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Correction of Contracture and Recurrence Rates of Dupuytren Contracture Following Invasive Treatment: The Importance of Clear Definitions

Paul M. N. Werker, MD, PhD, Gary M. Pess, MD, Annet L. van Rijssen, MD, PhD, Keith Denkler, MD

Purpose To call attention to the wide variety of definitions for recurrence that have been employed in studies of different invasive procedures for the treatment of Dupuytren contracture and how this important limitation has contributed to the wide range of reported results.

Methods This study reviewed definitions and rates of contracture correction and recurrence in patients undergoing invasive treatment of Dupuytren contracture. A literature search was carried out in January 2011 using the terms “Dupuytren” AND (“fasciectomy” OR “fasciotomy” OR “dermofasciectomy” OR “aponeurotomy” OR “aponeurectomy”) and limited to studies in English.

Results The search returned 218 studies, of which 21 had definitions, quantitative results for contracture correction and recurrence, and a sample size of at least 20 patients. Definitions for correction of contracture and recurrence varied greatly among articles and were almost always qualitative. Percentages of patients who achieved correction of contracture (ie, responder rate) when evaluated at various times after completion of surgery ranged from 15% to 96% for fasciectomy/aponeurectomy. Responder rates were not reported for fasciotomy/aponeurotomy. Recurrence rates ranged from 12% to 73% for patients treated with fasciectomy/aponeurectomy and from 33% to 100% for fasciotomy/aponeurotomy. Review of these reports underscored the difficulty involved in comparing correction of contracture and recurrence rates for different surgical interventions because of differences in definition and duration of follow-up.

Conclusions Clearly defined objective definitions for correction of contracture and for recurrence are needed for more meaningful comparisons of results achieved with different surgical interventions.

Clinical relevance Recurrence after surgical intervention for Dupuytren contracture is common. This study, which evaluated reported rates of recurrence following surgical treatment of Dupuytren contracture, provides clinicians with practical information regarding expected long-term outcomes of surgical treatment choices. (*J Hand Surg* 2012;37A:2095–2105. Copyright © 2012 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Economic and decision analysis III.

Key words Aponeurectomy, aponeurotomy, dermofasciectomy, Dupuytren contracture, fasciectomy.

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DUPUYTREN CONTRACTURE is a fibroproliferative disorder characterized by development of collagen nodules and cords within the palmar fascia that may shorten and cause progressive digital flexion deformity.^{1,2} The overall prevalence of Dupuytren contracture is uncertain but is believed to range from 0.2% to 56.0%.^{3,4} Results from a recent study in the United States indicate a prevalence of 1%.⁵

Diagnosis of Dupuytren contracture is based on a focused medical history and physical examination, with family history, risk factors (eg, smoking and alcohol consumption), and associated diseases (eg, diabetes mellitus, liver disease, epilepsy) often taken into consideration. The most common presenting feature early in the course of the disease is the appearance of a painless nodule in the palm. In addition, about 5% of patients complain of local tenderness.³ Dupuytren contracture manifests bilaterally in many patients (but not necessarily in the same stage), and there is no firm relation to handedness. The most commonly affected digits are the ring and little fingers, followed by the thumb, middle finger, and index finger. Dupuytren contracture may also be associated with ectopic lesions, including Garrod knuckle pads, Peyronie disease, and Ledderhose disease.^{3,6,7}

Currently, there is no cure for Dupuytren contracture, and it is generally believed that the condition does not resolve spontaneously.⁸ Nonsurgical treatments for Dupuytren contracture include splinting, physiotherapy, radiotherapy, oral vitamin E, and intralesional steroid injections.^{8,9} Injectable collagenase clostridium histolyticum (CCH) has also been used to treat Dupuytren contracture and has been shown to be significantly superior to placebo in clinical trials.^{10,11}

Although nonsurgical interventions can be employed in patients with Dupuytren contracture, surgery is still the most common intervention. Procedures include dermofasciectomy, standard limited fasciectomy, segmental fasciectomy, radical fasciectomy, open fasciotomy, and percutaneous needle fasciotomy (needle aponeurotomy).^{6,8,9,12–14}

Treatment outcomes for patients who undergo surgery for treatment of Dupuytren contracture can be considered in 4 broad categories: initial response, risks for short- and long-term complications, and risk for recurrence.^{15,16} Recurrence is relatively common in patients treated for Dupuytren contracture,¹⁷ and rational selection of therapy depends on understanding the different treatment options, minimizing the risks of treatment, and optimizing long-term outcomes. This systematic review provides information about the success of different surgical approaches to the treatment of

Dupuytren contracture, focusing on recurrence and considering the various criteria used to define successful treatment and recurrence.

