



The influence of Dupuytren's disease fingers contracture degree on surgical treatment outcome

Uticaj stepena kontrakture prstiju na uspešnost hirurškog lečenja Dupuytrenove kontrakture

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Abstract

Background/Aim. Dupuytren's disease is a progressive disease of the palmar and digital fascial structures, with functional limitations. There are no clear recommendations about the optimal time of surgical repair, concerning the hand impairment. The aim of our study was to investigate the relation between finger's contracture degree and success of surgical treatment of the Dupuytren's disease. **Methods.** This prospective analysis included 60 patients operated on due to Dupuytren's contracture. According to preoperative contracture degree of proximal interphalangeal (PIP) and metacarpophalangeal (MCP) joint, patients were divided into three groups: the group 1: $< 15^\circ$, the group 2: $15\text{--}30^\circ$ and the group 3: $> 30^\circ$. All the patients underwent operation of partial palmar fasciectomy. Postoperative improvement was expressed with contracture reduction INDEX. **Results.** There were 60 patients with 85 fingers affected. The groups 1, 2 and 3 had 22 (37%), 37 (62%) and 26 (43%) fingers with MCP contracture and 32 (37.4%), 24 (28.2%) and 29 (34.1%) fingers with PIP contracture, respectively. Postoperative contractures of MCP joint in these groups were 0 , 0.135° and 5° , and of PIP joint 0 , 2.08° and 16.89° , respectively. After six months all MCP contractures resolved, while PIP joint contracture in the group 3 remained 13.62° . The reduction INDEX was 98.85%, 97.62% and 75.52% in the groups 1, 2 and 3, respectively. There was a statistically significant difference in the INDEX value between the groups ($p = 0.0001$). **Conclusion.** The degree of PIP joint contracture is related to the outcome of surgical treatment of Dupuytren's disease. Optimal results are achieved when contracture degree is between 15° and 30° . Surgical treatment of MCP joint contracture is successful regardless of the preoperative joint contracture degree.

Key words:

dupuytren contracture; hand; reconstructive surgical procedures; prognosis.

Apstrakt

Uvod/Cilj. Dupuytrenova kontraktura (DK) je progresivna bolest palmarne i digitalne fascije sa funkcionalnim oštećenjem kao krajnjom posledicom. Za sada, ne postoje jasni stavovi o optimalnom trenutku hirurškog lečenja ovog oboljenja. Cilj rada bio je da se ispita odnos između stepena kontraktura prsta i rezultata hirurškog lečenja Dupuytrenove ukočenosti. **Metode.** Ova prospektivna studija obuhvatila je 60 bolesnika operisanih zbog DK. U zavisnosti od preoperativno izmerenog stepena kontrakture u predelu proksimalnog (PIP) i metakarpofalangealnog (MCP) zgloba bolesnici su podeljeni u tri grupe: grupa 1: $< 15^\circ$, grupa 2: $15\text{--}30^\circ$ i grupa 3: $> 30^\circ$. Svim bolesnicima učinjena je operacija parcijalne palmarne fasciektomije. Postoperativni rezultati izraženi su indeksom smanjenja kontrakture (INDEX). **Rezultati.** Kod 60 bolesnika DK zahvatala je 85 prstiju od kojih je u grupi 1 bilo 22 (37%), u grupi 2, 37 (62%), a u grupi 3, 26 (43%) prstiju sa kontrakturom MCP zgloba, kao i 32 (37,4%), 24 (28,2%) i 29 (34,1%) prstiju sa kontrakturom PIP zgloba. Postoperativna kontraktura MCP zgloba u navedene tri grupe bila je 0 , $0,135^\circ$, 5° , dok je kod PIP zgloba iznosila 0 , $2,08^\circ$ i $16,89^\circ$. Nakon šest meseci praćenja, kontrakture na MCP zglobu bile su sanirane kod svih bolesnika, dok je kod PIP zgloba u grupi 3 opstajala prosečna kontraktura od $13,62^\circ$. Izmereni INDEX bio je statistički značajno niži u grupi 3 (75,52%) u poređenju sa grupama 1 i 2 gde je iznosio 85% i 97,62% ($p = 0.0001$). **Zaključak.** Hirurško lečenje DK kod PIP zgloba daje značajno bolje rezultate kod kontrakture od 15 do 30° nego kod kontrakture većeg stepena, te bi u tom stadijumu trebalo primeniti hirurško lečenje. Hirurško lečenje kontrakture MCP zgloba uspešno je bez obzira na preoperativni stepen kontrakture.

