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Original Research

Recurrence and Factors Associated with Recurrence in Dupuytren's Disease Patients Treated with Percutaneous Needle Aponeurotomy

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ABSTRACT

Abstract

Objective: Dupuytren›s disease (DD) is a progressive condition of the palmar fascia that limits finger extension. Percutaneous needle aponeurotomy has become increasingly popular in recent years. Despite appropriate treatment, recurrence is common. This study investigates recurrence development following percutaneous needle aponeurotomy and evaluates the relationship between patient characteristics, disease-related factors, and recurrence in DD.

Methods: This retrospective study included 98 fingers from 41 patients diagnosed with Dupuytren›s disease who underwent percutaneous needle aponeurotomy at a hand surgery outpatient clinic between 2012 and 2022. Patient records were reviewed, and characteristics such as age, gender, occupation, and dominant hand were documented. The stage of DD was determined preoperatively. Functional outcomes were assessed using a subjective satisfaction scale, and postoperative complications and recurrences were analyzed.

Results: Of the 41 patients, 32 (78%) were male and 9 (22%) were female. The mean age was 62 years (range, 44–82 years), and the mean follow-up period was 45 months (range, 9–138 months). Postoperative evaluations showed that 17 patients (41.5%) had excellent results, 19 patients (46.3%) had good results, and 5 patients (12.2%) had fair results. Recurrence of Dupuytren›s disease occurred in 24 (58.5%) patients. Among all patients, 30 (73.2%) were willing to undergo reoperation, regardless of recurrence. The recurrence rate was significantly lower after percutaneous needle release in stage 1 DD ($p = 0.011$).

Conclusion: Percutaneous needle aponeurotomy offers high patient satisfaction and early discharge benefits, making it a preferred option for surgeons, despite the potential for recurrence. While the classification of recurrence as a complication is debated, it is a recognized outcome of progressive DD. Regardless of patient characteristics, performing percutaneous needle aponeurotomy at an early stage can significantly reduce recurrence rates.

Keywords: Dupuytren, percutaneous needle aponeurotomy, recurrence

INTRODUCTION

Dupuytren's disease (DD) is a chronic condition marked by progressive fibrosis of the palmar aponeurosis, resulting in flexion contracture of the fingers [1]. Genetic predisposition plays a role in the development of this insidious disease, but the exact underlying causation remains unclear [2,3]. Several treatment options are currently available for DD, which is still regarded as idiopathic, including needle aponeurotomy, collagenase injection, and open fasciectomy [4]. Minimally invasive techniques such as percutaneous needle aponeurotomy and collagenase injection have gained popularity and are often preferred by hand surgeons over open surgery due to the advantages of fewer complications, simpler technique and faster postoperative recovery [5,6]. Despite the success of percutaneous needle aponeurotomy, the major challenge remains the recurrence of the disease. Due to the progressive nature of DD, recurrence is common, regardless of the treatment method.

This study investigates potential factors influencing recurrence in patients who have undergone percutaneous needle aponeurotomy. By examining demographic characteristics and disease-related factors in patients with recurrence, we aim to identify any factors that may contribute to the recurrence of DD.

MATERIALS AND METHODS

Ethical approval was obtained from the ethics committee of 2024/6242 University for this study. The study was conducted in a single centre and was retrospective.

Main Points

- Dupuytren's disease is a progressive, chronic disease that causes dysfunction rather than pain in the hand.
- Percutaneous needle aponeurotomy is a more comfortable procedure than open surgery with rapid results.
- Although percutaneous needle aponeurotomy provides satisfactory functional results, recurrent disease may occur.
- Patients should be informed about the recurrence in percutaneous needle loosening in late stage Dupuytren's disease.

Patient Selection

Patients who were admitted to the hand surgery outpatient clinic between 2012 and 2022 with a diagnosis of Dupuytren's disease and underwent percutaneous aponeurotomy surgery, with a minimum follow-up period of 9 months and older than 18 years of age, and patients with complete file records (hospital electronic file) and regular follow-up (Dupuytren follow-up file) were included in the study. Patients who were diagnosed with Dupuytren's disease but underwent open fasciectomy, had incomplete hospital records or irregular follow-up and could not be reached, and patients with a history of previous hand surgery or other hand pathology in addition to Dupuytren's disease were excluded from the study.