METHODS

Collection of publications

On January 17, 2011, a PubMed literature search was carried out using the terms “Dupuytren” AND (“fasciectomy” OR “fasciotomy” OR “dermofasciectomy” OR “aponeurotomy” OR “aponeurectomy”) and limited to studies in English. No other limitations were placed on this search except that case studies reporting results for fewer than 20 patients were excluded. Studies with fewer than 20 patients would result in very wide 95% confidence intervals around the estimates for both initial treatment outcomes and recurrence. This search returned 218 reports (Appendix A is available on the *Journal's* Web site at www.jhandsurg.org).

A total of 90 papers were eliminated because review of abstracts indicated that they did not contain any primary data regarding the use of a specific intervention and outcomes (initial correction of contracture or recurrence). The 128 papers remaining after this step are listed in Appendix B (available on the *Journal's* Web site at www.jhandsurg.org). Full text of the remaining 128 papers was obtained and reviewed. During this review, studies were eliminated if there were results from fewer than 20 patients or if studies did not provide a description of the surgical procedure used, definitions for both correction of contracture and recurrence, and quantitative results for both of these outcomes. This resulted in a total of 21 studies that were included in the analysis. The following measures were tabulated for each of the remaining studies (note that not every study had information for each of the variables): number of patients, demographics (sex, age), clinical characteristics, type of treatment, definition of correction of contracture and time when assessed, percentage of patients with correction of contracture, definition of recurrence and duration of follow-up, and percentage of patients with recurrence. For evaluation, studies were grouped into 2 categories with respect to surgical intervention: fasciectomy (including aponeurectomy) and fasciotomy/aponeurotomy.

RESULTS

Results from this analysis, including the number and characteristics of the patients treated, study design and surgical procedure, definitions for correction of contracture and recurrence, correction rate (ie, percentage of patients meeting the criteria for initial treatment suc-

cess), duration of follow-up, and recurrence rate, are summarized in Table 1 for the 2 major classes of surgical procedures carried out. Eighteen of the studies used some variation of fasciectomy/aponeurectomy,^{16,18–34} and 3 studies used fasciotomy/aponeurotomy.^{35–37} Sixteen of the papers were descriptions of case series, 2 were randomized clinical trials, 1 was a prospective single-treatment study, 1 was a nonrandomized clinical trial, and 1 was a survey.

Correction of contracture was defined both quantitatively and qualitatively in the studies reviewed (Table 1); results were presented as percentages of patients who met the stated criteria for correction (ie, responder frequency) in all fasciectomy/aponeurectomy studies but none of the fasciotomy/aponeurotomy studies. Percentages of patients who achieved correction of contracture (ie, responder rate) when evaluated at various times after completion of surgery ranged from 15%²⁴ to 96%²⁸ for fasciectomy/aponeurectomy. Definitions for correction of contracture varied among the studies. Timing of evaluation of the initial outcome of the surgical procedure extended from 2 to 3 weeks to 2.5 years after the procedure.^{16,34} Detailed quantitative criteria for correction of contracture and timing of assessments were provided in only 2 studies.^{31,35}

Definitions of recurrence were qualitative in 20 of the 21 studies reviewed (95%). The single quantitative definition of recurrence was an increase in total passive extension deficit of greater than 30° during follow-up compared with the immediate postoperative measurements.³⁷ Another source of variability in assessment of recurrence was the wide range of follow-up durations in the studies reviewed (12 mo–10 y).^{16,32} Recurrence rates ranged from 12%³¹ to 73%³⁰ for patients treated with fasciectomy/aponeurectomy and from 33% to 100% for fasciotomy/aponeurotomy.^{35–37}

