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Nerve hydrodissection

Current evidence, common locations, and injection formulations

Howard Grattan, MD Spokane Pain Conference



Introduction:

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Disclosures

Howard Grattan, MD

I have no disclosures.

Learning objectives

01 Review current evidence for nerve hydrodissection

02 Identify the most common locations for nerve hydrodissection

03 Describe common injection formulations used for hydrodissection

Opening case: loss of hand function

01 Nocturnal tingling in the thumb, index, and middle fingers

02 Driving and gripping provoke symptoms

03 Splinting helps incompletely

04 **Patient goal: sleep and return to cycling**

The differential diagnosis

01 Focal entrapment or scar-related tethering

02 Radiculopathy or plexopathy

03 Polyneuropathy or systemic disease

04 **Tendon, joint, or muscle pain with overlapping symptoms**

Localization before intervention

01 History: distribution, triggers, and prior surgery

02 Examination: sensation, motor function, and provocation

03 Ultrasound: anatomy and dynamic relationships

04 **Electrodiagnostics when severity or localization is unclear**

Patient selection for hydrodissection

01 Persistent focal symptoms despite appropriate conservative care

02 A clinically concordant target that can be approached safely

03 A defined functional goal and reassessment plan

04 **Progressive deficit or major structural compression warrants escalation to surgery**

Foundations and patient selection

What hydrodissection does and who may benefit

What hydrodissection does

01 Fluid separates a nerve from adjacent tissue

02 Ultrasound shows the needle tip and fluid spread

03 The intended target is just outside the nerve

04 **Best clinical improvement requires repeat treatment and/or adjuvant therapies**

Mechanical rationale

01 Cadaveric work shows reduced median nerve gliding resistance

02 Clinical symptoms may improve after perineural injection

03 The contribution of mechanics versus injectate remains uncertain

04 **Human nerve regeneration has not been established but several studies show improved nerve conduction measurements.**

Ultrasound technique

Localization, needle guidance and procedural safety

Ultrasound examination

01 Trace the nerve in short and long axis

02 Assess focal caliber change and fascicular appearance which correlates with the compression point

03 Use dynamic scanning to inspect motion and tethering

04 **Map vessels and anatomical variants before needle entry**

Example: Median nerve scan and approach

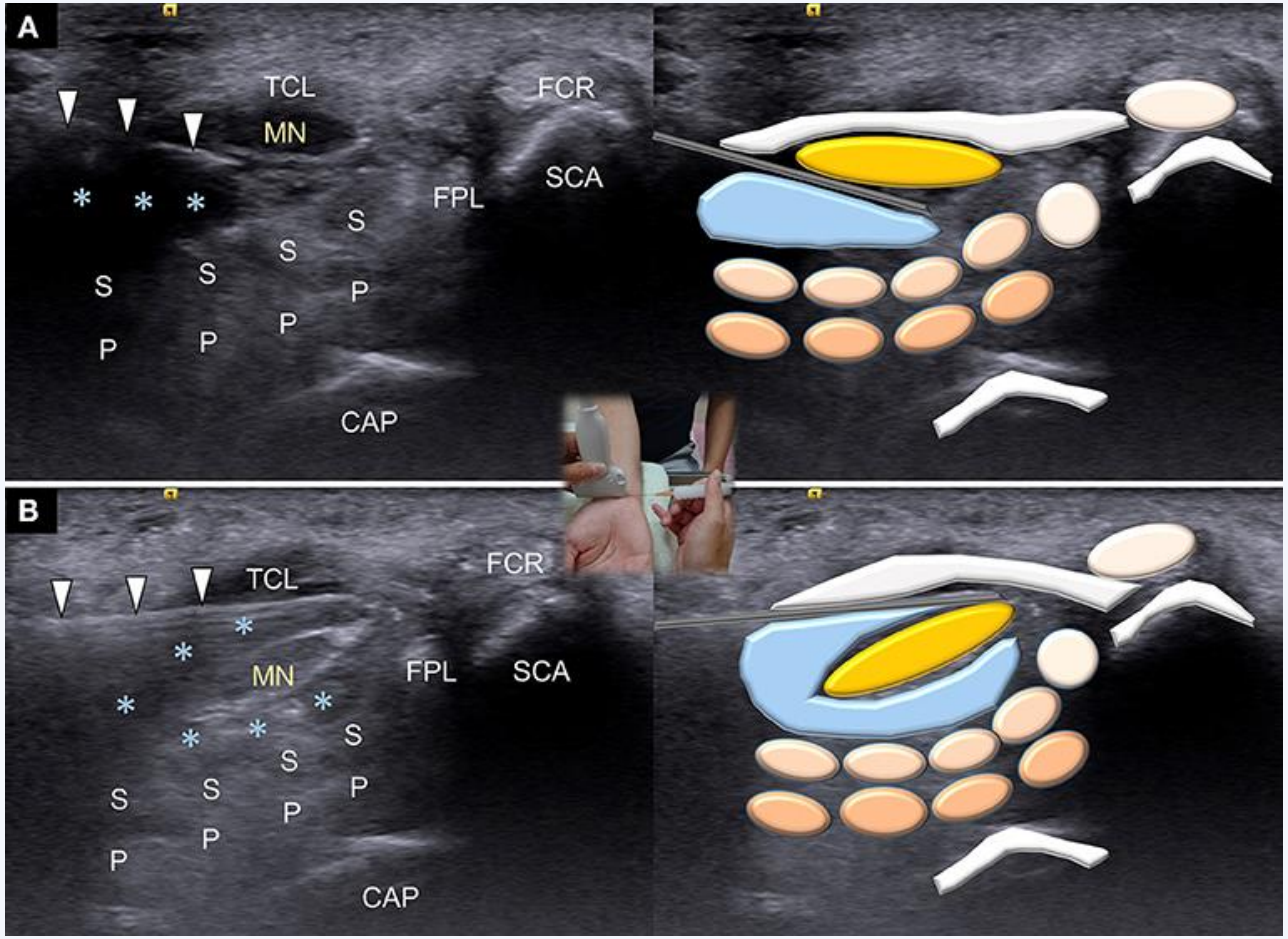
01 Short-axis imaging establishes surrounding anatomy

