Dutch Multidisciplinary Guideline on Dupuytren Disease

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Dutch Multidisciplinary Guideline on Dupuytren Disease

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Purpose: To provide a comprehensive, evidence-based overview of the treatment for Dupuytren disease, specifically needle techniques, radiotherapy, primary conservative therapy, surgery, lipofilling, operative arthrolysis, salvage techniques, and the postoperative protocol and to make clinical recommendations for health care practitioners and patients.
Methods: Comprehensive multidisciplinary guideline process funded by the Quality Foundation of the Dutch Federation of Medical Specialists. This process included a development, commentary, and authorization phase. Patients participated in every phase. Multiple databases and existing guidelines up to August 2020 were searched. Studies on Dupuytren disease were considered eligible. Specific eligibility criteria were described per module. To appraise the certainty of the evidence, reviewers extracted data, assessed the risk of bias, and used the Grading of Recommendations Assessment, Development and Evaluation method, where applicable. Important considerations were as follows: patient values and preferences, costs, acceptability of other stakeholders, and feasibility of implementation. Recommendations were made based on the evidence from the literature and the considerations. The primary and secondary outcome measures were defined per module based on the input of patients obtained in collaboration with the Netherlands Patient Federation and health care providers from different professions.
Results: The following 8 specific modules were completed for Dupuytren disease: (1) needle techniques, (2) radiotherapy, (3) primary conservative therapy, (4) surgery, (5) lipofilling, (6) operative arthrolysis, (7) salvage techniques, and (8) the postoperative protocol.
Conclusions: Our Dutch multidisciplinary guideline on Dupuytren disease provides 8 modules developed according to the standards of the Dutch Federation of Medical Specialists. Evidence-based recommendations for clinical practice are provided for needle techniques, radiotherapy, primary conservative therapy, surgery, lipofilling, operative arthrolysis, salvage techniques, and the postoperative protocol. This guideline can assist health care providers and patients in clinical practice.
Type of study/level of evidence: Systematic review/I-II.

Background to This Guideline

Dupuytren disease is an abnormal thickening of the palmar fascia. This thickened area may develop into a hard lump or thick band and, over time, can cause a flexion contracture of one or more fingers. The condition is mainly seen in northwestern

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Table
Overview of the Dutch Multidisciplinary Guideline Process and the 8 Modules

Contents of Each Module	Modules in This Guideline
Initial scoping questions	1. Needle techniques
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Literature search and selection*	3. Primary conservative therapy
Literature summary*	4. Surgery
Conclusions*	5. Lipofilling
Considerations*	6. Perioperative arthrolysis
Recommendations	7. Salvage techniques
	8. Postoperative protocol

* In Appendix 1 supplementary material

Europe and is relatively uncommon in the African population. In the United States, the estimated incidence is 0.03%.[1] Treatment is advised in flexion contractures of the metacarpophalangeal or the proximal interphalangeal joints of at least 30°. In the Netherlands, hand surgery is mainly the responsibility of the plastic surgeon, but general or orthopedic surgeons can also be involved. The standard treatment is a partial fasciectomy, but the associated comorbidity is attributable to the use of needle fasciotomy. The first Dutch guideline on Dupuytren disease was published in 2012.[2] Since then, many new scientific studies have been performed comparing partial and needle fasciotomies and there is a great need to answer the question of whether the 2 treatments are equally effective and, if so, whether 1 of the 2 is preferable in certain situations.

Aim of the Guideline

The aim was to develop a multidisciplinary, evidence-based guideline on needle techniques, radiotherapy, primary conservative therapy, surgery, lipofilling, operative arthrolysis, salvage techniques, and the postoperative protocol for Dupuytren disease (Table). The guideline could provide guidance on how to manage the challenges experienced by patients with Dupuytren disease in the primary (at the general practitioner's office) and secondary (hospital) health care settings.

Materials and Methods

This guideline, endorsed by all national professional associations involved, was developed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach in a process led by 2 GRADE methodologists.[3–5] The guideline panel comprised the authors, other multidisciplinary health care providers and researchers, and a representative of the Dutch patient association for Dupuytren disease (Appendix 1, available on the *Journal's* website www.jhsgo.org). The panel was first surveyed to prioritize questions and important outcomes.

