

Evaluation of range of motion after fasciectomy in Dupuytren's contracture and the effect of rehabilitation*

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* A preliminary cohort of 21 patients was presented at the TPRED Congress (15–19 October 2025), and the study was subsequently expanded to 41 patients.

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ABSTRACT

Aims: Dupuytren's disease affects the palmar fascia and causes a movement disorder. Treatment varies considerably, and many treatment options exist. This study aimed to determine the extent to which joint range of motion (ROM) increases after surgery and how postoperative rehabilitation affects functional outcomes.

Materials and Methods: Forty-one patients who underwent fasciectomy for Dupuytren's contracture were analyzed, with a mean follow-up of 12 months. We collected demographic details, affected fingers, surgical techniques, physical therapy status after surgery, and both preoperative and late postoperative joint ROM values. We measured ROM by calculating the total flexion-extension arc of the metacarpophalangeal and proximal interphalangeal joints with a goniometer. We used paired-samples and independent-samples t-tests for statistical analysis.

Results: The study included 36 male and 5 female patients with a mean age of 65.7 ± 7.8 years. The fourth and fifth fingers were most often affected. The mean increase in postoperative ROM was $37.12 \pm 6.45^\circ$ for patients receiving physical therapy and $29.18 \pm 15.55^\circ$ for those who did not, showing a significant difference between the two groups (p value = 0.029). In both groups, the ROM gains achieved after surgery were mostly maintained at late follow-up.

Conclusion: Functional ROM achieved after fasciectomy for Dupuytren's contracture is preserved over the long term. Postoperative physical therapy offers an additional significant improvement in ROM and seems to help maintain functional recovery.

Keywords: Dupuytren's contracture, range of motion, rehabilitation

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INTRODUCTION

Dupuytren's contracture is a long-term, progressive fibroproliferative disease of the palmar fascia. It causes progressive flexion contractures at the metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints, characterized by nodules and pathological cords (Figure 1). It most often affects the fourth and fifth fingers and occurs more frequently in men than in women (1,2). Histologically, it involves a fibroproliferative process where fibroblasts change into myofibroblasts in the palmar fascia (2). Dupuytren's disease is a common fibroproliferative disorder of the palmar fascia that predominantly affects individuals of Northern European descent and shows a marked male predominance. Progressive digital flexion contractures may impair hand function and interfere with daily activities (3).

Surgery is the most effective treatment for Dupuytren's contracture (4). The main goal is to straighten the fingers and improve hand function by removing the pathological tissue. Although there may be recurrence in some cases, these surgeries can provide good long-term outcomes when done correctly (5).

Currently, limited fasciectomy is the most commonly performed surgical procedure. This technique consists of excision of affected palmar and digital fascia while preserving the digital neurovascular bundle. Research shows that this approach is effective for correcting contractures, especially in moderate to severe cases involving the PIP joint. It may have better long-term results with low recurrence rates than percutaneous methods (2,3,6).

Alternatively, percutaneous needle fasciotomy is a quick and minimally invasive option, especially for MCP joint contractures. However, it has higher recurrence rates because of not removing all the pathological tissue (6-8). Dermofasciectomy is a more aggressive procedure than other methods; it removes all affected fascia and skin. This approach is primarily used for recurrent or severe cases with significant skin involvement. This approach has a low recurrence rate but is only done in selected cases because of longer recovery times and a higher risk of complications (9). Limited surgical techniques like segmental fasciectomy

or minimal aponeurotomy may be suggested for mild or localized disease (10).

Selection of the suitable surgical treatment for Dupuytren's contracture should be individualized for each patient. Factors to evaluate included the severity of the contracture, the affected joints, the patient's age, job requirements, expected function, and the chance of recurrence. Current literature supports limited fasciectomy as the best option for most patients.

In this study, we aimed to evaluate the long-term postoperative joint range of motion in patients who underwent limited or total fasciectomy for Dupuytren's contracture at our clinic. We also wanted to learn how postoperative physical therapy affected these surgical results. The main goal of surgical treatment is to increase finger extension and enhance hand function by removing the tissue that causes the contracture.

MATERIALS AND METHODS

Approval for this study was received from our hospital's Local Ethics Committee (Decision No. 2024/110). We included 41 patients diagnosed with Dupuytren's contracture who underwent surgical treatment.

