

The Impact of Prolotherapy and Steroid Injection on De Quervain's Tenosynovitis: A Retrospective Outcome Study

Proloterapi ve Steroid Enjeksiyonunun De Quervain Tenosinoviti Üzerindeki Etkisi: Retrospektif Sonuç Araştırması

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ABSTRACT

Aim: Patients with De Quervain's stenosing tenosynovitis (DQT) experience problems in daily living activities due to the chronic inflammatory process and tenderness around the wrist. This study aimed to compare the effects of prolotherapy and steroid injection on short-term functional outcomes in DQT patients.

Methods: In this retrospective study between January 2022 and 2023, a cohort of 34 patients with complete demographic data and elbow pain and functional scores, which were recorded at pre-treatment, two weeks, and six weeks post-treatment, was divided into the steroid injection (n=17) and prolotherapy (n=17) groups. Demographic and clinical data of all patients were recorded. The outcomes of the Visual Analogue Scale (VAS) score for wrist pain, Quick Disability Assessment of Arm, Shoulder, and Hand Problems (QuickDASH), and the Health Assessment Questionnaire (HAQ) for wrist functions were examined.

Results: Initial assessments did not reveal any differences between groups in terms of VAS (p=0.756), QuickDASH (p=0.168), and HAQ (p=0.615). In the second week post-treatment, there was a significant reduction in VAS, QuickDASH, and HAQ in steroid injection compared to the prolotherapy (p=0.001). This difference continued at sixth-week post-treatment; VAS (p=0.007), QuickDASH (p=0.003), and HAQ (p=0.011) were found to be significantly lower in steroid injection than in the prolotherapy.

Conclusion: Our findings underscore the superior effectiveness of steroid injection compared to prolotherapy in reducing wrist pain and improving functional outcomes in patients with DQT. These findings benefit orthopedic settings in choosing treatment options logically, though further research is needed to understand long-term effects and mechanisms.

Keywords: De Quervain stenosing tenosynovitis, injections, steroids, prolotherapy

ÖZ

Amaç: De Quervain stenoza tenosinoviti (DQT) hastalar, kronik inflamatuvar süreç ve el bileği çevresindeki hassasiyet nedeniyle günlük yaşam aktivitelerinde problemler yaşamaktadır. Bu çalışmanın amacı DQT hastalarında proloterapi ve steroid enjeksiyonunun kısa dönem fonksiyonel sonuçlar üzerindeki etkilerini karşılaştırmaktır.

Yöntem: Ocak 2022-2023 tarihleri arasında yapılan bu retrospektif çalışmada demografik verileri eksiksiz olan ve tedavi öncesi, tedavi sonrası iki hafta ve altı hafta dirsek ağrısı ve fonksiyonel skorları kaydedilen 34 hastadan oluşan bir kohort steroid enjeksiyonu (n=17) ve proloterapi (n=17) gruplarına ayrıldı. Tüm hastaların demografik ve klinik verileri kaydedildi. El bileği ağrısı için Görsel Analog Skalası (GAS) skoru, el bileği fonksiyonları için Kol, Omuz ve El Problemlerinin Hızlı Engellilik Değerlendirmesi (QuickDASH) ve Sağlık Değerlendirme Anketi (SDA) sonuçları incelendi.

Bulgular: İlk değerlendirmelerde GAS (p=0,756), QuickDASH (p=0,168) ve SDA (p=0,615) açısından gruplar arasında fark yoktu. Tedavi sonrası ikinci haftada, steroid enjeksiyonunda proloterapiye kıyasla GAS, QuickDASH ve SDA'da anlamlı bir azalma görüldü (p=0,001). Bu fark tedavi sonrası altıncı haftada da devam etti; GAS (p=0,007), QuickDASH (p=0,003) ve SDA (p=0,011) steroid enjeksiyonunda proloterapiye göre anlamlı şekilde düşük bulundu.

Sonuç: Elde edilen bulgular DQT'li hastalarda steroid enjeksiyonunun proloterapiye kıyasla el bileği ağrısını azaltmada ve fonksiyonel sonuçları iyileştirmedeki üstün etkinliğinin altını çizmektedir. Bu bulgular, tedavi seçeneklerinin mantıklı bir şekilde seçilmesinde ortopedik çerçeveye fayda sağlamaktadır, ancak uzun vadeli etkileri ve mekanizmaları anlamak için daha fazla araştırmaya ihtiyaç vardır.

