

Gentle Collagenase Injection Protocol (GCIP): A Safer, Controlled Approach to Treating Dupuytren's Contracture

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Executive Summary

The standard approach for treating Dupuytren's contracture using enzymatic injections (e.g., collagenase clostridium histolyticum) involves a high-dose injection followed by a forced extension maneuver to rupture the fibrous cord. This practice carries a high risk of complications, including skin tears, tendon injury, nerve damage, and uncontrolled enzyme diffusion.

This position paper proposes a novel protocol: the **Gentle Collagenase Injection Protocol (GCIP)**. Designed for safe and precise enzyme delivery without abrupt cord rupture, GCIP leverages precision targeting, controlled enzyme dosing, and a guided physical therapy follow-up phase. This method is particularly appropriate for mild, moderate, or severe contractures.

Background and Problem Statement

The manual rupture of Dupuytren cords post-collagenase injection, while effective, introduces preventable trauma. Clinical trials report skin tearing rates as high as 20–30%, with additional risks including flexor tendon damage, digital nerve compromise, and inflammation. These adverse events are typically linked to depth-related targeting errors and the uncontrolled release of active enzyme during rupture.

Goals of the GCIP Approach

- Eliminate or reduce post-injection trauma
- Prevent off-target enzyme exposure
- Adapt treatment to patient-specific anatomy and cord severity
- Enable repeatable, low-risk procedures across various care settings

Gentle Collagenase Injection Protocol (GCIP)

Step 1: Imaging and Injection Planning

- Use ultrasound (or OCT, if available) to localize and map the cord
- Identify depth, diameter, and cord relationships to critical structures
- Divide the cord into 2–5 injection zones based on length and tightness

Step 2: Multi-Point Micro-Injection

- Use lower volume per injection site (0.05–0.1 mL)
- Maintain total dose consistent with standard single-injection protocols
- Inject centrally into each zone using ultrasound guidance, if available

Step 3: Enzymatic Soaking Period

- No rupture attempt for 48–72 hours
- Encourage gentle, pain-free hand motion to aid enzyme diffusion

Step 4: Gentle Stretching and Splinting

- Begin dynamic extension splinting or guided therapy on Day 3–5
- Gradual soft tissue elongation, avoiding abrupt trauma

Step 5: Re-Injection if Needed

- Residual contracture zones treated with repeat low-dose injection
 - Allows adaptive correction while maintaining patient safety
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Clinical Advantages

- Low trauma, high-precision protocol
 - Applicability across all contracture severities
 - Reduced skin tear and tendon rupture risk
 - Safer for patients with fragile skin, comorbidities, or poor healing
 - Easily integrable with robotic systems and imaging technologies
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Proposed Use Cases

- Elderly patients with thin skin
 - Recurrent or post-surgical contractures
 - Deep, spiral, or anatomically complex cords
 - Cases where patients or clinicians wish to avoid mechanical rupture
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Implementation and Validation

Pilot Study Design:

- Randomized trial comparing GCIP vs. standard rupture protocol
 - Metrics: complication rates, ROM improvement, patient-reported outcomes
 - Sites: academic hospitals, outpatient clinics, hand therapy centers
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Conclusion

GCIP presents a scalable, low-risk alternative to manual cord rupture in enzymatic treatment of Dupuytren's disease. It aligns with evolving standards of precision medicine and is well-positioned for integration with next-generation robotic delivery platforms.