19 patients received local anesthesia, 5 received a regional block, and 17 received general anesthesia. A tourniquet is used on the upper arm. We preferred Bruner or zigzag incisions for surgery because they follow the hand's natural skin lines and provide better exposure of the affected fascia. If skin contracture was present, we modified these incisions using Z-plasties. In areas where the tissue had adhered, we carefully dissected skin flaps to separate them from the palmar fascia. Eight patients had limited fasciectomy, while 33 underwent total fasciectomy. The surgery involved removing the palmar aponeurosis and the pathological fascial bands that connect to the tendons and fingers. In 25 patients with PIP joint involvement, we traced the faulty cords to the joint and removed them completely and precisely. If the PIP joint capsule was contracted, a limited capsulotomy was performed.

After confirming that there was no bleeding, we closed the incisions in one layer using 5/0 or 6/0 polypropylene sutures while keeping the hand

extended. For skin defects, we used a full-thickness skin graft from the thigh. Four patients (9.8%) required FTSG reconstruction due to skin defects that could not be closed directly. All four healed well, and their postoperative ranges of motion were similar to those of the other patients. We placed a 5-mm Penrose drain at the proximal end of the incision.

After surgery, we maintained the hand in a neutral position using a splint. The drain was removed the day after surgery, and patients wore the splint for a week. Everyone was encouraged to raise the affected hand and start finger exercises early in the recovery process.

Joint range of motion measurement

We measured range of motion (ROM) at the MCP and PIP joints using a standard goniometer before surgery and at least six months after surgery. We recorded the total flexion-extension range.

Physical therapy protocol

Starting in the third week after surgery, patients participated in a personalized rehabilitation program that included active and passive joint mobilization, stretching exercises, and the use of a night splint. The average duration for physical therapy was 6 ± 2 weeks. In patients who underwent FTSG reconstruction, we delayed initiation of physical therapy to allow for proper graft integration.

Statistical analysis

We conducted statistical analyses using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). We expressed continuous variables as mean $\pm$ standard deviation (SD) and categorical variables as frequency and percentage (%). We assessed the normality of the data distribution using the Shapiro-Wilk test.

We used paired-samples t-tests for intra-group comparisons of preoperative and postoperative ROM. To compare the changes in ROM between groups (those receiving physical therapy vs. those not receiving it), we performed independent samples t-tests. If the data did not meet the assumption of normality, we used the

Mann-Whitney U test as a non-parametric alternative. A p-value of <0.05 was considered statistically significant.

Inclusion and exclusion criteria

The study included patients with primary Dupuytren's contracture who had a flexion contracture of $\geq 20^\circ$ at the MCP and/or PIP joint, had undergone limited or total fasciectomy, and could be followed for at least 6 months. We excluded patients with secondary contractures resulting from trauma, infection, burns, or neurological diseases, as well as those with congenital deformities, rheumatological diseases, or incomplete data records.

RESULTS

In all 41 patients included in the study (36 men, 5 women; mean age 65.7 ± 7.8 years), significant improvement in MCP and/or PIP joint range of motion was achieved following limited or total fasciectomy. The majority of the affected fingers were the 4th and 5th fingers (Table 1). The mean follow-up period was 12 months.

Twenty-four patients (58.5%) followed the postoperative physical therapy program, while 17 (41.5%) did not participate. In both groups, a statistically significant increase in postoperative ROM values was observed compared to the preoperative period ($p < 0.001$). The mean ROM increase was $37.12 \pm 6.45^\circ$ in the group receiving physical therapy, while it was $29.18 \pm 15.55^\circ$ in the group not receiving physical therapy. A statistically significant difference was found

Table 1. Distribution of patients by gender and location

Gender	n	%
Female	5	12.2
Male	36	87.8
Affected finger	n	%
Thumb	2	4.9
2nd and 3rd fingers	10	24.4
4th and 5th fingers	29	70.7

Table 2. Comparison of ROM values between patients who received and did not receive postoperative physical therapy (n=41)

Group	n	Preoperative ROM (Mean ± SD)	Postoperative ROM (Mean ± SD)	ROM increase (Mean ± SD)	Intra-group p-value	p-value between-groups
Received physical therapy	24	139.17 ± 6.16	176.29 ± 2.71	+37.12 ± 6.45	< 0,001	0.029
No physical therapy	17	141.82 ± 15.65	171 ± 4.11	+29.18 ± 15.55	< 0,001	0.029

ROM: Range of Motion of the joint

SD: Standard Deviation

Table 3. Distribution of involved joints

Joint involvement	Total Patients	Limited Fasciectomy	Total Fasciectomy
MCP + PIP (combined)	30	1 (%3,3)	29 (%96,7)
MCP only	9	5 (%55,6)	4 (%44,4)
PIP only	2	2 (%100)	0
Total	41	8 (%19,5)	33 (%80,5)

MCP: Metacarpophalangeal

PIP: Proximal Interphalangeal

between the groups in terms of ROM gain ($p = 0.029$) (Table 2). While total fasciectomy was performed on the vast majority (96.7%) of patients with combined MCP + PIP contractures, limited fasciectomy was preferred for 55.6% of patients with MCP contractures alone. Limited fasciectomy was performed on both of the 2 patients with PIP contractures alone (Table 3).