Anahtar Kelimeler: De Quervain stenoza tenosinoviti, enjeksiyonlar, steroidler, proloterapi

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Introduction

De Quervain's stenosing tenosynovitis (DQT) presents a distressing tendinosis characterized by discomfort and tenderness surrounding the radial styloid of the wrist during routine activities necessitating wrist and thumb motions.[1] Various potential etiologies for DQT have been postulated thus far, encompassing direct trauma, biomechanical compression, excessive fatigue from repetitive activities, genetic predisposition, as well as exposure to cold and heat; nevertheless, the precise causative factor remains a subject of contention.[2] DQT primarily originates from inflammation of the abductor pollicis longus (APL) tendons and extensor pollicis brevis (EPB).[3] With prevalence rates of 0.5% in men and 1.3% in women, DQT predominantly affects individuals within the age bracket of 40-60 years.[2] DQT usually affects especially adults who use repetitive hand or wrist movements in their daily activities. However, it can also arise in men and women who play sports or use hand instruments to strain the tendons in the wrist and hand.[3]

The management of DQT poses a considerable challenge for patients, with current conservative approaches encompassing a spectrum of interventions. These include pharmacotherapy involving oral nonsteroidal anti-inflammatory drugs, local corticosteroid injections, rest splints, prolotherapy, platelet-rich plasma, tailored physiotherapy regimens, and physical modalities. [2,4] Alternative conservative strategies other than steroid injections, though available, show limited efficacy and are associated with a notable recurrence rate.[1] Steroid injections are widely accepted for DQT, and their effectiveness has been demonstrated in previous reports and systematic analyses.[1,5] Nonetheless, the existing body of evidence in the form of systematic reviews and meta-analyses regarding steroid injection therapy for DQT remains limited.[5]

Prolotherapy, a therapeutic modality entailing the administration of sclerosing agents around painful tendinosis, has garnered increasing attention in upper extremity pathologies, as evidenced by a growing body of literature.[6] Despite this burgeoning interest, exploring prolotherapy's

efficacy in addressing DQT remains limited, with only two case studies thus far delving into its potential benefits. These studies have suggested that prolotherapy exhibits comparable efficacy to steroid injection in mitigating pain and offers favorable prognostic outcomes for symptom alleviation among DQT patients. [7,8] However, more research is needed regarding the comparative short-term effects of prolotherapy versus steroid injection on wrist pain and functional outcomes in individuals afflicted with DQT. Therefore, this study aimed to compare prolotherapy and steroid injections on wrist pain and functional outcomes in DQT patients.

Methods

The study was designed as a retrospective analysis, wherein we examined the records of 38 patients diagnosed with DQT who sought treatment for wrist pain at a Bursa Private Medicabil Hospital's orthopedics and traumatology polyclinics experiencing wrist pain for at least four weeks. All patients had been treated with either prolotherapy or steroid injections between January 2022 and January 2023. Ethics committee approval of the study was obtained from the Muş Alparslan University Scientific Research and Publication Ethics Committee (134645-5/53). The study was performed following the ethical standards of Helsinki. The informed consent form was obtained from all patients.

A cohort of 34 patients, characterized by complete demographic data, elbow pain, and functional scores recorded at pre-treatment, two weeks, and six weeks post-treatment, was divided into the steroid injection (n=17) and prolotherapy (n=17) groups. Patients experiencing wrist pain for at least four weeks and showing no improvement with thumb-supported static hand-wrist splinting and nonsteroidal anti-inflammatory drugs for a minimum of three weeks were included. Inclusion criteria were at least 40 mm pain according to the Visual Analogue Scale (VAS) around the distal of the radial styloid process, non-responsiveness to nonsteroidal anti-inflammatory medications and thumb-supported static hand-wrist splinting over three weeks, tenderness on the first dorsal compartment of the wrist, positive Finkelstein's sign, ineffectiveness of oral medication in

ameliorating the condition, and ages ranging from 18 to 65 years. Exclusion criteria encompassed patients who had undergone multiple steroid injections in the preceding six months, those with contraindications to steroid therapy, individuals with predisposing factors such as past fractures/dislocations, rheumatoid arthritis, or prior surgery in the same wrist region, as well as pregnant individuals and those with cancer, as these conditions could potentially confound functional outcome assessments.

