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Recurrent Dupuytren Disease

Charles Eaton, MD

From the Dupuytren Foundation, Palm Springs, FL.

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Abstract

Dupuytren disease poses two challenges to the treating surgeon: prevention of its recurrence through the primary procedure used for treating it, and treatment of its recurrence. As compared with average recurrence-free intervals after fasciectomy for Dupuytren disease, such intervals are shorter after minimally invasive treatment and longer after dermofasciectomy. In addition to surgical technique, local anatomy and diathetic factors influence the risk of recurrence of Dupuytren disease after its treatment. Recontracture may be due to the biology of Dupuytren disease, to pathologic changes resulting from its prior treatment, to tissue changes resulting from chronic joint contracture, or to a combination of these factors. A logical approach to treating recurrent Dupuytren disease requires consideration of the technique used for its prior treatment, the timeline to recontracture, the degree of deformity incurred by the disease, and patient selection.

Keywords: recurrent Dupuytren contracture, fasciotomy, fasciectomy, dermofasciectomy, enzymatic fasciotomy, needle aponeurotomy, collagenase injection

Introduction

Most patients treated with fasciectomy, fasciotomy, or the injection of collagenase for Dupuytren contracture will have some recurrence of the disease within 10 years of its initial treatment. The goals of treatment for either primary or recurrent Dupuytren contracture are to preserve function while minimizing the number of procedures for and complications of the disease over the patient's lifetime.

The treatment of a Dupuytren contracture does not cure Dupuytren disease. Recurrent contracture is not a complication. Dupuytren disease is a chronic connective tissue disease, and the risk of recurrence is cumulative with the passage of time. As such, meaningful statistics on recurrent Dupuytren contracture must include the duration of follow-up after each instance of its treatment.

The criteria used to define the recurrence of Dupuytren disease vary widely, and include loss of a specified number of degrees of original correction; loss of a given percentage of an initial correction; the need for retreatment; a return of Dupuytren disease without joint contracture, including or excluding extension into previously unaffected areas; and patient-reported measures. The definition of recurrence may reflect whether treatment resulted in full correction of the initial contracture. This multiplicity of definitions precludes meaningful statistical comparisons across all metrics for the recurrence of Dupuytren disease. Thus, for example, none of the definitions of recurrence reported for dermofasciectomy has any common ground, in terms of statistics, with any of the definitions of recurrence reported for treatment with collagenase. In fact, only half of existing publications reporting recurrences of Dupuytren disease actually define its recurrence. Because fasciectomy, fasciotomy, dermofasciectomy, and enzymatic fasciotomy treat contracture rather than Dupuytren disease itself, the terms "recontracture" or "recurrent contracture" are more accurate than "recurrence" or "recurrent Dupuytren disease" for describing recurrent contractures in patients with the disease.

Recurrent contractures in Dupuytren disease result from the overlap of three entities: the tissue affected by the disease, scar formation, and changes in ligaments or tendons resulting from fixed joint positions. The effects of each entity follow different time lines, with the result being the three common pat-

Table 1: Secondary Anatomic Changes Resulting in Short-lived Gain From Fasciectomy

Location/Anatomy	Intraoperative Sign	Optional Treatment
PIP Joint		
Lateral band tightness without subluxation	PIP joint has rubbery resistance to extension, may have sudden "give" when ranged toward extension, and may snap into hyperextension if the volar plate is incompetent	Lateral band release
Boutonnière deformity	Passive extension of PIP joint results in relative loss of passive flexion of DIP joint or in hyperextension of DIP joint	Release of triangular ligament with or without reconstruction of the central slip
Lateral digital sheet tightness	Palpable tightness of lateral digital sheet with extension of PIP joint	Excision of lateral digital skin ligaments
Lateral skin tightness	Palpable lateral skin tightness on digit with passive extension of PIP joint; may be diffuse	Release of skin and repair with a graft or flap
Central slip attenuation	Passive extension of PIP joint exceeds tenodesis extension from full wrist and MCP flexion	Central slip procedure versus prolonged postoperative extension splinting of PIP joint
MCP Joint		
Palmar skin tightness	Palpable tightness of palmar skin with passive extension of MCP and/or PIP joints	Skin lengthening with a flap or graft
Intrinsic muscle tightness	Loss of some passive flexion of PIP joint during full passive extension of MCP joint	Proximal intrinsic muscle release
Combined		
Palmar skin tightness	Palpable tightness of palmar skin with passive combined extension of MCP and PIP joints	Skin lengthening with a flap or graft
FDS muscle tightness	Dynamic change in combined passive extension of PIP and MCP joints with tenodesis of wrist	Intramuscular tenotomy of FDS muscle

PIP = proximal interphalangeal; DIP = distal interphalangeal; MCP = metacarpophalangeal; FDS = flexor digitorum superficialis.

terns of early, progressive, or late recontracture.