We conducted systematic searches of the literature for published network meta-analyses, systematic reviews, randomized controlled trials, and nonrandomized studies up to June 2020. Details of the synthesis of the evidence, preparation of evidence profiles, and evidence-to-decision tables for the 8 modules are presented in Appendix 1. Briefly, evidence for relative risks and differences among interventions were converted to absolute effects with 95% confidence intervals and were presented in evidence profiles. We assessed the quality of the evidence as high, moderate, low, or very low according to the GRADE criteria (Table, Appendix 1). The evidence-to-decision tables presented to the panel for consideration included a summary of the evidence for benefits and harms, quality of the evidence, relevant values and preferences of residents and their families, resource use, and feasibility.

Recommendations were made based on the results of both scientific research and the considerations of the working group, in which the patient perspective has an important role.

It is important to stress that GRADE recommends using interventions only in research in specific circumstances. In these circumstances, even if the evidence is low, guidelines can provide sweeping and definitive recommendations.

Promising interventions (usually new interventions) with thus far insufficient evidence of benefit to support their use may be associated with appreciable harms or costs. Decision makers may be concerned about providing premature favorable recommendations for their use, encouraging the rapid diffusion of potentially ineffective or harmful interventions, and preventing recruitment to research already underway. They may be equally reluctant to recommend against such interventions out of fear that they will inhibit further investigation. By making recommendations for the use of an intervention only in the context of research, they may provide an important stimulus in the efforts to answer important research questions, and thus, resolve uncertainty about optimal management.

Recommendations for using interventions only in research are appropriate when the following 3 conditions are met:

1. There is, thus far, insufficient evidence to support a decision for or against an intervention.
2. Further research has considerable potential for reducing uncertainty about the effects of the intervention.
3. Further research is considered to be of good value for the anticipated costs.

Recommendations for using interventions only in research should be accompanied by detailed suggestions about the specific research questions that should be addressed, particularly which patient-important outcomes they should measure. The recommendation for research may be accompanied by a strong explicit recommendation not to use the experimental intervention outside of the research context.

- Source: grade handbook[3–5]

Results

Module 1: Needle techniques as treatment of patients with Dupuytren disease

Scoping question

What are the indications for needle techniques (percutaneous needle fasciotomy and collagenase injections) in treating Dupuytren disease?

This scoping question includes the following 3 subquestions:

1. What is the effectiveness of percutaneous needle fasciotomy versus collagenase injections for flexion contractures in primary Dupuytren disease?
2. What is the effectiveness of collagenase injections versus partial fasciectomy for flexion contractures in primary Dupuytren disease?
3. What is the effectiveness of percutaneous needle fasciotomy versus partial fasciectomy for flexion contractures in primary Dupuytren disease?

Introduction

There is evidence that percutaneous needle fasciotomy effectively releases flexion contractures and can be performed on an outpatient basis under local anesthesia.[6–8] However, there is a 60% recurrence rate after 3 years.[6–8] For collagenase injections, only preliminary data were available when the previous guideline on Dupuytren disease was published. These results indicated that collagenase injections are safe and minimally invasive.[9–11] Long-term results on effectiveness have been published at the time of writing this article but do not indicate that collagenase injections are equally effective as standard therapy (partial fasciectomy).[12–17] The quality of evidence is low to very low.

Recommendations

1. Partial fasciectomy is the first-choice treatment.
2. Consider the following for percutaneous needle fasciotomy:
   -in the elderly patient with a palpable strand.
   -in the relatively younger patient with a palpable strand, should they wish for a minimally invasive treatment while accepting the higher recurrence rate.
3. Percutaneous needle fasciotomy is not indicated when there is no palpable strand.
4. The working group advises that collagenase injections to treat Dupuytren disease should be restricted to clinical trials.

Module 2: Radiotherapy as treatment of patients with Dupuytren disease

Scoping question

What is the value of radiotherapy in the treatment of Dupuytren disease?

Introduction

In the Netherlands, radiotherapy is rarely applied in the treatment of Dupuytren disease. However, in Germany it is common to treat Dupuytren disease in this way. A literature search revealed that all 10 included studies were patient series. Studies comparing radiotherapy versus natural courses or other nonsurgical treatments have not yet been published. The quality of evidence could not be judged using GRADE.

Recommendations

The working group advises that radiotherapy to treat Dupuytren disease should be restricted to clinical trials.