Each patient enrolled in the study received comprehensive instruction in a standardized physiotherapy regimen, which included specific exercises targeting the APL and EPB muscles, performed twice to thrice daily.[9] Additionally, a friction massage regimen and 5 to 10 minutes of cold application per/day were administered every three days, following the previous protocol.[10] All patients were given information and a follow-up chart as a home exercise program. Notably, all participants were instructed to use a thumb-supported static hand-wrist splint for six weeks following prolotherapy or steroid injections and to avoid strenuous physical activities involving the hand and thumb. Before the prolotherapy and steroid injection, the skin was stained with sterile povidone-iodine and ethyl alcohol. Approximately 0.5 cm distal to the radial styloid was marked with the patient sitting with the elbow flexed 90 degrees and the forearm neutral. For the steroid injection, a 22-gauge needle linked to a 5cc syringe constituting 1 ml of Methylprednisolone (40mg/ml) plus 1 ml of 0.5% lignocaine was prepared and injected into the tendon sheath. [11] In the prolotherapy group, injection with a 4ml mixture of 1% lidocaine and 12.5% dextrose was administered distal to the radial styloid and tendon sheath with a 22-gauge needle.[7] After the prolotherapy and steroid injections, the ice application was accomplished at the affected site.

Evaluations: Demographic data of all patients were recorded. The VAS is used to evaluate wrist pain, and the Quick Disability Assessment of Arm, Shoulder, and Hand Problems (QuickDASH) and the Health Assessment Questionnaire (HAQ) are used to evaluate wrist function. The previously recorded VAS, QuickDASH, and HAQ scores were examined. Patients with before injection,

two weeks after, and sixth-weeks outcome were complete were included in the study.

Visual Analogue Scale: The VAS is one of the most commonly used scales for assessing adult pain. In our study, all patients were asked to mark the severity of their activity pain on a 100 mm VAS, and the marked part was recorded in mm. [12]

Quick Disability Assessment of Arm, Shoulder, and Hand Problems: The QuickDASH is a Likert-type scale to evaluate physical function in patients with upper extremity musculoskeletal disorders. QuickDASH consists of 11 items, with questions scored from 1 to 5. A score of 1 indicates no strain, and a score of 5 indicates inability to perform the selected activity. The total score of the QuickDASH ranges from 0 to 100 (0 points indicate no impairment and 100 points indicate severe impairment). Lower scores obtained from QuickDASH indicate a better functional level for patients.[13]

Health Assessment Questionnaire: The HAQ is a comprehensive scale for evaluating various aspects of a patient's physical functioning over the past week. It meticulously assesses upper extremity movements, lower extremity locomotor activities, and tasks involving both upper and lower extremities. Comprising 20 questions organized into eight distinct subcategories, including dressing, standing up, eating, walking, hygiene, reaching, grasping, and daily tasks, the HAQ employs a scoring system ranging from 0 to 3. A score of 0 signifies no difficulty, while a score of 3 indicates the inability to perform the activity. The total score is derived by summing the scores of the marked items and dividing by the number of items marked. Typically, scores between 0 and 1 suggest mild to moderate difficulty, while those between 1 and 2 indicate moderate to severe disability, and scores between 2 and 3 denote severe disability.[14]

Statistical Analysis: The statistical analysis of the data obtained was conducted using the SPSS program, specifically Version 25, developed by IBM in Armonk, NY, USA. Descriptive statistics were utilized to present the data, and mean and standard deviation were reported. The analysis of variance test (ANOVA) was employed for comparisons between groups with normally

distributed data, while the Kruskal-Wallis analysis was utilized for non-normally distributed data. In cases of repeated measurements, the repeated measures ANOVA test was applied. The statistical significance was set at $p < 0.05$.

