10 fractures.

It was observed that in patients undergoing nailing through medial paratendinous approach, the incidence of anterior knee pain was 55% while with the midline transtendinous approach, the incidence was 71%. In their retrospective studies, Keating et al[6] found a clear association between a transtendinous surgical approach and chronic anterior knee pain, and they recommended the routine use of a medial paratendinous approach. In contrast Court-Brown et al[9] and Toivanen et al[7] did not find any association between the surgical approaches and anterior knee pain.

The position of the nail in relation to the proximal aspect of the tibia and knee was expected to be a determining factor. There is no doubt that a prominent nail will cause pain and even patellar impingement[10], and most surgeons now advance the nail at least to the level of the tibia during insertion and many actually bury the nail within the bone. In this study the incidence of knee pain in patients with nail protruding beyond the cortex was 63.6%, almost identical to the overall incidence of 67%. However this cannot be commented on conclusively due to small sample size of the study.

Hernigou and Cohen [11] showed that the intra articular structures particularly at risk for damage during tibial nailing are the medial meniscus, the lateral tibial plateau, and the transverse ligament. Their results demonstrated that in some bones, the safe zone is smaller than the size of standard reamers and the proximal part of some nails. Tornetta et al.[12] also studied intra articular anatomic risks of tibial nailing.[12] A lateral paratendinous approach placed the lateral articular surface, and a medial approach the medial meniscus, at the highest risk. They determined a safe zone for portal placement, which was located 9.1 ± 5 mm lateral to the midline of the plateau and 3 mm lateral to the center of tibial tubercle. The width of the safe zone averaged 22.9 mm and was as narrow as 12.6 mm.[12]

The trauma itself and damage to the infrapatellar nerve may also cause anterior knee pain. [13] There is a relationship between injury to the infrapatellar nerve and the cause and natural course of reflex sympathetic dystrophy of the knee[14]. In this study, the incidence of knee pain in open fractures was slightly higher in patients with open fractures (70%) compared with incidence in closed fractures (60%). But the difference was not very significant. Almost similar incidence was reported by Keating et

al.[6] (66%) in open fractures and (58%) in closed fractures.

While doing the functional assessment, pain, kneeling was found to be the most common and worst activity for pain (90%). A similar observation has been reported by Court-Brown et al (91.8%) and Mathew Cartwright, Terry et al (81%).

In this study, the severity in reference to VAS was, mild pain (VAS 2.1- 4) in 55%, moderate pain (VAS 4.1-6) in 25% and severe (VAS >6.1) in 20 % which was Comparable to studies conducted by Court brown et al.[9,15] (mild in 68.4%, moderate in 22% and severe in 9.5%). Keating et al.[6] described the effect of pain on leisure activities, according to his study 34% had no influence on leisure activity, 44% had restricted leisure activity and 22% were unable to return to leisure activities and sports.

Conclusion:
Taken together we may conclude as-

Chronic anterior knee pain may be the most common postoperative complication affecting up to 67% of patients after a nailing procedure in tibial shaft fractures.

Most of them having onset within 6 months

Slightly more prevalent in patients who have undergone patellar tendon splitting approach to insert the nail & in compound injuries.

 It is rarely severe, and most of the patients can return to their previous work and pre injury level of activity over the time & with proper rehabilitation.

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