









# Epidemiology of Dupuytren disease and Patients Undergoing Selective Fasciectomy

## *Epidemiologia da doença de Dupuytren e de pacientes submetidos a fasciectomia seletiva*

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### Abstract

**Objective** To describe the epidemiological and clinical profile of patients with Dupuytren disease treated by selective fasciectomy and the factors associated with the severity of the disease.

**Methods** Retrospective descriptive observational study involving 247 patients with Dupuytren disease, from 2013 to 2019. Multivariate logistic regression was performed for data analysis.

**Results** Most patients were male (83.8%), self-declared white (65.2%), alcoholics (59.6%) and 49% were smokers, with a mean age of  $66 \pm 9$  years old, with 77.2% presenting symptoms of the disease after the age of 51 years old. Approximately 51.9, 29.6 and 17.3%, respectively, had arterial hypertension, diabetes mellitus and dyslipidemia comorbidities. Bilateral involvement of the hands was observed in 73.3% of the patients. The rate of intra- and post-selective fasciectomy complications was of 0.6 and 24.3%, respectively, with 5.2% of the patients needing reintervention after 1 year of follow-up. After multivariate analysis, males were associated with bilateral involvement of the hands (odds ratio [OR] = 2.10; 95% confidence interval [CI]: 1.03–4.31) and with a greater number of affected rays (OR = 3.41; 95% CI: 1.66–7.03). Dyslipidemia was associated with reintervention (OR = 5.7; 95% CI = 1.03–31.4) and bilaterality with a higher number of complications (35.7 versus 19.7%).

### Keywords

- ▶ dupuytren disease
- ▶ fasciectomy
- ▶ risk factors
- ▶ operative complications
- ▶ reintervention

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## Resumo

**Conclusion** A low rate of reintervention and operative complications was observed in patients with Dupuytren disease treated by selective fasciectomy. Male gender was associated with severe disease (bilaterality and more than two affected rays), and dyslipidemia with reintervention.

**Objetivo** Descrever o perfil epidemiológico e clínico dos pacientes com doença de Dupuytren tratados por fasciectomia seletiva e os fatores associados com a gravidade da doença.

**Metodologia** Estudo observacional descritivo retrospectivo envolvendo 247 pacientes com doença de Dupuytren, no período de 2013 a 2019. Foi realizada regressão logística multivariada para análise dos dados.

**Resultados** A maioria dos pacientes era do sexo masculino (83,8%), autodeclarados brancos (65,2%), etilistas (59,6%), e 49% eram tabagistas. A média de idade foi de  $66 \pm 9$  anos, sendo que 77,2% apresentaram os sintomas da doença após os 51 anos. Aproximadamente 51,9, 29,6, e 17,3%, respectivamente, apresentaram hipertensão arterial, diabetes mellitus e dislipidemia. O acometimento bilateral das mãos foi observado em 73,3% dos pacientes. A taxa de complicações intra- e pós-fasciectomia seletiva foi de 0,6 e 24,3%, respectivamente, sendo que 5,2% dos pacientes necessitaram de reintervenção após 1 ano de acompanhamento. Após análise multivariada, o sexo masculino foi associado com acometimento bilateral das mãos (odds ratio [OR] = 2,10; intervalo de confiança [IC] 95%: 1,03–4,31) e com maior número de raios acometidos (OR = 3,41; IC 95%: 1,66–7,03). A dislipidemia foi associada com a reintervenção (OR = 5,7; CI 95%: 1,03–31,4) e a bilateridade com maior número de complicações (35,7% versus 19,7%).

**Conclusão** Foi observada uma baixa taxa de reintervenção e complicações operatórias nos pacientes com doença de Dupuytren tratados por fasciectomia seletiva. O sexo masculino foi associado com o quadro grave da doença (bilateridade e mais de dois raios acometidos), e a dislipidemia com a reintervenção.

