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The relationship between anterior knee pain occurring after tibial intramedullary nailing and the localization of the nail in the proximal tibia

Tibia kırıklarının intramedüller çivi ile tedavisi sonrası görülen diz önü ağrısının proksimal tibiadaki çivi yerleşimi ile ilişkisi

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Amaç: Tibia diyafiz kırığı nedeniyle kilitli intramedüller çivi uygulanan hastalarda, ameliyat sonrası dönemde gelişebilen diz önü ağrısı ile çivinin proksimal tibiadaki yerleşimi arasındaki ilişki araştırıldı.

Çalışma planı: Kliniğimizde tibia diyafiz kırığı nedeniyle kilitli intramedüller çivileme uygulanan ve ameliyat sonrası diz önü ağrısıyla ilişkili olabilecek diğer tüm nedenler dışlanan 30 hasta incelendi. Tüm hastalarda transtendinöz giriş ve oymalı yöntem kullanılmış ve hem proksimal hem distal kilitleme yapılmıştı. Hastalar diz önü ağrısı olup olmamasına göre iki grupta değerlendirildi. On hastada (3 kadın, 7 erkek; ort. yaş 38±14) diz önü ağrısı bulunurken, 20 hastada (5 kadın 15 erkek; ort. yaş 35±12) ağrı sorunu yoktu. Her iki grupta çivilerin tibia platosuna göre olan yüksekliği ve ön tibial kortekse olan uzaklığı yan grafiler üzerinde ölçüldü. Ortalama takip süresi diz önü ağrısı olan grupta 56.6 ay, ağrı sorunu olmayan grupta 45.2 ay idi.

Sonuçlar: İki grup arasında cinsiyet dağılımı ve takip süresi açısından anlamlı fark yoktu (p>0.05). Diz önü ağrısı olan grupta ortalama plato-çivi mesafesi -11.5±7.9 mm, ön tibial korteks-çivi mesafesi ise 3.7±5.4 mm ölçüldü. Ağrı sorunu olmayan grupta bu değerler sırasıyla -8.8±7.3 mm ve 6.5±4.7 mm idi. Çivilerin tibia platosuna ve ön kortekse mesafeleri açısından iki grup arasında anlamlı fark bulunmadı (p>0.05).

Çıkarımlar: Gerek çivinin tibia platosuna göre olan yüksekliğinin, gerekse sagital planda ön tibial kortekse göre olan yerleşiminin ameliyat sonrası gelişen diz önü ağrısı üzerine etkili olmadığı görülmüştür.

Anahtar sözcükler: Kemik çivisi; kırık tespiti, intramedüller/yan etki; ağrı, ameliyat sonrası/etyoloji; tibia kırığı/cerrahi.

Objectives: We investigated the relationship between the development of postoperative anterior knee pain and the location of the nail in the proximal tibia in patients treated with locked intramedullary nailing for tibial diaphyseal fractures.

Methods: Thirty patients were selected among those who underwent locked intramedullary nailing for tibial diaphyseal fractures, with exclusion of all other factors that might be associated with postoperative anterior knee pain. In all the patients, intramedullary nailing was performed using the transtendinous approach and both proximal and distal locking. The patients were evaluated in two groups: 10 patients (3 women, 7 men; mean age 38±14 years) had anterior knee pain, whereas 20 patients (5 women, 15 men; mean age 35±12 years) did not. The distances from the nail to the tibial plateau and anterior tibial cortex were measured on the lateral x-rays after a mean follow-up of 56.6 months and 45.2 months in patients with and without anterior knee pain, respectively.

Results: The two groups were similar with respect to gender and follow-up period (p>0.05). The mean distances from the nail to the tibial plateau and anterior tibial cortex were -11.5±7.9 mm and 3.7±5.4 mm, respectively, in patients with anterior knee pain. The corresponding distances were -8.8±7.3 mm and 6.5±4.7 mm in patients without knee pain. Neither of the distances showed a significant difference between the two groups (p>0.05).

Conclusion: Our findings suggest that the distances from the nail to the tibial plateau and anterior tibial cortex do not have any role in the development of postoperative anterior knee pain.

Key words: Bone nails; fracture fixation, intramedullary/adverse effects; pain, postoperative/etiology; tibial fractures/surgery.