02 In-plane access permits needle tracking

03 Doppler helps identify vessels

04 **Equipment and positioning depend on depth**

Median nerve: visible fluid separation



Wang et al., 2021. Fig. 1. CC BY.

MN identifies the median nerve

A: fluid deep to the nerve

B: fluid superficial to the nerve

Fluid spread should remain extraneural

Procedural safety and stop signals

01 Continuous needle-tip visualization. If you lose the tip… stop… reaquire

02 Small aliquots with observation of fluid spread

03 Stop for pain, marked resistance, or nerve expansion. Should be essentially pain free.

04 **Post care: New or progressive deficit requires prompt evaluation**

Injection formulations and CTS evidence

Common injectates and controlled clinical trials

D5W: proposed mechanisms

01 TRPV1 modulation may reduce sensory-fiber signaling and neurogenic inflammation

02 Local glucose may support metabolism in stressed nerves

03 Cell studies suggest reduced inflammatory and oxidative stress from the dextrose

04 **Fluid also separates tissue planes. The precise mechanism remains uncertain**

D5W = 5% dextrose in water. Biochemical mechanisms remain hypotheses.

Injectate choices

Injectate	Purpose / evidence	Key limitation
Normal saline	Fluid separation and comparator	Benefit depends on context
D5W	CTS trials support symptom benefit	Mechanism and durability uncertain
Local anesthetic	Anesthesia or diagnostic analgesia	Block effects complicate interpretation
Corticosteroid	Anti-inflammatory component	Durable benefit remains limited
PRP or PL	Small CTS comparative trials	Product variability and cost