DISCUSSION

The results from this systematic review of the current literature underscore the difficulties in comparing the initial effectiveness and risk for recurrence of different surgical interventions in patients with Dupuytren contracture. Definitions of both correction of contracture and recurrence are variable, and the times at which these outcomes are evaluated differ greatly from one study to another. This is largely due to the fact that the studies reviewed were not aimed at providing information about the comparative efficacy of different surgical procedures for Dupuytren contracture. Rather, they were retrospective evaluations of outcomes for a given procedure carried out by one surgeon or at a single center. Such studies have a different goal from random-

ized controlled clinical trials and generally do not include information about patient inclusion/exclusion criteria, an a priori definition of end points, or timing of evaluations. Interpretation of case reviews of a series of patients being managed with a single procedure is also limited by the possibility that results may be biased by inclusion of patients likely to have good outcomes from that intervention based on the investigator's past experience.³⁸ Moreover, all of the surgical interventions assessed in this review appear to be more effective than no treatment, and placebo-controlled studies of these established procedures would provide little useful information. Controlled comparative studies would be difficult because of the need to standardize the surgical interventions being evaluated across multiple surgeons, centers, and patients. It should also be acknowledged that comparison of different procedures is limited in the present review due to the fact that our search identified only 3 papers in which fasciotomy/aponeurotomy was employed for treatment of Dupuytren contracture. In addition, quantitative information about residual joint contracture was not provided in most of the papers reviewed, and it would have been useful for comparison of procedures.

An important factor that was not addressed in nearly all of the papers reviewed was the relationships between recurrence and Dupuytren diathesis. It has been shown that male patients with bilateral disease, ectopic lesions, a positive family history, and onset of disease prior to age 50 years have an increased risk for recurrence.³⁹ The studies reviewed did not stratify outcomes on the basis of factors indicative of Dupuytren diathesis.

Ideally, surgical interventions for Dupuytren contracture should be assessed in large-scale, randomized, double-blind, controlled clinical trials with well-defined patient populations and time points for evaluation. Double blinding is almost impossible in studies that compare surgical interventions for the correction of Dupuytren contracture. It has been accomplished in randomized, double-blind placebo-controlled studies of injection of CCH for the treatment of Dupuytren contracture,^{10,11} and it might be approximated in a surgical trial by having individuals other than the surgeons who carried out the intervention perform the assessment for recurrence. Ideally, these evaluators would not be involved in the surgical interventions for Dupuytren contracture and would be blinded for the treatment by having the patient wear tight-fitting gloves but the evaluators would be well trained in the application of well-defined quantitative tests, the results of which would be used to define recurrence. In addition, these studies would also need to carefully and quantitatively define

TABLE 1. Study Results of Patients Treated by Fasciectomy/Aponeurectomy and Fasciotomy/Aponeurotomy