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Intramedullary nailing has been used frequently and accepted as a superior technique in the treatment of tibial diaphyseal fractures recently.[1-9] Chronic anterior knee pain has been considered as the most frequent postoperative complication of this technique.[1,2,4,5,7,9-14] Cause of this complication is still controversial and it has been argued that, it occurs due to height of the nail, entry point of the nail, heterotropic ossification, postoperative muscle weakness, malalignment, or age and many researches have been performed about these factors.[1-5,8-11] As a result of these studies; transtendinous approach, failure in extansor mechanism, younger age and high placement of the nail in proximal tibia were blamed as the outstanding factors for the postoperative anterior knee pain.

In this study, we investigated the relationship between the anterior knee pain and the height of the nail through the tibial plateau and the distance of the nail to the anterior tibial cortex in a group of patients having tibial diaphyseal fracture which could be defined as homogenous in terms of previously specified factors and treated with intramedullary nailing technique.

Materials and methods

67 patients (45 male, 22 female) with tibial diaphyseal fractures treated with locked intramedullary nailing between July 1997 and June 2007 in our clinic were evaluated retrospectively. Patients having fractures except Type A acccording to AO classification, multitrauma, patients having quadriceps muscle strenght less than 5/5 in the follow-up period, patients having superficial or deep infection in their recovery period, patients with heterotropic ossification,angulation over 10 degrees in coronal plane, angulation over 20 degrees in sagittal plane on their x-rays have been excluded from the study. As a result, a group has been formed consisting of 30 patients with/without postoperative anterior knee pain. The group with anterior knee pain consisted of 10 patients (3 female, 7 male, mean age 38±14) and the group without anterior knee pain consisted of 20 patients (5 female,15 male, mean age 35±12)

All the surgical procedures were performed at the same institute, under general or spinal anesthesia on the standard operating table in a supine position. Transtendinous approach and reamed technique have been performed through all patients and both proximal and distal locking have been applied. In postoperative period isometric quadriceps exercises have been started immediately and patients have been couraged to assisted walking as early as possible.

In both groups distances from the nail to the tibial plateau and anterior tibial cortex have been evaluated in the final follow-up lateral x-rays according to definition of Keating et al.[3] All x-rays of the patients have been taken from a distance of 90 cm as a standart. In this evaluation; the distance between the line passing through the tibial plateau and the line parallel to this stripe thouching to the apex of the nail in the lateral x-ray is defined as the height of the nail (Figure 1a). The so-called (-) values display the burial of the nail and (+) values show the amount of the height of the nail in the tibial plateau as well. On the same lateral x-rays anterior cortex-nail distance is defined as the distance between the lines drawn on the anterior cortex of tibia and anterior tip of the nail (Figure 1b).

Mean follow-up period in the group with anterior knee pain was 56,6 months (range 17-104 months; median 62,5 months) and the mean follow-up in the group without pain was 45,2 months (range 13-116 months; median 36 months) respectively.

Comparisons between two groups were held with Mann-Whitney U-test.

Results

The two groups were similar with respect to gender and follow-up period ($p>0,05$). In the group with anterior knee pain mean plateau-nail distance was -11,5±7,9 mm and the anterior cortex-nail distance was 3,7±5,4 mm respectively. In the group without pain, mean plateau-nail distance was -8,8±7,3 mm and the mean anterior cortex-nail distance was 6,5±7.3 mm. There was no significant difference between the two groups in terms of plateau-nail or anterior cortex-nail distances ($p>0,05$).

Discussion

In this study, it was concluded that in patients who were treated with locked intramedullary nailing due to AO type A simple tibia fractures – those which are non-segmented or without butterfly fragments, whose fracture lines could be spiral, oblique or transverse – after factors causing anterior knee pain such as extensor muscle weakness, heterotopic ossification, and angulated healing are eliminated; the nail distance

