



Dorsal approach for excision of Morton's interdigital neuroma: A mid-term follow-up study

Dorsal yaklaşım ile Morton nöroma eksizyonu cerrahisi orta dönem sonuçları

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Abstract

Aim: Morton's neuroma is a paroxysmal neuralgia of forefoot and when nonsurgical treatment is unsuccessful, neuroma excision is indicated. The purpose of the present study was to evaluate the outcomes, complications and existing symptoms following an excision of the neuroma using dorsal approach.

Methods: The study evaluated 27 patients (21 women) with an average age of 49 years (range, 24-74) and an average follow-up of 52 months (range, 24-96). The clinical diagnosis was confirmed by history and clinical evaluation. Clinical outcomes were assessed using the interdigital neuroma score and the patients were asked in terms of the level of pain, shoe modification, and sensorial problems.

Results: Average interdigital neuroma score improved from 20 to 62 points following the surgery ($p<0.05$). An excellent interdigital neuroma score was reported in 11 cases (41%), well in 13 (48%) and fair in one patient (4%); and two patients (7%) had a poor result with a similar pain prior to surgery. Numbness was reported in 16 patients (59%) without a restriction in daily life. Seven patients (26%) reported mild limitation with fashionable shoes and one patient (4%) reported severe intolerance in footwear. 19 patients (70%) were completely pain-free.

Conclusion: Surgical excision via dorsal approach is an effective method for the treatment of Morton's neuroma. In spite of the fact that mild degree shoe modification and numbness were the most common existing symptoms after the surgery, clinical scores were not related to ongoing symptoms.

Keywords: Morton, interdigital neuroma, metatarsalgia

Öz

Amaç: Morton's nöroma ön ayağın ilerleyici ve ağrılı bir hastalığı olup, cerrahi dışı yöntemler başarısız olduğunda nöroma eksizyonu tedavi seçenekleri arasındadır. Bu çalışmada dorsal yaklaşım ile nöroma eksizyonu yapılan olgularda fonksiyonel sonuçlar, komplikasyonlar ve devam eden şikayetler araştırılmıştır.

Yöntemler: Morton's nöroma tanısı ile dorsal nöroma eksizyonu yapılan 27 hasta (21 kadın) çalışmaya dahil edildi. Ortalama yaş 49 yıl (Yaş aralığı 24-74 yıl) ortalama takip süresi 52 ay idi (Yaş aralığı 24-96 yıl). Klinik skorlar interdigital nöroma skorlama sistemine göre değerlendirildi. Hastalar son takiplerinde ağrı şiddeti, ayakkabı değişiklikleri ve duyu problemleri açısından sorgulandı.

Bulgular: Cerrahi öncesi 20 puan olan ortalama interdigital nöroma skorlaması, son takipte ortalama 62 puan olarak saptandı ($p<0.05$). Onbir olguda (%41) mükemmel, 13 olguda (%48) iyi, bir olguda (%4) orta ve iki olguda (%7) kötü sonuç elde edildi. Onaltı olguda (%59) günlük hayatı etkilemeyen his kaybı saptandı. Yedi hasta (%26) zaman zaman ayakkabı değişikliği yapmaları gerektiğini bildirirken, bir hasta (%4) özel ayakkabı dışında ayakkabı kullanmadığını ifade etti. 19 hastada (%70) hiç ağrı saptanmadı.

Sonuç: Dorsal yaklaşım ile nöroma eksizyonu, Morton nöroma tedavisinde etkili bir tedavi yöntemidir. Hafif dereceli ayakkabı intoleransı ve his kaybı sık devam eden şikayetler arasında olup klinik skorları ile ilişki saptanmamıştır.