Early recontracture occurs in the first 6 weeks after treatment and is most often the result of residual anatomic pathology from chronically flexed joint positions. **Table 1** lists risk factors for early recontracture. These consist of intraoperative tissue tightness, rubbery resistance to passive extension, or greater passive than active extension. Although the range of motion of an affected structure may improve during intraoperative manipulation, underlying abnormalities listed in **Table 1** may persist. If so, intraoperative gains from manipulation may be lost over the first few postoperative weeks, and usually reach a plateau by 6 weeks after the completion of treatment. Progressive recontracture is due to the persistence of an active Dupuytren biology resulting from mechanical tension on residual tissues affected by Dupuytren disease, from diffuse tissue involvement by an aggressive Dupuytren biology, or both. In contrast to early recontracture, progressive recontracture continues to progress beyond 3 months after treatment.[1] Late recontracture is the return of Dupuytren contracture after a period of stability lasting a year or more. It represents a local reactivation of disease and is the most accurately defined variant of recurrent Dupuytren disease.

Risk Factors for Recontracture

Pathologic anatomy, biology, and the primary surgical procedure each exert a distinct influence on the risk of recontracture in Dupuytren disease. The pathologic anatomy involves the affected joint(s) and the degree of joint contracture(s) before treatment. Biologic factors include the patient's diathesis and the disease activity at the time of treatment. Procedural factors include the choice of treatment and magnitude of intraoperative correction.

Joint Involvement

The joint involved by Dupuytren disease influences the risk of recontracture. Two factors result in a higher risk of recontracture

Table 2: Comparison of Risk Factors for Occurrence Versus Recurrence of Dupuytren Contracture

Occurrence/Disease	Recurrence/Diathesis
Caucasian	Age of onset before age 50 years
Familial occurrence	Bilateral disease at presentation
Smoking	Garrod pads or Ledderhose disease
Alcohol intake	Involvement of thumb ray
Frozen shoulder	Involvement of more than two rays
Peyronie disease	Familial occurrence
Diabetes	Male gender
Chronic strenuous manual labor	Palmar nodules at treatment

for proximal interphalangeal (PIP) than for metacarpophalangeal (MCP) joints, regardless of the type of treatment used. The first of these factors is the predisposition of a chronically contracted PIP joint to develop extension lag from attenuation of the central tendon. The second factor is that release of a PIP joint is more technically difficult than release of an MCP joint because the patterns of cords with Dupuytren disease that affect the PIP joint are anatomically more complex and more likely to involve multiple cords than those affecting the MCP joint.

Severity of Pretreatment Contracture

The severity of contracture of a PIP joint before treatment influences the risk of its recontracture. Pretreatment contractures of the PIP joint exceeding 60° pose a higher risk of recontracture after treatment with either fasciectomy[2] or collagenase.[3] This is an independent risk factor for early recontracture, and is usually the result of central tendon attenuation rather than of a Dupuytren cord. The pretreatment degree of contracture of an MCP joint has less of an effect on the risk of recontracture than does the pretreatment degree of contracture of a PIP joint.

Success of Initial Treatment

The success of the initial treatment for a Dupuytren contracture predicts the risk of recontracture. Failure to achieve full correction of a PIP joint contracture at the time of either fasciectomy[2] or collagenase treatment[3] is a risk factor for additional loss of contracture correction. In such cases, regression of correction plateaus by 3 months after treatment, consistent with the pattern of early recontracture. Even with full correction, the greater the degree of pretreatment PIP joint contracture, the greater is the likelihood of recontracture.[2,3]

Diathetic Factors

Diathetic factors are individual risk factors affecting the rate of recurrence of Dupuytren contracture (**Table 2**). They include an age of onset before age 50 years, a family history of Dupuytren disease, bilateral disease, the involvement of more than two digits per hand, ectopic disease such as Garrod nodes and Ledderhose disease, and involvement of the thumb. The greater the number of diathetic factors for a particular patient, the greater is the patient's predisposition to the recurrence of Dupuytren contracture. The relative importance of each diathetic factor is controversial.[4]

Primary Treatment Technique

The primary treatment technique influences the recurrence rate of Dupuytren contracture. However, the incompatibility of the definitions used to report the outcomes of different treatment techniques for Dupuytren disease makes their rigorous statistical comparison difficult. **Figure 1** presents a summary of data on the recurrence of Dupuytren contracture from 31 publications, spanning many definitions of recurrence, and formatted as the percentage of patients with a recurrence at the time of reported follow-up in years (**Table 3**). Although this difference in definitions of recurrence of Dupuytren contracture illustrates one of many obstacles to understanding the range of published data, it does suggest trends, important among which are that the highest average reported rates of recurrence follow minimally invasive procedures such as percutaneous needle fasciotomy (PNF) or collagenase, with a lower recurrence rate for fasciectomy and then for dermofasciectomy.