## Palavras-chave

- ▶ doença de Dupuytren
- ▶ fasciectomia
- ▶ fatores de risco
- ▶ complicações operatórias
- ▶ reintervenção

## Introduction

Dupuytren disease or contracture figures among the most common human connective tissue disorders.<sup>1</sup> It is characterized by a progressive, irreversible fibroblast proliferation affecting the palmar fascia, resulting in its gradual thickening, which causes a flexion contraction of the fingers.<sup>2</sup> Initially, it presents as subcutaneous nodules, followed by fibrous cords, which account for contractures.<sup>3</sup>

The incidence of Dupuytren disease ranges from 3 to 40%. It often affects males<sup>4</sup> > 50 years old, with a higher prevalence in Caucasians.<sup>5</sup> In addition, its incidence is high among patients with a history of smoking and alcohol use, metabolic disorders, or those treated with antiretrovirals or anticonvulsants.<sup>5</sup> Therefore, its etiology is multifactorial, associated with both intrinsic and extrinsic factors.<sup>3</sup>

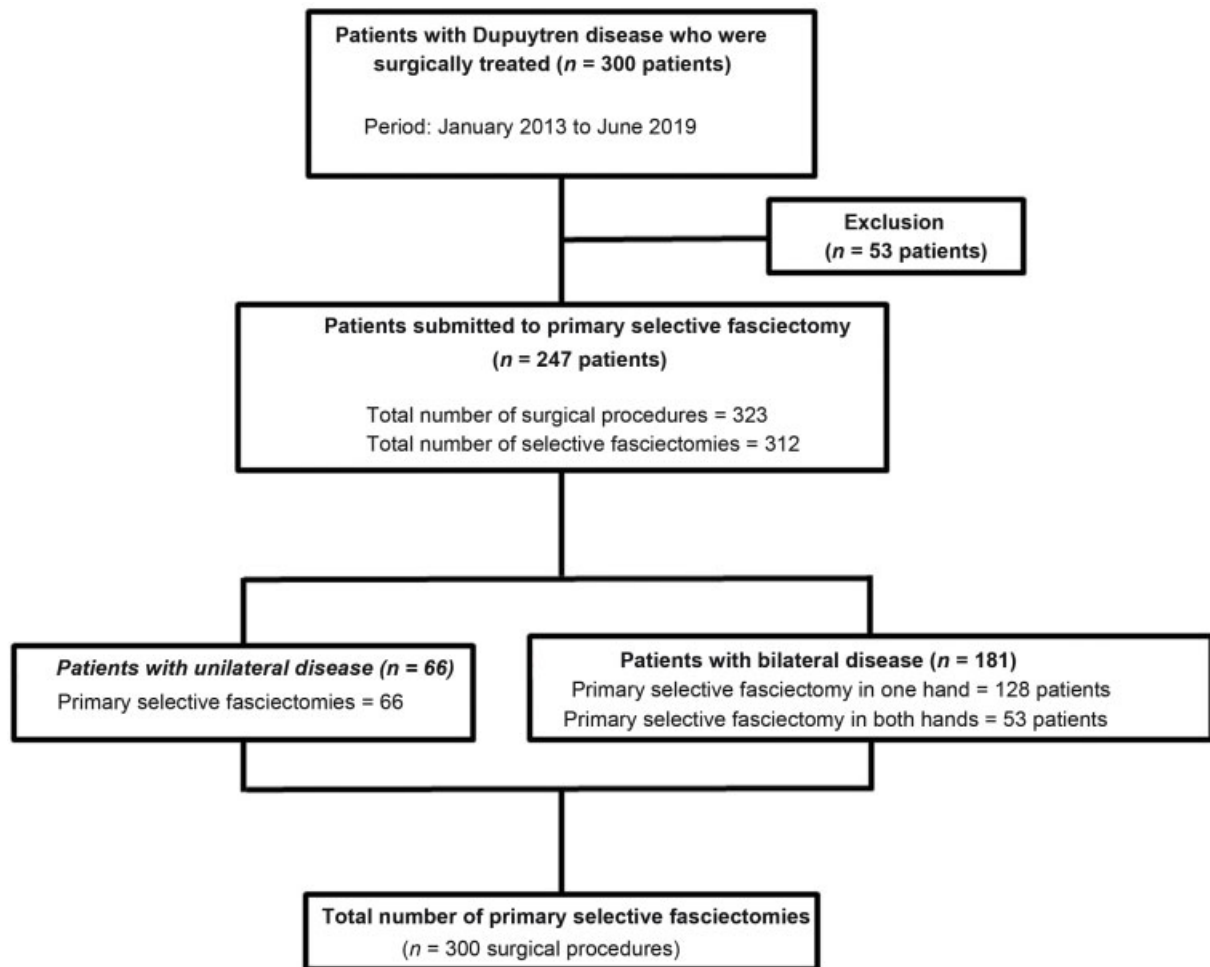
Today, several treatment options are available, including percutaneous fasciotomy, fasciotomy using collagenase (from *Clostridium histolyticum*), partial or selective fasciectomy, total fasciectomy, and dermofasciectomy.<sup>6</sup> However, the recurrence rate of the disease is high.<sup>7</sup> Surgical intervention is indicated after functional impairment,<sup>8</sup> and it is typically recommended for patients with at least 30° of metacarpophalangeal joint contracture and/or proximal interphalangeal joint contracture associated with functional impairment.<sup>9</sup>