DISCUSSION

The incision techniques used in Dupuytren's contracture surgery aim to ensure adequate exposure of the pathological fascia while preserving skin vascularity and minimizing postoperative complications. Various skin incision techniques, including zigzag (Bruner), longitudinal, and transverse palmar incisions, have been described in the literature for Dupuytren contracture surgery (1,2,10). In cases of Dupuytren's contracture where digital extension is present, converting longitudinal digital incisions into Z-plasty is a commonly used approach. This technique reduces skin tension, thereby decreasing the incidence of postoperative complications (11,12). Consequently, the use of Z-plasty modified incisions is recommended (13). In addition, multiple transverse palmar incisions may also be performed (14); however, long-term recurrence rates have been found to be higher (8). In

recent years, there has been a growing consensus that a single standardized incision is not universally applicable to all patients. Consequently, for cases presenting with palmar and digital involvement, incisions that follow the natural skin creases, are tailored to the individual, and are modified with Z-plasty when necessary, are highly recommended (20).

In the current study, a standard incision technique was not used; instead, individualized incisions that align with the hand's natural lines, safely expose the entire pathological fascia, and are supported by Z-plasty in cases with skin contraction were preferred (Figure 2). This approach is consistent with the functional and combined incision principles described in the literature (13). The low rates of skin complications and the level of functional improvement suggest that individualized incision planning may contribute to surgical success.

Open limited fasciectomy, the most commonly performed surgical method for Dupuytren's contracture, has been shown to provide good to excellent clinical outcomes in short- and medium-term follow-ups; success rates reported in the literature range from 60% to 90% (15). While early-stage surgical improvement is generally reported to be good in cases undergoing limited or total fasciotomy, it has



Figure 1. Preoperative view of the Dupuytren's contracture, 90-degree flexion at the MP (metacarpophalangeal) joint.

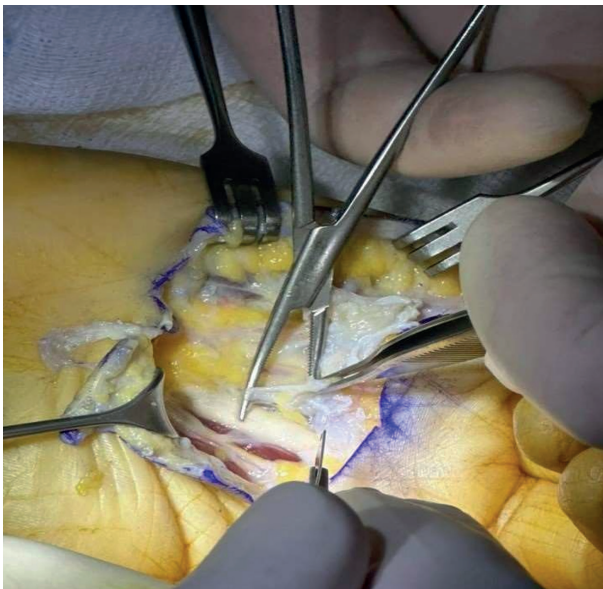


Figure 2. Postoperative view of the Dupuytren's contracture.

been demonstrated that recurrence rates can reach significant levels in long-term follow-ups (1,2,8). While rapid early functional recovery has been reported with minimally invasive methods such as percutaneous needle fasciotomy, high recurrence rates may be encountered in the long term, particularly in cases with PIP joint involvement (8). Dermofasciectomy, on the other hand, has been associated with lower recurrence rates in the literature; however, due to a longer recovery period and increased risk of complications, it is generally recommended for selected patients (1,2). In the current study, total fasciectomy was performed in the vast majority of cases and an average increase of 29–37° in total postoperative joint range of motion was achieved (Figure 3). These values are consistent with the ranges of functional improvement reported in the literature following fasciectomy (15) (Table 2). Furthermore, the absence of clinically significant loss of motion during the follow-up period supports the efficacy of the surgical technique employed. In Dupuytren's contracture surgery, the use of full-

