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Evaluation of Sesamoid Bone Reduction in Hallux Valgus Patients Treated With Three Different Osteotomy

Üç Farklı Osteotomi İle Tedavi Edilen Halluks Valgus Hastalarında, Sesamoid Kemik Redüksiyonun Değerlendirilmesi

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ABSTRACT

Aim: The aim of this study is to investigate the effect of three different osteotomies on sesamoid rotation in hallux valgus surgery.

Patients and Method: 64 out of 108 patients between March 2012-January 2015 were included retrospectively. Procedure of distal chevron, proximal dome and lapidus was applied to 26,18 and 20 patients respectively. Mean age of patients was 46,6 (26-62) and mean time of follow-up was 17 months.

Results: At the last follow - up of patients, the mean hallux valgus angle was 18.4º, intermetatarsal angle was 7.4 º, AOFAS score was 86.1, sesamoid rotation was 13,5. When three different osteotomies were compared in terms of preop and postop sesamoid rotation differences in terms of their ability to correct most sesamoid position within themselves, a significant difference was found in patients treated with lapidus osteotomy in terms of success of sesamoid reduction compared to both patients treated with proximal dome osteotomy (p: 0.02) and patients treated with distal chevron osteotomy (p: 0.000). There was no significant difference in the success rate of sesamoid reduction between patients with proximal dome and patients with distal chevron. (P = 0.242)

Discussion: Patients treated with lapidus osteotomy; both sesamoid rotation angle changes and sesamoid reduction were found to be better than the other two osteotomy types. According to the study, we think that the lapidus procedure will give better results in patients with moderate and severe hallux valgus when sesamoid reduction is considered to be related to recurrence.

Keywords: Sesamoid reduction, Lapidus osteotomy, Sesamoid bone

ÖZ

Amaç: Bu çalışmanın amacı halluks valgus cerrahisinde üç farklı osteotominin sesamoid rotasyonuna etkisini araştırmaktır.

Yöntem: Mart 2012-Ocak 2015 arasında 108 hastanın 64'ü retrospektif olarak incelendi. Sırasıyla 26,18 ve 20 hastaya distal chevron osteotomisi, proksimal domeosteotomisi ve lapidus osteotomisi uygulandı. Hastaların yaş ortalaması 46,6 (26-62) ve takip süresi ortalama 17 ay (12- 26) idi.

Bulgular: Son kontrollerinde ortalama Halluks valgus açısı 18.4º , intermetatarsal açısı 7.4 º, AOFAS skoru 86.1, sesamoid rotasyonu 13,5 idi. Preoperatif ve postoperatif sesamoid rotasyon farklılıkları sesamoid pozisyonlarının çoğunu kendi başlarına düzeltebilme kabiliyetleri açısından üç farklı osteotomi karşılaştırıldığında, Lapidus osteotomisi yapılan hastalarda hem proksimal dome yapılan hastalara göre (p:0.02) hem de distal chevron yapılan hastalara göre (p:0.000) sesamoid redüksiyonu başarısı açısından anlamlı bir fark bulunmuştur. Proksimal dome yapılan hastalarla distal chevron yapılan hastalar arasında sesamoid redüksiyon başarısı açısından anlamlı bir fark bulunmamıştır (p=0.242).

Sonuç: Lapidus osteotomisi uygulanan hastalarda hem sesamoid rotasyon açılarının değişimi bakımından hem de sesamoid redüksiyonu açısından diğer iki osteotomi çeşidine göre daha iyi sonuçlar bulunmuştur. Çalışmamıza göre, Lapidus prosedürünün, sesamoid redüksiyonun nüks ile ilişkili olduğu düşünüldüğünde, orta ve şiddetli halluks valguslu hastalarda daha iyi sonuçlar vereceğini düşünüyoruz.

Anahtar kelimler: Sesamoid redüksiyon, Lapidus osteotomisi, Sesamoid kemik

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Metatarsophalangeal joint of big toe is different from other joints with sesamoid bone mechanism. As the severity of hallux valgus increases , subluxation of sesamoid bones increase laterally. As increasing deformity first metatarsal sheers medially and then luxation of sesamoid increases with subluxation of joint [1-9]. Reduction of sesamoid in postoperative period has an importance in relapse in hallux valgus operation [6-18]. Reduction of sesamoid is one of the most important factor to prevent metatarsalgia in postoperative period. Full correction of rotation could reduce pressure of metatarsals and pain ,increase effect of windlass mechanism of foot and also prevent relapses by neutralization of forces in hallux valgus pathology [7,18-21]. The aim of this study to investigate the effect of three different osteotomies in rotation of sesamoid at preoperative and postoperative period.