Ključne reči:

kontraktura, dupuytrenova; šaka; hirurgija, rekonstruktivna, procedure; prognoza.

Introduction

Dupuytren's disease is one of the most commonly acquired contractures of the hand. It is a benign palmar fibromatosis characterised by progressive shortening of the palmar fascia and often causes significant contracture of the metacarpophalangeal and proximal interphalangeal joints. This leads to significant deformity and impaired function of the hand¹. The basic process includes a large density of fibroblasts, which increase extracellular matrix protein deposition with greater proportions of type III/type I collagen and myofibroblasts that cause wound contracture. According to pathogenesis, the ideal treatment for Dupuytren's disease in the hand would involve managing these cellular mechanisms to prevent or control the development of fibroproliferative disorder. Since there is no available method that prevents this process, contemporary therapy is based on permanent contracture resolution and prevention of the recurrence of contractures. There are two options for managing this problem: surgical and non-surgical treatment^{2,3}.

Surgical treatment includes percutaneous needle fasciotomy, open fasciotomy, radical or partial fasciectomy and dermofasciectomy. Procedure selection is based on the degree and localisation of fixed flexion contracture, amount of skin involvement, patients' general health status and surgeons' individual preferences. There are no clear recommendations for the exact time of surgical repair, when functional hand impairment is concerned.

The aim of this study was to investigate the relation between finger's contracture degree and success of surgical treatment of Dupuytren's disease.

Methods

This prospective study analysed of 60 subsequent patients who had underwent surgical treatment of Dupuytren's contracture in the Clinic for Plastic and Reconstructive Surgery and Burns, Military Medical Academy in Belgrade.

Preoperatively, demographic characteristics (age, sex and profession), localisation and degree of the contracture were noted. The degree of active and passive flexion contracture of the proximal interphalangeal (PIP) and metacarpophalangeal (MCP) joint were measured with goniometer. According to the preoperative degree of the finger contracture in PIP and MCP joint, the patients were divided into three groups, with less than 15° degrees (the group 1), 15°–30° degrees (the group 2) and over 30° (the group 3).

The degree of passive flexion contracture in PIP and MCP joints was measured immediately postoperatively and after six months.

Partial palmar fasciectomy with a tourniquet in the regional intravenous anaesthesia was used as surgical technique in all the patients¹.

Controlled physical therapy was applied on fourth postoperative day while intensive physical therapy was initiated after suture removal, on 10–12th postoperative day, and lasted one month.

The degree of PIP joint contracture decreasing was represented as a numerical difference of contractures measured pre-

and postoperatively (PIP-Diff.). In order to calculate the relative value of PIP joint contractures improvement, we defined the index of contractures improvement (INDEX), which represents a reduced percentage of total preoperative contracture.

That INDEX was calculated as the quotient of absolute values (PIP-Diff.) and the measured preoperative contracture of the PIP joint (PIP Pre-OP), times 100.

$$\text{INDEX} = (\text{PIP-Diff.}) / (\text{PIP Pre-OP}) \times 100$$

Fingers that were with no contracture after treatment were considered cured, while those with left contracture were considered partially cured.

Data analysis was performed using SPSS Software 11 (SPSS Inc, Chicago, Ill). All data were expressed as mean and standard deviation (SD). We used *t*-test and χ^2 test for parametric and nonparametric distributed values. Each *p* value < 0.05 was considered statistically significant.

