

Percutaneous Fasciotomy for Dupuytren's Contracture

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Needle aponeurotomy (percutaneous needle fasciotomy) for Dupuytren's contracture can be performed in the office setting with local anesthesia. It is simple and inexpensive and has a low complication rate and rapid recovery compared with open fasciectomy. It can usually be repeated safely and effectively for recurrent disease. (*J Hand Surg* 2011;36A:910–915. Copyright © 2011 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Dupuytren's, aponeurotomy, percutaneous, fasciotomy.

NEEDLE APONEUROTOMY (NA) is a method of percutaneous fasciotomy using a small hypodermic needle as a scalpel blade. Compared with fasciectomy, there is a lower incidence of prolonged recovery, nerve injury, flare reaction, and reflex sympathy dystrophy.^{1–3} Nerve injuries are avoided with intradermal anesthesia and monitoring distal sensibility during the procedure. The chance of tendon injury is minimized by monitoring active finger motion when the needle tip position is in the proximity of flexor tendons. Needle aponeurotomy can be performed in the office setting, usually permits return to normal manual activities 1 week after the procedure, allows both hands to be treated on consecutive days, and is safe in high-risk patients, including patients receiving anticoagulants. Disadvantages include recurrences occurring more rapidly than with open surgery and an inability to correct either skin shortage or capsular contractures of the proximal interphalangeal (PIP) joint. The following technique is based on the author's experience with NA on over 8,000 hands.

INDICATIONS

There are 4 requirements for NA for Dupuytren's: (1) contracture due to a (2) palpable cord lying beneath (3) redundant skin in a (4) cooperative patient.

From The Hand Center, Jupiter, FL.

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CONTRAINDICATIONS

Needle aponeurotomy will not correct longitudinally inadequate skin or scar and should not be attempted in the absence of a palpable cord. Needle aponeurotomy will not correct contractures not resulting from Dupuytren's. Patients with constitutionally treatment-resistant Dupuytren's^{4,5} will just as likely have rapid recurrence after NA as they will after simple fasciectomy and should be considered for arthrodesis or dermofasciectomy and skin graft.

SURGICAL ANATOMY

Sensory end organs of the skin are in the deep dermis, but the subdermal fat and palmar aponeurosis have no sensory innervation. Joint capsules are innervated,⁶ digital nerves are sensitive to pressure, and clinical experience is that there is sensory innervation of flexor tendon sheaths. Cords are insensate, but vital structures are not, which allows NA to be performed safely with intradermal anesthesia.

CONTRACTURES

Dupuytren's transforms longitudinal fascial and subdermal fat into shortened cords. Vertical septal fiber anatomy is distorted, bunching and dimpling the skin by oblique tethering between the dermis and the fascial cord (Fig. 1). Secondary contractures may develop from immobilization (PIP joint capsule or intrinsic muscle) and position-related attrition (boutonniere or sagittal band rupture).

TECHNIQUE

Setting

Needle aponeurotomy can be performed in an office setting using local antiseptic preparation with-

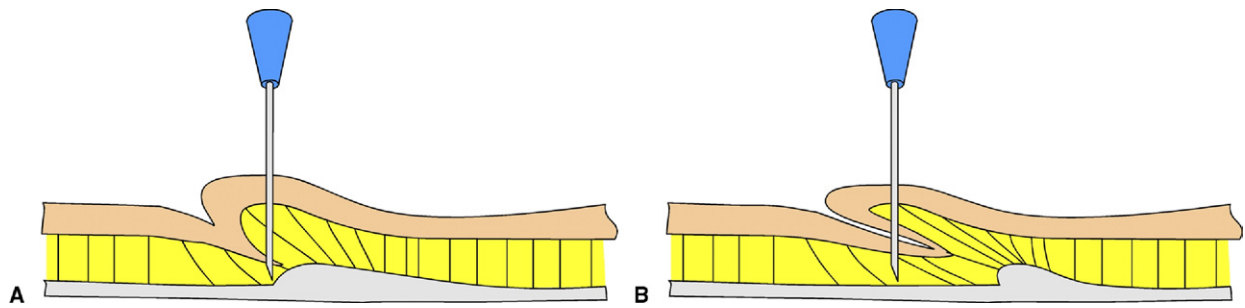


FIGURE 1: Dimples may be deeper than they appear. If there is a question, a small probe should be used measure depth. **A** Innervated deep dermis extends beyond the apparent depth, resulting in unexpected tenderness. **B** Without caution, deep dimples may be inadvertently entered or transected.