Of the 113 patients with Dupuytren's disease identified in our clinic records, 41 met the inclusion criteria, and 98 fingers of these patients were evaluated.Patients were routinely evaluated in the hand surgery clinic and diagnosed with DD through clinical examination. If there were no additional complaints, no further tests or imaging methods were performed. Demographic data, including age, gender, occupation involving repetitive hand use, and dominant hand, were recorded. A detailed medical history was also taken, covering conditions associated with DD, such as diabetes mellitus, and lifestyle factors like smoking, alcohol use, and chronic medication use. Conditions with similar pathogenesis to DD, such as Ledderhose disease, Garrod's pads, and Peyronie's disease, were documented. Hand examinations were conducted to assess the presence of cords and nodules related to DD, and the affected fingers were identified. The disease stage was classified preoperatively using the Tubiana classification [7] (Table 1). The percutaneous needle release technique was explained to all patients, and written and verbal consent for surgery was obtained.Patient satisfaction was assessed using a subjective satisfaction score based on the self-assessment of function, activities of daily living, and quality of life after orthopedic intervention, with outcomes categorized as excellent, good, fair, or poor. Patients who experienced recurrence were identified, and the relationships between recurrence and factors such as preoperative disease stage, age, gender, presence of additional involvement, occupation, smoking, medication use, and comorbidities were analyzed. Functional outcomes for patients who developed recurrence were examined, and their interest in repeat surgery was recorded. The average time to recurrence was calculated, and postoperative complications were documented.

Table 1. Tubiana classification [7]

Stage	Deformity
Stage 0	No extension deficit
N	N describes a nodul, but without contracture
Stage 1	contracture between 0-45 degrees
Stage 2	contracture between 45-90 degrees
Stage 3	contracture between 90-135 degrees
Stage 4	contracture greater than 135 degrees

Surgical Technique

The surgery was performed under local anesthesia without the use of a tourniquet. The hand to be treated was washed with an antiseptic solution and then painted with Betadine before being covered with sterile drapes. The Dupuytren cords and nodules were marked with a pen (Figure 1-2). Local anesthesia was applied over the cord and at the needle entry site subcutaneously. The anesthesia was applied very superficially to prevent nerve damage, a possible complication during the intraoperative percutaneous needle release. Throughout the procedure, feedback from the patient was sought to monitor for potential nerve damage. To prevent another complication of percutaneous aponeurotomy, skin tears, a minimum distance of 5 mm was maintained between release sites. The releases were performed at 2 or 3 levels and applied from distal to proximal. To avoid flexor tendon injury, the needle was placed in the release area, and the patient was asked to perform finger flexion and extension movements to determine the release level and protect the flexor tendon. We used three basic methods movements: clean, perforate and sweep. Needle once the needle was directed towards the dermis. Tangentially and in a plane between the dermis and the cord improved transversely at the level (cleared) the portal is at least as wide as the palpable cord width. Needle vertically reorientated, inclination transverse and slightly reciprocating (perforate) used to define movement, scope and surface cord geometry. Once the cord geometry defined, the needle tip inclination was used repeatedly sweep or scrape the surface of the cord. In the meantime fingers were held in extension position, We changed the needles at frequent intervals to maintain its sharpness needle. After releases were made in several areas, the fingers were hyperextended to free any remaining cord attachments [6] (Figure 3-4). We inject 1cc betamethasone in the released area to prevent the recurrence of the cord. The needle entry sites were covered with gauze, and the hands were wrapped with bandages, to be removed the next day. Patients were discharged on the same day. They were informed about possible early complications such as infection, hematoma, and prolonged edema, and provided with relevant advice.We recommend patients to use an extension splint at night for 2 months. We retrospectively used follow-up data from outpatient clinic visits at 2 weeks, 6 weeks, 3 months, 6 months, and 12 months postoperatively.

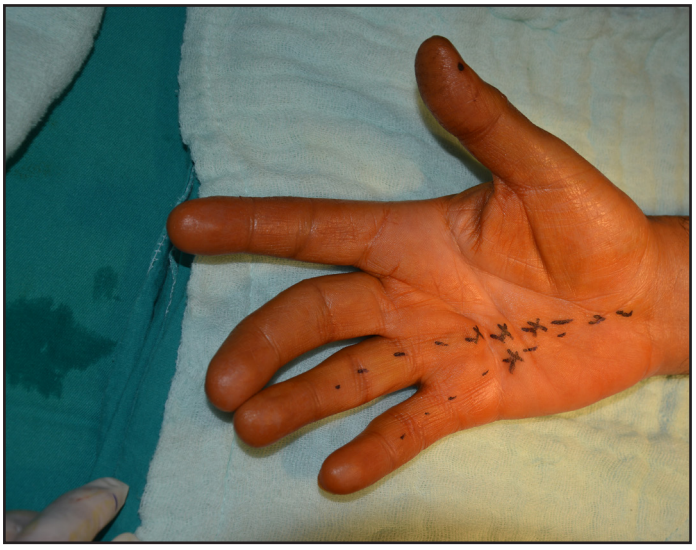

Figure 1. The 4th and 5th fingers of the right hand affected by Dupuytren's disease. Preoperative marking of cords and nodules.