Citation	Number of Patients	Patient Characteristics	Study Design and Procedure	Correction of Contracture Definition	Correction Rate	Recurrence Definition	Recurrence Rate
Fasciectomy/aponeurectomy Hueston, 1963 ¹⁸	224	Not stated	Case series—fasciectomy (limited in 202 patients; total in 22 patients)	Clearance of disease	47% during up to 5 y of follow-up	Appearance of new Dupuytren tissue within the area cleared at operation	28% during up to 5 y of follow-up
Gelberman, 1980 ¹⁹	24	All patients were men; 45–67 y of age; average duration of disease of 8.5 y; deformity was mild in 8 patients, moderate in 7 patients, and severe in 9 patients; 6 had bilateral disease; fasciitis was present in the plantar fascia in 2 patients; and Peyronie disease was present in 2 patients	Case series—fasciectomy	Correction was good if $\leq 15^\circ$ loss of extension remained after treatment for either the MCP or the PIP joint and flexion to the palm was complete, fair if there was 15° – 25° loss of extension and the patient could flex to within 1 cm of the distal palmar crease, and poor if the patient had greater loss of flexion or extension	Results were good in 11 patients, fair in 12 patients, and poor in 1 patient during 18 mo of follow-up	The appearance of new fascial bands, determined by appearance and palpation, in an area where fasciectomy had been previously performed	12% during 18 mo of follow-up
Nieminen, 1986 ²⁰	70	63 men and 7 women; mean age, 63 y	Case series—regional fasciectomy	No recurrence or extension of disease	No extension of disease was noted and 57% of hands had no recurrence during 47 mo of follow-up	Reappearance of Dupuytren disease in the cleared operative field	43% of hands during a mean of 47 mo of follow-up
Rombouts, 1989 ²¹	63	54 men and 9 women; mean age, 59 y; 1 had early disease (presence of nodules in the absence of retraction), 66 had active disease (increasing retraction), and 10 had advanced disease (long-standing condition that has not worsened during recent months)	Case series—selective fasciectomy	Freedom from disease	29% during a mean of 63 mo of follow-up	Appearance of new lesions (bands or nodules) determined by appearance and palpation in an already operated area	39% of hands during a mean of 63 mo of follow-up
Foucher, 1997 ²²	107	100 men and 7 women; median age at operation 57 y; median duration of disease 4 y; Garrod knuckle pads were present in 11%, Ledderhose disease in 5%, and Peyronie disease in 3%; bilateral involvement was present in 42%	Case series—open palm with Bruner incisions	Improvement in mobility at 5 y	36%	Disease reappearing in a site that had been operated on	41% during a mean of 5.6 y of follow-up

TABLE 1. Continued

Citation	Number of Patients	Patient Characteristics	Study Design and Procedure	Correction of Contracture Definition	Correction Rate	Recurrence Definition	Recurrence Rate
Adam, 1992 ²³	85	74 men and 11 women; average age at time of operation 57 y	Case series—partial fasciectomy	Outcomes were defined as excellent (full flexion and extension of the fingers, full function, and no recurrence), good (slight limitation of flexion or extension; recurrence, if present, was too slight to interfere with normal activity), fair (limitation of flexion or extension with joint stiffness, recurrence or extension causing some limitation of hand's function), or poor (no improvement in the initial range of movement or function, recurrence or extension causing serious loss of function)	Outcomes were rated as excellent or good in 57% of hands and fair or poor in 43% of 113 hands during a mean of 41 mo of follow-up	Appearance of Dupuytren disease in area cleared by operation	34% during a mean of 41 mo of follow-up
Cools, 1994 ²⁴	28	25 men and 3 women; mean age at time of operation 64 y; disease duration ranged from 1 to 32 y; 15% had severe disease according to Tubiana classification; 25% had ectopic disease (18% knuckle pads, 7% plantar nodules)	Case series—partial fasciectomy with open palm technique	Freedom from recurrence and extension	15% of patients had no recurrence or extension during a mean of 2.5 y of follow-up	New Dupuytren disease in the area operated on	34% during a mean of 2.5 y of follow-up
Foucher, 1995 ²⁵	54	50 men and 4 women; mean age 54 y; mean duration of disease 3 y; 8 patients were in stage 4 of Tubiana and Michon classification, 11 in stage 3, 25 in stage 2, and 10 in stage 1; 3 patients had associated ulnar nerve lesions at the elbow; 6 had knuckle pads, 3 had plantar fibromatosis, and 2 had Peyronie disease	Case series—open palm with transverse and Bruner incisions	Extension and flexion deficits at the MCP and PIP joints were measured before and after operation with a goniometer	Immediate postoperative median gains in extension were 49° for the MCP joint, 31° for the PIP joint, and 81° globally	Disease reappearing in a site that had been operated on	39% during a mean of 6.6 y of follow-up

(Continued on following page)

TABLE 1. Study Results of Patients Treated by Fasciectomy/Aponeurectomy and Fasciotomy/Aponeurotomy (Continued)