Module 3: Primary conservative therapy as treatment of patients with Dupuytren disease

Scoping question

What is the value of hand therapy (orthosis fabrication, exercises, hand therapy, manipulation, or a combination) as therapy in primary Dupuytren disease?

Introduction

Many patients with Dupuytren disease are interested in noninvasive treatment options. This module investigates if hand therapy as the primary treatment for Dupuytren disease is effective for patients who have not undergone surgery. The literature concerning noninvasive therapies offers studies comparing different types of orthoses or shockwave therapy, laser therapy, and extension exercises.[18,19] Quality of evidence could not be judged with GRADE.

Recommendations

The working group cannot recommend noninvasive treatments as primary therapy in primary Dupuytren disease

Module 4: Surgery as a treatment option for patients with Dupuytren disease

Scoping question

What is the effectiveness of surgery for Dupuytren disease?
This scoping question includes the following 5 submodules:

1. What is the effect of dermofasciectomy compared with partial fasciectomy in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?
2. What is the effect of segmental fasciectomy compared with partial fasciectomy in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?
3. What is the effect of radical fasciectomy compared with partial fasciectomy in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?
4. Is there an indication for preoperative orthosis fabrication?
5. Is there an indication for an external fixator?

Submodule 4.1: Dermofasciectomy as compared with partial fasciectomy

What is the effect of dermofasciectomy compared with partial fasciectomy in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?

Introduction

In partial fasciectomy, the affected fascia is removed. The technique was described by Goyrand in 1834 and has become the gold standard for surgery in Dupuytren disease. The affected strand is removed as proximally and distally as possible, resulting in a considerable wound bed and postoperative swelling. The exact recurrence rate after 5 years is uncertain, and previous cohort studies report that it varies between 17.5% and 40.7%.[20,21]

In dermofasciectomy, the affected fascia is removed together with the overlying skin. The defect is then closed with a full-thickness skin graft. Excision of the affected dermis is expected to lead to a low recurrence rate.[22,23] Dermofasciectomy has not become a popular treatment option. Skin transplants lead to a longer operating time, require postoperative immobilization, and can lead to contractures after shrinking. The quality of evidence is low.

Recommendations

Before considering surgery, patients should be informed of the following:

1. that surgery cannot result in a completely straight finger or removal of the entire affected fascia.
2. the possibility of Dupuytren disease recurring.
3. that wound healing takes time and that scar tissue is to be anticipated
4. the intensity and duration of the postoperative period.

Reconsider surgery in case of the following relative contraindications: (1) immunosuppressive therapy, (2) anticoagulant therapy, (3) smoking, (4) diabetes mellitus, (5) vascularly compromised upper extremities.

Apply partial fasciectomy, preferably in primary Dupuytren disease, and a positive tabletop test.

Apply dermofasciectomy preferably when the skin above the strand cannot be saved, and in cases of persistent recurrence.

Consider dermofasciectomy in young patients with a strong diathesis.

Submodule 4.2: Segmental fasciectomy compared with partial fasciectomy

What is the effect of segmental fasciectomy compared with partial fasciectomy in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?

Introduction

Segmental fasciectomy was first described by Moermans.[24,25] This technique removes several segments of approximately 1 cm through a C-shaped incision over the strand. The technique was said to be particularly useful in contractures of the metacarpophalangeal joint. In addition, it would lead to fewer wound healing problems and stiffness. In 1991, Andrew and Kay[26] reported a 20% recurrence rate 1 year after segmental fasciectomy. Clibbon and Logan[27] described a recurrence rate of 10%. However, the results are unreliable since 30% of patients were lost to follow-up. The quality of evidence could not be judged using GRADE.

Recommendations

There is no indication of a segmental fasciectomy.

Submodule 4.3: Radical fasciectomy compared with partial fasciectomy

What is the effect of radical fasciectomy compared with partial fasciectomy in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?

Introduction

Radical fasciectomy is performed through a palmar Y-shaped incision. The complete palmar fascia is removed, including the thenar and hypothenar fascia. Consequently, the recurrence rate is theoretically low. However, the treatment is associated with more scar contractures than equally effective alternative therapies. Only poor-quality studies have been published concerning radical fasciectomy. The complication rate has been reported to be 8% to 24%, and the recurrence rate to be 5% to 40% after a mean period of 3.5 years.[28–31] The quality of evidence could not be judged using GRADE.