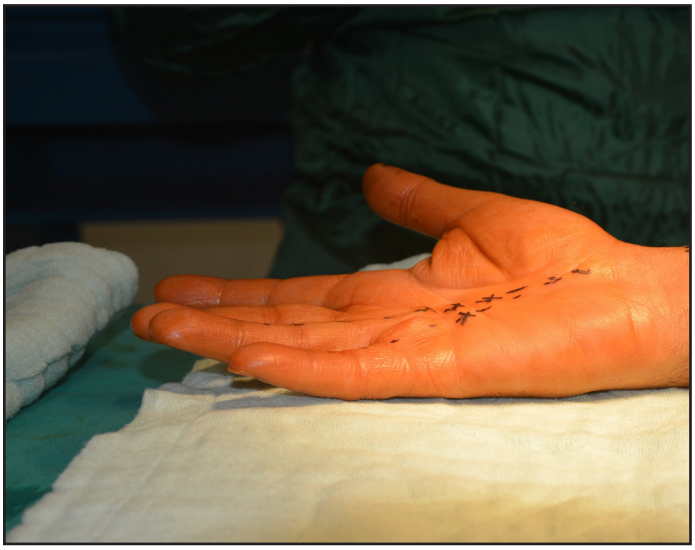

Figure 2. Lateral profile view of the hand. Early stage flexion contracture

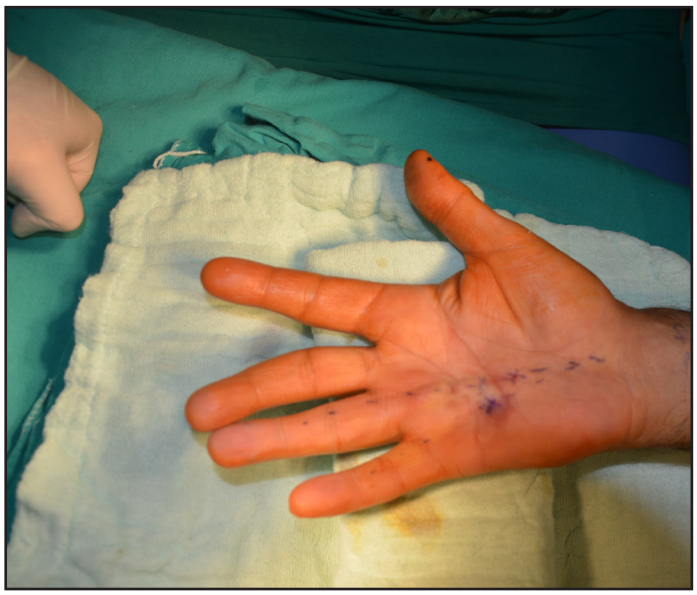

Figure 3. Anterior view of the hand after percutaneous needle release

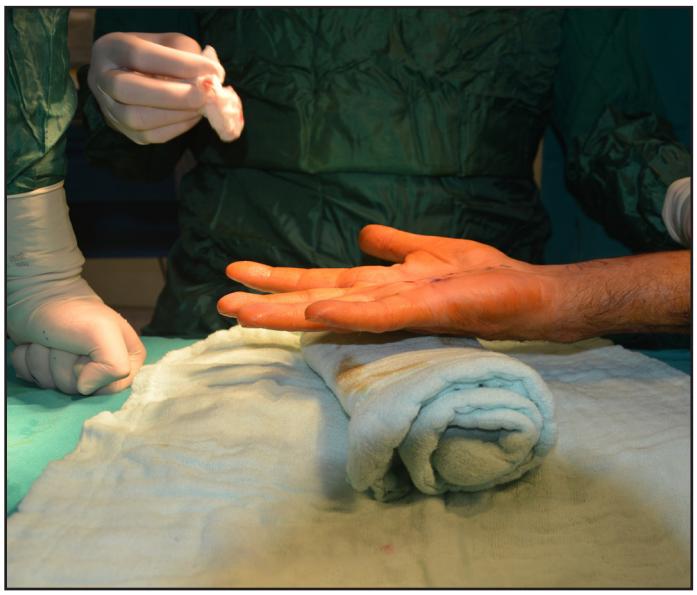

Figure 4. Gain of extension in the fingers after release procedure

Statistical Analysis

Qualitative variables were summarized as numbers (percentages). The normality of the distribution of quantitative variables was assessed using the Shapiro-Wilk test. Quantitative data that did not show a normal distribution were summarized as median (minimum-maximum), while those that showed a normal distribution were summarized as mean ± standard deviation. For statistical analysis, categorical variables were compared using Pearson's chi-square test, Yates' corrected chi-square test, and Fisher's exact chi-square test. For quantitative variables, the Mann-Whitney U test was used for comparisons between two independent groups when appropriate. A p-value of <0.05 was considered statistically significant in the analyses. All analyses were performed using IBM SPSS Statistics 26.0 for Windows (New York, USA). Within the scope of the study, it is aimed to evaluate the relationship between the development of recurrence after percutaneous needle aponeurotomy and the characteristics of patients, disease-related factors, and recurrence in Dupuytren's disease. According to the theoretical power analysis conducted using the G*Power 3.1 program, in comparing the recurrence of postoperative outcomes with the preoperative clinical stage, one of the significant output variables, the Type I error rate (alpha) is 0.05, the power of the test (1-beta) is 0.8, the effect size is 0.5, and the degrees of freedom (df) is 2. Therefore, the minimum sample size required to find a significant difference using the multigroup: Goodness of fit test should be a total of 39 patients.

RESULTS

Of the 41 patients, 32 (78%) were male, and 9 (22%) were female. The mean age was 62 years, ranging from 44 to 82 years. The mean follow-up period was 45 months, with a range from 9 to 138 months. The dominant hand was the right in 38 patients (92.7%) and left in 3 patients (7.3%). The demographic data, including gender, habits, comorbidities, and findings related to DD, are detailed in Table 2. During follow-up, 24 out of 41 patients (58.5%) experienced a recurrence of DD and a total of 98 fingers were operated. And recurrence was found in 38 fingers. Preoperative stage 3 