Citation	Number of Patients	Patient Characteristics	Study Design and Procedure	Correction of Contracture Definition	Correction Rate	Recurrence Definition	Recurrence Rate
Abe, 2004 ²⁶	57	53 men, 4 women; mean age 61 y; mean disease duration 4.5 y; 23 ectopic lesions (12 knuckle pads, 11 plantar fibrosis, 1 Peyronie disease)	Case series—subtotal fasciectomy	Percentage improvement of extension in each finger joint; an excellent result was defined as a 90%–100% improvement, a good result as a 70%–89% improvement, a fair result as a 30%–69% improvement, and a poor result as < 30% improvement of the extension loss	Approximately 90% improvement in the loss of extension was achieved in the MCP joints of each finger. The mean percentage improvements were 54% and 38% in the PIP joints of the ring and the little fingers, respectively, indicating only fair results	Disease within previously operated sites	14% (5% with recurrence plus extension) during a mean follow-up of 4 y
Abe, 2004 ²⁷	77	72 men and 5 women; average age 62 y; average duration of disease 5 y; 15 patients had involvement of knuckle pads; 20 had plantar fibrosis; and 58 had bilateral hand involvement	Case series—surgery involving radial side of hand	No recurrence or extension	50% had no recurrence or extension during a mean of 4 y of follow-up	Disease within previously operated sites	23% during a mean follow-up of 4 y
Citron, 2005 ²⁸	79	63 men and 16 women; 12 with knuckle pads	Randomized clinical trial—fasciectomy	Full correction of contracture	96%	Any new nodule of disease in the operative field under the flaps	26% during 2 y of follow-up
Dias, 2006 ²⁹	1,177	969 men and 208 women; mean age 63 y; 197 with bilateral disease	Survey—partial fasciectomy, open palm, dermofasciectomy with skin graft	Full correction of contracture	58% of 229 patients with a mild MCP joint contracture had a full correction versus 28% of 264 patients with severe contractures of both the MCP and the PIP joints	Reappearance of a contracture sufficient to require surgery, according to the Hueston table-top test	15% had recurrent or persistent disease during a mean of 27 mo of follow-up

TABLE 1. Continued

Citation	Number of Patients	Patient Characteristics	Study Design and Procedure	Correction of Contracture Definition	Correction Rate	Recurrence Definition	Recurrence Rate
Anwar, 2007 ¹⁶	109	All women; average age 63 y	Case series—fasciectomy, fasciectomy and local flap, or dermofasciectomy	Comparison of pre- and postoperative measurements made using a goniometer; and percentages of patients achieving full correction	Mean pre- and postoperative contractures for MCP joints were 35° and 1°, respectively. Mean preoperative contracture for PIP joints was 42°, and mean postoperative contracture was 7°. Full correction was 97% for MCP, 67% for PIP, and 100% for DIP	Disease within previously operated sites	22% (pooled for all procedures) during an average of 12 mo of follow-up
Juriscic, 2008 ³⁰	93	Mean age 58 y; mean duration of disease 10 y; bilateral hand involvement in 62 patients, ectopic lesions in 13 patients (9 Garrod knuckle pads and 4 Ledderhose disease)	Case series—partial fasciectomy	No recurrence or extension of disease	52% had extension, 42% had recurrence with extension, and 73% had recurrence during 7 y of follow-up (data presentation made it impossible to determine mutually exclusive outcomes)	Development of new Dupuytren disease lesions, including the smallest palpable nodule irrespective of a presenting contracture, in the same area where fasciectomy had been performed	73% during a median of 7 y of follow-up
Ullah, 2009 ³¹	79	65 men and 14 women; mean age 62.9 y; mean duration of disease 6.1 y; mean contracture was 21° at the MCP joint and 59° at the PIP joint; 46 patients had bilateral disease	Randomized clinical trial—fasciectomy versus dermofasciectomy (firebreak skin graft)	Degree of contracture, its correction, and the range of movement at the MCP and PIP joints assessed immediately and 2 wk after surgery	All the MCP contractures were corrected fully, whereas the PIP deformities were corrected to a mean of 6° of contracture in both groups	Recurrence of contracture of the PIP joint	12% (pooled for both procedures) during 3 y of follow-up

(Continued on following page)