D5W = 5% dextrose in water

Mechanical effect: saline trial

01 34 participants with mild-to-moderate CTS

02 5 mL intracarpal saline versus subcutaneous saline

03 Better symptom severity at months 2 and 3 with intracarpal

04 **Small study with a location-based comparator**

D5W versus saline in CTS

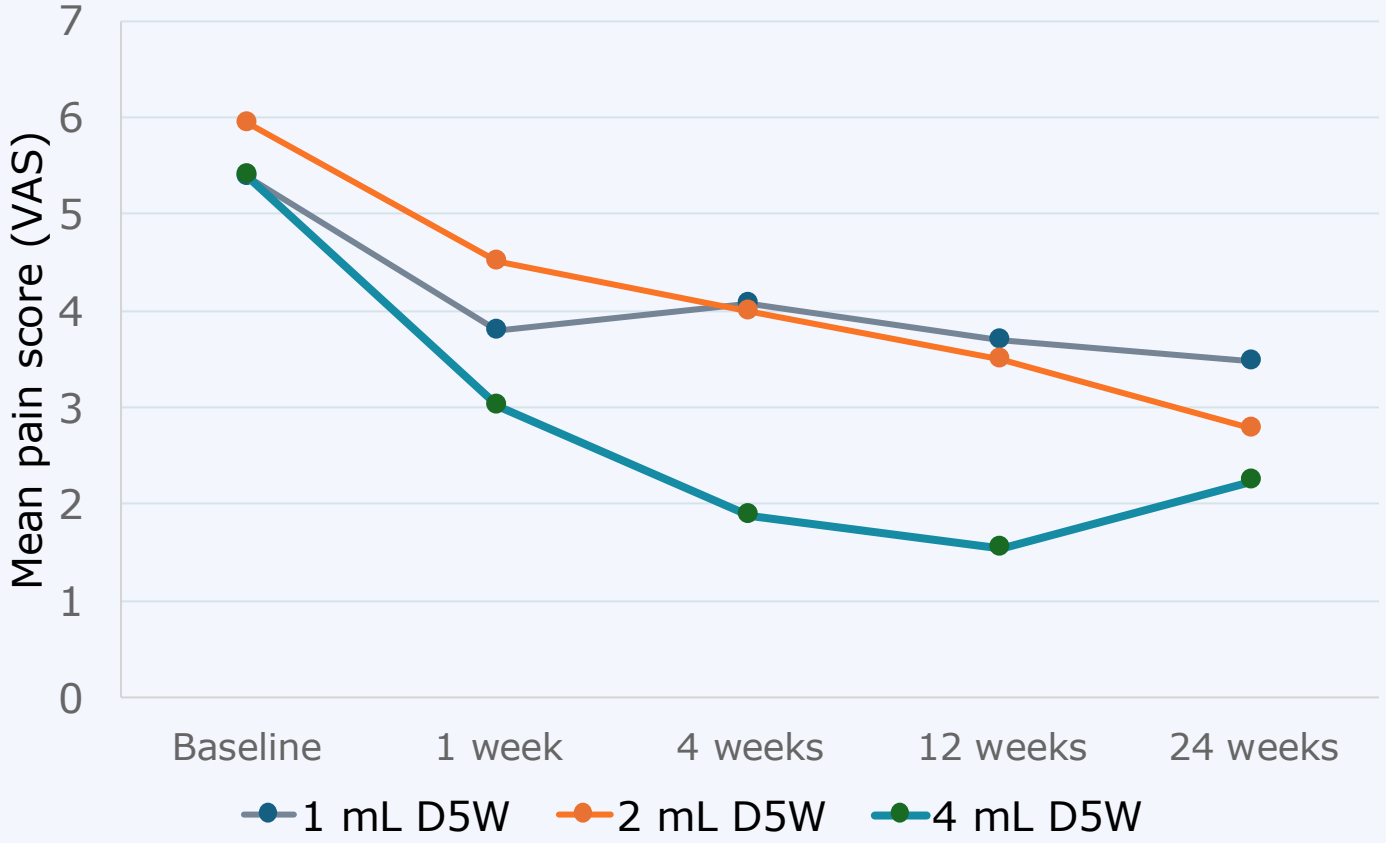
01 49 participants, 60 wrists

02 One session of 5 mL perineural D5W or saline

03 D5W favored pain and disability through six months

04 **Results apply to mild-to-moderate CTS**

Volume trial: pain scores over time



63 wrists randomized to 1, 2, or 4 mL D5W

4 mL favored pain reduction at weeks 4 and 12

Between-group differences were not significant at week 24

Lin et al., 2020. Table 2. Group means, no error bars.

Newer volume evidence

01 2025 trial: 80 participants in four groups

02 5 or 10 mL of saline or D5W

03 10 mL D5W favored pain and nerve size versus saline at week 12

04 **An optimal volume remains uncertain**

A trial with no added hydrodissection benefit

01 64 patients with CTS

02 10 mL steroid mixture versus 2 mL perineural mixture

03 Both groups improved at 6 and 12 weeks

04 **No significant group-by-time difference**

PRP and other biologics

01 52 patients with moderate CTS: PRP versus D5W

02 Selected functional, electrophysiologic, and nerve-size outcomes favored PRP

03 Small comparative trial with product-specific findings

Carpal tunnel guideline

American Academy of Orthopaedic Surgeons (AAOS)

Where does hydrodissection fit?

