

# Extracorporeal Shock Wave Therapy in Dupuytren's Disease

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## ABSTRACT:

### Extracorporeal shock wave therapy in dupuytren's disease

**Objective:** We investigated the use of Extracorporeal Shock Wave Therapy (ESWT) in patients with Dupuytren's Disease (DD) palmar nodules in an attempt to reduce the contracture, alleviate the pain (if any), increase the range of motion and quality of life, and delay a probable surgery in the long term.

**Methods:** Patients with DD who presented to our Hand Surgery Clinic were enrolled in the study, based on the our inclusion criteria. The treatment was applied by the same physician using the ESWT device once a week for six weeks. The patients were evaluated with the VAS score, Quick-DASH questionnaire, and MAYO wrist score and their grip strength were measured using a Jamar dynamometer.

**Results:** The mean age of the 23 patients included in the study was 51 years. There was a significant improvement in the second measurement of VAS and DASH scores in comparison to the preoperative values. The increase in the second and final follow-up measurements of the MAYO score and grip strength results in comparison to the preoperative values was found significant. The table-top test results turned negative in 16 patients.

**Conclusion:** We can suggest that ESWT in the early term can be preferred over the costly injection and surgical intervention options as it increases the quality of life and delays the recurrence of contractures.

**Keywords:** Extracorporeal shockwave therapy (ESWT), dupuytren's disease, treatment

## ÖZET:

### Dupuytren hastalığında ekstrakorporeal şok dalga tedavisi

**Amaç:** Çalışmamızda palmar nodülü bulunan Dupuytren hastalarında Ekstrakorporeal şok dalga tedavisinin (ESWT) kontraktürlerin azaltılmasına, ağrının azaltılmasına, eklem hareket açıklığına, yaşam kalitesine ve muhtemel cerrahi süresinin gecikmesine olan etkinliğini araştırılması amaçlandı.

**Yöntemler:** Hastanemiz El Cerrahisi kliniğine müracaat eden kabul kriterlerine uygun olan Dupuytren hastaları çalışma kapsamına alındı. Tüm hastalara aynı uzman tarafından haftada 1 kez olmak üzere 6 hafta süreyle ESWT uygulandı. Hastalar görsel analog skala (VAS), QuickDASH skorlaması, Mayo el bileği skorlaması, el dinamometre sistemleri ile kavrama gücü ölçümü, kullanılarak değerlendirildi.

**Bulgular:** Ortalama yaşı 51 olan 23 olgu çalışma kapsamına alındı. Tedavi öncesi ölçümlerine göre takiplerde VAS ve Quick-DASH skorlarında anlamlı iyileşme görüldü. MAYO skorlamasında ve kavrama gücünde takip ve son kontrol ölçümlerinde tedavi öncesine göre anlamlı artış saptandı. Olgularımızın 16'unda table -top testinin negatifleştiği görüldü.

**Sonuç:** Yaşam kalitesini arttırması ve kontraktür tekrarlamasını geciktirmesi nedeniyle daha maliyetli olan enjeksiyon ve cerrahi tedavi seçenekleri yerine erken dönemde kullanılabileceğini düşünmekteyiz.

**Anahtar kelimeler:** Ekstrakorporeal şok dalga tedavisi (ESWT), dupuytren hastalığı, tedavi

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## INTRODUCTION

Dupuytren's disease (DD), also known as palmar fibromatosis, is a proliferative fibroplasia of palmar aponeurosis. The condition is a major cause of morbidity which causes progressive and irreversible

flexion contractures in the fingers, which in turn affects patients' daily activities and reduces their quality of life. Although the etiology of DD is unknown, it has been shown to originate from an autosomal dominant inheritance with incomplete penetrance (1). Diabetes mellitus, long-term use of



**Figure-1:** ESWT application

anticonvulsants due to epilepsy, liver disease, HIV infection, complex regional pain syndrome, myocardial infarction, alcohol consumption and/or smoking, and trauma are the risk factors for DD. The disease is clinically categorized into early, active and advanced stages. In the early stage, the integrity of the skin is compromised. Nodules and cords are seen during the active stage. In the advanced stage, fibrocytes and contracture develop (2-4).