TABLE 1. Study Results of Patients Treated by Fasciectomy/Aponeurectomy and Fasciotomy/Aponeurotomy (Continued)

Citation	Number of Patients	Patient Characteristics	Study Design and Procedure	Correction of Contracture Definition	Correction Rate	Recurrence Definition	Recurrence Rate
Kartik, 1963 ³²	294	Bilateral involvement in 40 patients	Case series—aponeurectomy	Qualitative assessment with rating of excellent, good, or bad	79% of surgeries were rated as excellent; 16% as good; and 5% as bad	Nodes or fasciae appearing in the area of the operation	5% during up to 10 y of follow-up
Andrew, 1991 ³³	46	38 men and 8 women; mean age 65.5 y mean duration of disease was 6.5 y	Prospective single-treatment study—segmental aponeurectomy	Change in mean flexion contracture	At 12 mo, MCP joint contracture decreased from 41° to 1°, PIP joint contracture from 50° to 22°, and total flexion deformity decreased from 61° to 12°	The presence of a detectable disease in the operated ray	15% during 12 mo of follow-up
De Maglio, 1996 ³⁴	186 (124 evaluable for recurrence)	169 men and 17 women; mean age 59 y; 21 had bilateral involvement; Tubiana-Michon stage was 1 for 20 patients, 2 for 41 patients, 3 for 36 patients, and 4 for 48 patients	Case series—aponeurectomy	Excellent was defined as complete extension, good as residual flexion ≤ 15°, fair as residual flexion > 15°, and poor as no improvement in function	Postsurgical outcomes were 55% excellent, 34% good, 6% fair, and 6% poor	Occurrence of a nodule	24% during a mean follow-up of 33 mo
Fasciotomy/aponeurotomy Rodrigo, 1976 ³⁵	359 hands (135 available for follow-up for ≥ 2 y)	Preoperative deficits in MCP extension were 27° for hands undergoing fasciectomy and 43° for hands undergoing fasciotomy; the respective values for PIP joints were 46° and 44°	Case series—fasciotomy and fasciectomy (fascial excision)	Changes from baseline in MCP and PIP joint extension	Postoperative gains in MCP extension at 2 mo after surgery were 26° for hands undergoing fasciectomy and 35° for hands undergoing fasciotomy; the respective values for PIP joints were 19° and 1°	Recurrence of the disease in areas of the hand from which the fascia had been removed previously	Fasciotomy: 100%; fasciectomy: 63% of hands during ≥ 2 y of follow-up

TABLE 1. Continued

Citation	Number of Patients	Patient Characteristics	Study Design and Procedure	Correction of Contracture Definition	Correction Rate	Recurrence Definition	Recurrence Rate
Citron, 2003 ³⁶	30	24 men and 6 women; mean age 66.5 y; knuckle pads in 2 patients	Nonrandomized clinical trial—fasciotomy with transverse incision and direct closure or longitudinal incision and z-plasty closure	Change from preoperative MCP flexion deformity	Fasciotomy decreased MCP flexion deformity from 35° to 12° and fasciotomy plus z-plasty decreased MCP flexion deformity from 28° to 9°	The reappearance of Dupuytren tissue in the operative field. This included isolated nodules, without contracture but did not include extension beyond the operative field	33% (pooled for all procedures) during 2 y of follow-up
van Rijssen, 2006 ³⁷	52	44 men and 8 women; mean age 65 y; mean preoperative TPED 62°	Case series—percutaneous needle fasciotomy	Postoperative change from baseline TPED	Mean TPED overall immediately after surgery was 18°, a mean reduction of 77%. In the MCP joints, the mean reduction in TPED of 88%; and in the PIP joints, it was 46%. The TPED was decreased by 75% for the single PIP joint treated	TPED increased during follow-up of ≥ 30° compared with the immediate postoperative measurements	65% after 32 mo of follow-up

DIP, distal interphalangeal; MCP, metacarpophalangeal; PIP, proximal interphalangeal; TPED, total passive extension deficit.

the entry criteria for the trial, as did the CCH studies^{10,11} and the studies of van Rijssen et al⁴⁰ that compared limited fasciectomy with fasciotomy.