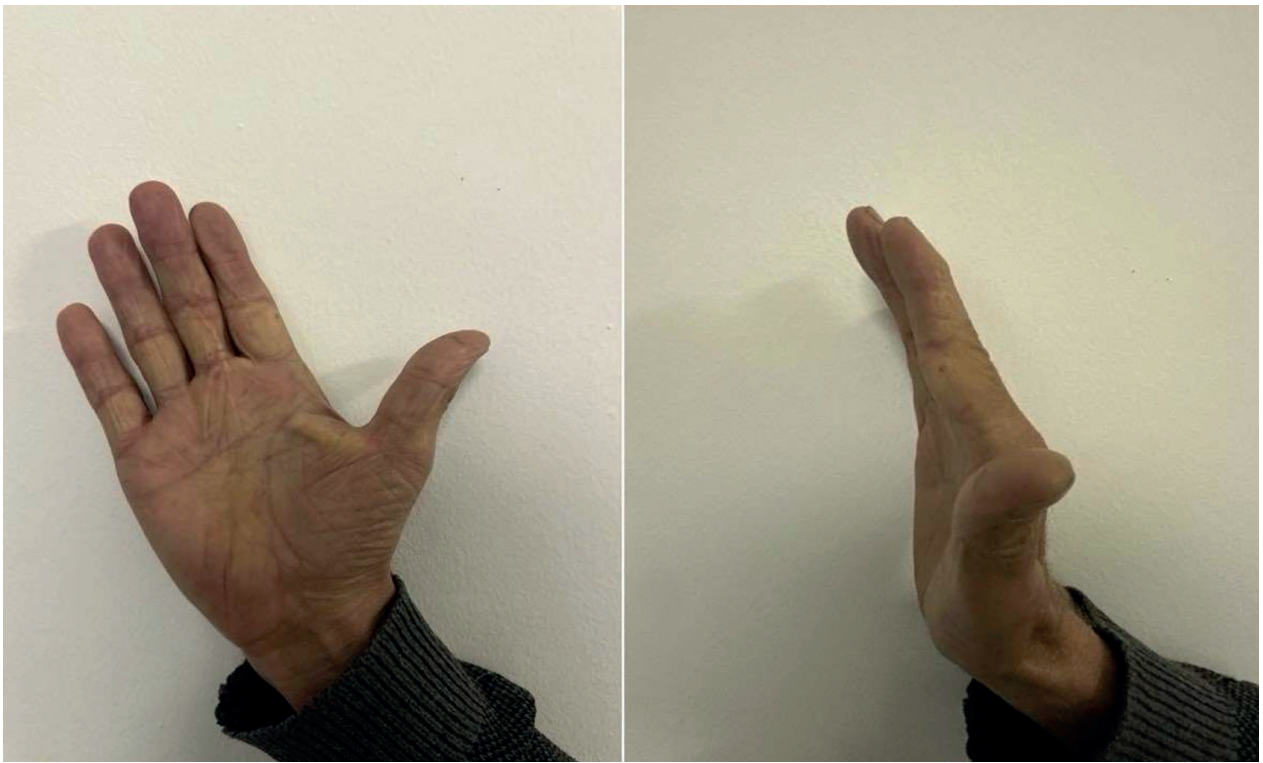


Figure 3. Intraoperative view of the Dupuytren's contracture.



Figure 4. Intraoperative view of the Dupuytren's contracture.



Figure 5. Intraoperative view of the Dupuytren's contracture, after the removal of the fascia.

thickness skin grafts (FTSG) is recommended in cases of advanced disease, significant skin contracture, and situations where primary skin closure is not possible following the excision of pathological fascia (Figure 6).

Recent studies emphasize that reduced skin elasticity and increased dermal adhesions in the presence of long-standing contractures are key factors determining the need for a graft. Clinical series and reviews published in recent years report that full-thickness



Figure 6. Repair with a graft, post-op 12 months.

skin grafts, particularly when performed in conjunction with dermofasciectomy, significantly reduce local recurrence rates. In a study published by Ansari et al., it was reported that surgical success under the graft was high in patients who underwent dermofasciectomy and FTSG, and that recurrence tended to occur more frequently in areas where grafts were not applied (16). Additionally, they reported that full-thickness skin grafts applied in the early postoperative period following dermofasciectomy are reliable and do not adversely affect functional outcomes. Current literature indicates that the rates of full-thickness skin graft application in series involving dermofasciectomy range between 20% and 40% (17). In contrast, it is stated that the need for grafts is significantly lower in fasciectomy-based surgeries and is generally limited to cases with advanced-stage, severe skin contractures (17). Although we did not perform dermofasciectomy in our study, full-thickness skin grafts were applied in 4 out of 41 cases (9.8%) to close the defect formed after releasing the contracture. This rate is lower than graft rates reported in dermofasciectomy series.