As the treatment modalities for the disease is still a matter of debate, medical therapy and physiotherapy modalities are preferred in the early stage while collagenase injection and radiotherapy, dimethyl sulfoxide, topical use of Vitamin A and E, hyperbaric oxygen application, corticosteroids, gamma-interferon and 5-fluorouracil applications are applied in the advanced stages. Surgical options are considered for joint contractures which may affect daily activities (5,6).

Despite the success of surgical interventions, alternative medical treatment methods have been investigated as the condition has a high recurrence rate after surgery. One of these alternative methods is the extracorporeal shock wave therapy (ESWT). We planned our current study taking another study from 2011 as a reference, whose hypothesis was based on the use of ESWT in DD (7). In the current study, we investigated the use of ESWT in patients with palmar nodules in an attempt to reduce the contracture,

alleviate the pain (if any), increase the range of motion and quality of life, and delay a probable surgery in the long term.

## MATERIAL AND METHOD

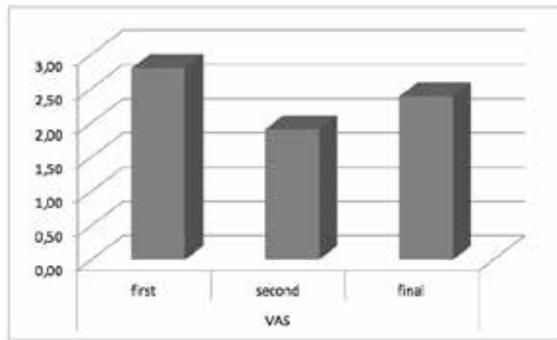
Approval for this study was provided by the Our Hospital's Ethical Committee. All patients signed a free and informed consent form. Patients with DD who presented to our Hand Surgery Clinic were enrolled in the study, based on the following inclusion criteria;

- Diagnosis of DD in a minimum of one finger,
- Patients who were able to attend the follow-up visits,
- Of 18 years of age or older,
- Those with a flexion of 30 degrees or less in the metacarpophalangeal (MP) joint and without a contracture in the proximal interphalangeal (PIP) joint

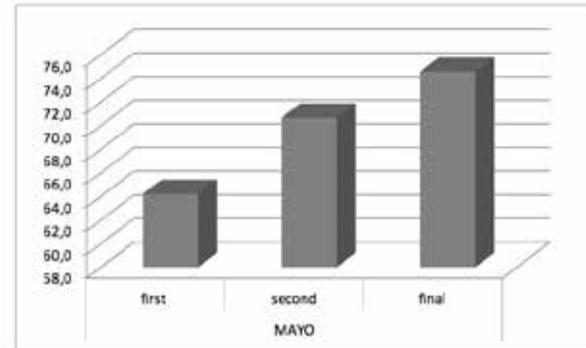
Exclusion criteria;

- Patients who were pregnant or planned of getting pregnant during the treatment period,
- Presence of a chronic, neurological or neuromuscular disorder that affect the hands,
- Patients who did not accept to receive a treatment for their contractures,
- Patients who were contraindicated for ESWT

Loss of extension in the involved MP, PIP, Distal interphalangeal (DIP) joints due to the contracture cords were evaluated in the examinations of the patients. All patients were applied the table-top test. The ESWT application was performed with the patient sitting on a gurney with the elbow flexed at 30 degrees, the forearm in supination and the probe of the ESWT device positioned 90 degrees tangent to the pain site. The physician who performed the ESWT and the patient had to wear earmuffs as the device operated with high noise. The application site was cleaned with povidone-iodine solution and gel was applied on the skin to enhance conductivity. None of the patients were performed local anesthesia. The regions with nodules were marked and the probe was moved around this mark in a circular fashion. The



**Graphic-1: First and Follow-up VAS results**



**Graphic-2: First and Follow-up MAYO results**

treatment was applied by the same physician using the ESWT device (Roland E-SWT 2; Elettronica Pagani srl, Milan, Italy) once a week for six weeks, run at a frequency of 6 to 8 Hz with 1700 pulse/session at 0.18 mj/cm<sup>2</sup>. No hot or cold therapy was performed following ESWT application. None of the patients encountered the rarely seen symptoms of redness, pain or swelling.