Selective fasciectomy is the most frequently performed surgical procedure for Dupuytren disease, and it is deemed the gold standard for the primary release of flexion contracture.<sup>10</sup> The literature is inconsistent in defining the percentage of contracture correction and recurrence rate, making it difficult to assess the effectiveness and safety of surgical interventions for Dupuytren disease.<sup>11</sup> In addition, an important aspect for surgical treatment evaluation is patient satisfaction after the intervention, which is not always related to a greater flexion contracture correction, hindering the comparison of therapeutic options.<sup>12</sup>

The present study aimed to describe the epidemiological and clinical profile of patients with Dupuytren disease surgically treated with selective fasciectomy. In addition, the present study attempted to determine the frequency of surgical complications, the need for new surgical procedures, and potential factors associated with the clinical characteristics of this condition.

## Materials and Methods

This is a retrospective observational descriptive study of a sample of patients with Dupuytren disease who were seen and surgically treated by the Hand Surgery Service of a tertiary hospital from the Brazilian Unified Health System



**Fig. 1** Flowchart to select patients with Dupuytren disease surgically treated by primary selective fasciectomy.

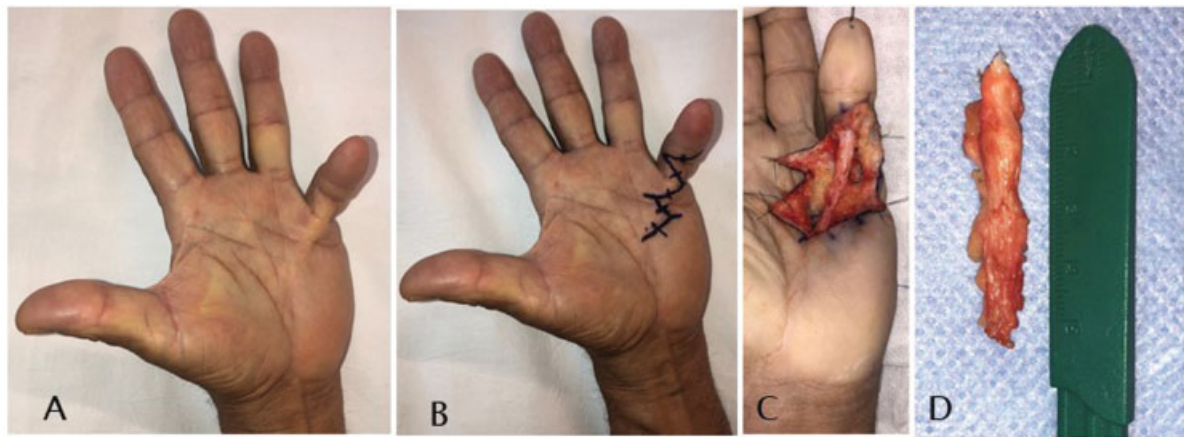
(SUS, in the Portuguese acronym), from January 1, 2013 to June 30, 2019. The study protocol was approved by the Institutional Research Ethics Committee (3.100.284/2018).

