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Review

Needle aponeurotomy in Dupuytren's disease

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ARTICLE INFO

Article history:
Accepted 8 March 2011
Available online xxx

Keywords:
Dupuytren's disease
Needle aponeurotomy
Lermusiaux's standard

ABSTRACT

Needle aponeurotomy (NA) is recommended as a nonsurgical treatment for Dupuytren's disease. The aim of the procedure is to cut the Dupuytren's cord by use of the bevel of a needle and to restore full extension of the metacarpophalangeal or proximal interphalangeal joints. According to Lermusiaux's standard, NA is performed in an outpatient setting, with the patient under local anesthesia. It entails the use of a 25-gauge, 16 mm-long needle and an anesthetic mixture of lidocaine and acetate of prednisolone. Various modifications have been proposed since the description of Lermusiaux's standard. Lermusiaux's and modified standards demonstrated structural efficacy in Dupuytren's disease. Clinical studies indicate that the mean rate of good structural results of NA is 80% at short-term assessment and 69% at 5-year assessment. Most of the studies are case series and only one is a randomized trial. Better results are demonstrated in early stages of the disease. NA also reduces disability and patients are highly satisfied. The short-term results with Lermusiaux's standard do not appear to be impaired in digital involvement. This is not the case for modified standards providing better results with palmar involvement. Lermusiaux's standard appears to provide less recurrences and less adverse events. In the largest study, skin fissure was observed in 8% of hands, transient dysesthesia in 3%, local infection in 0.7%, and flexor tendon rupture in 0.2%. Values were lower if related to NA sessions or NAs during each session. We therefore recommend Lermusiaux's standard for safe and effective NA in patients with Dupuytren's disease.

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1. Introduction

Dupuytren's disease is a chronic fibrosing disorder [1]. It consists in pathologic production and deposition of collagen in the palmar fascia. The consequence is the formation of nodules and cords that can induce flexion contracture of the metacarpophalangeal (MP) or proximal interphalangeal (PIP) joints. Dupuytren's disease is therefore considered as a potential disabling condition. Nonsurgical and surgical procedures have been proposed. Aponeurotomy with a blade was first used by famous surgeons such as Cline [2], Cooper [3] and Dupuytren [4,5]. Helped by the emergence of anesthesia, aponeurectomy became the reference for surgery [1]. Lermusiaux, a rheumatologist from Lariboisière Hospital in Paris, reintroduced the idea of aponeurotomy in 1972, devising a new procedure that he called needle aponeurotomy (NA) [6], and taught it to a worldwide panel of rheumatologists and surgeons, until December 11, 2009, when he retired. NA is now recommended as a nonsurgical treatment for Dupuytren's disease [7].

2. Lermusiaux's standard procedure of needle aponeurotomy

2.1. Main principles

The aim of the procedure is to cut the Dupuytren's cord by use of the bevel of a needle and to restore full extension of the MP or PIP joints. NA is performed in an outpatient setting, without use of a tourniquet, with the patient under local, not regional anesthesia.

2.2. Spotting and local anesthesia

After the skin is washed and disinfected twice, the area to treat is spotted and anesthetized locally by use of a 25-gauge, 16 mm-long needle screwed onto a 5 ml syringe. The anesthetic mixture is lidocaine (4 ml) and acetate of prednisolone (1 ml). Corticosteroids are not used for patients with diabetes. One to 3 ml of the mixture is slowly injected subcutaneously all around and into the cord of interest. During injection, attention is paid to early detection of and avoiding neurovascular pedicles and tendons. Neurovascular proximity is indicated by an electric discharge along the finger, of which the patient is aware. Tendon contact is detected when passive flex-

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ion and extension of the finger induce simultaneous movements of the needle, its tip being attracted proximally and distally.

2.3. Technique of needle aponeurotomy

The NA is performed in the prepared area (Fig. 1). The physician places the patient's finger in as slight an extension as possible to apply a light tension to the cord. The NA is performed with the device that was used for the local anesthesia. The tip of the needle is placed under the skin perpendicular to the cord. It is moved up and down across the cord, at different angles in a transverse plane to cut the cord. The needle crossing the cord is associated with a sensation of resistance. NA is considered complete with the loss of this sensation or with reduced flexion contracture. The needle is then withdrawn. With persistent or residual deformity, the finger is passively extended to pull the ends of the sectioned cord apart and obtain maximal release of the contracture. NA is repeated as necessary along the cord from the proximal to distal areas. A dressing is applied for 48 h. The patient is advised to avoid heavy manual labor for 2 weeks but can immediately resume regular activities, keeping the hand dry and clean. Wearing a night extension splint for 3 months is proposed only with incomplete results with elastic flexion contracture of a PIP joint. Home exercises are not necessary.

2.4. Treatment organisation

One to three NAs are usually performed in a 10 to 20 min session. This number is sufficient to treat a one-ray involvement up to stage III – 135° flexion contracture – according to Tubiana's classification (Fig. 2) [8]. For advanced Dupuytren's disease, successive



Fig. 1. Photograph of needle aponeurotomy procedure.

sessions can be proposed, with at least a 1-week interval. Increasing the number of NAs in a single session is also possible. This approach, multi-NA, has been developed for Dupuytren's disease with palmodigital or polydigital involvement [9]. Up to 20 NAs are usually performed in a 45 to 60 min session.