The patients were evaluated with the VAS score, Quick-DASH questionnaire, and MAYO wrist score and their grip strength were measured using a Jamar dynamometer (Sammons Preston, Inc., Bolingbrook, IL, USA). Grip strength of the patients was measured three times with one minute intervals between measurements and the average of the three measurements was noted.

The mean, standard deviation, median, minimum and maximum values were considered in the descriptive statistical analysis of our data. Analysis of the repeating measurements was performed with the Wilcoxon test. Analyses were performed using the SPSS 22.0 software.

## RESULTS

The mean age of the 23 (17 male, 6 female) patients included in the study was 51 (range: 20 to 74) years. The five patients who had bilateral involvements were all males. Fourteen cases had contracture in the fourth finger, nine had in the third and five had in the fifth finger.

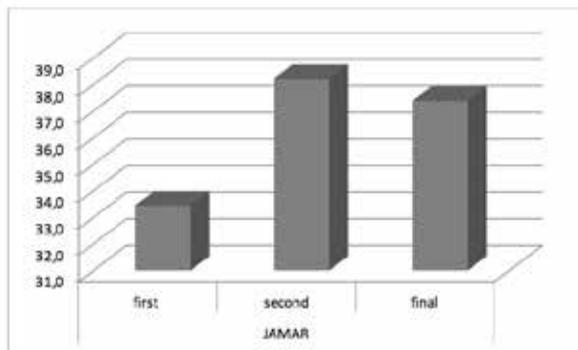
There was a significant improvement in the second

measurement of VAS and DASH scores in comparison to the preoperative values ( $p < 0.05$ ), however, no statistically significant difference was detected at the final follow-up measurements (Table-1, Graphic-1). On the other hand, the increase in the second and final follow-up measurements of the MAYO score and grip strength results in comparison to the preoperative values was found significant. However, no significant difference was observed between the second and final follow-up measurements (Graphic-2,3). The table-top test results turned negative in 16 patients.

## DISCUSSION

In the management of DD, which still lacks a universal treatment protocol and is usually managed with injection and surgical interventions in the advanced stage, we achieved a significant functional recovery in the early term using ESWT. In accordance with the literature, the prevalence of DD was higher in our male population and peaked at the fifth decade. It has been reported that the Dupuytren contracture mostly involves the fourth finger (8,9). In our study, the fourth finger was either involved alone or together with other fingers in 14 patients. Six of our patients had a positive family history.

The gold standard in the surgical management of DD is the excision of the affected tissue and the correction of finger contractures if any (10). In a systematic review by Werker et al., it was shown that the rate of success in correction of the



**Graphic-3: First and Follow-up Grip-Strength results**

contractures varied between 15% and 96% while the rate of recurrence was found between 12% and 100%, following surgeries performed at different stages of the disease (11). In another systematic review by Chen et al., the rate of recurrence was 12 to 39% in a follow-up period of 1.5 to 7.3 years following open partial fasciectomy, 50 to 58% in a follow-up period of 3 to 5 years following needle aponeurotomy and 10 to 31% in a follow-up period of 3 months to 4 years following collagenase clostridium histolyticum (CCH) treatment (12).