Selective fasciectomy was the main treatment option for Dupuytren disease during the study period, corresponding to 96.6% of the procedures performed in these patients. To homogenize the sample, patients with Dupuytren disease diagnosis confirmed by a hand surgeon were treated with an isolated primary selective fasciectomy (► **Figure 1**) ( $n = 247$ ). This was the first surgical approach for disease treatment, and no other procedures were performed, including capsulotomies or tenotomies. Patients previously submitted to surgical treatment and those with unavailable information in medical records were excluded.

Demographics were obtained through an active search in medical records, and the following information was recorded in a data collection instrument: (i) sociodemographic features, such as gender, age, self-declared skin color, weight, height, smoking and alcohol intake; (ii) positive history for diabetes mellitus, dyslipidemia, epilepsy, cardiovascular diseases, hypertension, HIV seropositivity, Ledderhose disease, Peyronie disease, adhesive shoulder capsulitis or hand trauma; and (iii) clinical presentation of Dupuytren disease: unilateral or bilateral involvement, affected rays, presence of Garrod dorsal

nodules, age at onset of symptoms, positive family history for the disease, intra- and postoperative complications, length of follow-up after primary selective fasciectomy, and the need for a new surgical approach to treat a complication associated with the initial selective fasciectomy or due to recurrence of flexion contracture in the fingers, which is deemed a re-intervention. Postoperative complications included an extension deficit with no report of any apparent cause, such as scar retraction, pain, or other interference, in the medical record.

Surgery was indicated for functional impairment,<sup>8</sup> metacarpophalangeal joint flexion contracture  $> 30^\circ$  and/or proximal interphalangeal joint contracture (► **Figure 2A**). Selective fasciectomy was performed with limb exsanguination using a pneumatic cuff. The volar face of the hand was incised as popularized by Bruner, extending to the affected radius (► **Figure 2B**). After mobilization of skin flaps, neurovascular bundles and the thickened palmar fascia were dissected, identified, and protected. Next, the affected fascia was excised (► **Figure 2C**). This specimen (► **Figure 2D**) was sent for histopathological study, confirming the characteristic changes associated with Dupuytren disease. A dressing and a volar plaster cast were applied to maintain extension of the fingers. The plastered immobilization was removed when the first dressing was changed, around the end of the 1<sup>st</sup> week. Then,



**Fig. 2** Selective fasciectomy in a patient with Dupuytren disease. (A) Flexion contracture of the little finger. (B) Surgical planning. (C) Palmar fascia thickening with chord formation. (D) Excised palmar fascia segment.

passive and/or active finger mobility was initiated by the team of occupational therapists specialized in hand surgery. None of the included patients used orthosis during the postoperative period.

Continuous variables were presented as mean  $\pm$  standard deviation (SD). Factors associated with clinical characteristics of Dupuytren disease were determined based on odds ratios (ORs) and their respective 95% confidence intervals (CIs) estimative using the multivariate logistic regression method. This univariate analysis considered both the biological importance and the degree of statistical significance; *p-values*  $\leq 0.25$  and  $\leq 0.10$ , respectively, were required for regression model input and maintenance. The analyzes were performed using IBMSPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA), and statistical significance was set as  $p < 0.05$ .

## Results

The majority of the 247 patients with Dupuytren disease treated with selective fasciectomy were male, self-declared white (**Table 1**), reporting alcohol use (59.6%) and/or smoking (49.0%). Their mean age was  $66.3 \pm 9.2$  years old (minimum, 31 and maximum, 94). Most subjects (84.4%) had a body mass index (BMI) ranging from 18.5 to 29.9 kg/m<sup>2</sup>. As for comorbidities associated with Dupuytren disease, 29.6% of the patients had diabetes mellitus, 17.3% dyslipidemia, 6.6% epilepsy, and 2.5% cardiovascular diseases; less than 1% were HIV-positive. In addition, 51.9% of the subjects reported high blood pressure.

