Research Article / Araştırma Makalesi
doi: 10.18678/dtfd.1443155

Duzce Med J, 2024;26(2):118-121
Düzce Tıp Fak Derg, 2024;26(2):118-121

The Effect of Prolotherapy and Dry Needling on Pain and Foot Functions in Hallux Valgus

Halluks Valgusta Proloterapi ve Kuru İğnelemenin Ağrı ve Ayak Fonksiyonları Üzerine Etkisi

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Received / Geliş Tarihi : 26.02.2024
Accepted / Kabul Tarihi : 03.07.2024
Available Online / Çevrimiçi Yayın Tarihi : 11.08.2024

ABSTRACT

Aim: Hallux valgus is a common foot deformity that causes significant pain and functional impairment. This study aimed to compare the effectiveness of prolotherapy and dry needling in treating mild to moderate hallux valgus pain.
Material and Methods: Patients with hallux valgus deformity experiencing refractory pain after orthotic and analgesic treatment, and treated with prolotherapy (52 patients, 68 feet) or dry needling (49 patients, 57 feet) methods were included in the study. Each group received three treatment sessions at 3-week intervals. Clinical assessments were performed using the visual analog scale (VAS) and American Orthopedic Foot and Ankle Society (AOFAS) scores at baseline, in the third month, and twelfth month.
Results: Both groups showed significant improvement in VAS and AOFAS scores after treatment ($p<0.001$). In the prolotherapy group, the VAS score decreased from 6 (range, 4-8) in the pre-treatment period to 2 (range, 1-5) both in the third and twelfth months ($p<0.001$). In the dry needling group, the VAS score decreased from 6 (range, 4-7) in the pre-treatment period to 4 (range, 2-7) both in the third and twelfth months ($p<0.001$). While the AOFAS scores improved to 75 (range, 63-85) in the third month and 76 (range, 60-80) in the twelfth month in the prolotherapy group ($p<0.001$), improved to 56 (range, 44-75) in the third month and 50 (range, 36-75) in the twelfth month in the dry needling group ($p<0.001$).
Conclusion: Both prolotherapy and dry needling effectively treat hallux valgus pain and improve foot function, with prolotherapy showing superior effectiveness.
Keywords: Conservative; dry needling; symptomatic hallux valgus; pain; prolotherapy.

ÖZ

Amaç: Halluks valgus, ayağın yaygın bir deformitesi olup önemli ağrı ve fonksiyonel bozukluğa neden olabilir. Bu çalışmanın amacı hafif ve orta dereceli halluks valgus ağrısının tedavisinde proloterapi ve kuru iğnelemenin etkinliğini karşılaştırmaktır.
Gereç ve Yöntemler: Ortez ve analjezik tedavi sonrası dirençli ağrı yaşayan halluks valgus deformitesi olan ve proloterapi (52 hasta, 68 ayak) veya kuru iğneleme (49 hasta, 57 ayak) ile tedavi edilen hastalar çalışmaya dahil edildi. Her grup 3 haftalık aralıklarla üç tedavi seansı aldı. Görsel analog skala (visual analog scale, VAS) ve Amerikan Ortopedik Ayak ve Ayak Bileği Derneği (American Orthopedic Foot and Ankle Society, AOFAS) skorları kullanılarak klinik değerlendirmeler başlangıçta, üçüncü ayda ve on ikinci ayda yapıldı.
Bulgular: Her iki grup da tedavi sonrası VAS ve AOFAS skorlarında anlamlı iyileşme gösterdi ($p<0,001$). Proloterapi grubunda, VAS skoru tedavi öncesi 6'dan (aralık, 4-8) hem üç ve hem de on ikinci aylarda 2'ye (aralık, 1-5) düştü ($p<0,001$). Kuru iğneleme grubunda, VAS skoru tedavi öncesi 6'dan (aralık, 4-7) hem üç ve hem de on ikinci aylarda 4'e (aralık, 2-7) düştü ($p<0,001$). AOFAS skorları, proloterapi grubunda, üçüncü ayda 75'e (aralık, 63-85) ve on ikinci ayda 76'ya (aralık, 60-80) yükselirken ($p<0,001$), kuru iğneleme grubunda üçüncü ayda 56'ya (aralık, 44-75) ve on ikinci ayda 50'ye (aralık, 36-75) yükseldi ($p<0,001$).
Sonuç: Hem proloterapi hem de kuru iğneleme halluks valgus ağrısını etkili bir şekilde tedavi eder ve ayak fonksiyonunu iyileştirir, ancak proloterapi daha üstün sonuçlar gösterir.
Anahtar kelimeler: Konservatif; kuru iğneleme; semptomatik halluks valgus; ağrı; proloterapi.