Comparison of surgical treatments for Dupuytren contracture could also be facilitated by consistent and quantitative definitions of both correction of contracture and recurrence. The definitions for both correction of contracture and recurrence were qualitative in all but a few of the studies included in this review (Table 1). The most detailed definition for correction of contracture in the studies reviewed was good correction if less than 15° loss of extension remained after treatment for either the metacarpophalangeal or the proximal interphalangeal joint and flexion to the palm was complete, fair if there was 15° to 25° loss of extension and the patient could flex to within 1 cm of the distal palmar crease, and poor if the patient had greater loss of flexion or extension.¹⁹ More often, correction of contracture was defined qualitatively as clearance of disease,¹⁸ freedom from disease,²¹ or full correction of contracture.²⁹ A detailed quantitative definition of correction of contracture was employed in the Food and Drug Administration phase 3 studies of CCH for the treatment of Dupuytren contracture. In these studies, correction of contracture was defined as clinically successful if a reduction in primary joint contracture to 0° to 5° of full extension was achieved 30 days after the last injection. Presentation of results from these trials also included mean changes in range of motion for injected joints at 30 days after the last injection.^{10,11} Definitions of recurrence in most of the studies reviewed were also qualitative. Examples include appearance of new Dupuytren tissue within the area cleared at operation,¹⁸ reappearance of Dupuytren disease in the cleared operative field,²⁰ and the appearance of new fascial bands, determined by appearance and palpation in an area where fasciectomy had been previously performed.¹⁹ Comparison of the long-term efficacy of different treatments for Dupuytren contracture would be facilitated by a quantitative definition of recurrence of the type employed in the phase 3 studies of CCH injection. In these trials, recurrence of contracture was defined as an increase in joint contracture to greater than 20° in the presence of a palpable cord at any time during the study in primary joints that reached the criterion for correction of contracture.^{10,11} An earlier study of CCH injection for the treatment of Dupuytren contracture also employed the greater than 20° definition of recurrence.⁴¹

van Rijssen and colleagues have also used a quantitative definition (total passive extension deficit increase of ≥30° compared with immediate postoperative mea-

surements) to assess recurrence following percutaneous needle fasciotomy.³⁷ A recently published 5-year follow-up of a randomized clinical trial comparing percutaneous needle fasciotomy and limited fasciectomy also provides further insight into response to surgery and recurrence by using specific definitions for assessment of these parameters.⁴⁰

An important question that remains to be answered is what the best approach to study interventions aimed at correcting Dupuytren contracture is. Assessments of CCH injection^{10,11,41} for the treatment of this condition and the van Rijssen et al data⁴⁰ may provide some guidance for changes. Becker and Davis have also suggested that objective measures for correction of contracture, well-defined follow-up intervals, and a consensus definition of recurrence be employed in studies of treatments for Dupuytren contracture.⁴²

As previously noted, the small number of fasciotomy studies limits the ability to compare outcomes with different treatments. This limitation may reflect a drawback of the search criteria and methods used for this review. It is possible that some of the excluded studies (ie, those that did not include specific information in the abstract) in fact reported the outcomes of interest within the full reports and would have been appropriate to include. Similarly, our search methods identified a survey that, although meeting the inclusion criteria, may be of somewhat limited value relative to the other studies reviewed.²⁹ Results from the present analysis indicate high variability in the definition of both correction of contracture and recurrence and a corresponding wide range of outcomes reported in studies of surgical interventions for Dupuytren contracture. Randomized controlled clinical trials provide the best approach to comparison of treatments but are difficult to carry out for this condition. At a minimum, development of consensus end points and approaches to follow-up of patients undergoing specific treatments may facilitate evidence-based recommendations for treatment of Dupuytren contracture. The detailed definitions for correction of contracture and recurrence and clear definition of timing for patient evaluations in clinical studies of CCH for the treatment of Dupuytren contracture^{10,11} provide a good example of how this can be accomplished.

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APPENDIX B: PAPERS INCLUDED IN FULL-TEXT REVIEW

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