disease was found in 15 fingers with recurrence, while 18 fingers had stage 2 and 5 fingers had stage 1 DD. The mean time to recurrence was 30.4 months, ranging from 2 to 84 months. Clinical outcomes showed that 30 of the 41 patients (73.2%) were willing to undergo reoperation, irrespective of recurrence status. The relationship between recurrence and patient characteristics is detailed in Table 3. Postoperative recurrence was higher in males (82.6%) compared to females (17.4%), but this difference was not statistically significant ($p = 0.702$). Recurrence rates were similar among laborers, office workers, and housewives ($p = 0.911$). Although recurrence rates were higher in patients with the right hand as the dominant hand, this difference was not statistically significant ($p = 0.254$). There was also no significant difference in recurrence rates among patients with right, left, or bilateral finger involvement ($p = 0.684$).In terms of preoperative clinical stage, the rate of no recurrence in stage 1 patients was 58.8%, while the recurrence rate was 20.8%, and

this difference was statistically significant (p = 0.011). There was no statistically significant difference in recurrence rates for patients in stages 2 and 3.Although the recurrence rate was higher in patients with diabetes mellitus (DM), this difference was borderline statistically significant (p = 0.052). No significant difference was observed between patients with and without postoperative recurrence in terms of comorbidities and family history (p = 0.724 and p = 0.679, respectively). The presence of additional lesions did not affect postoperative recurrence (p = 1.000). Although the recurrence rate was higher in smokers, the difference was not statistically significant (p = 0.123). There was no significant difference in terms of medication use (p = 0.724).When the subjective satisfaction results of the patients were analyzed, 17 patients (41.5%) had excellent results, 19 patients (46.3%) had good results, and 5 patients (12.2%) had fair results. No patient reported poor results after surgery. No early complications were observed in any patient. In 2 patients (4.9%), loss of sensation in the operated area and web space was observed as a late complication; however, the clinical results of these patients were rated as 'good' by subjective evaluation. No significant difference was observed in terms of reoperation demand with postoperative recurrence (p = 0.736). Patients with recurrence were willing to undergo reoperation.