Pathology

The pathology of primary Dupuytren contracture remodels the palmar fascia and retinacular structures of the palm and digits, but also extends, along lines of mechanical stress, through the fibrous transformation of extrafascial subcutaneous tissues. Loss of digital extension results from longitudinal tethering by cords arising from palmar and lateral components of these structures. Multiple cords may develop, each with a different tethering effect. Dupuytren contracture at PIP joints is more likely to involve multiple cords than Dupuytren contracture at MCP joints.[5] Histologic changes produced by Dupuytren disease extend into grossly normal fascia adjacent to visibly diseased tissues.

The pathology of recurrent Dupuytren disease parallels that of the primary contracture, but varies according to the primary surgical procedure. Cords may develop in unusual locations or take unusual directions. Findings at the time of fasciectomy for recurrent Dupuytren contracture and after collagenase treatment resemble the findings made during exploration for untreated Dupuytren contracture. Exploration in cases of recurrence following PNF reveal scar tissue adhesions of variable length and width between deep structures and the overlying dermis. Pathology after repeat fasciectomy often results in the loss of subcutaneous tissue, loss of normal tissue planes between the dermis and flexor tendon sheath, and adherence of scar tissue to neurovascular bundles.

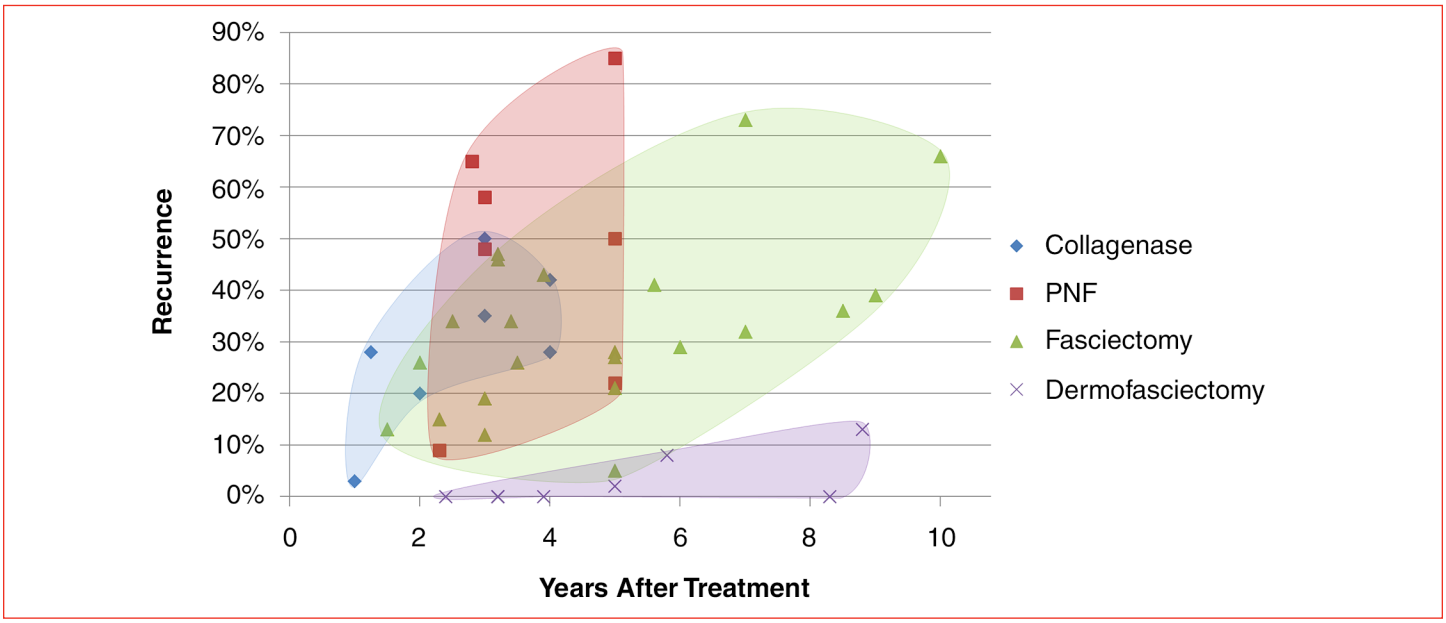

Figure 1. Summary of a personal review, by the author, of 31 publications reporting recurrence of Dupuytren contracture after treatment with collagenase, percutaneous needle fasciotomy (PNF), fasciectomy, and dermofasciectomy. All of the selected studies pooled outcomes for both metacarpophalangeal and proximal interphalangeal joints. Because statistical comparison is not possible for many definitions of recurrence of Dupuytren contracture, this is a qualitative representation of outcome. References and data are included in **Table 3**, as are notes explaining interpretation of the raw data. Each data point represents an overall percentage of recurrence at the average follow-up duration. Shaded areas include all data points for each technique.