Recommendations

There is no indication of a radical fasciectomy.

Submodule 4.4: Is there an indication for preoperative splinting?

What is the effect of preoperative orthosis fabrication in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?

Introduction

Although uncommon, some research has been performed to study preoperative orthosis fabrication in patients with primary Dupuytren disease.[32] The idea behind preoperative orthosis fabrication is to prepare the finger for surgery, potentially resulting in a better outcome. The quality of evidence could not be judged using GRADE.

Recommendations

The working group cannot recommend preoperative orthosis fabrication based on the available data.

Submodule 4.5: Is there an indication for a preoperative external fixator?

What is the effect of a preoperative external fixator in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?

Introduction

Although uncommon, some research has been performed to study a preoperative external fixator in patients with primary Dupuytren disease.[33,34] The idea behind a preoperative external fixator is to prepare the finger for surgery, potentially resulting in a better outcome. The quality of evidence could not be judged using GRADE.

Recommendations

The working group cannot recommend the use of an external fixator.

Module 5: Lipofilling as a treatment option for patients with Dupuytren disease

Scoping question

What is the effectiveness of lipofilling for Dupuytren disease?

This scoping question includes the following 2 subquestions:

1. What is the effectiveness of partial fasciectomy or percutaneous needle fasciotomy, both in combination with lipofilling, compared with partial fasciectomy or percutaneous needle fasciotomy alone?
2. What is the effectiveness of percutaneous needle fasciotomy combined with lipofilling compared with partial fasciectomy?

Introduction

Since 2016, lipofilling has been used as an addition to percutaneous needle fasciotomy. This procedure injects a small amount of autologous fat into the subcutaneous space after performing a percutaneous needle fasciotomy. Theoretically, this would result in softer and better scars and a lower recurrence rate.[35] The quality of evidence is very low.

Recommendations

The working group advises that the application of lipofilling be restricted to clinical trials in patients with primary Dupuytren disease.

Module 6: Perioperative arthrolysis as treatment of patients with Dupuytren disease

Scoping question

What is the effect of perioperative arthrolysis in addition to partial fasciectomy compared with partial fasciectomy alone in patients with primary Dupuytren disease resulting in a flexion contracture of the finger?

Introduction

In the case of a longstanding flexion contracture of the proximal interphalangeal joint resulting from Dupuytren disease, a secondary contracture may occur. In such cases, after removal of the Dupuytren tissue, a proximal interphalangeal joint contracture remains. Arthrolysis, a release of the accessory collateral ligaments and/or the checkrein ligaments, could then potentially be of value

in resolving the contracture. The quality of evidence could not be judged using GRADE.

Recommendations

The working group cannot recommend the value of perioperative arthrolysis in cases where a flexion contracture remains after partial fasciectomy.

Module 7: Salvage techniques as a treatment option for patients with Dupuytren disease

Scoping question

What is the indication for salvage techniques like amputation and arthrodesis in patients with Dupuytren disease?

Introduction

In some severe cases, if one of the regular treatments for Dupuytren disease is no longer indicated, then more extreme measures might need to be taken. Examples of such cases are severe functional impediments resulting from flexion contracture, vascular insufficiency, and pain or loss of sensation resulting from several previous operations. The quality of evidence could not be judged using GRADE.

Recommendations

Consider salvage techniques in severe recurrent contracture when partial fasciectomy cannot generate improvement and in cases with vascular insufficiency or damaged sensation.

Module 8: The postoperative protocol in patients with Dupuytren disease

Scoping question

What is the effect of postoperative treatment on Dupuytren disease?

This scoping question includes the following 3 submodules:

1. Hand therapy versus no hand therapy.
2. Hand therapy plus splinting versus no hand therapy plus splinting.
3. Hand therapy along with orthosis fabrication versus hand therapy alone.

Submodule 8.1: Hand therapy versus no hand therapy

What is the effect of hand therapy versus no hand therapy after surgery or needle technique therapy in patients with Dupuytren disease with or without a residual flexion contracture of the finger?

Introduction

After surgical treatment for Dupuytren disease, patients are usually referred for hand therapy to improve the mobility of finger joints and hand function.[36,37] An explanation for the absence of studies comparing hand therapy with no hand therapy could be that postoperative hand therapy is so common in the treatment of Dupuytren disease that it is considered unethical to withhold patients therapy.[38] The quality of evidence could not be judged using GRADE.