Table 2. Demographic data of the patients and data for Dupuytren's disease

	n	%
Gender		
Male	32	78.0
Woman	9	22.0
Occupation		
Labourer	20	48.8
Office Worker	13	31.7
Working at home	8	19.5
Smoking		
Positive	14	34.1
Negative	27	65.9
Diabetes		
Positive	18	43.9
Negative	23	56.1
Family history		
Positive	7	17.1
Negative	34	82.9
Dominant Hand		
Right	38	92.7
Left	3	7.3
Dupuytren'sDisease side		
Right	14	34.1
Left	12	29.3
Bilateral	15	36.6
Clinical Stage		
Stage 1	15	36.6
Stage 2	19	46.3
Stage 3	7	17.1
Additional lesions (Gorrod' pad, Peyronie, Ledderhose)		
Positive	10	24.4
Negative	31	75.6

Table 3. Recurrence and its relation with patient characteristic

	Recurrence n(%)		p
	Positive	**Negative**	
Age			
Under 55 years	7 (29.2%)	2 (11.8%)	0.262
Over 55 years	17 (70.8%)	15 (88.2%)	
Gender			
Male	19 (79.2%)	13 (76.5)	0.702
Female	5 (20.8%)	4 (23.5)	
Dominant Hand			
Right	21 (87.5%)	17 (100.0%)	0.254
Left	3 (12.5%)	0 (0.0%)	
Occupation			
Labourer	12(50.0%)	8 (47.1%)	
Office Worker	7(29.2%)	6 (35.3%)	0.911
Working at home	5(20.8%)	3 (17.7%)	
Diabetes			
Positive	7 (29.2%)	11 (64.7%)	0.052
Negative	17 (70.8%)	6 (35.3%)	
Smoking			
Positive	11 (45.8%)	3 (17.6%)	0.123
Negative	13 (54.2%)	14 (82.4%)	
Clinical Stage			
Stage 1	5 (20.8%)	10 (58.8%)	
Stage 2	12 (50.0%)	7 (41.2%)	**0.01**
Stage 3	7 (29.2%)	0 (0.0%)	
Family history			
Positive	5 (20.8%)	2 (11.8%)	0.679
Negative	19 (79.2%)	15 (88.2%)	
Additional lesions			
Positive	6 (25.0%)	4 (23.5%)	1.0
Negative	18 (75.0%)	13 (76.5%)	
Hand affected			
Right	7 (29.17)	7 (41.18)	
Left	8 (33.33)	4 (23.53)	0.684
Bilateral	9 (37.50)	6 (35.29)	
Medications			
Has	13 (54.17)	11 (64.71)	0.724
None	11 (45.83)	6 (35.29)	
Comorbidity			
Has	13 (54.17)	11 (64.71)	0.724
None	11 (45.83)	6 (35.29)	

DISCUSSION

Postoperative complications of Dupuytren's surgery include infection, hematoma, digital nerve damage, and flexor tendon injuries. However, the recurrence of the deformity remains a topic of debate, as it is unclear whether it should be classified as a complication or a natural progression of the disease. The term "residual deformity" has been introduced for patients whose deformity persists after surgery or who experience recurrence within one year [8]. Even in the presence of a residual lesion, functional problems can persist. Recurrence is typically defined as an extension loss of more than 20 degrees or the presence of a palpable cord. The recurrence rate after percutaneous aponeurotomy has been reported in the literature to range from 9% to 65%, and it has been suggested that this rate could rise to as high as 85% in long-term follow-ups [9]. In a study, it was reported that recurrence after open surgery, injection and percutaneous release was most common in percutaneous release [10]. Although there are studies in the literature with relatively low rates of 12% after percutaneous aponeurotomy, open surgery has been found to be better in terms of recurrence in large-scale systematic reviews [11,12]. In our study, recurrence was observed in 24 patients (58.5%), and sensory loss was noted in 2 patients (4.88%). We found that the recurrence rate was lower after percutaneous aponeurotomy in Stage 1 DD ($p = 0.01$). When considering both modifiable and non-modifiable characteristics, the recurrence rate increases significantly after surgeries performed with percutaneous needle aponeurotomy after stage 1. In the literature, there are systematic reviews investigating recurrence rates and presenting results, but research on the causes is very limited [9].