Clinical Picture

Patients with recurrent Dupuytren contractures vary greatly in their awareness of and response to their deformity. Those who had a difficult recovery from or experienced a severe complication of their initial treatment may delay or avoid treatment for recurrent disease. Patients who have a recurrence after fasciectomy are less likely to consent to a revision procedure than those who have a recurrence after a minimally invasive procedure.[6]

Preoperatively, one can identify pretendinous cords causing contractures of MCP joints through their tendency to bowstring in a palmar direction under tension. Bowstringing is less common in lateral digital cords affecting PIP joints, making them more difficult to identify. Moreover, scar tissue may make the clinical assessment of recurrent contractures more difficult. Cutaneous scarring may be the primary cause of loss of joint extension in a patient with Dupuytren disease. Overlying longitudinal surgical scars may be confluent with and indistinguishable from underlying cords. Preoperatively it is possible to differentiate scar tissue from diseased cord if an area without scarring overlies the cord. As with primary Dupuytren contractures, the key finding in recurrent contractures is the palpable tightening and softening of a cord, felt as the examiner repeatedly ranges the affected joint through extension and flexion.

The inability to palpate a cord in the foregoing fashion suggests that a contracture may be due to a non-Dupuytren pathoanatomy, as listed in **Table 1**. Other diagnoses to consider in contractures of PIP joints in this situation are contracture of the joint capsule, longitudinal contracture of the flexor tendon sheath, tendon adhesions, and flexor pulley incompetence. Physical examination is the key method for making these diagnoses; imaging studies are not routinely used for this.

Histologic Biomarkers

Histologic features and molecular biomarkers can predict the risk of recurrence of Dupuytren contracture, as shown in **Table 4**. The natural history of Dupuytren disease follows a progression through three histologic stages. The histologic stage of the disease parallels abnormalities in both local and serum markers of collagen metabolism. Tissues affected by Dupuytren disease have elevated levels of both matrix metalloproteinase-2 (MMP-2) and tissue inhibitor of metalloproteinase-1 (TIMP-1).[7] The ratio of TIMP-1 to MMP-2 is abnormally elevated in both affected tissues and the serum of affected patients. These biomarker abnormalities are greater in areas of proliferative histology (nodules) than in areas of residual histology (cords).[7] Abnormal serum levels of MMP-2 and TIMP-1 also exist in other fibrotic disorders, including systemic sclerosis and arteriosclerosis. Further clarification of the relationship between serum MMP-2, serum TIMP-1, and the activity of Dupuytren disease may form the basis of future blood tests with which to determine the most appropriate treatment procedure to minimize recurrence risk.

Table 3: Summary of Published Data on Recurrence of Dupuytren Contracture

Study	Technique	Follow-up (Years)	Recurrence	Calculations
Abe et al (*J Hand Surgery Eur Vol* 2007)	Dermofasciectomy	2.4	0%	
Adam and Loynes (*J Hand Surg Am* 1992)	Fasciectomy	3.4	34%	
Armstrong et al (*J Bone Joint Surg Br* 2000)	Dermofasciectomy	5.8	8%	
Badois et al (*Rev Rhum Ed Fr* 1993)	Percutaneous needle fasciotomy	5	50%	
Balaguer et al (*J Hand Surgery Eur Vol* 2009)	Fasciectomy	3.5	26%	Based on patients with recurrence in follow-up period of 3 to 4 years.
		6	29%	Based on patients with recurrence in follow-up period of 5 to 7 years.
		8.5	36%	Based on patients with recurrence in follow-up period of 8 to 9 years.
Brotherston et al (*Br J Plast Surg* 1994)	Dermofasciectomy	8.3	0%	
Chen et al (*Orthop Surg* 2009)	Fasciectomy	3.2	46%	
	Dermofasciectomy	3.2	0%	
Citron and Nunez (*J Hand Surg Br* 2005)	Fasciectomy	2	26%	Based on combined data from all patients.
Cools and Verstreken (*Acta Orthop Belg* 1994)	Fasciectomy	2.5	34%	
Dias and Braybrooke (*J Hand Surg Br* 2006)	Fasciectomy	2.3	15%	
Foucher et al (*J Hand Surg Br* 2003)	Percutaneous needle fasciotomy	3.2	58%	
Foucher et al (*Ann Chir Main Memb Super* 1992)	Fasciectomy	5.6	41%	
Gelberman et al (*J Bone Joint Surg Am* 1980)	Fasciectomy	1.5	13%	
Hotchkiss et al (*J Hand Surg Am* 2013)	Collagenase	4	28%	Based on loss of 30° of initial correction after initial complete correction.
		4	42%	Based on loss of 20° of initial correction after initial complete correction.
		2	20%	
Hueston (*Plast Reconstr Surg* 1963)	Fasciectomy	5	28%	
Iselin (personal commuinication, 2000)	Dermofasciectomy	5	2%	
Jurisic et al (*Coll Antropol* 2008)	Fasciectomy	7	73%	
Ketchum and Hixson (*J Hand Surg Am* 1987)	Dermofasciectomy	3.9	0%	
Leclercq and Tubiana (*Chirurgie* 1986)	Fasciectomy	10	66%	
McMahon et al (*Hand* 2013)	Collagenase	1.25	28%	