Anahtar sözcükler: Morton, interdigital nöroma, metatarsalji

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Introduction

An interdigital neuroma is among the causes of the forefoot pain and a controversy still exists for the etiology and treatment [1, 2]. It was first reported by Civinini [3] in 1835 and later by Morton in 1876.[4] Ischemia of the nerve and the entrapment of the common digital nerve by the deep transverse ligament has been considered as the possible etiologies [2, 5, 6]. Fibrosis of the soft tissue, demyelination and endoneurial fibrosis of the nerve are the main histopathological findings [7, 8]. The golden standard method for diagnosis is a clinical examination and the imaging modalities are usually used to exclude other causes of forefoot pain [9, 10]. The pain is aggravated by walking while rest and removal of shoes bring relief [8]. An acute pain is induced with palpable clicking sensation when pressure is applied to intermetatarsal space (Mulder's sign) [8]. The third and second web spaces were the most commonly affected regions [11, 12]. Various conservative methods such as orthosis, shoe modifications, metatarsal unloading, and local steroid infiltrations are the initial treatment. Surgical excision of Morton's neuroma via dorsal or palmar approach is the most common techniques in case of the failure of the conservative treatment with a high success rate [2]. In spite of the fact that the case series related to the surgical treatment of Morton's neuroma indicate successful outcomes, the number of studies are limited [1]. We aimed to report the functional results of our patients after surgical neuroma excision via a dorsal approach and evaluated the possible factors affecting the clinical outcomes.

Material and methods

The present study was approved by the local ethics committee of Umraniye Training and Research Hospital. Between 2010 and 2016, 35 consecutive patients underwent a dorsal neuroma excision for Morton's neuroma were reviewed retrospectively. Inclusion criteria were pain with activities, positive Mulder clunk sign, local tenderness, loss of sensory and unresponsiveness to the conservative management. Three patients were excluded due to association of another anatomical forefoot pathologies and 5 patients could not be reached for a final follow-up. Magnetic resonance imaging (MRI) was used to confirm the neuromas and to exclude the other possible causes. Informed consent was obtained for each patient prior to the surgery. All surgeries were performed by the senior author.

Surgical technique

All operations were performed using spinal anesthesia or continuous epidural anesthesia combined with spinal anesthesia. Patients were placed in the supine position on the operating table, and the lower limb tourniquet was inflated. A 5-6 cm dorsal longitudinal incision was made on the affected interdigital space. Dissection was carried down to the transverse intermetatarsal ligament and a lamina spreader was utilized to have enough space between metatarsal heads. Once transverse ligament was released, the common digital nerve was identified just below the ligament. The neuroma was resected such that 1 cm distal and 3 cm proximally to the bulking tissue (Figure). All tissues were prepared for pathological examination. Once bleeding control was made skin closed with nonabsorbable multi-ligament sutures and a compressive bandage was utilized. After ten days sutures were removed and weight-bearing was allowed. The patients were not undergo any rehabilitation protocol.

The histopathological evaluation indicated interdigital neuroma in all patients. At the final follow-up, all patients were

asked to complete an interdigital neuroma clinical evaluation score [9]. The neuroma score includes the assessment of pain, walking distance, sensitivity, and footwear choices into a numerical scale from zero to 80 points (Table). The patients were also asked related to their pain level, restrictions in their life, and sensorial changes on the distal part of the surgical incision and the distance of walking. Clinical scores were compared in terms of gender and location of the neuroma. In addition, the patients were asked whether they had another operation related to this issue and their satisfaction with the surgery.

Statistical analysis was performed using SPSS version 12 (SPSS Inc, Chicago, IL). Means and frequencies were calculated to summarize the study data. Normal distribution was investigated using the Shapiro-Wilk test. A paired Student t-test and a qi-square test were used to detect significant differences. The threshold for significance was set at $p < 0.05$.



Figure: Excised bulky interdigital neuroma tissue.

Table. Interdigital neuroma clinical evaluation score

| Parameter | Score | |
|--------------------------|---------------------------------|----|
| Pain | None | 20 |
| | Mild | 10 |
| | Severe | 0 |
| Maximum walking distance | Without limitation (>6 blocks) | 20 |
| | Some limitation (2-6 blocks) | 10 |
| | Severe limitation (<2 blocks) | 0 |
| Sensitivity | Normal | 20 |
| | Numbness | 10 |
| | Dysesthesia | 0 |
| Footwear requirement | Fashionable conventional shoes | 20 |
| | Comfort footwear or shoe insert | 10 |
| | Difficulty with any shoewear | 0 |

Results

The study evaluated 27 patients (21 women) with an average age of 49 years (range 24-74 year) and an average follow-up of 52 months (range 24-96 months). Sixteen neuroma pathologies were located at the left side. In eight patients, neuromas were detected in the second web space, 18 had in the third web space and one patient had in both. No patients had postoperative superficial or deep infection or soft tissue problem.