How the AAOS guideline was formed

01 A multidisciplinary panel defined the clinical questions

02 A systematic review identified and graded primary studies

03 GRADE weighed evidence, benefits and harms to set strength

04 **Panel voting and external review preceded May 2024 approval**

AAOS = American Academy of Orthopaedic Surgeons.

AAOS guidance on hydrodissection

01 Scope: adult carpal tunnel syndrome and durable outcomes

02 Hydrodissection and perineural injection appear in a group with no demonstrated long-term benefit

03 Formal category: limited-strength option, downgraded for heterogeneous evidence

04 **Some studies show benefit at 3–6 months. Durability remains uncertain**

Return to the opening case

01 Confirmed wrist-level median nerve involvement

02 Documented motor findings and severity

03 Discussed options with a trial of care, surgical indications, and risks

04 **After treatment track sleep, grip tolerance, and return to cycling to confirm benefit**

Other nerve compression sites

Ulnar nerve and lower-limb entrapments

Ulnar nerve at the elbow

01 Symptoms may involve the small finger and ulnar ring finger

02 Examine intrinsic hand strength and proximal causes

03 Dynamic imaging can reveal nerve movement

04 **Subluxation vs fixed compression may require different plans**

Ulnar neuropathy: controlled evidence

01 40 patients completed a D5W-versus-saline trial

02 Two ultrasound-guided sessions, two weeks apart

03 Total 5 mL distributed across five levels

04 **D5W favored several outcomes at weeks 4 and 12**

Lower-limb localization

Nerve	Clinical clue	Anatomical focus
Common fibular	Dorsiflexion / eversion weakness	Fibular neck vs Fibular head
Superficial fibular	Dorsal-foot sensory symptoms	Fascial exit in distal leg
Deep fibular	First dorsal web-space symptoms	Anterior ankle / extensor retinaculum
Tibial	Plantar-foot symptoms	Tarsal tunnel and distal branches
Sural	Lateral-foot / posterolateral ankle pain	Gastroc fascia, crural fascia, lateral malleolus, sinus tarsi

Common fibular nerve: persistent symptoms

01 Case evidence is much smaller than the CTS literature

02 Song et al. reported temporary relief with hydrodissection

03 A resistant scar region helped guide further evaluation

04 **The patient ultimately underwent surgical decompression**

Scar-related sural neuropathy

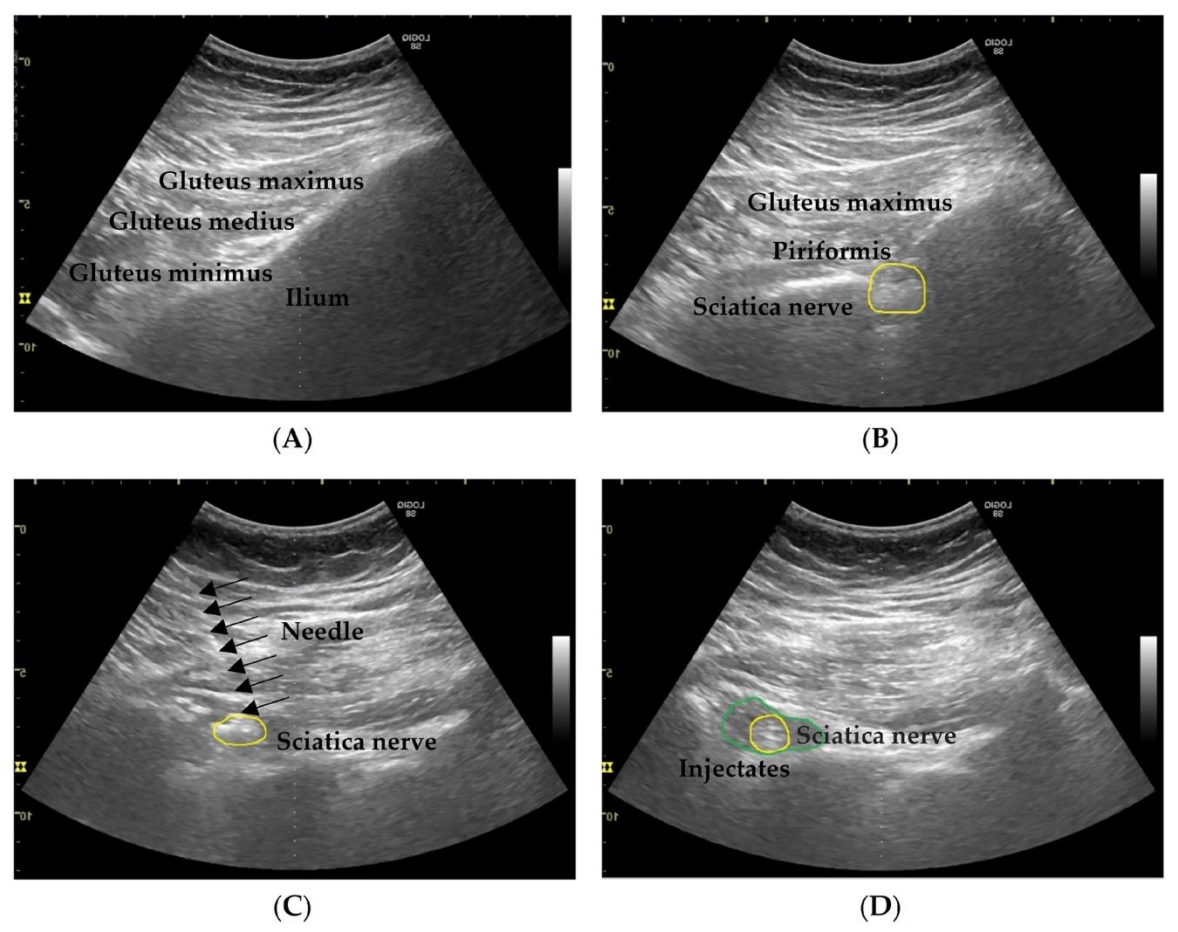
01 Focal lateral ankle pain after surgery can have a neural source