Table 3: Summary of Published Data on Recurrence of Dupuytren Contracture

Study	Technique	Follow-up (Years)	Recurrence	Calculations
Nieminen and Leto (*Ann Chir Gynaecol* 1986)	Fasciectomy	3.9	43%	
Peimer et al (*J Hand Surg Am* 2013)	Collagenase	1	3%	
		2	20%	
		3	35%	
		3	50%	Recurrence (nondurable response) defined as loss of correction of ≥20° in the group that had improvement in pretreatment contracture ≥50% but incomplete correction with residual contracture of ≥5°.
Pereira et al (*Acta Orthop Belg* 2012)	Percutaneous needle fasciotomy	2.3	9%	
Pess and Pess (*J Hand Surg Am* 2012)	Percutaneous needle fasciotomy	3	48%	
Rombouts et al (*J Hand Surg A*m 1989)	Fasciectomy	3	19%	Based on patients with recurrence in follow-up period of 2 to 4 years.
		5	27%	Based on patients with recurrence in follow-up period of 4 to 6 years.
		7	32%	Based on patients with recurrence in follow-up period of 6 to 8 years.
		9	39%	Based on patients with recurrence in follow-up period of 8 to 10 years.
Searle and Logan (*Ann Chir Main Memb Super* 1992)	Dermofasciectomy	3.2	0%	
Tonkin et al (*J Hand Surg Br* 1984)	Fasciectomy	3.2	47%	
	Dermofasciectomy	3.2	0%	
Ullah et al (*J Bone Joint Surg Br* 2009)	Fasciectomy	3	12%	
van Rijssen and Werker (*J Hand Surg Br* 2006)	Percutaneous needle fasciotomy	2.8	65%	
van Rijssen et al (*Plast Reconstr Surg* 2012)	Fasciectomy	5	21%	
	Percutaneous needle fasciotomy	5	85%	
	Fasciectomy	5	5%	Using collagenase literature, definition of loss of ≥20° of initial correction after initial complete correction.
	Percutaneous needle fasciotomy	5	22%	Using collagenase literature definition of loss of ≥20° of initial correction after initial complete correction.
Villani et al (*Chir Main* 2009)	Dermofasciectomy	8.8	13%	

Each data point in **Figure 1** represents the percentage of patients with recurrence at an average follow-up calculated in years. All data points represent pooled data from both MCP and PIP joints. If a publication reported multiple outcomes for the same patients using different definitions of recurrence, each outcome was included separately. Some data points are calculations from raw data in the original publications. If so, these figures and calculations are listed in the far right column.

Table 4: Correlation of Luck Stage of Dupuytren Contracture With Appearance, Histology, Biomarkers, and Rate of Recontracture

Luck Stage	Pathology	Type III Collagen (%)19	Serum TIMP-1 Concentrations	Typical Clinical Appearance	Rate of Recurrence at 8 to 9 Years After Fasciectomy20
I. Proliferative (early)	Cellular with mitoses, myofibroblasts present, collagen strands randomly organized	>35%	More elevated	Nodular	71%
II. Involutional (fibrocellular)	Less cellular, no mitoses, myofibroblasts present, cells aligned along lines of stress, some longitudinal collagen strand orientation	20% to 35%	More elevated	Nodules and cords	32%
III. Residual (fibrotic)	Hypocellular, no myofibroblasts, densely packed broad longitudinal collagen bundles	<20%	Elevated	Cords only	20%

TIMP-1 = tissue inhibitor of metalloproteinase-1.