Recommendations

Inform patients about the intensity of the postoperative protocol, the duration of wound healing and scar formation, and the cost coverage of hand therapy.

Give postoperative instructions concerning the following: (1) prevention/reduction of edema, (2) wound care and scar treatment, (3) load and load capacity, (4) involving the hand/wrist in daily activity and work, and (5) specific aids.

Consider the following regarding postoperative exercise therapy:

1. Exercise therapy is always indicated.
2. Preferably start 3–5 days after surgery.
3. Exercise therapy consists of passive and active finger flexion, passive and active finger extension, active gliding exercises, stretching of the intrinsics, building strength and functionality.
4. Apply a frequency of exercises of 3–6 times a day.
5. Evaluate the exercise therapy and adapt it if necessary.
6. Continue postoperative exercise therapy for 3–12 weeks.
7. Stop the postoperative exercise therapy when scar tissue no longer contracts and limitations have subsided concerning function, activities, and participation.

Submodule 8.2: Hand therapy plus splinting versus no hand therapy plus splinting

What is the effect of hand therapy along with orthosis fabrication versus no hand therapy along with orthosis fabrication after surgery or needle technique therapy in patients with Dupuytren disease with or without a residual flexion contracture of the finger?

Introduction

After surgical treatment for Dupuytren disease, patients are usually referred for hand therapy and in many cases orthosis fabrication is part of the postoperative protocol.[39,40] The quality of evidence could not be judged using GRADE.

Recommendations

Based on this submodule, the working group cannot recommend the fabrication of orthoses.

Submodule 8.3: Hand therapy along with orthosis fabrication versus hand therapy alone

What is the effect of hand therapy along with orthosis fabrication versus hand therapy alone after surgery or needle technique therapy in patients with Dupuytren disease with or without a residual flexion contracture of the finger?

Introduction

Three randomized controlled trials have been published comparing hand therapy along with orthosis fabrication with hand therapy alone.[41–43] The total active extension deficit after 12 months was similar between hand therapy along with orthosis fabrication and hand therapy alone. The quality of evidence was low to very low.

Recommendations

The working group advises against the routine use of postoperative orthosis fabrication. Postoperative orthosis fabrication should be reserved for selected indications, such as capsulogenic flexion contractures, after arthrolysis, or in progressive extension deficit.

Consider the following when postoperative orthosis fabrication is indicated:

1. Apply limited redress force.
2. Use the orthosis at night for 6–24 weeks.
3. Evaluate the orthotic therapy and adapt it if necessary.
4. Stop the orthotic therapy when the scar tissue no longer contracts or the arthrogenic limitation is nonmodifiable.

Discussion

Dupuytren disease is a common condition in the hand surgical practice that can result in reduced quality of life and is notorious for its recurrence. The Netherlands Society of Plastic Surgery initiated this new multidisciplinary clinical guideline on Dupuytren disease. We followed the standard national comprehensive multidisciplinary guideline process. In collaboration with the Dutch patient association, we identified current barriers for patients with Dupuytren disease. The following domains were deemed important for Dupuytren disease: (1) needle techniques, (2) radiotherapy, (3) primary conservative therapy, (4) surgery, (5) lipofilling, (6) operative arthrolysis, (7) salvage techniques, and the (8) postoperative protocol. Standardized scientific approaches were used, including a systematic search, publication selection, data extraction, assessing the risk of bias, and appraising the certainty of evidence. This information was combined with other essential considerations, including patient values and preferences, costs, acceptability of other stakeholders, and feasibility of implementation.

Recommendations were made on the basis of the evidence from the literature and the considerations. All the national associations involved approved the guideline in January 2022.