Treatment with CCH (Xiaflex) has been clinically approved by the US Food and Drug Administration (FDA). Collagenase injections are also called enzymatic fasciotomy. After eight years of follow-up of eight enzymatic fasciotomy patients, Watt et al. found that the contracture had increased by a mean of 23° in the MP joint (n=6) and 60° in the PIP joint (n=2) (13). Although the authors had observed recurrences throughout their follow-up, they underlined the fact that these were less severe contractures than the original ones. In another study, McCarthy et al. concluded that enzymatic fasciotomy was not superior to surgical fasciotomy (14).

There is no study in the literature investigating the use of ESWT in the management of DD. When we look into the use of ESWT in other conditions, we see that Knobloch et al. (7). The authors also hypothesized that the technique could be applied in a similar fibromatous disease such as DD. The literature holds no validated questionnaire designed for DD. The DASH questionnaire, being a subscale of the SF-36, has a reasonable validity. We used this questionnaire in our study (15). In an animal model for Peyronie’s disease 2000 shockwaves were applied (16). Used the technique on 44 patients

**Table-1: Wilcoxon test p<0.05**

	Min-Max	Median	Range±SS	First measurement	Second measurement
<b>VAS</b>					
first	0.0 - 9.0	2.0	2.8±3.2		
second	0.0 - 8.0	0.0	1.9±2.6	0.005	
final	0.0 - 8.0	2.0	2.4±2.5	0.142	0.136
<b>DASH</b>					
first	0.0 - 79.5	15.0	24.6±26.3		
second	0.0 - 79.5	9.1	20.4±26.0	0.040	
final	0.0 - 65.9	11.4	23.0±24.9	0.271	0.396
<b>MAYO</b>					
first	25.0 - 100.0	65.0	64.2±18.3		
second	30.0 - 100.0	75.0	70.7±20.4	0.048	
final	25.0 - 100.0	77.5	74.5±20.6	0.024	0.419
<b>JAMAR</b>					
first	13.0 - 52.0	37.3	33.4±10.5		
second	8.0 - 98.0	38.0	38.2±17.9	0.038	
final	14.6 - 60.3	42.0	37.4±13.1	0.039	0.416
<b>JAMARL</b>					
first	11.3 - 50.6	36.0	32.4±10.0		
second	10.0 - 91.3	39.3	38.4±16.0	0.004	
final	15.0 - 55.6	37.3	36.5±12.1	0.016	0.768

with Peyronie's disease in their controlled study and achieved a reduction in pain, significant recovery in erectile function and an increase in quality of life (17). The same study clinical randomized controlled trial in Peyronie's disease shock waves reduced pain significantly and improved erectile function and quality of life (18).

In another study of theirs, Knobloch et al. reported reduction of pain and softening of the nodules in the third month following application of ESWT on six patients with painful plantar fibromatosis (Ledderhose's disease) (19).

The limitations of our study are its short follow-up period and small number of patients. However, by sharing our significant early-term results, we wanted to pave the way for future studies with larger series and longer follow-up periods. When similar fibroproliferative diseases are taken into account, it

can be contemplated that ESWT can be used in Peyronie's disease, Garrod's pads, and Ledderhose's disease.

## CONCLUSION

A definite treatment for DD still does not exist. Corrective surgeries may loosen the contractures, lessen the symptoms and increase the quality of life. Recurrence is a common and inevitable complication of all treatment modalities available. We can suggest that ESWT in the early term can be preferred over the costly injection and surgical intervention options as it increases the quality of life and delays the recurrence of contractures. We believe a valid treatment protocol for ESWT should be established with further randomized controlled series with long-term outcomes.