Results

Upon analyzing the demographic data, no significant differences were observed between the groups in age ($p = 0.552$) and body mass index ($p = 0.755$). In the steroid injection and prolotherapy cohorts, 52.9% ($n = 9$) of patients were female, whereas 47.1% ($n = 8$) were male. 88.2% ($n = 15$) of patients in the prolotherapy group showed dominant limb involvement, with the remaining 11.8% ($n = 2$) experiencing non-dominant limb involvement. In contrast, in the steroid injection group, 82.4% ($n = 14$) of patients reported affected dominant limbs, while 17.6% ($n = 3$) presented with non-dominant limb involvement (Table 1).

Table 1. Demographic and clinical data of the groups

	Prolotherapy (n=17)		Steroid Injection (n=17)		p
	Mean ± SD	%95 CI	Mean ± SD	%95 CI	
Age (year)	37.58 ± 7.20	33.88 – 41.29	36.17 ± 6.45	32.85 – 39.49	0.552 (t=0.602)
Body mass index (kg/m ²)	23.26 ± 2.13	22.16 – 24.36	23.51 ± 2.42	22.26 – 24.75	0.755 (t=-0.315)
	n	%	n	%	
Sex					
Female	9	52.9	9	52.9	1.000
Male	8	47.1	8	47.1	
Dominant Extremity					
Right	16	94.1	15	88.2	0.545
Left	1	5.9	2	11.8	
Affected Extremity					
Dominant	15	88.2	14	82.4	0.628
Non-dominant	2	11.8	3	17.6	

SD: standard deviation; kg: kilogram; m: meter; t: independent samples t-test, %95 CI: %95 Confidence Interval for means

Initial assessments did not reveal differences between the groups before beginning the treatment in wrist pain (VAS, $p = 0.756$) and functional capacity (QuickDASH, $p = 0.168$; HAQ, $p = 0.615$). However, after two weeks of post-treatment, there was a significant reduction in both wrist pain and functional abilities in the steroid injection group

compared to the prolotherapy group ($p = 0.001$). This difference continued to persist at the six-week follow-up, with wrist pain (VAS, $p = 0.007$) and functional abilities (QuickDASH, $p = 0.003$; HAQ, $p = 0.011$) being notably lower in the steroid injection group than in the prolotherapy group (Table 2).

Table 2. Intragroup and intergroup comparisons of wrist pain and function in prolotherapy and steroid injection groups

	Prolotherapy (n=17)		Steroid Injection (n=17)		P1
	Mean ± SD	%95 CI	Mean ± SD	%95 CI	
VAS (mm)					
Before	79.64 ± 7.01	76.04 – 83.25	80.47 ± 8.26	76.22 – 84.71	0.756 (F=0.098)
2nd week	17.41 ± 6.66	13.98 – 20.83	8.94 ± 4.53	6.61 – 11.27	0.001* (F=18.783)
6th week	10.47 ± 6.83	6.95 – 13.98	5.17 ± 3.39	3.43 – 6.92	0.007* (F=8.174)
P ²	0.001*1-2, 1-3, 2-3 ($\eta^2 = 0.155$)				
QuickDASH					
Before	46.92 ± 8.83	42.37 – 51.46	51.73 ± 10.15	46.51 – 56.95	0.150 (F=2.174)
2nd week	20.31 ± 8.29	16.05 – 24.57	6.27 ± 3.26	4.59 – 7.95	0.001* (F=42.214)
6th week	7.21 ± 5.97	4.14 – 10.28	2.27 ± 1.96	1.25 – 3.28	0.003* (F=10.520)
P ²	0.001*1-2, 1-3, 2-3 ($\eta^2 = 0.340$)				
HAQ					
Before	1.13 ± 0.11	1.07 – 1.19	1.11 ± 0.12	1.05 – 1.17	0.615 (F=0.258)
2nd week	0.46 ± 0.22	0.35 – 0.58	0.19 ± 0.11	0.13 – 0.25	0.001* (F=20.785)
6th week	0.22 ± 0.17	0.13 – 0.31	0.10 ± 0.07	0.06 – 0.13	0.011* (F=7.321)
P ²	0.001*1-2, 1-3, 2-3 ($\eta^2 = 0.224$)				

