



Dorsal closing-wedge osteotomy in the treatment of Freiberg's disease

Freiberg hastalığında dorsal kapalı kama osteotomisi

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Amaç: Metatars başı osteokondrozunun (Freiberg hastalığı) debridman, sinoviyektomi ve dorsal kapalı kama osteotomisiyle tedavisinin orta dönem sonuçları değerlendirildi.

Çalışma planı: Metatars başı osteokondrozu nedeniyle 19 hasta (17 kadın, 2 erkek; ort. yaş 26; dağılım 13-49) debridman, sinoviyektomi ve dorsal kapalı kama osteotomisi ile tedavi edildi. Hastaların temel yakınması yürüme veya spor aktivitesi sırasında ağrı idi. On altı hastada ikinci, iki hastada üçüncü metatarsta, bir hastada ise aynı ayakta her iki metatarsta tutulum vardı. Dört hastada travma, diğer hastalarda günlük iş aktiviteleri sırasında uzun süre ayakta durma öyküsü vardı. Smillie sınıflamasına göre, dört hastada tip 5, 12'sinde tip 4, üçünde tip 3 osteonekroz saptandı. Osteotomi ile metatars başı plantar yüzeyinin falanks ile düzgün yüzey oluşturacak şekilde eklem yapması sağlandı. Ortalama izlem süresi 41 ay (dağılım 15-88 ay) idi. Değerlendirme Kitaoka ve ark.nın skalasına (Lesser Metatarsophalangeal-Interphalangeal Scale) göre yapıldı.

Sonuçlar: Değerlendirme skalasına göre yedi hastada (%36.8) mükemmel, dokuz hastada (%47.4) iyi, üç hastada (%15.8) kötü sonuç elde edildi. Kötü sonuç alınan üç hastanın ikisi tip 5, biri tip 4 idi. Bu hastalarda metatars başında aseptik nekroz ve yaklaşık 4 mm kısalık gelişti. Bir hastaya avasküler nekroz nedeniyle rezeksiyon artroplastisi uygulandı. Hastalarda ortalama 15° (dağılım 0°-30°) fleksiyon, 10° (dağılım 0°-20°) ekstansiyon kaybı gelişti. Ameliyat sonrasında metatars uzunluğunda ortalama 1.6 mm (dağılım 1-4 mm) kısalık saptandı. Hiçbir hastada ameliyat sonrasında enfeksiyon, kaynamama, artroz görülmedi.

Çıkarımlar: Freiberg hastalığının tedavisinde debridman, sinoviyektomi ve dorsal kapalı kama osteotomisi başarılı bir yöntemdir.

Anahtar sözcükler: Debridman; osteokondrit/cerrahi; metatarsal kemikler; osteotomi/yöntem.

Objectives: We evaluated the midterm results of debridement, synovectomy, and dorsal closing-wedge osteotomy in the treatment of metatarsal head osteochondrosis (Freiberg's disease).

Methods: Nineteen patients (17 females, 2 males; mean age 26 years; range 13 to 49 years) were treated with debridement, synovectomy, and dorsal closing-wedge osteotomy for metatarsal head osteochondrosis. The main presenting symptom was pain on walking or sports activities. The second metatarsal head was affected in 16 patients, the third in two patients, and both heads in one patient. Four patients had a history of trauma, while the remaining patients had a history of standing for long hours. According to the Smillie's classification, four patients had type 5, 12 patients had type 4, and three patients had type 3 osteonecrosis. After osteotomy, the smooth and healthy plantar surface of the metatarsal head faced the phalangeal cartilage. The mean follow-up period was 41 months (range 15 to 88 months). The results were assessed by the Lesser Metatarsophalangeal-Interphalangeal Scale by Kitaoka et al.

Results: The results were excellent in seven patients (%36.8), good in nine patients (%47.4), and poor in three patients (%15.8). Poor results were seen in two patients with type 5, and one patient with type 4 osteonecrosis, all of whom developed aseptic necrosis in the metatarsal head and shortening of about 4 mm. One patient underwent resection arthroplasty. The mean flexion and extension losses were 15° (range 0° to 30°) and 10° (range 0° to 20°), respectively. The mean shortening in the metatarsal length was 1.6 mm (range 1 to 4 mm), postoperatively. No instances of infection, nonunion, or arthrosis were encountered.

Conclusion: Treatment with debridement, synovectomy, and dorsal closing-wedge osteotomy yields successful results in Freiberg's disease.

Key Words: Debridement; osteochondritis/surgery; metatarsal bones; osteotomy/methods.