Results

Out of 60 patients, 57 (95%) were males and 3 (5%) females with the average age of 64.26 (29–80).

Preoperative results

Clinically evident unilateral or bilateral contracture was found in 27 (45%) patients and 33 (55%) patients, respectively. Thirty five (58%) of the patients had only one finger affected, while 25 (42%) had the contracture of more than one finger. The most common contracture affected together the fingers IV and V (19 patients; 32%). Involvement of the fingers III and IV had 5 (8%) of the patients, while only one patient (2%) had disease localized on the fingers I, III and IV.

All the patients had contracture in the MCP joint, with the average degree of 29.34°. In 22 (37%), 37 (62%), and 26 (43%) fingers contracture was less than 15°, between 15° and 30°, and over 30°, respectively. The average values of the contracture for the fingers III, IV and V were 29°, 28.55° and 28.74°, respectively.

Contracture of the PIP joint was registered in 85 fingers. Thirty two (37.5%) fingers had contracture less than 15°, 24 (28.3%) 15–30°, and 29 (34.2%) over 30°. The average degree of the contracture in the PIP joint was 30.59°. The average values of contracture for the fingers III, IV and V were 30°, 29.34° and 32.03°, respectively.

The results of postoperative and by a month follow-up

Postoperatively, all contractures of the MCP joint from the group I were completely resolved, while after 6 months patients from the groups II and III had the rest of average contracture of 0.135° and 5°, respectively. Postoperative contractures in MCP joint for the fingers III, IV and V were 2.5°, 1.18° and 1.76°, respectively. After six months all MCP contractures were completely resolved.

Postoperatively, contractures of the PIP joint in the group I of the patients were resolved, while in the groups II and III of the patients remained contracture of 2.08° and 16.89°, respectively.

After a 6 month follow-up, the weakest results of PIP joint contracture treatment were obtained in the group III (the patients with preoperative contracture greater than 30°), where the average residual contracture was 13.62°, after completing the treatment.

The average degree of the preoperative MCP and PIP arti-

culcation contracture as well as immediately postoperatively and after 6 months are shown in Tables 1 and 2, and Figures 1 and 2.

The frequency of cured and partially cured patients was statistically significantly different between the groups ($\chi^2 = 73.077$; $p = 0.0001$). Detailed results are presented in Table 2.

Table 1
The average contracture of the metacarpophalangeal (MCP) and the proximal interphalangeal (PIP) joint

Affected finger (°)	Preoperatively		Postoperatively		After 6 months	
	MCP	PIP	MCP	PIP	MCP	PIP
III	29°	30°	2.5°	5.5°	0°	4°
IV	28.55°	29.34°	1.18°	6.58°	0°	4.60°
V	28.74°	32.03°	1.76°	6.35°	0°	5.40°

°contracture degree.

Table 2
Results of surgical treatment of the proximal interphalangeal (PIP) joint contractures in the group of patients

Degree (°) of the joint contracture	Number (%) of the patients	Cured, n (%)	Partially cured, n (%)
Less than 15	32 (37.5)	31 (58.5)	1 (3.1)
From 15 to 30	24 (28.3)	22 (41.5)	2 (6.3)
Over 30	29 (34.2)	0 (0)	29 (90.6)
Total (n)	85	53	32