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References

1. United States Department of Commerce, Bureau of the Census. Statistical abstract of the United States: 2010 (129th edition). U.S. Department of Commerce. United States Census Bureau. 2010. Accessed December 18, 2022. https://www.census.gov/library/publications/2009/compendia/statab/129ed.html
2. Dupuytren Disease. 2012. Accessed December 18, 2022. https://docplayer.nl/14855922-Richtlijn-ziekte-van-dupuytren.html
3. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336(7650):924–926.
4. Guyatt GH, Oxman AD, Kunz R, et al. Going from evidence to recommendations. *BMJ*. 2008;336(7652):1049–1051.
5. Grading of Recommendations Assessment, Development and Evaluation Working Group. GRADEWorkingGroup. Accessed December 18, 2022. www.gradeworkinggroup.org
6. Foucher G, Medina J, Malizos K. Percutaneous needle fasciotomy in Dupuytren disease. *Tech Hand Up Extrem Surg*. 2001;5(3):161–164.
7. van Rijssen AL, Werker PMN. Percutaneous needle fasciotomy for recurrent Dupuytren disease. *J Hand Surg Am*. 2012;37(9):1820–1823.
8. van Rijssen AL, ter Linden H, Werker PMN. Five-year results of a randomized clinical trial on treatment in Dupuytren's disease: percutaneous needle fasciotomy versus limited fasciectomy. *Plast Reconstr Surg*. 2012;129(2):469–477.
9. Hurst LC, Badalamente MA, Hentz VR, et al. Injectable collagenase *Clostridium histolyticum* for Dupuytren's contracture. *N Engl J Med*. 2009;361(10):968–979.
10. Badalamente MA, Hurst LC, Hentz VR. Collagen as a clinical target: nonoperative treatment of Dupuytren's disease. *J Hand Surg Am*. 2002;27(5):788–798.
11. Badalamente MA, Hurst LC. Efficacy and safety of injectable mixed collagenase subtypes in the treatment of Dupuytren's contracture. *J Hand Surg Am*. 2007;32(6):767–774.
12. Scherman P, Jenmalm P, Dahlin LB. One-year results of needle fasciotomy and collagenase injection in treatment of Dupuytren's contracture: a two-centre prospective randomized clinical trial. *J Hand Surg Eur*. 2016;41(6):577–582.
13. Scherman P, Jenmalm P, Dahlin LB. Three-year recurrence of Dupuytren's contracture after needle fasciotomy and collagenase injection: a two-centre randomized controlled trial. *J Hand Surg Eur*. 2018;43(8):836–840.
14. Skov ST, Bisgaard T, Søndergaard P, Lange J. Injectable collagenase versus percutaneous needle fasciotomy for Dupuytren contracture in proximal interphalangeal joints: a randomized controlled trial. *J Hand Surg Am*. 2017;42(5):321–328.e3.
15. Strömberg J, Ibsen-Sörensen A, Fridén J. Comparison of treatment outcome after collagenase and needle fasciotomy for Dupuytren contracture: a randomized, single-blinded, clinical trial with a 1-year follow-up. *J Hand Surg Am*. 2016;41(9):873–880.
16. Strömberg J, Ibsen Sörensen A, Fridén J. Percutaneous needle fasciotomy versus collagenase treatment for Dupuytren contracture: a randomized controlled trial with a two-year follow-up. *J Bone Joint Surg Am*. 2018;100(13):1079–1086.
17. Abe Y. Comparison of treatment outcomes after collagenase injection and percutaneous needle fasciotomy for Dupuytren's contracture: objective and subjective comparisons with a 3-year follow-up. *Plast Reconstr Surg*. 2020;145(6):1464–1474.
18. Brauns A, Van Nuffel M, De Smet L, Degreef I. A clinical trial of tension and compression orthoses for Dupuytren contractures. *J Hand Ther*. 2017;30(3):253–261.
19. Notarnicola A, Maccagnano G, Rifino F, et al. Short-term effect of shockwave therapy, temperature controlled high energy adjustable multi-mode emission laser or stretching in Dupuytren's disease: a prospective randomized clinical trial. *J Biol Regul Homeost Agents*. 2017;31(3):775–784.
20. Gordon S. Dupuytren's contracture: recurrence and extension following surgical treatment. *Br J Plast Surg*. 1957;9(4):286–288.