MATERİAL AND METHOD

108 patients diagnosed as hallux valgus and operated between March 2012-January 2015 were included retrospectively. Severe pathologies at mid and back foot deficiency of tibialis posterior, romatoid artritis, posttraumatic deformities, neuromuscular deformities, operated hallux valgus, severe osteoartritis of foot-ankle were excluded to study. 44 patients were excluded from this study for this reasons. 64 patients were considered appropriate in the study. 3 patients were male (%4,6), 61 was female (%95,4). Mean age at operation was 46,6 (range,26-62). 33 patients had hallux valgus deformity on right , 31 had left foot. There are no patients in the study group who were operated from both feet. All patients of lapidus procedure had first row hypermobility. All patients were operated by two surgeons. Surgeons to be decided together which osteotomy for patients. Preoperative and Postoperative measurements was assessed by measuring by different surgeon.

Patients were evaluated by anteroposterior and lateral foot graphy , axial sesamoid graphy and AOFAS score in preoperative and postoperative period.

To standardize axial sesamoid graphy, extansion of forefoot by 10 degrees and hind foot 20 degrees a platform was created. 1 meter far away from platform, creation of angle on head of second metatarsa graphies were taken. (Figure -1) The reason we use this platform, the best method of indicating the position of the sesamoid; publications showing that these platforms are available in the X-ray taken. Some sources suggested Routine radiographs the withdrawal of the sesamoid. [22,4] Measurements were taken by İNFİNİTT PACS system in digitally.

Statistical Analysis: Patients results were evaluated by SPSS 22 statistical program. Simple paired test was used to compare preoperative and postoperative values of three different osteotomies.Postoperative values of three different osteotomies were compared with OneWay ANOVA. The significance was accepted for P values below 0.05.

RESULTS

Procedure of distal chevron ,proximal dome and lapidus was applied to 26, 18 and 20 patients respectively. Mean time of follow -up was 17 months (range 12 – 20) . Mean angle of hallux valgus and intermetatarsal was 38.54º and 15,7º respectively , mean AOFAS score was 47.5 and rotation of sesamoid was 25.8 preoperatively. Mean angle of hallux valgus was 18.4 º , intermetatarsal was 7.4 º, score of AOFAS was 86.1, rotation of sesamoid was 13,5 at final control. There are no patients in the study group who were operated from both feet.

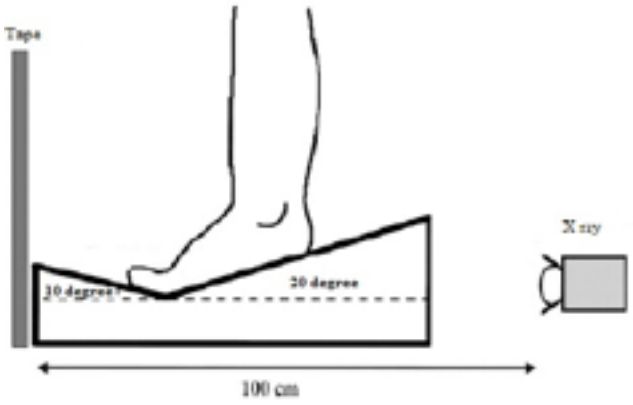

Figure -1 Sesamoid axial radiography platform

Preoperative and postoperative HVA, İMA values, AOFAS score and rotation of sesamoid were shown in Table 1. Preoperative and postopoperative HVA ,IMA, rotation of sesamoid and score of AOFAS were evaluated by paired simple test of SPSS 22 statistical program. In three different osteotomies preoperative and postoperative HVA, İMA, AOFAS and rotation of sesamoid were statistically different by paired simple test (P: 0,000 (P<0,05)).