Prior to surgical treatment, the interdigital neuroma score was an average of 20 points (range 10 to 30). 21 patients (78%) reported severe limitation in walking and all the patients had a restriction on footwear. The numbness was recorded in 9 patients (33 %) and no patient had dysesthesia.

At the final follow-up, average interdigital neuroma score was found 62 points (range 20 to 70) with a statistically significant improvement compared to prior to surgery. ($p < 0.05$) An excellent interdigital neuroma score was reported in 11 cases

approach

(41%), good in 13 cases (48%), fair in one patient (4%) and two patients (7%) had a poor result with a similar pain prior to surgery. One of the patients who had poor result was recommended to undergo a revision neuroma excision surgery due to the persistent pain however, the patient did not accept the surgery. The other patient had radiofrequency treatment for polyneuropathy and satisfied after the treatment.

There was no significant difference in outcomes related to gender or location of the neuroma ($p>0.05$). Numbness was reported in 16 patients (59%) without a restriction in daily life. 19 patients (70%) had no restriction in wearing any style of shoes. Seven patients (26%) reported mild limitation with fashionable shoes and one patient reported severe intolerance in footwear. Nineteen patients (70%) were completely pain-free whereas the other patients described a residual discomfort of the situation.

Discussion

Despite its histological nature, no study has provided a gold standard treatment method and significant risk factors regarding the failure in Morton's neuroma. Neuroma excision using either a dorsal or plantar approach has been the most common surgical method for the treatment of the disease. Giannini et al. [9] described a functional scoring system for interdigital neuroma and reported 85% good and excellent results with neuroma excision using dorsal approach. In similar, Coughlin et al. [13] and Kasperek et al. [2] reported 85% and 78% good and excellent results, respectively. Contrary to the aforementioned studies Womack et al. [14] determined poor results in 40% of patients and the authors stated that the higher rate of numbness in their series might cause poor results [14]. We obtained a high rate of good to excellent results in our series similar to literature. Only two patients had poor clinical scores and one of them satisfied after the additional treatment.

Pain after the interdigital neuroma surgery has been reported in 25% - 64% of the patients. In a study a quarter of the cohort was reported an interspace tenderness after surgery with no effect on patients' satisfaction [2]. In our cohort, 30 % of the patients determined a low-level pain without a restriction in their daily life. One of our patients had a severe pain due to possible amputation neuroma below the metatarsal head or scar tissue formation. The patient did not accept the further treatment even though we had recommended an additional surgery.

Shoe modification is a common existing symptom has been reported commonly [8]. Schroyen et al. determined that even after a successful surgery, a part of patients had problems with wearing normal shoes [15]. We observed shoe modification in 8 patients (30%) Patients reported that although that situation does not affect their daily life, they choose comfortable shoes. No patient used a special orthosis after surgery. As similar the previous studies, we think that shoe modification does not affect the patient satisfaction.

Numbness in the distal part of the incision is a well-described complication after interdigital neuroma surgery and reported between %51- 72 of the patients [2, 13]. In our cohort, 16 patient had numbness in the last follow up. We also assessed the influence of the sensory deficit on clinical scores, however, we did not find a significant difference between the patients had a sensory deficit or not.

The location of neuroma was mostly reported in third intermetatarsal space. Womack et al. [14] reported lower functional scores with the neuromas located in second web space however in another study the location was not seen as a predictor for lower results [16]. In our study, the most interdigital

neuromas were located in the third web space; however, we did not find any statistical difference in outcome between the patients had neuromas in the second or the third web space.

Number of the neuromas might affect the clinical scores and multiple neuromas associated worse outcomes [2]. However, Coughlin et al. [13] reported that patients who had undergone excision of multiple neuromas had a slightly lower of satisfaction without a statistical difference. In our patients, one patient had neuromas in adjacent interspaces and reported good result at the final follow-up.

The second most common procedure for excision of the neuroma is plantar approach. Even though neuroma excision can be performed successfully via plantar approach, scar related problems, delayed wound healing, inclusion cysts were higher than dorsal approach [1].

Limitations of the present study are possible recall bias due to its retrospective design and the lack of comparison with a different surgical technique. In addition lack of a power analysis was another limitation for the present study.

In conclusion, surgical excision via a dorsal approach is an effective method for the treatment of Morton's neuroma. In spite of the fact that mild degree shoe modification and numbness are the most common existing symptoms after the surgery, clinical scores are not affected due to ongoing symptoms.

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