21. Zachariae L. Dupuytren's contracture. The operative treatment illustrated by a follow-up study of 520 cases. *Ugeskr Laeger*. 1969;131(51):2243–2247.
22. Ketchum LD. The use of the full thickness skin graft in Dupuytren's contracture. *Hand Clin*. 1991;7(4):731–741.
23. Armstrong JR, Hurren JS, Logan AM. Dermofasciectomy in the management of Dupuytren's disease. *J Bone Joint Surg Br*. 2000;82(1):90–94.
24. Moermans JP. Segmental aponeurectomy in Dupuytren's disease. *J Hand Surg Br*. 1991;16(3):243–254.
25. Moermans JP. Long-term results after segmental aponeurectomy for Dupuytren's Disease. *J Hand Surg Br*. 1996;21(6):797–800.
26. Andrew JG, Kay NRM. Segmental aponeurectomy for Dupuytren's disease: a prospective study. *J Hand Surg Br*. 1991;16(3):255–257.
27. Clibbon JJ, Logan AM. Palmar segmental aponeurectomy for Dupuytren's disease with metacarpophalangeal flexion contracture. *J Hand Surg Br*. 2001;26(4):360–361.
28. Webb-Jones A. Dupuytren's contracture. The results of radical fasciectomy. *Br J Plast Surg*. 1965;18(4):377–384.
29. Dickie WR, Hughes NC. Dupuytren's contracture: a review of the late results of radical fasciectomy. *Br J Plast Surg*. 1967;20(3):311–314.
30. Sennwald GR. Fasciectomy for treatment of Dupuytren's disease and early complications. *J Hand Surg Am*. 1990;15(5):755–761.
31. Högemann A, Kendoff D, Wolfhard U, O'Loughlin P, Olivier L. Total vs. partial aponeurectomy for Dupuytren's contracture–a literature review. *Cent Eur J Med*. 2010;5(1):1–5.
32. Piza-Katzer H, Herczeg E, Aspek R. Preoperative intermittent pneumatic extension treatment stage III and IV Dupuytren contracture. *Handchir Mikrochir Plast Chir*. 2000;32(1):33–37.
33. Craft RO, Smith AA, Coakley B, Casey WJ III, Rebecca AM, Duncan SFM. Preliminary soft-tissue distraction versus checkrein ligament release after fasciectomy in the treatment of Dupuytren proximal interphalangeal joint contractures. *Plast Reconstr Surg*. 2011;128(5):1107–1113.
34. Citron N, Messina JC. The use of skeletal traction in the treatment of severe primary Dupuytren's disease. *J Bone Joint Surg Br*. 1998;80(1):126–129.
35. Selles RW, Zhou C, Kan HJ, Wouters RM, van Nieuwenhoven CA, Hovius SER. Percutaneous aponeurotomy and lipofilling versus limited fasciectomy for Dupuytren's contracture: 5-year results from a randomized clinical trial. *Plast Reconstr Surg*. 2018;142(6):1523–1531.
36. Au-Yong ITH, Wildin CJ, Dias JJ, Page RE. A review of common practice in Dupuytren surgery. *Tech Hand Up Extrem Surg*. 2005;9(4):178–187.
37. Salim J, Walker AP, Sau I, Sharara KH. Dupuytren's contracture: postoperative management survey in United Kingdom. EFNAOT Proceedings. *J Bone Joint Surg*. 2006;88B(suppl 1):35.
38. Herweijer H, Dijkstra PU, Nicolai JPA, van der Sluis CK. Postoperative hand therapy in Dupuytren's disease. *Disabil Rehabil*. 2007;29(22):1736–1741.
39. Larson D, Jerosch-Herold C. Clinical effectiveness of post-operative splinting after surgical release of Dupuytren's contracture: a systematic review. *BMC Musculoskelet Disord*. 2008;9:104.
40. Del Frari B, Estermann D, Piza-Katzer H. Dupuytren's contracture –surgery of recurrencies. *Handchir Mikrochir Plast Chir*. 2005;37(5):309–315.
41. Jerosch-Herold C, Shepstone L, Chojnowski AJ, Larson D, Barrett E, Vaughan SP. Night-time splinting after fasciectomy or dermo-fasciectomy for Dupuytren's contracture: a pragmatic, multi-centre, randomised controlled trial. *BMC Musculoskelet Disord*. 2011;12:136.
42. Kemler MA, Houpt P, van der Horst CMAM. A pilot study assessing the effectiveness of postoperative splinting after limited fasciectomy for Dupuytren's disease. *J Hand Surg Eur*. 2012;37(8):733–737.
43. Collis J, Collocott S, Hing W, Kelly E. The effect of night extension orthoses following surgical release of Dupuytren contracture: a single-center, randomized, controlled trial. *J Hand Surg Am*. 2013;38(7):1285–1294.e2.