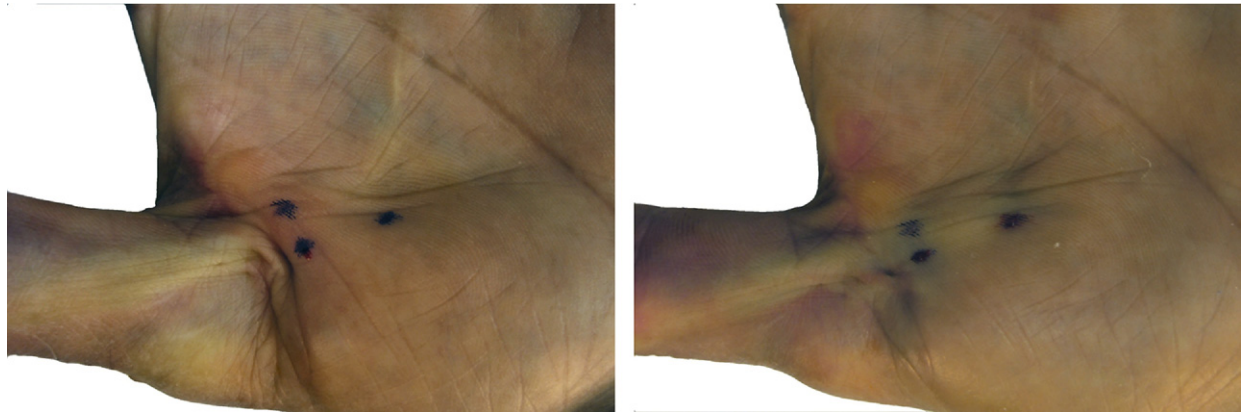


FIGURE 2: Blanching and skin crease deformation can be used to plan portals and assess adequacy of release. Left: Blanching stops at the flexion crease at the base of the left thumb, which has become curved, convex proximal. Both findings suggest cord tethering at the area of the 2 side-by-side portals. Right: After release, normal flexion crease contour; blanching crosses the portals, indicating adequate cord release.

out either sedation or tourniquet. Alternatively, a formal operating room environment and light sedation may be used as long as the patient remains responsive to mild pain. The patient should be recumbent to prevent vasovagal issues. A 5-cm (2-in)-thick pad of folded towels is used as a bump behind the metacarpus to facilitate metacarpophalangeal (MCP) extension.

Instruction

Expectations are explained as possible improvement up to 90° of composite MCP plus PIP contracture, 50% improvement in PIP contracture, or both. The technique is explained, including the importance of reporting paresthesias or numbness and of avoiding sudden movements. Short excursion fingertip flexion and extension is explained to the patient and then demonstrated. The chance of skin tear and nerve or tendon injury is reviewed, as well as the postoperative care protocol.

Portal planning

Fasciotomy portals are best planned in areas where the skin is soft and the cord is a discrete linear structure that changes from soft to firm with joint extension. Nodules feel firm independent of joint position and are avoided. Planned portals are marked with a surgical marking pen. Portals are usually spaced a minimum of 5 mm apart, directly over the cord. Dual side-by-side portals may be used for broad cords over 5 mm wide. If skin creases are curved, portals are planned on the convex side of the curve to allow maximum skin release (convex points to the portal) (Fig. 2). Skin tears are most common in and adjacent to flexion creases at the PIP and the base of the finger. Skin creases are not used for portals because of the proximity of the flexor sheath and the likelihood of skin tear. Once a tear develops, further attempts at passive extension are likely to propagate the tear rather than separate a cord at a different portal. Dimples are evaluated with a small probe to avoid portals that