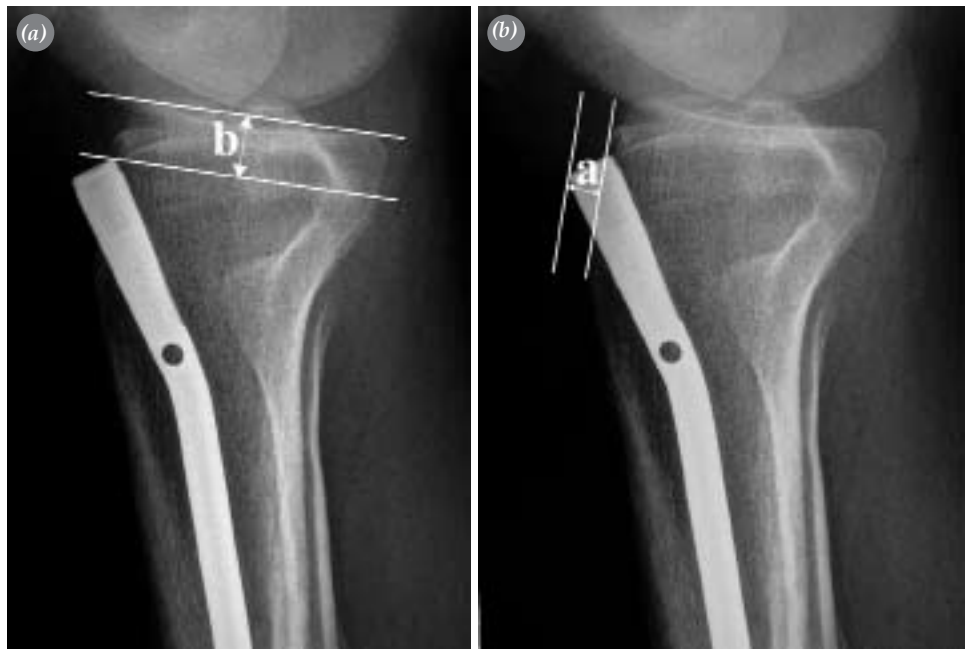

Figure 1. (a) Measurement of the height of the nail in relation with tibial plateau.
(b) Measurement of the distance between anterior cortex of tibia and the nail.

from the proximal enterance point to the tibial plateau or anterior tibial cortex are not related with the anterior knee pain.

Keating et al.[3] reported the mean plateau-nail distance value as 13 mm and proposed that anterior knee pain is independent of this distance. Additionally, anterior knee pain was noted in 57% of the patients with a 5mm outward nail penetration distance from anterior cortex.[3] In another study in which the plateau-nail and anterior cortex-nail distances were used as evaluation parameters, it was reported that anterior knee pain and the nail position in proximal tibia were related wih each other; and that the nail which was buried 1.25cm deeper in relation to tibial plateau in coronal and sagittal planes diminished some degree of pain but not a total recovery was established.[10] However, in our study it was noted that in the group with anterior knee pain, even though the mean nail distance to tibial plateau was 11.5±7.9mm, the pain persisted. At this point, our results and the results of the fore-mentioned study contradict one another. In a meta-analysis published in 2006 examining anterior knee pain occurring after intramedullary nailing, it was suggested that outward penetration of the nail should be avoided; however, absolute distance values were not presented.[13]

Another possible factor causing anterior knee pain is the nail entry route. In literature, transtendineous (passing through the patellar tendon) and paratendineous (passing right by the tendon side) techniques have been discussed and different opinions have been stated.[2-4] . Keating et al.[3] suggested paratendineous route in order to decrease the risk of anterior knee pain following intramedullary nailing. However, there are studies proclaiming that paratendineous route does not decrease anterior knee pain; adding that it might severe the fatty tissue under patellar tendon due to continuous pull and cause fibrosis due to continuous microtrauma.[2,4] In our study we preferred transtendineous route of entrance in all our patients. We believe that transtendineous route is a method technically easy to perform, providing a better anatomical point of view and that it is applicable without the need to remove the surrounding soft tissues.

Court-Brown et al.[7] reported a statistically significant difference between the number of young, active patients experiencing anterior knee pain following intramedullary nailing because of tibial diaphyseal fractures and that of older patients. In our study, however, we did not determine a significant difference of age among the groups of patients with and without anterior knee pain.

Väistö et al.[5] reported a significant relationship between chronic anterior knee pain accuring in pos-

toperative period and quadriceps muscle weakness. The patients with quadriceps muscle weakness were excluded from our study and the data concerning the placement of nails into the tibia were accepted as the only variables.

The retrospective study design and the relatively less number of patients are the weak points of our study, but two relatively homogeneous groups with the same type of fractures operated by the same technique, similar due to the absence of problems such as extensor muscle weakness, angulated healing and heterotopic ossification were compared and the placement of the nail in proximal tibia was kept as the only variable, and no significant difference between two groups was detected in our study as a conclusion.

Under the light of the data of the current report, deeper placement of nails during surgery does not seem to be a solution for anterior knee pain; however, to state certain judgments, studies which consist of larger groups of patients and in which all the probable causes of anterior knee pain are examined separately as single variables are mandatory.

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