INTRODUCTION

Hallux valgus is a common foot deformity characterized by the lateral deviation of the great toe over 15° and associated pain (1). Multiple predisposing factors contribute to hallux valgus, but no specific etiological mechanism has been definitively identified (2). The lateral deviation causes metatarsal rotation and valgus at the metatarsophalangeal joint, resulting in joint instability, decreased range of motion, and pain. Muscle imbalances around the joint further exacerbate the deformity (3).

Treatment options for hallux valgus include both surgical and nonsurgical methods. Nonsurgical treatments such as orthotic devices, physical therapy, and footwear modifications are commonly used for mild to moderate deformities (4). Surgical intervention is often reserved for severe cases but carries risks of postoperative complications (5). Recently, local injections like prolotherapy and dry needling have been used effectively for various musculoskeletal disorders, including hallux valgus (5,6). Prolotherapy involves injecting hypertonic dextrose to promote natural healing, while dry needling uses thin needles at trigger points to alleviate pain (7,8).

Prolotherapy aims to strengthen ligaments, tendons, and joint capsules by inducing local inflammation, leading to tissue regeneration and pain relief. Dry needling induces biochemical changes in muscle function, affecting pain, inflammation, and blood flow (9-11). This study aimed to evaluate the effectiveness of these treatments in patients with hallux valgus pain unresponsive to conventional therapies.

MATERIAL AND METHODS

This study was approved by the ethics committee of the University of Health Sciences (03.06.2021, 258). Informed consent was obtained from all participants, and the study adhered to the principles of the Declaration of Helsinki.

Patient Selection

Patients diagnosed with painful hallux valgus deformity between March 2020 and April 2021, and who had persistent pain after at least six months of orthotic and analgesic treatment were included in this retrospective study. Exclusion criteria were: age below 18 years, absence of pain, rheumatic or systemic inflammatory diseases, neuromuscular disorders, diabetes mellitus, history of foot infections or surgeries, recent corticosteroid injections, bleeding tendencies, and pregnancy. Patients with hallux valgus angles greater than 40° or less than 15° were also excluded. A total of 120 patients, 60 in prolotherapy and 60 in dry needling groups were included in the study (Figure 1).

Treatment Protocol

Prolotherapy injections (3.6 mL dextrose, 15% solution, and 0.4 mL lidocaine) were administered using a 27-gauge needle at three points around the medial capsule of the metatarsophalangeal joint under aseptic conditions. Dry needling was performed similarly at three trigger points around the medial capsule. Both treatments were given three times at 3-week intervals. Patients were blinded to the treatment method. Post-treatment, patients were advised to rest, avoid long walks, and use standard analgesics (500 mg acetaminophen three times daily for three days). No home exercises or splints were recommended (Figure 2).

Clinical Evaluation

The visual analog scale (VAS) and the American Orthopedic Foot and Ankle Society (AOFAS) scores were recorded at baseline, third month, and twelfth month. The VAS is a tool used to measure a patient's pain intensity, where patients rate their pain on a scale from 0 (no pain) to 10 (worst possible pain). The AOFAS score is a comprehensive assessment used to evaluate foot and ankle function, which includes parameters such as pain, function, and alignment of the forefoot. These evaluations were conducted to monitor the effectiveness of the treatments over time.