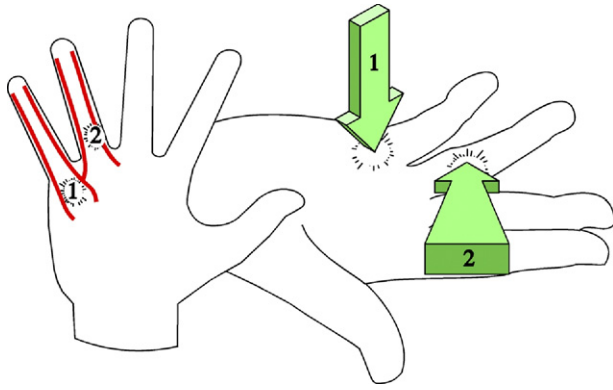


FIGURE 3: Doppler examination for spiral cords. In areas where a fleshy prominence suggests a spiral cord, the Doppler probe tip should be placed at the planned skin portal but pointed toward areas where a digital artery should not be heard: (1) perpendicular to the palm for pretendinous bulges and (2) superficial and tangential to the palm for prevascular prominences.

might transect a dimple sinus or cause pain from contacting the dermis at the depths of the dimple (Fig. 1).

Spiral cords

Doppler examination (Fig. 3) should be performed when there is a question of a spiral cord, based on soft tissue prominence in the distal palm or proximal digit.⁷ Spiral cords are marked with a surgical marking pen. Portals may be used proximal or distal to an identified spiral cord.

Surgical field preparation

Needle aponeurotomy may be performed with local field sterility similar to that for intravenous needle insertion. The patient washes and dries the hands and the palm is painted with antiseptic solution. Sterile needles are used. Surgical drapes and sterile gloves are not required.

Anesthesia

Pinpoint surface anesthesia is obtained by injecting each portal area intradermally with 0.05 to 0.10 mL of local anesthetic using a 30-gauge needle, avoiding subcutaneous injection. Injection pain is reduced by buffering the local anesthetic with sodium bicarbonate, using a personal massager to vibrate the adjacent skin during injection, lightly touching the injection site with the needle tip 1 to 2 seconds before penetration and using a verbal countdown, penetrating the skin 0.25 seconds before the final count. Penetrate just the surface of the dermis and inject during needle withdrawal: this produces immediate anesthesia.

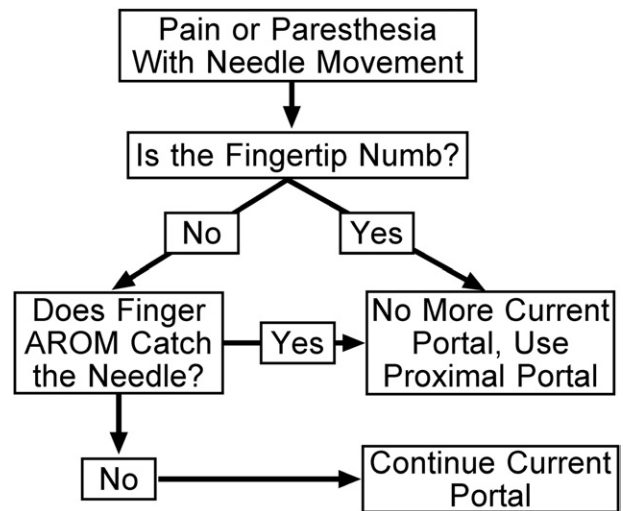


FIGURE 4: Algorithm to manage pain or paresthesia during NA. Digital nerves in proximity of the current portal are assessed with fingertip sensitivity before and after anesthesia and frequently during instrumentation. Pain may represent nerve or tendon sheath incursion and prompts the need to check each.

Nerve monitoring

Fingertip sensitivity is repeatedly checked through the procedure. Releases are begun at distal portals, progressing proximally. Despite careful technique, anesthetic diffusion or mild nerve contusion may produce digital nerve conduction block. If sensitivity to light gauze touch remains, the nerve is considered live even if the patient reports a subjective change, and NA may be continued, following the decision tree of Figure 4.