SD: Standard deviation; %95 CI: %95 Confidence Interval for means; mm: millimeters; VAS: Visual Analogue Scale; QuickDASH: Quick Disability Assessment of Arm, Shoulder, and Hand Problems; HAQ: Health Assessment Questionnaire; η^2 : Eta square analysis for effect size P1: p-value for the difference between independent groups P2: p-value for difference in dependent groups

In the sixth week following injections, the VAS wrist pain level exhibited a change of 75.29 ± 8.42 mm in the steroid injection group and 69.17 ± 10.61 mm in the prolotherapy group (Figure 1). Regarding the QuickDASH wrist function score, a change of 49.46 ± 10.37 points was observed in the steroid injection group compared to 39.70 ± 11.25 points in the prolotherapy group (Figure 2). Additionally,

the change in HAQ score amounted to 1.01 ± 0.09 points in the steroid injection group and 0.91 ± 0.22 points in the prolotherapy group (Figure 3).

Discussion

In this study, which aimed to compare the effects of steroid injection or prolotherapy on short-term wrist pain and functions in patients with DQT, the steroid injection group experienced greater improvements in both wrist pain levels and functional abilities at the six-week follow-up compared to the prolotherapy group in the short-term follow-up.

Pain experienced by patients with DQT predominantly arises from resistance encountered by the APL and EPB tendons within the thickened compartment.[15] Among the conservative treatment options for DQT pain relief, steroid injection therapy consistently emerges as the most effective method in various studies.[5,16] Likewise, prior meta-analyses have indicated that steroid injections have shown superiority in alleviating pain in the short term among DQT patients.[17,18] While there is limited evidence to support the treatment of DQT, prolotherapy has become increasingly popular in recent years. Prolotherapy inhibits capsaicin-sensitive receptors and calcitonin gene-related peptides, contributing to nerve and tissue inflammation and edema. This helps to reduce neurogenic inflammation.[15] Additionally, prolotherapy functions as a nutrient at the injection site, prompting the body's natural tissue repair processes,[8] with reported pain improvement ranging from 70% to 80%.[15] Prior research has reported the efficacy of physiotherapeutic interventions, including APL and EPB strengthening, cryotherapy, and manual massage therapy, in reducing pain among patients with DQT.[9,10,19] In this investigation, we consider that the physiotherapy regimen administered to both injection groups might potentially support steroid and prolotherapy injections to reduce pain levels. The findings regarding pain in this study align with previous observations, supporting the short-term efficacy of steroid injections over prolotherapy in alleviating pain among DQT patients. The findings of this study align with previous observations, supporting the short-term efficacy of steroid injections over

prolotherapy in alleviating pain among DQT patients.

Interventional injection techniques, such as steroid injection or prolotherapy, are often pursued when conservative treatment modalities fail to address conditions such as DQT adequately.[8] However, a paucity of literature exists concerning the assessment of functional outcomes after such injections in DQT patients. Noteworthy studies include Vaghasia et al.'s findings of an 80% functional improvement following prolotherapy injections for DQT,[15] and Rowland et al.'s observations of functional enhancement based on DASH scores post-steroid injections.[17] Furthermore, Bhat et al. discovered comparable pain relief and functional outcomes between ultrasound-guided steroid injections and surgical release.[1] The systematic reviews conducted by Cavaleri et al. and Calloumas et al. highlighted the enhanced efficacy of combined orthotic intervention and corticosteroid injections compared to individual modalities.[18,19] Unlike prior research, Suwannaphisit et al. suggested that ketorolac injection, a nonsteroidal anti-inflammatory drug, yielded superior functional outcomes and grip strength compared to steroid injection during a 6-week follow-up period among patients with DQT. [20] In addition to injectional treatments, earlier research has demonstrated the short-term effectiveness of physiotherapy regimens for patients with DQT.[18,21] In this study, implementing a physiotherapy program comprising manual massage, cryotherapy, and APL and EPB strengthening exercises may have yielded significant improvements in short-term functional outcomes across both study groups. Despite extensive comparisons between steroid injection and thumb-supported static hand-wrist splinting in existing literature, there has been no direct comparison between prolotherapy and steroid injection in DQT patients in the short-term follow-up. Our study aims to address this gap by elucidating the superior functional efficacy of steroid injection over prolotherapy in managing DQT.