## REFERENCES

- Hu FZ, Nystrom A, Ahmed A, Palmquist M, Dopico R, Mossberg I, et al. Mapping of an autosomal dominant gene for Dupuytren's contracture to chromosome 16q in a Swedish family. *Clin Genet* 2005; 68: 424-9. [\[CrossRef\]](#)
- McGrouther DA. Dupuytren's contracture. In: Green DP, Hotchkiss RN, Pederson WC, eds. *Operative Hand Surgery*. 4<sup>th</sup> ed. New York, NY: Churchill Livingstone; 1999:5 63-91.
- Umlas ME, Bischoff RJ, Gelberman RH. Predictors of neurovascular displacement in hands with Dupuytren's contracture. *J Hand Surg [Br]* 1994; 19: 664-6. [\[CrossRef\]](#)
- Short WH, Watson HK. Prediction of the spiral nerve in Dupuytren's contracture. *J Hand Surg Am* 1982; 7: 84-6. [\[CrossRef\]](#)
- Bansal V, Naidu SH. Dupuytren's disease. *Curr Opin Orthop* 2005; 16: 236-9. [\[CrossRef\]](#)
- Badalamente MA, Hurst LC, Hentz VR. Collagen as a clinical target: nonoperative treatment of Dupuytren's disease. *J Hand Surg* 2002; 27A: 788-98. [\[CrossRef\]](#)
- Knobloch K, Kuehn M, Vogt PM. Focused extracorporeal shockwave therapy in Dupuytren's disease--a hypothesis. *Med Hypotheses* 2011; 76: 635-7. [\[CrossRef\]](#)
- Dominguez-Malagon HR, Alfeiran-Ruiz A, Chavarria-Xicotencatl P, Duran-Hernandez MS. Clinical and cellular effects of colchicine in fibromatosis. *Cancer* 1992; 69: 2478-83. [\[CrossRef\]](#)
- Luck JV. Dupuytren's contracture; a new concept of the pathogenesis correlated with surgical management. *J Bone Joint Surg Am* 1959; 41-A: 635-64. [\[CrossRef\]](#)
- Badalmonte MA, Hurst LL. Enzyme injection as non-surgical treatment of Dupuytren's disease. *J Hand Surg Am* 2000; 25: 629-36. [\[CrossRef\]](#)
- Werker PMN, Pess G, van Rijessen AL, Denkler K. Correction of contracture and recurrence rates of Dupuytren's contracture following invasive treatments: the importance of clear definitions. *J Hand Surg Am* 2012; 37: 2095-105. [\[CrossRef\]](#)
- Chen NC, Srinivasan RC, Shauver MJ, Chung KC. A systematic review of outcomes of fasciotomy, aponeurotomy, and collagenase treatments for Dupuytren's contracture. *Hand (N Y)* 2011; 6: 250-5. [\[CrossRef\]](#)
- Watt A, Curtin C, Hentz V. Collagenase injection as nonsurgical treatment of Dupuytren's disease: 8-year follow-up. *J Hand Surg Am* 2010; 35: 534-9. [\[CrossRef\]](#)
- McCarthy D. The long-term results of enzymic fasciotomy. *J Hand Surg Br* 1992; 17: 356. [\[CrossRef\]](#)
- Soo-Hoo NF, McDonald AP, Seiler JG, McGillivray GR. Evaluation of construct validity of the DASH questionnaire by correlation to SF-36. *J Hand Surg Am* 2002; 27: 537-41. [\[CrossRef\]](#)
- Andrade E, Cortez I, Claro J, Pompeu E, Leite K, Paranhos M, et al. Preliminary findings from a new animal model for Peyronie's disease involving extracorporeal shock waves. *BJU Int* 2009; 103: 1104-6. [\[CrossRef\]](#)
- Srirangam SJ, Manikandan R, Hussain J, Collins GN, O'Reilly PH. Long-term results of extracorporeal shockwave therapy for Peyronie's disease. *J Endourol* 2006; 20: 880-4. [\[CrossRef\]](#)
- Palmieri A, Imbimbo C, Longo N, Fusco F, Verze P, Mangiapia F, et al. A first prospective, randomized, double-blind, placebo-controlled clinical trial evaluating extracorporeal shock wave therapy for the treatment of Peyronie's disease. *Eur Urol* 2009; 56: 363-9. [\[CrossRef\]](#)