Tendon monitoring

Tendon proximity is repeatedly checked through the procedure. With the needle in place, the patient is asked to lightly flex and extend the PIP and DIP joints to demonstrate presence or absence of needle motion with active tendon excursion.

Needle maneuvers

A 16-mm (5/8-in), 25-gauge needle is used as a scalpel. The needle tip has 2 cutting edges that are identified visually (loupes may be helpful) and maintained with needle bevel perpendicular to cord fibers after insertion. The goal is to perform a transverse fasciotomy deep to the skin. There are 3 basic moves: clear, perforate, and sweep. Once the needle is through the dermis, the needle is oriented tangentially and a plane between dermis and cord is developed (cleared) transversely at the level of the portal at least as wide as the palpable

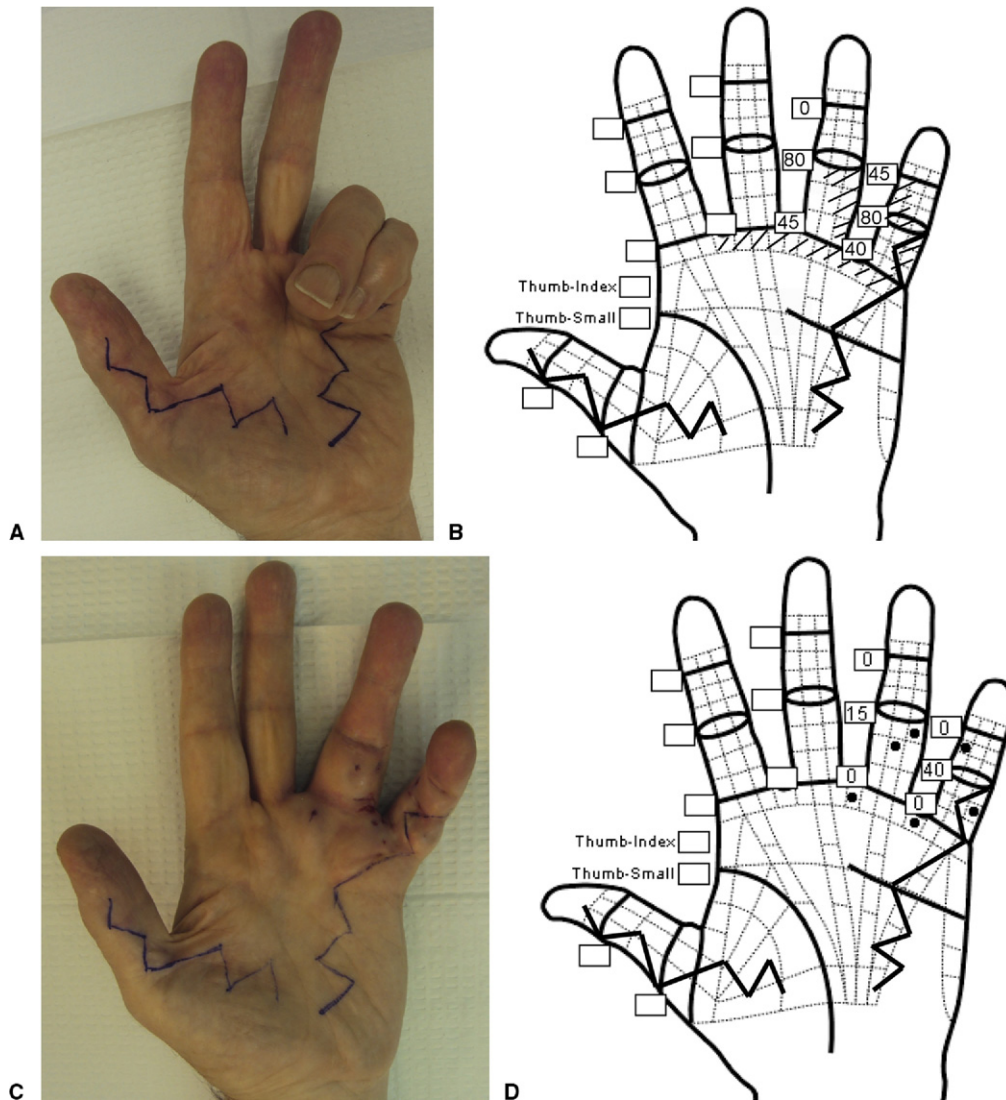


FIGURE 5: **A, B** Day 1. Left hand, 8 years after dermofasciotomy: scars (bold lines), cords (single hatched lines), and contracture measurements. **C, D** Immediately after needle aponeurotomy: locations of portals (dots) and active extension measurements.