Limitations: This study is subject to several limitations, the foremost being the absence of long-term follow-up, which restricts our ability to ascertain the sustained efficacy of the interventions

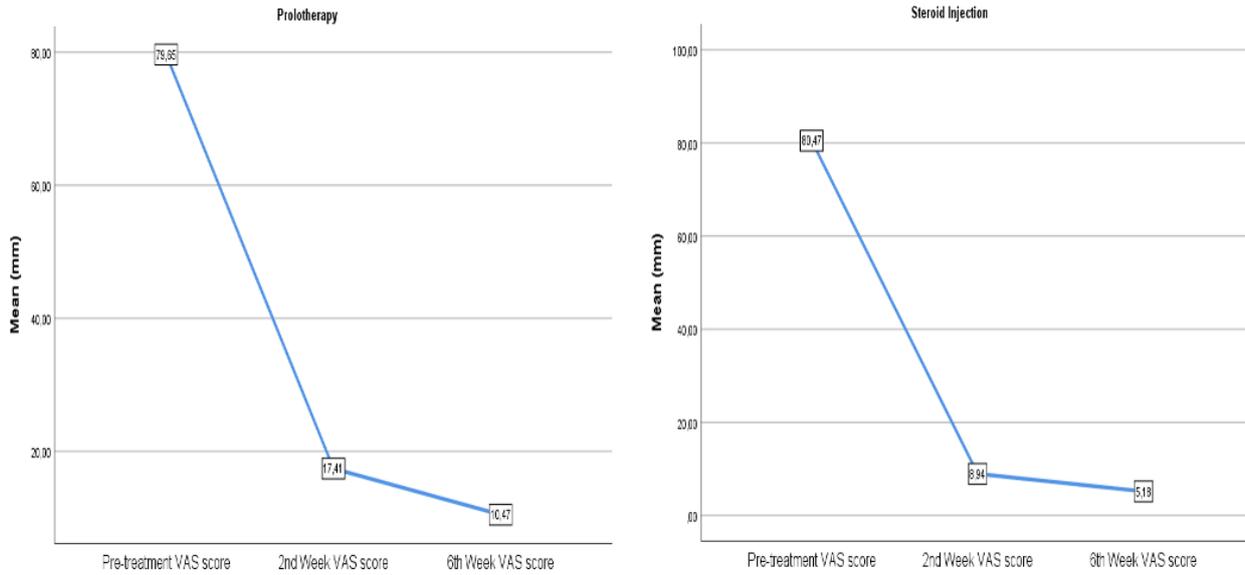


Figure 1. The alterations in VAS wrist pain scores over six weeks among groups.