Freiberg disease (metatarsal head osteochondrosis) is usually found in the dorsal part of second metatarsal head. It is the only osteochondrosis that is found more in women than in man. Freiberg was first diagnosed in six patients in 1914 and trauma was determined to be the cause. As the number of cases grew (Smillie)^[1] 41 case, Gauthier and Elbaz^[2] 88 case), research in to the cases couldn't determine the cause of the disease in most of the patients. Necrosis and chondral collapse develops in subchondral cancellous bone and it accompanys the progress of synovitis osteonecrosis. Restricted ability on all movements especially in extension results due to severe synovitis.^[3-6]

In case of an early diagnosis; semirigid orthosis, metatarsal bar, short leg splint can be used for conservative cure.^[4,7] If conservative cure is not enough surgery will be performed. In surgery there are multiple options: metatars head resection arthroplasty, osteochondral graft, dorsal closing-wedge osteotomy, prox. phalangeal base resection, syndactylized of 2-3 fingers, debridement, remodeling metatarsal head and osteochondral plug transplantation.^[4,8]

Dorsal closing-wedge osteotomy was first diagnosed in 1979 by Gauthier and Elbaz.^[2] Kinnard and Lirette^[9] displayed successful results in 1991 using the same technique.

This study looks at the results of the dorsal closing-wedge osteotomy applied to patients with metatarsal head osteochondrosis.

Patients and method

119 patients (17 female, 2 male, ages 13-39 (26 average)) that didn't respond to conservative care such as analgesic, metatarsal bar and splint were admitted to debridement, synovectomy and dorsal closing-wedge osteotomy from 1998 to 2005.

Main complaints of the patients were pain during walking and active sports. Osteochondrosis was observed in second metatars in 16 patients, third metatars in 2 patients and both metatars in the same leg in 1 patient. 4 patients had trauma and 1 patient had to stand on his feet for long periods during the day for work.

The patients were grouped according to the classification by Smillie method. According to this classification method there are 5 different types from osteonecrosis to metatarsal head deformation. 1- Early fracture of the subchondral epiphysis. 2- Early

collapse of dorsal central portion of metatarsal with flattening of articular surface. 3-Further flattening of the metatarsal head with continued collapse of the central portion of the articular surface with medial and lateral projection. 4-Loose bodies form from fractures of the lateral projection and separation of the central articular fragment. 5- End-stage degenerative arthrosis with marked flattening of the metatarsal head and joint space narrowing.^[1] According to this system, there were 4 cases of type 5, 12 cases of type 4 and 3 cases of type 3 disease.

All patients had surgery with spinal anesthesia. The metatarsophalangeal articulation was approached via dorsal long insizion. To avoid aseptic necrosis and nonunion complications removal of soft tissue was avoided as much as possible. Dorsal closing-wedge osteotomy was applied after debridement and synovectomy. After osteotomy, special attention was paid to articulation between the metatarsal head and the proximal phalangeal base. Osteotomy was stabilized with K-wire (Figure 1). Short leg splint was applied for four weeks after the surgery. After four weeks kirschner wire and splint was removed and the patients were allowed to bear moderate weight.

The progress of the cases were tracked for 15 to 88 months (average 44). The results were measured according to Kitaoka et al. Scale.^[10] This scale grades success in pain from 0 to 40, function from 0 to 45 and anatomic structure from 0 to 15. The points are added to give an overall score to the operation: 90 and above is perfect, 80 to 89 is good, 70 to 79 is average, 0 to 69 points is poor. Additionally the change in the length of the metatars before and after the operations was an additional factor (Figure2).

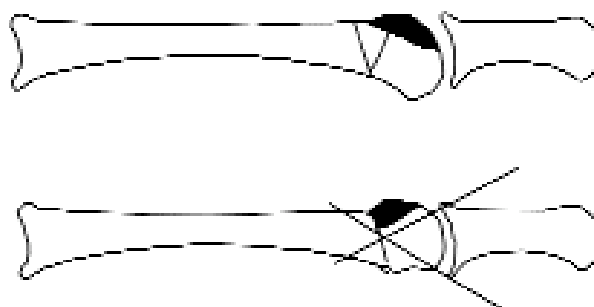


Figure 1. Dorsal closing-wedge osteotomy

Results

The overall score was perfect for seven patients (36.8%), good for nine patients (47.4%) and poor for three patients (15.8%). Out of three patients with poor results, two were type 5 and one was type 4. In these patients aseptic necrosis developed at the tip of metatarsal head and the metatarsal heads were shortened by 4mm. Afterwards, resection arthroplasty was applied to one patient. The other two patients didn't choose to be operated.