02 Symptoms and scar location must agree

03 Published reports describe improvement after hydrodissection

04 **Case reports cannot predict response rates**

Sciatic nerve in the deep gluteal space



Yen et al., 2024. Fig. 1. CC BY.

Deep anatomy requires a different skill set

Lumbar and local causes may overlap

Published images show a perineural fluid plane

Depth and nearby vessels affect procedural risk

Deep gluteal syndrome: case-series findings

01 53 patients, follow-up of 3–19 months

02 62.3% had at least 50% pain reduction at final follow-up

03 Injectate combined D5W, lidocaine, and betamethasone

04 **No control group and variable treatment exposure**

Rehabilitation and follow-up

Functional goals, outcome tracking and referral

Rehabilitation after intervention

01 Reduce the provoking compression or activity pattern

02 Resume movement and loading according to irritability

03 Use symptom-limited neural mobility when appropriate

04 **Advance toward the patient’s specific functional goal**

Outcome tracking

01 Baseline pain and a condition-specific measure

02 A functional task that matters to the patient

03 Motor and sensory findings over time. Consider repeat NCS

04 **Track durability, repeat treatments, and adverse events**

When the response is incomplete

01 Revisit localization and competing pain generators

02 Check ongoing compression and structural lesions

03 Consider severity, axonal loss, and rehabilitation barriers

04 **Change the plan when a repeated approach adds no additional value**

Referral and escalation

01 Progressive weakness, atrophy, or persistent major deficit

02 A mass, major structural compression, or instability

03 New deficit after injection or suspected hematoma / infection

04 **Persistent disability despite a defined trial of care**

Emerging treatments

Superficial dextrose, platelet lysate and methylcobalamin

Emerging treatments: superficial D5W

01 Kim et al., 2024: subcutaneous buffered D5W near painful nerve branches

02 Peripheral neuropathy subgroup: 31 D5W patients and 9 lidocaine patients

03 Mean pain score fell from 5.7 to 3.8 after four weekly sessions

04 **Short follow-up and nonrandomized groups limit confidence**

Kim et al., 2024. Retrospective study. Early analgesic signal.

Emerging treatments: glucose with B12

01 Qiu et al., 2026: 57 patients with refractory painful peripheral neuropathy

02 18 had diabetes and 39 had non-diabetic neuropathy

03 Glucose plus methylcobalamin hydrodissection: pain improved through six months

04 **No untreated control and a combined injectate prevent causal attribution**

Qiu et al., 2026. Retrospective study. Local perineural use is investigational.