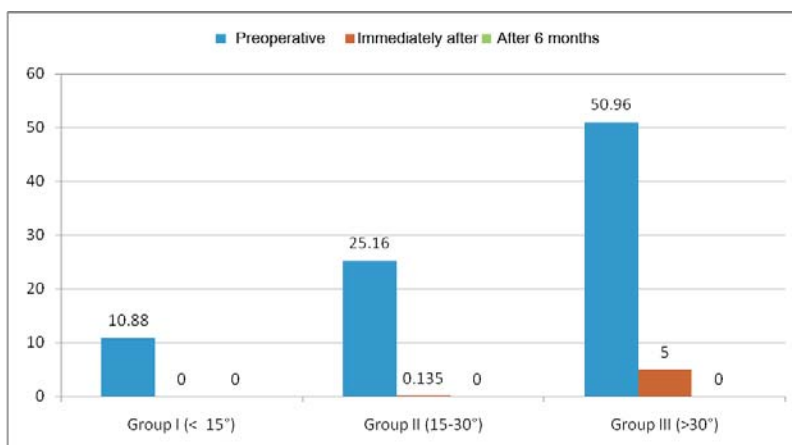


Fig. 1 – The average metacarpophalangeal (MCP) joint contracture (°) in all the three groups before, immediately after and 6 months after operation.

(y axis- contracture degree; x axis- preoperative, postoperative and 6 months follow-up contracture degree in three groups of patients).

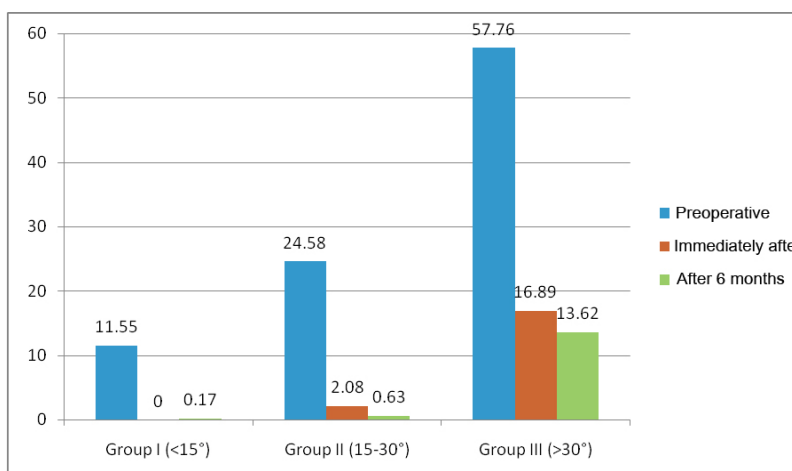


Fig. 2 – The average proximal interphalangeal (PIP) joint contracture (°) in all three groups before, immediately after and 6 months after operation.

(y axis – contracture degree; x axis – preoperative, postoperative and 6-month follow-up contracture degree in the three groups of the patients).

Relation of pre- and postoperative PIP joint degree of contracture

Average reduction of contracture degree ranged from 5° to 80° with an average value of 26.65°. The group 3 had the greatest reduction in the degree of contracture, on the average of 44.14°. The average values of contracture decreasing are shown in Table 3.

The decision to start surgical treatment of Dupuytren's contracture is based on functional issues that illness brings. One of the basic and clearly established principles is that surgical treatment should not be used before the onset of contracture of the fingers. The presence of palmar nodules that do not restrict movement of the fingers is not an indication for surgical treatment. Hueston⁵ thought that surgical treatment should be started when "table top" test is positive

Table 3

The average values of contracture decreasing		
Degree (°) of joint contracture	Number (%) of the patients	Average values of contracture decreasing (degree °)
Less than 15	32 (37.5)	11.38
From 15 to 30	24 (28.3)	23.96
Over 30	29 (34.2)	44.14

The PIP joint contracture INDEX ranged from 66% to 100%, with the average of 90.68%. The greatest reduction in the degree of contracture we had in the group I of the patients (98.85%), while in the groups II and III INDEX was 97.62% and 75.52%, respectively. There was statistically significant difference in the INDEX values among the three groups, (ANOVA – $p = 0.0001$; OR=100.877).

Discussion

This study demonstrates that surgery of Dupuytren's disease at the MCP joint is likely to provide full correction of joint contracture of any degree. Unlike MCP, contracture of the PIP joint is surgically best reduced when the degree of contracture is between 15° and 30°. Since the PIP joint rather than the MCP joint correction correlated better with hand function, the above-mentioned interval might be one of the main indications for surgery.