Table I. Preoperative and postoperative characteristics of the patients

	HVA		IMA		AOFAS		Sesamoid rotation	
	Preop	Preop	Preop	Postop	Preop	Postop	Preop	Postop
Lapidus	42.7 (30–57)	42.7 (30–57)	17.1 (13–24)	8.3 (5–13)	40.1 (29–52)	86 (77–100)	27 (16–38)	11.5 (5–22)
Proximal dome	41.2 (30–56)	41.2 (30–56)	17.2 (14–23)	6.6 (4–13)	48.1 (34–57)	84.4 (70–100)	29.8 (18–52)	17 (10–33)
Distal chevron	31.7 (23–40)	31.7 (23–40)	12.8 (8–20)	7.5 (4–12)	54.2 (42–69)	88 (77–100)	20.7 (9-40)	12.2 (5–30)

HVA:Hallux valgus angle, IMA: intermetatarsal angle, AOFAS: American Orthopedic Foot and Ankle Society score

Postoperative HVA (p:0,20), IMA, (p:0,132), AOFAS scores were compared with three different osteotomies respectively (p:0.115) by One Way ANOVA method and no significant difference was found between groups (p > 0.05).

As three different osteotomies compared as correction of position of sesamoid at preoperative and postoperative period; Lapidus procedure was found succesful than both proximal dome (p:0.02) and distal chevron (p:0.000) procedure by SPSS 22. Statistical program, One Way ANOVA method (p<0,05). No significant difference was found in success between proximal dome and distal chevron procedure by One Way ANOVA method (p:0.242) (p> 0.05).

According to these two statistical results; In patients who treated with the lapidus procedure, the improvement of the sesamoid reduction is much better than the other two osteotomies.

Three patients treated with different osteotomy; preoperatively and postoperatively AP radiography , sesamoid radiographs are shown in figure 2 -7

In early postoperative period infection and delayed tissue healing was seen in 2 (%3) patients. In treatment of these, debridment was done ,evaluated as superficial tissue infection and oral antibiotics were given for 5 days. No complaints of 2 patients were found after 4 weeks . No nonunion was found in all of patients. Mean union time was 6 weeks.

DISCUSSION

In hallux valgus pathophysiology , lateralization of sesamoid bone,dorsal rotation causes increase in hallux valgus by flexor hallusis longus and brevis. So then rotation and deplation of sesamoid increases angle of hallux valgus and deterioates [2,11,16].

In order to reduct sesamoid, contracture of MTP had to be loosen properly. This contracture in MTP joint is attached to lateral joint capsule,adductor tendon and transverse metatarsal ligament. If not this contracture loosen properly, no loosening could occur in sesamoid bone and optimal reduction be achieved. For this reason reduction of sesamoid could be easier by loosening the contracture [12,19,21]. In our study, soft tissue procedure was done to all patients in reduction of sesamoid. Two surgeons have performed bunionectomy in all patients. Applying soft tissue procedures by performing adductor tenotomy and lateral capsulotomy. Medial capsules loosening was not applied to the patient.

Figure 2 (53 year - old male pateient Preoperative AP and Sesamoid Axial X ray 23,3°. Patients treated with proximal dome osteotomy

Reduction of sesamoid changes by flexion of MTP joint in literatüre [5,8,22]. Kuwano T. et al showed increase in rotation of sesamoid by increase in MP joint dorsiflexion[16]. Yıldırım et al studied as same by computed tomography and showed by dorsiflexion of MP joint at angle of 0 – 30 – 70 and as increasing angle , rotation of sesamoid increases in hallux valgus [23]. In our study to standardize axial sesamoid graphy, extansion of forefoot by 10 degrees and hind foot

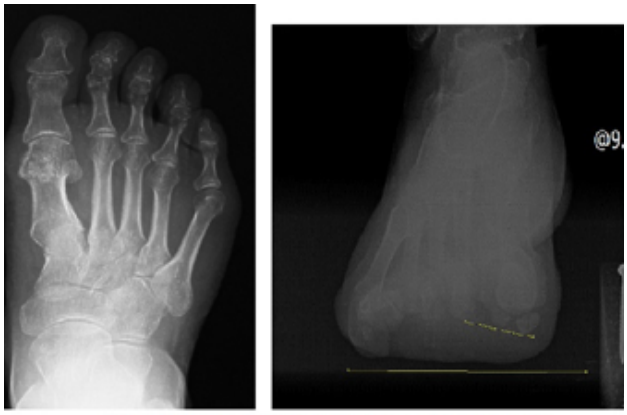

Figure 3 (Postoperative 12. Month AP and Sesamoid Axial X ray 9,5°)