cord width. The needle is reoriented vertically, bevel transverse, and a light reciprocating (perforating) motion is used to define the extent and surface geometry of the cord. Once the cord geometry is defined, the needle tip bevel is used to repeatedly sweep or graze the surface of the cord, dividing it incrementally from superficial to deep.

Traction

Cords must be held under tension, both to allow the needle to cut and to pull the cord up and away from deeper structures. The safest traction is pulling on the skin or a nodule distal to the portal in distal direction. The flexor tendons should be slack, reducing the risk of inadvertent tendon injury. Do not pull on the fingertips, and remind the patient to relax the fingers.

Cord palpation

Use fingertips to palpate cords, which should be felt to tighten as the finger is passively moved from flexion to extension. In areas of diffuse skin involvement or in the thenar or first webspace zones, cords can be demonstrated by “trampoline” fingertip bouncing to assess adequacy of cord rupture.

Blanching

If the underlying cord is tighter than the skin, the skin will not blanch with traction owing to stress shielding (Fig. 2). This usually indicates a good site for a portal (pink = portal). Unless resulting from obvious cord bowstringing, blanching indicates that the skin is tight and there is nothing deeper to release. Blanching will

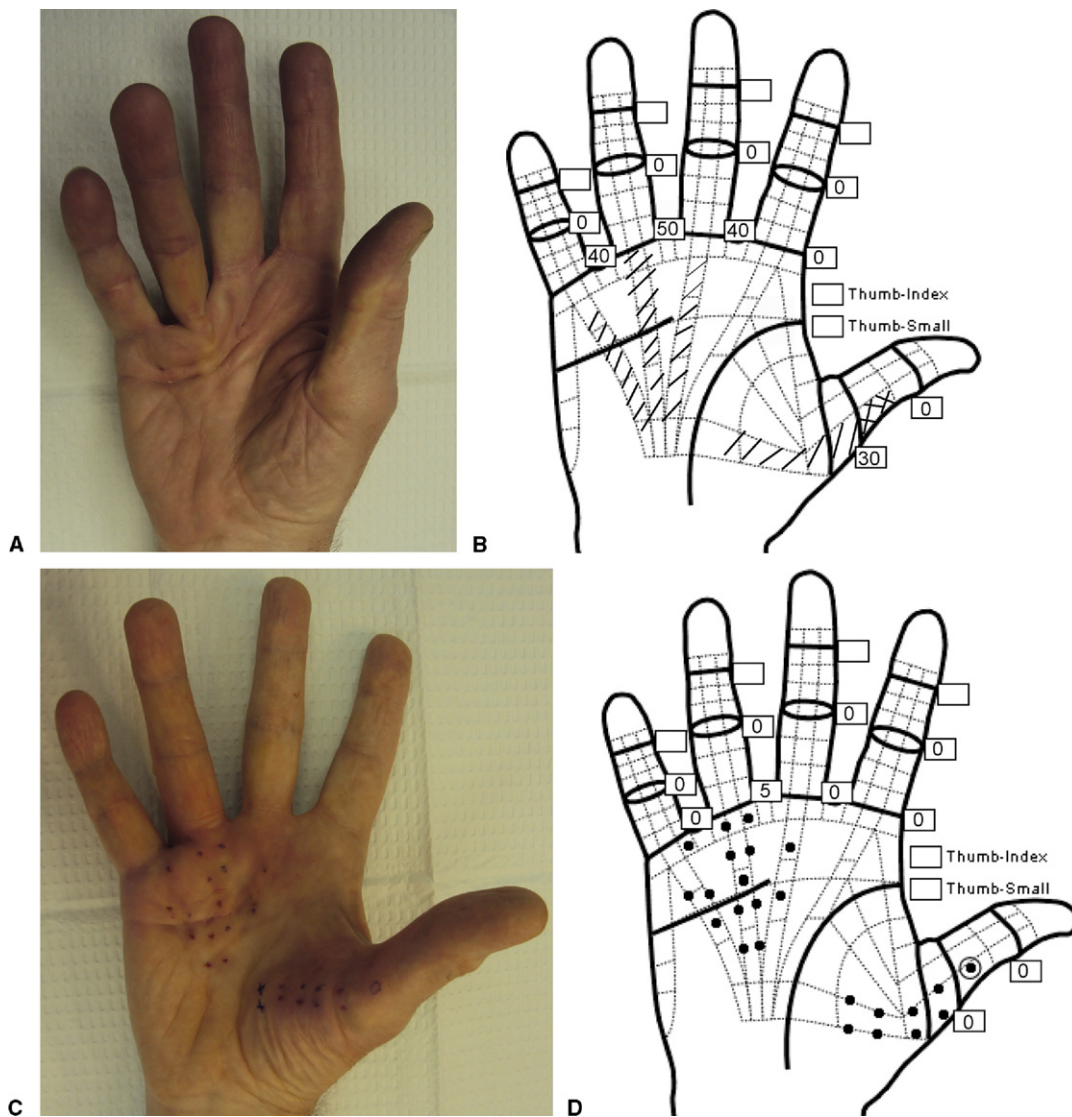


FIGURE 6: **A, B** Right hand of patient shown in Figure 4, the following day. No prior treatment: cords (single hatched lines), nodule (cross hatched lines) and contracture measurements. **C, D** Immediately after needle aponeurotomy: locations of portals (dots), nodule steroid injection (bullseye), and active extension measurements.

advance across a portal when the underlying fascia has been adequately released (Fig. 2).

Needle feel

The fascia should feel crisp or crunchy when being cut. When the needle meets rubbery resistance to insertion or withdrawal, it is dull and should be replaced.

Final manipulation

Passive stretching may be done after each portal release. If a portal looks suspicious for tearing, defer definitive pull until several proximal portals have been released to reduce the chance of a skin tear. Flex the