None of the patients developed infection, nonunion or arthrosis after the surgery. Patients suffered 15° (0°-30°) loss in flexion and 10° (0°-20°) loss in extension. This functional loss didn't lead to complaints from any patients. The average metatarsal shortening was 1.6mm (range of 1-4mm) due to the surgeries.

Discussion

Freiberg avascular necrosis is not a common disease. Although preliminary research had found trauma to be the cause of the disease, later research found cases where there was no history of trauma.^[4] Majority of the cases (15 patients, 79%) we looked at didn't have a history of trauma.

Conservative care can be applied at the earlier stages of the disease. In the cases we looked at, con-

servative treatments had been used with no positive results. Many different surgical methods have been declared as appropriate treatment method. Dorsal closing-wedge osteotomy was first applied by Gauthier and Elbaz^[2] in 1979 and had displayed positive results in 52 out of 53 patients. These writers had used serclage wire for internal fixation of the osteotomy and recommended that removed tissue during dorsal-wedge osteotomy to avoid of nonunion. Although it has been advised that extra-articular to avoid avascular necrosis, this method results in a higher risk of non-binding nonunion compared with other methods.^[11] In our cases, to give necessary articulation between the metatarsal head and the proximal phalangeal base we removed unhealthy tissue when needed. We paid special attention to soft tissue dissection to avoid aseptic necrosis. We used two pieces of cross K-wire to fixation. The only disadvantage of using the K-wires was the need to remove them before we could ask the patients to bear weight. Kinnard and Lirette^[9] used absorbable suture to fixation and had positive results from all 15 patients.

Hayashi et al.^[8] performed osteochondral plug transplantation on a patient with bilateral and obtained positive results.

Although resection arthroplasty is recommended in cases degree of 4-5^[12,13] metatarsalgia is an impor-

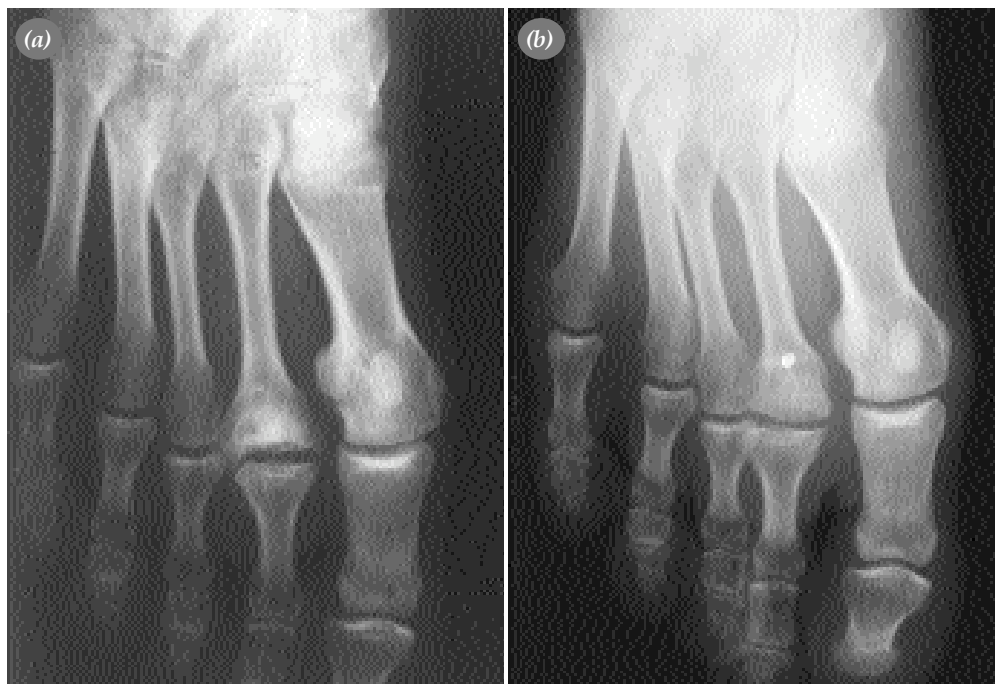


Figure 2. A patient preop. and postop. X-ray

tant complication. In our group, 2 people out of the 4 type 5 people and 1 type 4 person developed avascular necrosis; we performed resection arthroplasty to one patient. After resection arthroplasty, there wasn't any complaint of metatarsalgia.

After the osteotomy, loss in the flexibility of motion range is observed specially when considering normal finger. However, this hasn't resulted in any complaints by the patients.^[9,11] In our cases we observed an average loss of 15° in flexibility and an average loss of 10° in extension. This loss hasn't resulted in any loss of ability to perform activities like walking or running.

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