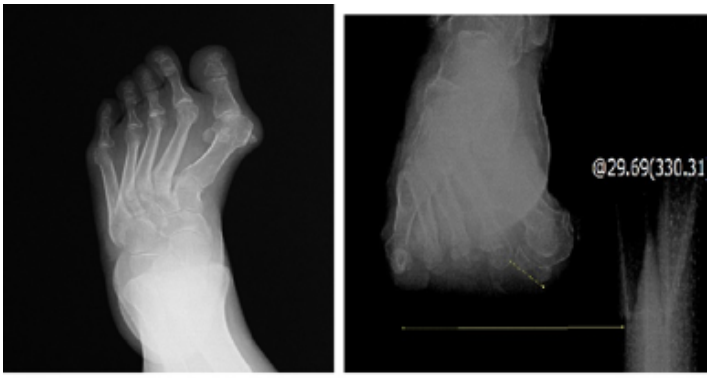

Figure 4 (57 year- old Female patient Preoperative AP and Sesamoid Axial X ray 29,6 °. Patient treated with Lapidus osteotomy)

Figure 5 (Postoperative 13. Month AP and Sesamoid axial X ray 5°)

Figure 6 (55 year -Old Famele patient preoperative Ap and Sesamoid Axial X ray 20°, Patient treated with distal chevron osteotomy)

(Figure 7 Postoperative 12. Month AP and Sesamoid Axial X ray; 4,8°)

20 degrees a platform was created.

Sesamoid rotation correction of pathological hallux valgus angle increases the forces will prevent recurrences may occur later in the normal physiological making. One of the biggest causes of recurrence after surgery are published in the literature showing that this position does not become obsolete [3,13,15,21]. Okuda et al's average 4-year follow-up; According to Hardy & Champton classification postoperative grade 4 and above on the hallux valgus patients, compared with postoperative grade 4 below hallux valgus patients. The recurrence in patients with grade 4 and above demonstrated that more than [18].

In postoperative period reduction of sesamoid prevents metatarsalgia. In podographic studies showed that rotation of sesamoid in hallux valgus increases pressure on heads of first and second metatarsa. By correction of hallux valgus and reduction of sesamoid decrease in pressure and metatarsalgia was shown significantly [7]. In our study lapidus osteotomy had advantages in sesamoid reduction but no difference in AOFAS scores between two other osteotomy types.

In the literature, position of sesamoid was not regarded as a parameter in comparing osteotomy results. Limited number of studies was found in the literature. Park CH et al compared distal chevron and proximal

chevron osteotomies radiologically. In this study no difference was found as AOFAS scores {DCO 93.9 (82 - 100) and PCO 91.8 (77 - 100) }, postoperative HV and IMA angles and reduction of sesamoid. [20] Markbreiter etal compared long term results of crescenteric osteotomy and proximal distal chevron osteotomy . No significant difference was found in postoperative HVA, IMA AOFAS scores between two groups [17]. Tun Hing Lui did soft tissue procedure and 1-2 intermetatarsal screw fixation method to 94 hallux valgus patients artroscopically. In these patients significant difference was found between preoperative and postoperative HVA, İMA, AOFAS and reduction of sesamoid. Loosening joint capsule of MTP by artroscopically was shown more success [14]. No superior method was found in reduction of sesamoid in literature. In our study no significant difference was found in postoperative HVA, IMA and AOFAS scores between three osteotomies. In postoperative period lapidus procedure could be better than others in terms of sesamoid reduction. Hypermobility in lapidus procedure could cause better sesamoid reduction.

One of the main cause of relapse in hallux valgus is inappropriate indication of patients. In moderate and severe hallux valgus with hypermobility and hyperlaxity lapidus procedure could be chosen [21]. In our study reduction of sesamoid was better in lapidus procedure. Short term follow-up was a weak point of our study .In this study, by considering relapse of reduction of sesamoid, we prefer lapidus procedure in moderate and severe hallux valgus.

Conflict of interest: The authors declare that there are no actual or potential conflicts of interest in relation to this article.

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