Platelet lysate with hydrodissection

01 Platelet lysate contains growth factors released by disrupting platelets and filtering out the inflammatory cell walls

02 Hooper et al., 2025: three ulnar neuropathy cases using PL, dextrose and ropivacaine

03 Patients reported pain improvement at follow-up of 18–67 months

04 **The case series cannot establish PL's added benefit or nerve regeneration**

Hooper et al., 2025. Case series. Investigational perineural use.

B12 as an adjunct to hydrodissection

01 Whole body B12 deficiency requires evaluation and replacement, however it can be added to local injection

02 A 24-patient CTS pilot compared local methylcobalamin with D5W at two weeks

03 A registered CTS study tests B12 added to dextrose hydrodissection

04 **Added benefit, formulation and dosing remain uncertain**

Sugiharto et al., 2024. NCT05423028. Local perineural use is investigational.

My clinical protocol

Final formulation and ultrasound endpoint

My hydrodissection protocol

01 Platelet lysate: at least 7× concentration in the final preparation

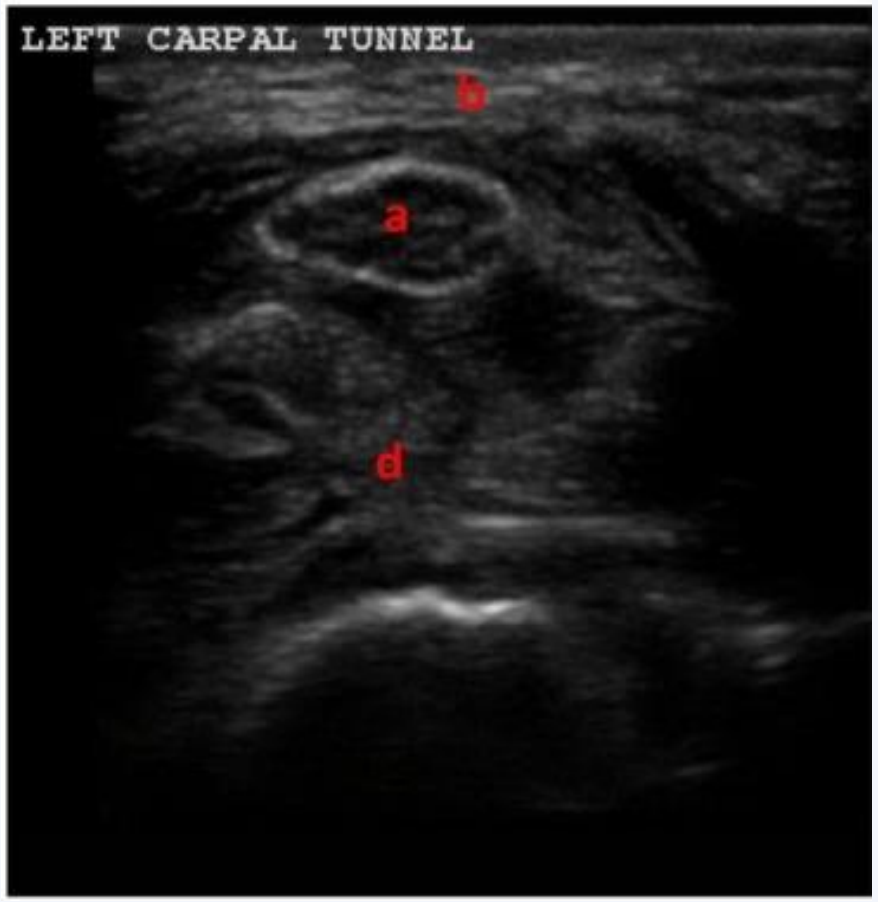
02 Methylcobalamin: 1,000 mcg

03 Dextrose: enough to achieve 5% in the final mixture

04 **Volume goal: at least 5 cc per nerve compression point**

Howard Grattan, MD. Personal clinical protocol.

Ultrasound endpoint



Fried & Nazarian, 2019. Fig. 8, transverse view.

Circumferential extraneural fluid ring

Confirm spread proximal and distal to the compression point

Median nerve (a) surrounded by a dark fluid halo

Clinical takeaways

01 Current evidence: strongest for CTS, with uncertain long-term durability

02 Other locations: ulnar nerve at the elbow, radial, LFCN, II, GF, LT, GO, Intercostal and selected lower-limb entrapments. Basically anything you can find on ultrasound

03 Possible formulations: saline, D5W, anesthetic/steroid mixtures and PRP, PL and B12

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Questions?



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