A study comparing patients with Dupuytren's disease who underwent open fasciectomy and percutaneous needle aponeurotomy found similar levels of postoperative patient satisfaction [13]. Another study evaluating functional outcomes reported that the passive extension range was better in patients who underwent limited fasciotomy compared to those who had percutaneous release, although satisfaction scores for both procedures were similar. Notably, patients who had needle aponeurotomy achieved better Visual Analogue Scale (VAS) scores [14]. In a study where the reoperation rate for percutaneous surgery was reported as 29.7%, it was emphasized that patient satisfaction remained high and that patients had a positive attitude towards undergoing surgery again [15]. In our study, the satisfaction rate was approximately 90% based on subjective scoring, and 73.2% of patients expressed a willingness to undergo surgery again. In the literature, high satisfaction rates of up to 75% have been reported for the percutaneous aponeurotomy procedure [16]. Despite the relatively high rates of recurrence, percutaneous needle aponeurotomy is considered a successful method for many patients due to its advantages.

Dupuytren's disease is closely associated with factors such as alcohol use, smoking, antiepileptic medications, and diabetes, with family history being significant due to genetic factors [17]. A recent study confirmed that diabetes is a significant risk factor for Dupuytren's disease [18]. In our study, Dupuytren's disease was more common in patients with diabetes. Although the recurrence rate was higher in patients with diabetes compared to those without, this difference was not statistically significant. The lack of statistical significance may be related to the sample size; however, despite a higher recurrence rate in smokers, no positive correlation with recurrence was established. As we had no patients who used alcohol, this factor could not be evaluated.

Repetitive handwork, exposure to vibration, male gender, and a family history of the disease are also recognized risk factors for DD [19]. There is also an association between Dupuytren's disease and Peyronie's and Ledderhose diseases, which share similar pathogenesis [20]. However, studies exploring whether these factors also predict recurrence after surgery are limited. A study on recurrence after fasciectomy found that male gender, family history, onset of the disease before age 50, additional involvement, particularly Garrod's pads, and bilateral disease presence were significant for recurrence and associated with approximately threefold higher recurrence rates [21]. In patients who underwent partial fasciectomy, the onset of the disease at an older age was identified as a factor for recurrence [22]. In our study, no significant recurrence was detected in relation to family history of Dupuytren's disease or bilateral hand involvement. Consistent with the epidemiology of Dupuytren's disease, the number of primary cases was higher in males; however, no association was found between male gender and recurrence after percutaneous needle aponeurotomy. Among the 10 patients with Peyronie's disease, Ledderhose disease, or Garrod's nodules, which have similar pathogenesis to DD, there was no significant relationship in terms of recurrence. Additionally, no difference in recurrence rates was observed between workers and household employees in terms of repetitive hand use and vibration exposure.

This study has several limitations. It is primarily a single-center

study so, the patient and included finger numbers were limited and therefore power of the study was low . Secondly, it has a retrospective nature, and the follow-up period for detecting recurrence cases is relatively short thus it does not give us a cause and effect relation.. Finally, in Dupuytren's disease diagnosed through examination, there may be incomplete evaluations, and due to changes in the outpatient clinic doctors recording the data, there could be discrepancies in the extension measurements during preoperative staging.

In conclusion, DD is an insidious, progressive, and chronic condition. The percutaneous needle aponeurotomy procedure used in treatment offers high patient satisfaction. However, due to the nature of this disease, recurrence is quite common. The most significant factor affecting recurrence is the stage of Dupuytren's disease rather than patient characteristics such as age, gender, comorbidities, additional involvement, and bilateral involvement. Therefore, especially in advanced stage cases, patients should be informed about the risk of recurrence as part of patient management. Percutaneous needle aponeurotomy is quite safe in Stage 1 Dupuytren's surgery.

CONCLUSION

Percutaneous needle aponeurotomy is an effective treatment for Dupuytren's disease, offering high patient satisfaction and minimal invasiveness. However, recurrence remains a common outcome, particularly in advanced stages of the disease. This study highlights that performing the procedure at an early stage can significantly reduce recurrence rates, irrespective of patient demographics or comorbidities. These findings underscore the importance of early intervention and patient education about the potential for recurrence in managing Dupuytren's disease.

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Informed Consent: Written informed consent was obtained from each patient following a detailed explanation of the study objectives and protocol.

Ethical Approval: Ethical approval was obtained from the ethics committee of 2024/6242 University for this study.

Author Contributions: Conception: M, K; M, K - Design: M, K Analysis and/or Interpretation: M, K; M, K; HU, Ö; İ, BÇ - Literature: G, T; HU, Ö - Critical Review: E, E; O, A - Writing: HU, Ö - Supervision: K, E- Materials: E, Ö; E, E; İ, BÇ- Data Collection: E, Ö; G, T; O, A

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