Prevention of Recurrence

No single method exists for universally preventing the recurrence of Dupuytren contracture. However, the choice of surgical technique used for the correction of an initial contracture may reduce the rate of recurrence.

Time the Procedure to the Contracture Severity

The greater the pretreatment contracture of a joint, the greater is the risk of recontracture. Threshold angles of contracture for an increased risk of recontracture are 50° for contractures of MCP joints and 40° for contractures of PIP joints.[3] Treatment before a contracture exceeds these criteria reduces the risk of recontracture.

Match the Procedure to the Patient's Biology

In the past decade, there has been a trend toward treating primary Dupuytren disease with a minimally invasive procedure. However, the risk of rapid recontracture increases when a minimally invasive technique is used to treat patients whose disease has an aggressive biology. Clinical predictors of recontracture include diffuse nodular disease (Luck proliferative stage) and various diathetic factors.

In aggressive Dupuytren disease, the palmar skin and subcutaneous tissues themselves may provoke recurrence. In some patients, myofibroblasts are present in the dermis and subcutaneous tissue superficial to cords, and the presence of dermal myofibroblasts correlates with a greater risk of recurrence after fasciectomy. Recurrent Dupuytren contracture is rare beneath a full-thickness skin graft in dermofasciectomy. This effect is limited to grafted areas, so the protection against recurrence is therefore proportional to the size of the graft. Dermofasciectomy involves excision and the replacement, with a full-thickness graft, of a functional unit of affected skin and subcutaneous tissue, as shown in **Figure 2**, rather than the simple addition of skin grafts to allow primary closure.

Because the cumulative risk of severe complications increases with each repeat fasciectomy, primary dermofasciectomy is appropriate for patients at high risk for recurrent Dupuytren disease. The recovery time following a single dermofasciectomy is more rapid and is accompanied by fewer complications than with two or more fasciectomies at the same location, and produces stable results for a longer period.

Anecdotal experience suggests that treatment in the presence of palmar nodules is a risk factor for a flare reaction and recontracture in the early postoperative period. The clinical finding of such nodules is consistent with the proliferative stage of Dupuytren disease, and supports historical recommendations to avoid surgery while the disease is "active." Such delay may benefit some patients with lesser degrees of contracture, allowing nodularity to subside. However, disease with a severe pathobiology may remain in this active state during progression to severe contracture. Primary dermofasciectomy is appropriate for patients with such disease before contractures exceed the threshold angles of contraction noted earlier.

Match the Procedure to the Pathology

A minimally invasive procedure is appropriate for an isolated contracture of an MCP joint unless the patient has strong indicators of a severe diathesis or an active disease biology. In contrast, primary fasciectomy may be a better choice for contractures of PIP joints because, when fully corrected with a minimally invasive procedure, most such contractures will recur within 3 years after treatment.[3] Preliminary soft-tissue distraction before fasciectomy improves early outcomes over those with fasciectomy and concurrent joint

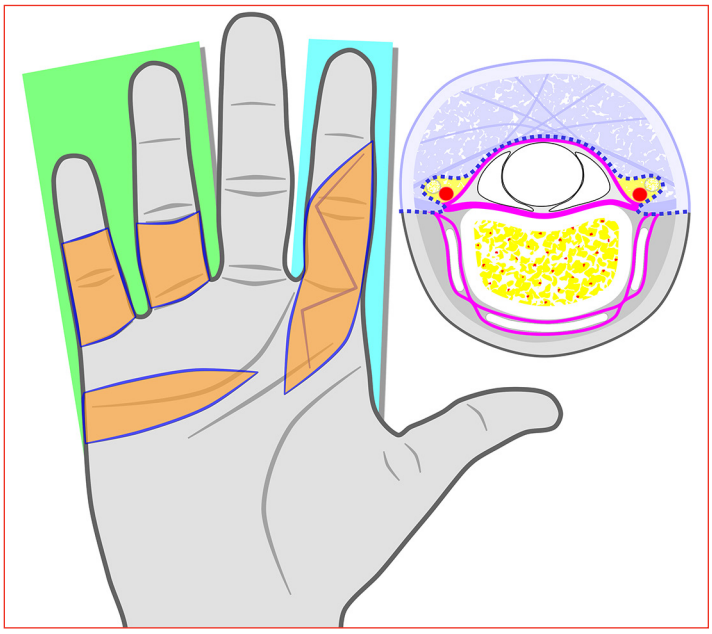

Figure 2. Dermofasciectomy involves the replacement with full-thickness skin grafts of functional soft-tissue units of the hand. The illustration of the hand on the left side of the figure shows typical patterns of dermofasciectomy. The small and ring finger patterns are for primary dermofasciectomy for disease of differing extent. The index finger pattern shows a modification to include scar from prior fasciectomy. Skin grafting over the metacarpal heads should be avoided when possible because the engrafted skin may not be sufficiently durable for this location. The cross section of a finger on the right side of the figure shows the extent of excision in the finger, in which skin and subcutaneous tissue are excised from the midlateral line on one side of the finger to the midlateral line on the other side, with the excision extending to the flexion creases that form the proximal and distal borders of the pulp.

release,[8] but no published data are available about the effect of this technique on the risk of recurrence.