Table 1
Needle aponeurotomy studies: methods.

Authors	Study design	No. hands, [patients], fingers	Procedure	Outcomes
Badois et al., 1993 [15]	Monocentric Case series	Baseline: 123, [90] Final: [59]	Lermusiaux's standard	5-year follow-up Flexion contracture Recurrence Adverse events
Lermusiaux et al., 1997 [16]	Multicentric Case series	Baseline: 992, [799] Final: 992, [799]	Lermusiaux's standard	3-month follow-up Flexion contracture Adverse events
Lermusiaux et al., 2001 [17]	Monocentric Case series	Baseline: [32], 42 Final: [32], 42	Lermusiaux's standard	3-month follow-up Flexion contracture Adverse events
Foucher et al., 2003 [10]	Monocentric Case series	Baseline: 261, [211], 311 Final: 100	Modified standard: 19-gauge needle, local corticosteroids at 1 month if pain only, regional anesthesia in some cases, tourniquet in all	3.2-year follow-up Flexion contracture Recurrence Adverse events
Van Rijssen 2006 [13]	Monocentric Case series	Baseline: 56, [52], 74 Final: 41, [38], 55	Modified standard: no corticosteroids	33-month follow-up Flexion contracture Recurrence Adverse events
Van Rijssen et al., 2006 [14]	Monocentric Randomized trial	Baseline: 125, [121] Final: 115, [111], 164	Modified standard: no corticosteroids	6-week follow-up Flexion contracture Satisfaction (function and discomfort) DASH Adverse events
Cheng et al., 2008 [11]	Monocentric Case series	Baseline: [8], 13 Final: unspecified	Modified standard: 23-gauge needle, no corticosteroids	22-month follow-up Flexion contracture Satisfaction Adverse events
Lee 2009 et al., [12]	Monocentric Case series	Baseline: [37] Final: [26]	Modified standard: 19-gauge needle, no corticosteroids	Unspecified follow-up Improvement Satisfaction Recurrence Adverse events

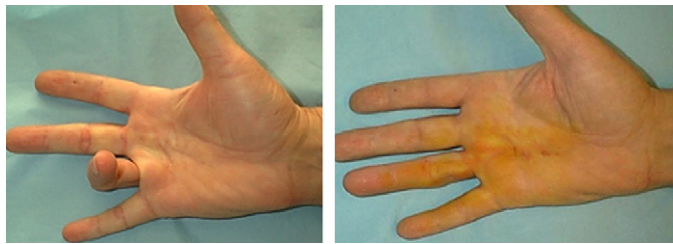


Fig. 2. Photographs before (left) and after (right) needle aponeurotomy.

2.5. Modified standards

Different procedures for NA have been described (Table 1). Changes mainly involve the use of 19- to 23-gauge needles [10–12] and corticosteroids [10–14]. Corticosteroids were either excluded of the procedure [11–14], either locally injected 1 month after NA, with only residual pain [10]. So modified standards should therefore be considered when analyzing the results of NA.

3. Results of needle aponeurotomy according to Lermusiaux's standard

The results of NA according to Lermusiaux's standard have been reported in three case series [15–17] (Table 1). The first series included 90 French patients and 123 hands followed for 5 years after one to three NA sessions in Lariboisière Hospital [15]. In total, 66% of patients were followed up. Good results according to Tubiana score corresponded to stage 0 (absence of flexion contracture) or improvement up to stage I (1 to 45° flexion contracture). Short-term assessment suggested meaningful improvement. The mean Tubiana score evolved from 3.15 to 0.66. The mean rate of good results was 81%: 92% for cases at initial Tubiana stage I, 89% stage II, 83% stage III, and 48% stage IV. At 5-year assessment, mean Tubiana score remained low, at 0.99; the mean rate of good results was 69%: 92% for stage I, 74% stage II, 57% stage III, and 38% stage IV. Five-year recurrence which was not specified, was 50% for all cases: 43% for stage I, 48% stage II, 53% stage III, and 61% stage IV. Adverse events included skin fissure in 16% of hands, transient dysesthesia in 2% and local infection in 2%. The rate of adverse events was therefore 20%.

The other two studies reinforced the efficacy and safety of NA with Lermusiaux's standard in Dupuytren's disease [16,17]. The largest one prospectively enrolled 799 patients for 992 hands, for which 1557 NA sessions and 3736 NA procedures were performed [16]. Fourteen physicians trained in Lariboisière Hospital performed NA in a multicenter setting. Short-term improvement of total extension deficit and adverse events were reported. Good results corresponded to $\geq 70\%$ improvement. Good results were observed in 81% of all hands. Values were 93% for cases at stage I, 78% stage II, 71% stage III, and 57% stage IV. The rate of adverse events was 14% of hands (Table 2). Skin fissure was observed in 8% of hands, transient dysesthesia in 3%, local infection in 0.7%, and flexor tendon rupture in 0.2%. Values were lower if related to NA sessions or NAs during each session.