Bilateral hand involvement was observed in 73.3% of the patients. The little (35.0%) and ring (34.7%) fingers were the most affected rays, followed by the thumb, middle and index fingers, with 15.1, 12.1 and 3.1% of involvement, respectively. In addition, 37.2 and 38.9% of the patients had, respectively, 1 and 2 affected rays. The remaining patients had 3 (18.4%) or more affected rays (5.5%). About 11.1% of the patients also had a previous history of hand trauma, 19.7% of Ledderhose disease, 7.5% of Peyronie disease (considering the 207 affect-

**Table 1** Demographics from the 247 patients with Dupuytren disease

Variables	Dupuytren (n = 247)
	n (%)
<b>Age (years old)</b>	
$\leq 40$	2 (0.8)
41–50	6 (2.4)
51–60	53 (21.5)
61–70	110 (44.5)
71–80	62 (25.1)
81–90	13 (5.3)
$\geq 91$	1 (0.4)
<b>Gender</b>	
Female	40 (16.2)
Male	207 (83.8)
<b>Skin color<sup>a</sup></b>	
White	161 (65.2)
Brown	58 (23.5)
Black	27 (10.9)
Yellow	1 (0.4)

<sup>a</sup>Skin color was self-reported according to the classification used by the Brazilian Institute of Geography and Statistics (IBGE, in the Portuguese acronym) census.

ed men), 7.2% of adhesive shoulder capsulitis, and 27.8% of Garrod dorsal nodules, affecting most the index finger (33.4%), followed by the middle and ring (25.9% each) fingers, the little finger (11.1%) and the thumb (3.7%). A family history of Dupuytren disease was reported in 18.5% of the cases, and 3.7% of the patients had  $\geq 3$  affected relatives.

In total, 300 selective fasciectomies were performed as the first surgical approach in these 247 patients with Dupuytren disease. Patients with bilateral involvement ( $n = 181$ ) underwent primary selective fasciectomy in each hand ( $n = 53$ ) at

different times (► **Figure 1**). Considering patients with a minimum follow-up period of 1 year, the frequency of reintervention was 5.2%. The following reinterventions were performed during the study: surgical dressing due to surgical wound complication; selective fasciectomy associated with volar capsulotomy at the proximal interphalangeal joint, and z-plasty for scar contracture; selective fasciectomy associated only with volar capsulotomy of the proximal interphalangeal joint; 5th finger amputation; and isolated selective fasciectomies.

Regarding intraoperative complications of selective fasciectomies, 2 cases of digital nerve injury (0.6%) were recorded. Another case of digital nerve injury was recorded during the reintervention of a patient who underwent a new selective fasciectomy. All three cases were primarily repaired but presented some sensorial loss in the affected finger. A total of 73 complications were recorded after the 300 primary selective fasciectomies (24.3%). The most common complication was a deficit in complete extension of the affected finger (50.7%), followed by joint stiffness (24.7%) and skin necrosis (8.2%). The remaining complications totaled 16.4% (► **Figure 3**).

Factors associated with the severity of Dupuytren disease were determined at a multivariate analysis. Male gender was associated with bilateral hand involvement and the number of affected rays (► **Table 2**). Dyslipidemia was associated with reintervention ( $p = 0.04$ ; OR = 5.7; 95%CI: 1.03–31.4). Patients with bilateral involvement had a higher number of postoperative complications (35.7 versus 19.7% in patients with unilateral involvement, OR = 2.27; 95%CI = 1.15–4.46). Other evaluated factors (age, skin color, alcohol intake, smoking, diabetes mellitus, dyslipidemia, epilepsy, HIV and surgical complications) were not significantly associated with bilateral disease, number of affected rays (1 ray versus  $\geq 2$  rays), age at disease onset ( $\leq 50$  years old versus  $\geq 51$  years old) or need for reintervention.