wrist while asking the patient to actively extend as you stretch. Intraarticular local anesthetic injection of the PIP and MCP joints is helpful, as well as axial traction to reduce pain from joint surface compression during manipulation. Manipulation under anesthetic wrist block may help if manipulation is limited by pain.

Steroid injection

After release, portals and nodules may be injected with depot corticosteroid such as triamcinolone acetate or its equivalent, 2 and 20 mg, respectively.

Bandaging should be light, allowing immediate motion and postprocedure icing. Use small adhesive bandages or a light gauze wrap.

DOCUMENTATION

Figures 5 and 6 document the location of cords, nodules, range of motion, and portal and nodule injection sites. Forms for this are available at <http://docsna.com>.

REHABILITATION

Therapy is not usually needed. Bandages may be removed the day of the procedure. Ice and elevation are recommended for the first 2 days. Strenuous gripping is strictly avoided for 1 week, and then activities are resumed as tolerated.

CLINICAL CASE

A 68-year-old, right-handed man developed Dupuytren's at age 47. History is positive for Ledderhose, Peyronie's, and knuckle pads. He underwent left thumb and small fasciectomy 8 years previously. He now has recurrence and extension in the left ring and small finger and new involvement of the right thumb, ring, and small fingers. His hands were treated with NA on consecutive days (Figs. 5, 6).

PITFALLS AND COMPLICATONS

- Not emphasizing enough to avoid strenuous gripping, golf, tennis, gardening, fishing, weight

training, and so forth for a full week after release, even if the patient has no pain or tenderness, because the deep fasciotomy sites are insensate.

- Not clearly warning patients preoperatively that they may have a skin tear that may require bandaging for a few weeks if it is full thickness.
- Not repeatedly checking for distal anesthesia when near a nerve or checking active flexion when near a tendon.
- Not changing to a fresh needle when the entry feels rubbery or the cord will not cut.

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