Avoid Skin Tension

Skin flaps designed to reduce longitudinal tension on the skin reduce the risk of recurrence. Full-thickness skin grafting is an alternative to a local skin flap that fails to adequately relieve skin tension. Although open palm technique reduces immediate skin tension after fasciectomy or fasciotomy, it does not influence the risk of recontracture. Incisions planned along lines of tension may result in recontracture from scar tissue formation, even after dermofasciectomy.

Adjuvant Pharmacologic Treatment

Adjuvant pharmacologic treatment following the initial treatment of a contracture may provide a short-term reduction in the risk of recontracture in patients with Dupuytren disease. Studies of high-dose oral tamoxifen given as a perioperative adjuvant with fasciectomy,[9] and of local injections of triamcinolone acetate following PNF,[10] have reported short-term reductions in the incidence of recontracture. Each of these studies discontinued adjuvant therapy at 3 months postoperatively, and each study documented a smaller loss of initial correction in treated than in control patients at 1 year after treatment, but these differences in outcome were absent after 2 years. Although these studies are encouraging, they suggest that disease-modifying interventions will require long-term use for long-term efficacy against recontracture.

Absorbable Implants As Biologic Barriers

Absorbable carboxycellulose implants, inserted after fasciectomy and acting as biologic barriers between the dermis and the underlying wound bed, have shown short-term effectiveness in reducing the rate of recontracture in Dupuytren disease. The barrier mechanism proposed for their action resembles that of dermofasciectomy and reduces stimulation of the core pathobiology in the disease. Two recent studies have compared the results of fasciectomy with and without an absorbable barrier implanted between the wound bed and the overlying skin. When an acellular dermal matrix[11] and oxidized regenerated cellulose[12] were used as barrier materials, there was less of a loss of initial correction at average follow-up intervals of 22 and 12 months, respectively, than in controls treated with fasciectomy alone. No recurrence data are available for reports of the use of autologous fat grafts as biologic barriers in conjunction with percutaneous aponeurotomy.[13]

Radiotherapy

Radiotherapy may reduce the risk of progression in nodular Dupuytren disease without contracture.[14] It induces the regression of nodules in most patients for whom it is used, but its effect on the progression of contracture remains controversial. The role of radiotherapy for recurrent Dupuytren contracture is unknown.

Treatment of Recurrent Contracture

The treatment of recurrent Dupuytren contracture should address structures modified by the biology of the disease, the pathoanatomy resulting from chronic joint contracture, and scar tissue.

The most appropriate procedure for treating recurrent Dupuytren contracture depends on patient choice, the last previous technique used for treating a contracture, the immediate outcome of this last treatment, and the chronology of the events following this last treatment. **Table 5** summarizes these decision factors. The progressive levels of the treatment ladder for Dupuytren contracture, arranged in sequence from the treatment approach with the least morbidity and highest recurrence rate to that with the highest morbidity and lowest recurrence rate, are as follows: minimally invasive treatment (collagenase or PNF), fasciectomy, dermofasciectomy, and salvage procedures (arthrodesis, middle phalangectomy, amputation). Risk-averse patients choose low morbidity over low recurrence. If a minimally invasive procedure worked well and provided at least a year of stability before recurrence (late recontracture), it is appropriate to repeat that procedure.

Table 5: Factors in Selection of Successive Treatment Procedures for Dupuytren Recontracture

Pattern of Recontracture	Initial Correction With Previous Procedure	
	Satisfactory	Unsatisfactory
Early	Treat secondary anatomy.	1. Move up one level of treatment ladder. 2. Treat secondary anatomy.
Progressive	Move up two levels of treatment ladder.	Move up one or two levels of treatment ladder with or without treatment of secondary anatomy.
Later	Repeat treatment at same level of ladder or move up ladder by one level.	1. Move up one level of treatment ladder. 2. Treat secondary anatomy.

The levels of the treatment ladder for Dupuytren contracture, from bottom to top are as follows: minimally invasive treatment (collagenase or PNF), fasciectomy, dermofasciectomy, and salvage procedures (arthrodesis, middle phalangectomy, amputation).