## Discussion

Dupuytren disease is common in the hand surgery specialist office. However, several aspects remain inconsistent, includ-

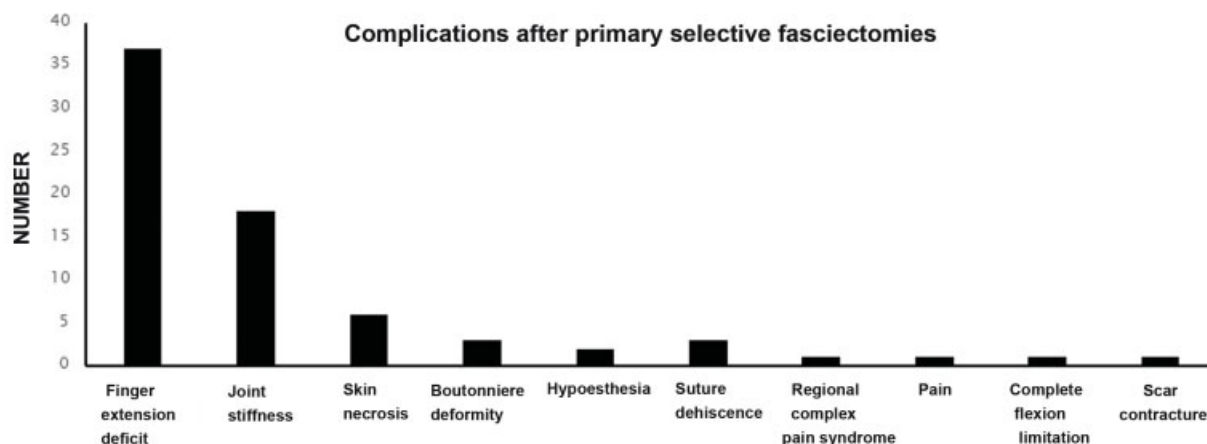
ing its etiology and the most appropriate treatment option for the clinical presentation.

Classically, Dupuytren disease mainly affects white males,  $> 50$  years old,<sup>5,13,14</sup> and its prevalence increases with age.<sup>13</sup> We noted a predominance of white or brown individuals, aged  $> 50$  years old. A 5:1 ratio between men and women was observed, which is consistent with previous descriptions (5.9:1).<sup>13</sup> Moreover, males were associated with an approximately two-fold higher risk for the most severe disease (bilateral involvement and more than two affected rays). Hindocha et al.<sup>15</sup> reported that bilateral presentation and male gender are associated with a greater recurrence of Dupuytren disease after surgical treatment.

Bilateral disease involving the little and ring fingers was commonly observed in our sample, which is consistent with the literature.<sup>5,6,13,16</sup> Garrod dorsal nodules were more frequent in the index finger, as previously described.<sup>17</sup> These nodules have been associated with an increased risk of Dupuytren diathesis.<sup>18</sup>

Alcohol intake and smoking have been associated with Dupuytren disease.<sup>5,13,19</sup> The cause and the mechanisms of such associations remain unclear. Most patients have a history of alcohol intake and smoking; however, in a greater proportion than evidenced by Mansur et al.<sup>5</sup> when evaluating a smaller number of Brazilian patients ( $n = 58$ ) with Dupuytren disease (9 and 22%, respectively, compared with 60 and 49% in our study). Smoking and alcohol intake are associated with the need for surgical treatment for Dupuytren disease.<sup>13</sup> Since our sample consisted only of patients undergoing surgical treatment, potentially with more severe presentations, the prevalence of alcoholics and smokers is higher when compared with the data described by Mansur et al.<sup>5</sup>

Among conditions associated with Dupuytren disease, 29.6% of the patients presented diabetes mellitus. In a series with only 58 cases of Brazilian patients with Dupuytren disease, Mansur et al.<sup>5</sup> found a 44.8% prevalence of diabetes, with 62% of insulin-dependent subjects. Recently, a meta-analysis observed an approximately three-fold risk association between Dupuytren disease and diabetes mellitus.<sup>20</sup> Although the molecular mechanism involved in both