Statistical Analysis

Descriptive statistics were presented as mean±standard deviation for normally distributed data, median, 25^{th}-75^{th} percentile, minimum-maximum for non-normally distributed data, and number and percentage for categorical data. The Shapiro-Wilk test was used to assess normality. Comparisons between groups utilized t-tests for normally distributed data and Mann-Whitney U tests for non-normally distributed data. Changes in VAS and AOFAS scores over time were analyzed using the Friedman test, with post-hoc Wilcoxon tests for pairwise comparisons. Statistical analyses were conducted using IBM SPSS Statistics v.20, and $p<0.05$ was considered statistically significant.

RESULTS

Eleven patients in the dry needling group and six patients in the prolotherapy group did not complete the follow-up. Additionally, two prolotherapy patients withdrew due to severe pain and hypotension during injection. Thus, 49 patients in the dry needling group and 52 in the prolotherapy

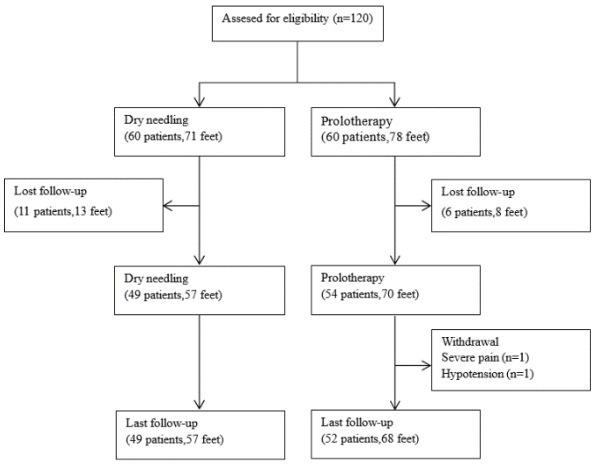

Figure 1. Flowchart of subjects in the study

Figure 2. A) dry needling method, **B)** prolotherapy procedure

group completed the treatment protocol. Demographic characteristics, including body mass index (BMI), were similar between the groups (Table 1).

Both groups showed significant improvement in VAS scores post-treatment ($p<0.001$). In the prolotherapy group, VAS scores decreased from 6 (range, 4-8) in the pre-treatment period to 2 (range, 1-5) both in the third and twelfth months. In the dry needling group, VAS scores decreased from 6 (range, 4-7) in the pre-treatment period to 4 (range, 2-7) both in the third and twelfth months. The improvement of the VAS scores in the prolotherapy group was higher than in the dry needling group both in the third and twelfth months ($p<0.001$). Both groups showed significant improvement in post-treatment AOFAS scores ($p<0.001$). In the prolotherapy group, AOFAS scores improved from 75 (range, 63-85) in the third month to 76 (range, 60-80) in the twelfth month. In the dry needling group, AOFAS scores improved from 56 (range, 44-75) in the third month to 50 (range, 36-75) in the twelfth month. It was observed that the improvement in the prolotherapy group was better than in the dry needling group (Table 2).

DISCUSSION

This study compared the effectiveness of prolotherapy and dry needling in treating hallux valgus pain. Both treatments significantly reduced pain and improved foot function, but prolotherapy showed superior results in both VAS and AOFAS scores at the third and twelfth months.

The pathogenesis of hallux valgus involves the failure of the first metatarsosamoid ligament, medial collateral ligament, and medial capsule, leading to joint instability and muscle imbalance (12). Non-surgical treatments aim to alleviate pain and improve function (13,14). Prolotherapy, a regenerative injection therapy, induces local inflammation and tissue regeneration, thus reducing pain without significant side effects (15). The findings of the present study align with previous studies showing the efficacy of prolotherapy in various musculoskeletal conditions (16,17).

Dry needling relieves pain by targeting hypersensitive trigger points in muscles, tendons, and ligaments (18,19). Although its exact mechanism is unclear, dry needling is effective in treating various musculoskeletal pain conditions. Our study showed that dry needling also alleviates pain in hallux valgus patients, although less effectively than prolotherapy.