It should however be noted that patients who have one recurrence of Dupuytren contracture may be more likely to have another recurrence because of factors other than the technique used to treat an initial or recurrent contracture. Early recontracture is due to pathologic anatomy in addition to the biology of Dupuytren disease in a particular case, and the approach to early recontracture should focus on identifying and treating secondary pathologic changes. Progressive recontracture that has not reached a plateau by 3 months after treatment should prompt consideration of advancing, in a subsequent procedure, to a higher level on the treatment ladder, to address an aggressive disease biology, secondary anatomic pathology, or both.

Surgical Technique

Technical principles of primary fasciectomy apply to surgery for recurrent Dupuytren contracture: flaps should be handled gently, hemostasis should be maintained, optical magnification and sharp dissection should be used, work should proceed from known to unknown, and neurovascular bundles should not be skeletonized. Additional considerations that apply in surgery for recontracture are that scar tissue may encase neurovascular bundles, and that scarring tends to draw neurovascular bundles in a palmar direction and toward the midline. Furthermore, scarred skin flaps may not advance or transpose in the same way as normal skin flaps. When planning incisions, it is important to consider the possibility of future surgery; when possible, prior incisions should be reused and extended, rather than making new incisions that will leave multiple adjacent, parallel scars. Because diffuse scarring may reduce the hemostatic efficacy of tumescent local anesthesia with epinephrine, tourniquet hemostasis should be used or prepared for use. Dissecting scissors with very sharp tips offer better control in dissecting scar tissue than do smooth-tipped tenotomy or smaller scissors, and their availability should be ascertained in advance of the surgical procedure. Another consideration is that contraction of the palmar skin and flexor sheath may prevent the full extension of a hand or digit. This is a much more commonly encountered problem in recurrent than in primary Dupuytren contracture, and may require skin grafting or flap reconstruction. Nor is skin tightness always obvious on preoperative examination, and the true extent of skin deficiency may not be clear until it is unmasked by correction of the contracture. In cases of recontracture of a PIP joint, surgical planning should include the possibility that the combination of inadequate skin and the release of a flexor tendon sheath may require a cross-finger or other regional flap to cover exposed flexor tendons at the proximal phalangeal level.

Specific Situations

In the case of a patient who requests a minimally invasive procedure for a Dupuytren recontracture after fasciectomy or dermofasciectomy, either PNF or collagenase is an option for selected patients, although both options are temporizing measures to delay repeat fasciectomy, rather than being definitive treatments. Treatment-related adverse events and failure to achieve a complete correction of recontracture with collagenase are each more likely to occur in digits previously treated surgically than in previously untreated digits.[15] Moreover, the safety of collagenase in the presence of a healed skin graft is controversial.[16]

Severe recurrent contracture of a PIP joint may require more than one soft-tissue procedure. Salvage may be possible with a staged approach using an apparatus for the distraction lengthening of soft tissue followed by fasciectomy or dermofasciectomy.[8] Radical procedures, in the form of shortening arthrodesis, middle phalangectomy,[17] or amputation are options if salvage is not possible.

A patient who has a recontracted finger with cold intolerance, prior nerve injury, pain, or disuse after two or more procedures is a candidate for amputation. Amputation also provides the opportunity to utilize a digital fillet flap to correct skin deficiency in digits adjacent to the amputated digit.

Complications

Complications such as nerve injury, vascular injury, marginal skin necrosis, or infection are more common after primary fasciectomy for other common elective surgical procedures on the hand than after primary fasciectomy for Dupuytren disease. With repeat fasciectomy, the risk of these complications is nearly twice that after primary fasciectomy.[18] Other possible complications of dermofasciectomy are related to the loss of graft skin, and the recovery time after dermofasciectomy averages 50% longer than after fasciectomy.

Conclusion

Despite the magnitude of recurrent Dupuytren disease, few data exist on the long-term outcomes of its treatment, and even fewer data are available for comparing the outcomes of different techniques for treating it. Because of this, current recommendations regarding the treatment of recurrent Dupuytren contracture are extrapolations from the experience gained with the treatment of an initial contracture. Lack of a widely adopted single definition of recurrence in Dupuytren disease, lack of attention to different patterns of recontracture, and the addition of new, minimally invasive treatment techniques all hamper the analysis of outcomes of treatment for the disease.

True progress in preventing the recurrence of Dupuytren disease will come from better understanding of its biology and from the development of long-term disease-modifying treatments that work on a molecular level. Recent progress with adjuvant therapy in conjunction with current standard procedures, and in the identification of biomarkers related to Dupuytren disease, may be the starting points for developing an effective means of preventing recurrent Dupuytren contracture.

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