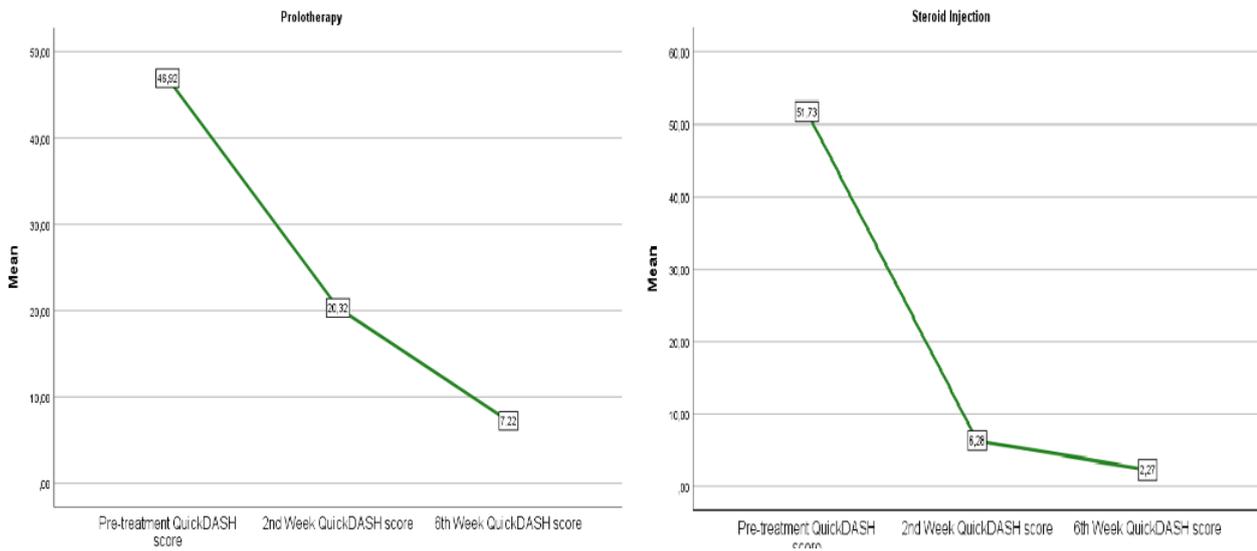


Figure 2. The alterations in QuickDASH function scores over six weeks among groups.

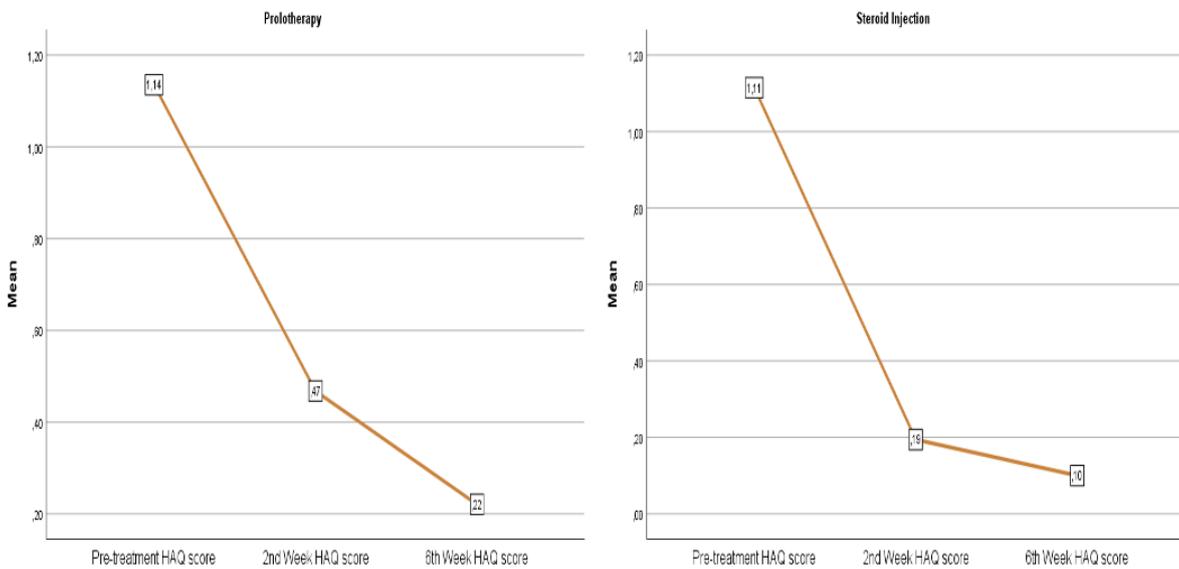


Figure 3. The alterations in HAQ function scores over six weeks among groups.

studied. Secondly, inadequate data collection regarding patient compliance with the prescribed home-based physiotherapy program, coupled with a lack of comprehensive exercise follow-up charts, limits our understanding of the potential impact of this adjunctive physiotherapy on treatment outcomes. These limitations emphasize the need for future research endeavours to incorporate extended follow-up periods and careful monitoring of patient adherence to prescribed physiotherapy protocols, thereby enhancing the robustness and applicability of study findings in clinical practice.

Conclusion

The results of this study shed light on the effectiveness of steroid injection versus prolotherapy in managing wrist pain and improving functional outcomes among DQT patients. Notably, the steroid injection group experienced greater improvements in wrist pain levels and functional abilities compared to the prolotherapy group, with these differences continued at the six-week follow-up. These results highlight the potential benefits of steroid injection over prolotherapy for patients suffering from DQT. The findings provide valuable insights to orthopedic practitioners, enabling them to make informed decisions regarding treatment options for their patients. Further research is necessary to explore the long-term outcomes and potential underlying mechanisms of these therapeutic effects on the prognosis of DQT.

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