Prolotherapy injections stimulate healing by inducing local inflammation, resulting in the production of new fibrous tissue, thus strengthening the ligaments, tendons, and joint capsules. This mechanism leads to decreased pain and improved function (20,21). Dry needling, on the other hand, works by causing microtrauma to the tissues, which triggers the body's natural healing response and results in pain relief and improved muscle function (22,23).

The significant improvement in both VAS and AOFAS scores in the prolotherapy group suggests that this treatment is more effective in reducing pain and improving foot function compared to dry needling. The findings support the use of prolotherapy as a viable non-surgical treatment option for patients with mild to moderate hallux valgus who do not respond to conventional therapies.

The study lacked a control group, and larger sample sizes with diverse clinical evaluations are needed. Additionally, the lack of long-term follow-up beyond twelve months limits the ability to assess the sustained effectiveness of the treatments. Nevertheless, this study provides valuable insights into the comparative effectiveness of prolotherapy and dry needling in treating hallux valgus.

CONCLUSION

Both prolotherapy and dry needling are effective in treating hallux valgus pain and improving foot function. Prolotherapy demonstrated superior results than dry needling both in pain management and functional improvement in hallux valgus. Both methods can be considered viable options for the non-surgical treatment of mild to moderate hallux valgus.

Table 1. Baseline demographic characteristics of the groups

	Prolotherapy (n=52)	**Dry Needling (n=49)**	**p**
Age (years)	48.25±11.41	49.29±8.12	0.602
BMI (kg/m^2)	26.65±3.28	27.08±3.68	0.713
Gender, n (%)			
Female	39 (75.0)	40 (81.6)	0.420
Male	13 (25.0)	9 (18.4)	
Side, n (%)			
Left	16 (30.8)	26 (53.1)	
Right	20 (38.4)	15 (30.6)	0.058
Bilateral	16 (30.8)	8 (16.3)	

BMI: body mass index, descriptive statistics reported as mean±standard deviation

Table 2. VAS and AOFAS scores of the groups in pre-treatment visit and post-treatment visits

	Prolotherapy (n=52)		**Dry Needling (n=49)**		**p****
	Mean±SD	**Median (IQR) [min-max]**	**Mean±SD**	**Median (IQR) [min-max]**	
VAS					
Pre-treatment	6.19±1.20	6 (5-7) [4-8]	5.55±0.91	6 (5-6) [4-7]	**0.006**
3rd month	2.40±1.01	2 (1-3) [1-5]	4.33±1.04	4 (3-5) [2-7]	**<0.001**
12th month	2.54±1.07	2 (1-3) [1-5]	4.16±1.01	4 (3-5) [2-7]	**<0.001**
p*		**<0.001**		**<0.001**	
AOFAS					
Pre-treatment	35.92±7.67	36 (30-45) [23-52]	35.12±6.60	36 (28-42) [23-48]	0.600
3rd month	74.67±5.58	75 (68-80) [63-85]	56.35±7.88	56 (50-65) [44-75]	**<0.001**
12th month	73.44±5.47	76 (67-79) [60-80]	49.96±7.80	50 (45-63) [36-75]	**<0.001**
p*		**<0.001**		**<0.001**	

SD: standard deviation, IQR: interquartile range (25th-75th percentile), VAS: visual analog scale, AOFAS: American Orthopedic Foot and Ankle Society, *: Friedman test, **: Mann-Whitney U test

Ethics Committee Approval: The study was approved by the Gülhane Scientific Research Ethics Committee of the University of Health Sciences (03.06.2021, 258).

Conflict of Interest: None declared by the authors.

Financial Disclosure: None declared by the authors.

Acknowledgments: None declared by the authors.

Author Contributions: Idea/Concept: SS, MA, UY; Design: SS, MA; VU; Data Collection/Processing: UY, ÖE; Analysis/Interpretation: SS, MA, ÖE; Literature Review: SS, VU; Drafting/Writing: SS, MA, UY; Critical Review: SS, MA, VU.

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