**Fig. 3** Number of postoperative complications in patients with Dupuytren disease treated with selective fasciectomy.

**Table 2** Multivariate analysis of factors associated with Dupuytren disease

Variables	Unilateral (n = 66)	Bilateral (n = 181)	p-value <sup>a</sup>	Adjusted odds ratio (95% confidence interval)
<b>Gender</b>	<i>n</i> (%)			
Female	16 (24.2)	24 (13.3)	0.04	1 <sup>b</sup>
Male	50 (75.8)	157 (86.7)		2.10 (1.03–4.31) <sup>c</sup>
	<b>1 ray (n = 71)</b>	<b>≥ 2 rays (n = 176)</b>		
<b>Gender</b>				
Female	20 (28.2)	20 (11.4)	0.001	1 <sup>b</sup>
Male	51 (71.8)	156 (88.6)		3.41 (1.66–7.03) <sup>d</sup>

<sup>a</sup>Pearson chi-squared test ( $\chi^2$ ).

<sup>b</sup>Reference value.

<sup>c</sup>Multivariate analysis adjusted for gender and postoperative complications.

<sup>d</sup>Multivariate analysis adjusted for gender, epilepsy, and postoperative complications.

conditions has been widely studied,<sup>20</sup> it is suggested that the metabolites generated by diabetes mellitus stimulate the development of myofibroblasts, the main cell type involved in Dupuytren disease.<sup>21</sup> In addition, the majority of patients had arterial hypertension, consistent with the aforementioned study from Mansur et al.,<sup>5</sup> in which 55% of the subjects presented it.<sup>5</sup> Both conditions mainly affect elderly patients, but the cause of the association between arterial hypertension and Dupuytren disease has not been described in the literature.

The rate of reintervention after the surgical treatment for Dupuytren disease depends on several factors, including contracture severity and the type of procedure performed. The observed reintervention rate (5.2%) was consistent with a recent description in the American population, which evaluated 132 selective fasciectomies and detected a reintervention rate of 4%.<sup>22</sup> The multivariate analysis revealed an association between dyslipidemia and a higher rate of reintervention. Dyslipidemia has been associated with Dupuytren disease,<sup>23</sup> suggesting the need to consider this condition in patients with palmar fibromatosis for proper treatment planning.

In a comprehensive review, Denkler<sup>24</sup> reported that the rate of surgical complications after primary selective fasciectomy ranged from 4 to 39%.<sup>24</sup> We observed a low rate of intraoperative complications, consisting only of digital nerve injury (0.6%). According to the literature, the average rate of digital nerve injury is ~ 3%.<sup>24,25</sup> The most common postoperative complications included wound healing issues, ranging from 0 to 86%.<sup>24</sup> However, in our sample, the most common postoperative complication was a complete extension deficit, followed by joint stiffness. In addition, patients with bilateral involvement had an approximately two-fold higher risk of postoperative complications, as the contracture may have been aggravated by the longer waiting time for surgical treatment of the contralateral hand. Ribak et al.<sup>6</sup> described a case of transient digital nerve paresthesia and type I regional complex pain syndrome as complications after resection of the affected fascia during a study comparing selective and percutaneous fasciectomy. In addition, they observed no significant differences between groups submit-

ted to different fasciectomies regarding the Tubiana classification, time to resume professional activities and disease recurrence.<sup>6</sup>

Since this is a retrospective study, the absence of a standardized electronic medical record system and the lack of determining the degree of flexion contracture of the fingers to aid disease recurrence identification after selective fasciectomy are our main limitations. However, the sample size, as well as information confirmation through a double database check contribute to the robustness of our results, which can be used to build a database of different populations to identify disease-associated factors. Together, this information can assist in prognosis and postoperative follow-up, suggesting the need for early referral to a specialist, even with no functional limitation of the hand, which is the main determinant for the surgical treatment of Dupuytren disease.

## Conclusion

Selective fasciectomy showed a low rate of reintervention and surgical complications. Male gender was associated with bilateral hand involvement and a higher number of affected rays, while dyslipidemia was associated with reintervention.

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### Conflict of interests

The authors have no conflict of interests to declare.

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