This can be explained by the fact that fasciectomy was performed without skin excision in the vast majority of cases and that incisions were planned in accordance with skin-sparing principles. Indeed, designing the incisions to align with the hand's natural creases and modifying them with Z-plasty in cases accompanied by skin contracture contributed to reducing skin tension and enabled primary closure (12,13). Since full-

thickness skin grafts are known to reduce recurrence in the long term, their use is recommended in appropriate patients for Dupuytren's contracture surgery (17,18). In conclusion, the use of full-thickness skin grafts in our study was limited to cases selected in accordance with current indications described in the literature; we believe that the need for grafts can be reduced when combined with appropriate surgical selection for the patient and skin-sparing surgical techniques.

In the current study, a significant increase in total joint ROM was observed in the late postoperative period in patients who underwent surgery for Dupuytren contracture. The increase in ROM was significant in both the group receiving physical therapy and the group not receiving it; an average increase of $37.12 \pm 6.45^\circ$ in the group receiving physical therapy and $29.18 \pm 15.55^\circ$ in the group not receiving physical therapy was observed; the difference between the groups was statistically significant ($p = 0.029$) (Table 2). This finding suggests that surgical treatment is the primary determinant of functional improvement in Dupuytren's contracture. It has been reported in some studies that nighttime splinting following Dupuytren's contracture surgery may negatively affect surgical success and lead to a decrease in joint range of motion (12). Additionally, a multicenter study demonstrated that postoperative physical therapy interventions did not provide an additional gain in range of motion (12). However, a different study noted that hand rehabilitation may contribute to maintaining the joint range of motion achieved through surgery (19). In the current study statistical analysis revealed that postoperative physical therapy for Dupuytren's contracture provided an additional contribution to ROM increase. This finding suggests that physical Therapy yields a significant advantage ROM.

Although the observed difference reached statistical significance, its clinical impact was relatively small. This may be because all participants were taught specific massage techniques and home exercises, which constituted a key part of their physical therapy. As a result, the patients' strict adherence to these home programs likely compensated for the missed in-person hospital sessions. In our study, focusing only on the MCP joint level led to better outcomes than cases with contractures that extended to the

PIP joint level, which matches previous reports (4). These observations are based on clinical impressions rather than on group analyses and should therefore be interpreted with caution. Higher recurrence rates and limited functional improvements have been reported, especially in cases involving the PIP or DIP (Distal Interphalangeal) joints (4). These findings show that the level of the affected anatomical structure is critical for predicting postoperative outcomes.

The vast majority of patients achieved a good functional range of motion after surgery, with significant improvements observed. While postoperative physical therapy can significantly improve the range of motion, differences in treatment protocols and patient compliance must be considered. Therefore, careful selection of the timing of surgery, treatment methods, and rehabilitation strategies remains crucial.

This study has some limitations. Its retrospective nature and reliance on patient records made it difficult to objectively monitor adherence to postoperative physical therapy. Furthermore, the lack of randomized testing may lead to bias. We were unable to standardize the duration and type of physical therapy because they were based on patient reports of home exercises. Additionally, our assessment focused solely on range-of-motion measurements because we did not aggregate patient-reported functional outcomes.

While an average follow-up period of 12 months is suitable for short- and medium-term assessments, it is insufficient to definitively evaluate long-term recurrence rates. Combining patients who underwent limited and total fasciectomy reduced our ability to assess potential differences between these two techniques. Furthermore, the timelines for initiating physical therapy for patients who underwent skin grafting were inconsistent, which may have affected the outcomes. In particular, the observation that patients with isolated MCP joint contractures benefited more from treatment stemmed from clinical impressions rather than formal subgroup analysis, which affects the generalizability of this finding.

CONCLUSION

Both limited and total fasciectomy can significantly improve joint function in patients with Dupuytren's contracture. Gains in mobility are generally sustained over time.

Postoperative physical therapy was associated with an additional significant improvement in range of motion, but the overall effect was modest. This demonstrates that although surgery is the primary factor in recovery, rehabilitation plays a crucial role in optimizing and maintaining outcomes. Personalized surgical plans and well-chosen rehabilitation programs can enhance recovery after Dupuytren's contracture surgery.

Ethical approval

This study has been approved by the Bolu Abant İzzet Baysal University Ethics Committee (approval date 15.05.2024, number 2024/110). Written informed consent was obtained from the participants.

Author contribution

Concept: EK, MG, ŞBT; Design: EK, ŞBT; Data Collection or Processing: EGÖ, BB, MFT; Analysis or Interpretation: BB, MFT; Literature Search: BB, EGÖ; Writing: EK, MG, EGÖ. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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