The third study assessing NA according to Lermusiaux's standard was of with digital involvement only [17]. Thirty-two patients and 42 fingers were prospectively included for NA in Lariboisière Hospital. Three months after treatment the rate of good results was 79%. Skin fissure was noted in one case, with no other adverse events, namely no nerve injury or tendon rupture.

These data indicate that NA according to Lermusiaux's standard is safe and effective in treating Dupuytren's disease if performed by

Table 2

Adverse events after needle aponeurotomy according to Lermusiaux's standard [16].

	No. events	% Hands	% NA sessions	% NA procedures
Skin fissure	75	7.6	4.8	2.0
Transient dysesthesia	29	2.9	1.9	0.8
Pain	12	1.2	0.8	0.3
Local infection	7	0.7	0.4	0.2
Faintness	6	0.6	0.4	0.2
Local inflammation	4	0.4	0.3	0.1
Hematoma	3	0.3	0.2	0.08
Flexor tendon rupture	2	0.2	0.1	0.05
Total	138	13.9	8.8	3.7

a trained physician. The technique is suitable for palmar and digital involvement. Short-term structural efficacy is well documented. However, data for long-term evolution remain sparse. The rate of recurrence after 5 years may be 50%.

4. Results of needle aponeurotomy according to modified standards

Modified NA standards for Dupuytren's disease have been assessed for safety and efficacy in case series [10–13] and in a randomized trial with aponeurectomy used for comparison [14] (Table 1).

Two studies reported 65% improvement, 80–85% patient satisfaction and 12% recurrence [11,12]. However, both are impaired by unspecified follow-up duration at the time of assessment.

Three case series reported on short-term structural efficacy of NA with modified standards [10,11,13]. Immediate or 1-week post-treatment assessments showed 76–77% global improvement as compared with baseline values of deficit extension. Results were 79–100% for MP joints, 46–76% for PIP joints, and 75% for distal interphalangeal (DIP) joints. These results were reinforced by those of a randomized trial with follow-up 1 and 6 weeks after NA [14]. At the last assessment, structural improvement was 63% in all cases, 75% for MP joints, 33% for PIP joints, and 61% for DIP joints. Limited aponeurectomy provided better structural effect as compared with NA for cases of initial Tubiana stages III and IV but not for stages I and II. NA provided better scores than did limited aponeurectomy on the disabilities of the arm, shoulder and hand and greater patient satisfaction for all stages.

Two case series reported long-term structural efficacy [10,11]. Global improvement was 69% at 38 months after NA [10]. Values were 70–74% for MP joints and 35–41% for PIP joints at 22–38 months after NA [10,11]. Recurrence defined as an increase in flexion contracture of at least 30° was observed in 65% of hands 33 months after NA [13]. Another study that did not define recurrence reported a rate of 58% at 38 months [10].

Table 3

Needle aponeurotomy according to Lermusiaux's standard: relevant technical conditions.

Physician trained for needle aponeurotomy
Washing and disinfection twice
Use of a 25-gauge, 16 mm-long needle
Local but not regional anesthesia
Use of local corticosteroids
Attention to the needle position before injecting the anesthetic mixture to prevent any nerve or tendon injury
Dressing for 48 hours
Regular activities, keeping the hand dry and clean, immediately allowed
Heavy manual labor not allowed for 2 weeks

In a case series, the rate of the adverse events varied from 4 to 6% for patients [12,13], from 26 to 85% for fingers [10,11] and was 27% of NA procedures [11]. Adverse events consisted in 1 flexor injury in 26 patients [12]; three sensation troubles in 52 patients [13]; 11 skin fissure in 13 fingers and in 41 NA procedures [11]; and 50 painful conditions, 19 skin fissures, six sensation troubles, two immediate failures, one bleeding, one oedema, and one suspected algodystrophy, in 311 fingers [10]. In a randomized trial, the rate of adverse events after NA was 55% for hands [14]. Adverse events included 29 skin fissures and four cases of paresthesia. The rate of adverse events was lower, 30% after limited aponeurectomy but events were more serious. They included one infection, one hematoma, and 15 sensation troubles for which one digital nerve injury required repair.

5. Conclusions

NA according to Lermusiaux's standard is used for a long time in patients with Dupuytren's disease. Modified standards for NA have been proposed since its first description. Lermusiaux's and modified standards for NA have shown structural efficacy for Dupuytren's disease. NA also reduces disability and patients are highly satisfied. NA is therefore a recommended treatment for Dupuytren's disease. Better results occur at early stages. Short-term results with Lermusiaux's standard do not appear to be impaired in digital involvement. This is not the case for modified standards. NA with Lermusiaux's standard appears to be associated with fewer recurrences and adverse events than with modified standards. Differences in safety results between standards mainly involve pain, skin fissure and flexor tendon rupture. Even with exclusion of potential bias such as patient and operator characteristics, this finding also suggests the importance of technical conditions for NA in Dupuytren's disease (Table 3). Corticosteroids injection during NA may be useful to prevent recurrence. Local but not regional anesthesia and a small-sized needle are suitable for reducing adverse events.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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