Dupuytren's disease has certainly affected people for hundreds of years. A large number of important scientific studies over the last decade contributed to understanding the process of formation, clinical presentation and treatment of Dupuytren's contracture. Nowadays, it is well defined that myofibroblasts play a key role in the pathogenesis of this disease. These cells induce wound contraction, but their origin is not clear yet. So, the ideal treatment for Dupuytren's disease in the hand would involve managing these cellular mechanisms to prevent or control the development of fibroproliferative disorder. The ideal treatment would provide permanent contracture resolution and prevent the recurrence of contractures and diseased fascia. Historically, non-surgical management, generally, was found to be ineffective or not suitable for clinical use²⁻⁴. Recently, treatment with collagenase *Clostridium histolyticum* has been approved for use in the United States of America and Europe in adult patients. Despite the huge popularity of this "surgical drug", many surgeons across the world still perform surgery as the first and the best option for this kind of disease.

test. According to Hurst⁶, each MCP joint flexion contractures greater than 30° and/or any kind of PIP joint contracture is an indication for surgical treatment. McFarlane⁷ reported that MCP joint contractures can be successfully surgically corrected regardless of the duration of the disease, while PIP joint contractures greater than 30° will not be fully resolved, and will require additional procedures of the surrounding anatomic structures.

Contracture of 30° in the PIP joint is commonly referred to as the cut off value for the beginning of surgical treatment⁸. However, there are no information on whether the surgical treatment of contractures smaller or larger degree than the abovementioned, gives better functional outcome and surgeons in practice are usually guided by personal experience.

Some authors claim that MCP contracture does not affect the overall success of Dupuytren's contracture treatment, but contractures greater than 30° require a qualified physical therapy and increases the cost of treatment⁹⁻¹¹. We agree with this statement because in our study all the patients with MCP contracture less than 30° (59 fingers involved) were completely resolved surgically without additional postoperative procedures. The patients with MCP contracture greater than 30° (26 fingers involved) had a minimal contracture and only after application of a qualified physical therapy, were completely cured.

Studies have also assessed the outcome of Dupuytren's surgery for PIP joint contracture. Abe et al.¹² demonstrated that those with a worse preoperative deformity were more likely to have a worse postoperative outcome. Misra et al.¹³ also assessed this and supported this relationship. Our study reaffirms that preoperative degree of PIP joint contracture is a significant predictor of surgical success.

In the group of patients with PIP joint contracture less than 15° and from 15° to 30°, the contracture rest after six months was on the average 0.17° and 0.63°, respectively, while the patients with PIP joint contracture greater than 30° had improvement of 13.62°. Therefore, the greatest reduction in the degree of contracture we had in the group of patients with less than 15° (98.85%) and between 15° and 30°

(97.72%), while the reduction was the least obtained in the subjects from the group with contracture greater than 30° (76.52%). Based on these results we believe that PIP joint contracture of 15° to 30° with or without MCP joint contracture is an indication for surgical treatment. Although the treatment of PIP joint contracture less than 15° gave also good results, we believe that they do not represent an absolute indication for surgical treatment for several reasons. In our clinical material, the group of patients with contracture less than 15° did not have significantly better results compared to the patients with contractures of 15° to 30°. As we mentioned earlier, the goal of surgical treatment is not only to cor-

rect flexion contracture, but to completely preserve flexion of the affected finger. Operative treatment represents an additional trauma and does not lead to significantly better results for contracture smaller than 15°.

Conclusion

The degree of PIP joint contracture is related to the outcome of surgical treatment of Dupuytren's disease. Optimal results are achieved when contracture degree is between 15° and 30°. Surgical treatment of MCP joint contracture is successful regardless of the preoperative joint contracture degree.

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