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Osteosynthesis

# NeuroMatrix
# Type 1 Collagen Conduit

Operative Technique

- Peripheral Nerve Repair

# Indications and Contraindications

## Common Uses

The NeuroMatrix conduit allows repair without tension of peripheral nerve discontinuities of less than 3cm. Nerve gaps may occur in the following types of discontinuities (gaps) injuries:

1. **Crushing Injury (damaged nerve may need to be resected)**
2. **Penetrating Injury**
   **Lacerations/Stabbing injuries**
   **Severe Fractures or Dislocations**
3. **Oncology related excision**
4. **Repair of Iatrogenic Nerve Injury**
5. **Failed Primary Repair**

## Contraindications

1. **Acute infections**
2. **Contaminated wound in the immediate area surrounding the peripheral nerve discontinuity**
3. **Known history of allergic reactions to collagen and/or bovine-derived products**

**See package insert for warnings, precautions, adverse effects and other essential product information.**

# Introduction

**Repairing Peripheral Nerve Injuries (PNI) where the gap is less than 3.0cm with a type 1 collagen conduit offers several potential advantages:**

**Eliminates the need to harvest an autograft in a second surgical procedure.**

- Reduces associated morbidity at the donor site, which may include scarring, neuroma formation, and loss of donor site function.[1]
- May improve OR efficiency.
- Removing the need to harvest autograft from the lower extremity (sural nerve), may allow regional anesthesia and use at an ambulatory surgery center.

**Multiple nerve conduits are readily available at the time of surgery, and can be size-matched to fit the nerve repair site/s. This may be a benefit to surgeons addressing multiple nerves or segmental nerve injuries.**

**Approximation of nerve fasicles is not required.**

- Studies have suggested regenerating axons are able to align themselves as a result of various neurotropic and neurotrophic factors.[2,3,4] This allows growth factors to influence the proximal growth cone as a severed nerve ending grows across a confined gap.

**Allows tensionless repair of the nerve.**

- In many situations, a primary tensionless repair of the nerve is not possible, even with extensive mobilization. Extensive mobilization may also negatively influence the epineurial vasculature. The NeuroMatrix nerve conduit allows for a tensionless repair.
- In many cases, the hand may be positioned in a more anatomic position following nerve repair where the gap is bridged by a conduit than when the surgeon re-approximates the nerve endings. This is often helpful to lessen swelling and stiffness.

**Type 1 Collagen is ideally suited to peripheral nerve repair.**[5]

- Selective conduit permeability allows nutrients to diffuse, yet acts as a barrier to larger fibroblast cells.
- Type 1 collagen may be better accepted by soft tissue than PGA based conduits.[2,6,7]
- Degrades via normal metabolic pathways usually within 3-6 months following implantation.
- Hypo-immunogenic[8]

# Operative Technique

### Step 1: Prepare Nerve

Expose nerve at the appropriate incision site according to standard procedures.

Prepare the nerve bed. Examine the local tissues (fat/muscle), resecting scar tissue as needed.

The proximal and distal segments of the injured nerves are debrided to normal tissue by visual and tactile cues (Figure 1).

**Note: Axoplasmic fluid often will weep out of the resected nerve ending, and may be one indication of adequate debridement.**

Figure 1

# Operative Technique

### Step 2: Select and prepare appropriate size NeuroMatrix conduit

The diameter of the nerve is measured and an appropriate size NeuroMatrix conduit is selected. The internal diameter of the chosen nerve cuff should be slightly larger than the nerve diameter (Figures 2,3).

**Note: For late repairs when a neuroma/schwanoma exist, there is often significant swelling of the nerve. This may be an important consideration when sizing the nerve conduit.**

Figure 2

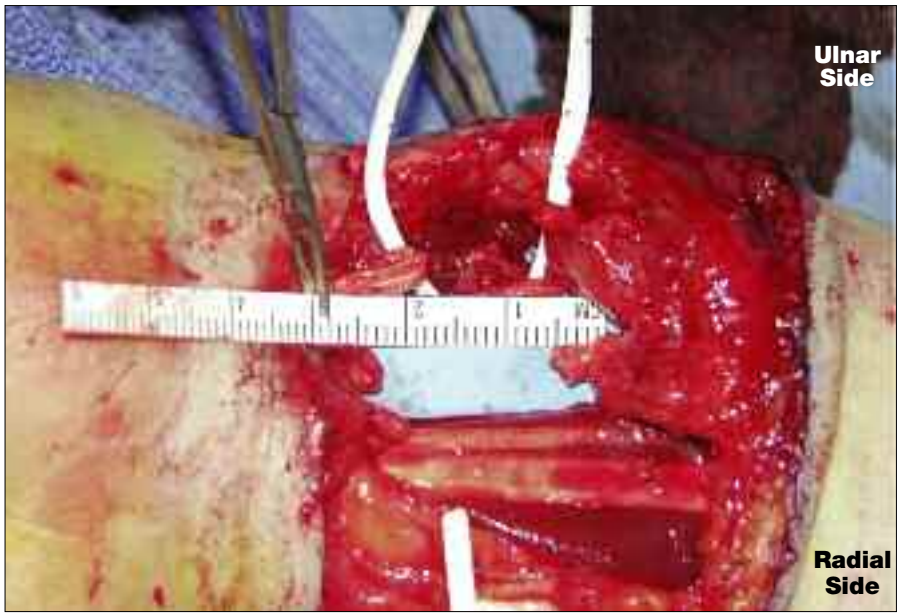


Figure 3

**Patient with an open distal radius fracture. The ulnar nerve was damaged at the wrist, just before Guyon's canal.**

### Step 3: Hydrate NeuroMatrix Conduit

Hydrate nerve conduit in sterile physiological saline solution for 5 minutes.

After hydration, the nerve conduit is trimmed accordingly to at least a minimum length of 5mm longer than the measured nerve gap, so that both the proximal and distal nerve stumps can be inserted adequately into each end of the nerve conduit.

# Operative Technique

### Step 4: Suture nerve into NeuroMatrix conduit (Entubulation)

**Horizontal Mattress Suture Technique**

Using atraumatic (8.0 - 9.0 nylon) suture, pass the suture through the NeuroMatrix conduit from the outside to inside, at least 2 mm from the end of the tube.

Pass the suture longitudinally through the epineurium of the nerve stump and back through the epineurium again (u-shape) (Figure 4). Pass the suture through the inside of the NeuroMatrix conduit to the outside.

Gently draw the nerve stump into the NeuroMatrix conduit by pulling the suture such that the nerve stump is drawn into the conduit.

The final length of insertion of the nerve stump into the conduit should be greater than or equal to the nerve diameter. A tensionless secure knot is tied in the suture (Figure 5).

Using a syringe, gently flush the lumen of the nerve cuff with sterile saline or Lactated Ringer's solution (USP) (Figure 6). Repeat the suturing procedure for the other nerve stump (Figure 7). Repeat the flushing procedure and fill the interior of the nerve cuff with saline or Lactated Ringer's solution (USP) (Figure 8).

Typically three sutures are placed approximately 120 degrees apart in a 'triangulation' technique (Figure 9).

**Note: Avoid tension of the peripheral nerve to be repaired during the entire procedure.**

Figure 4

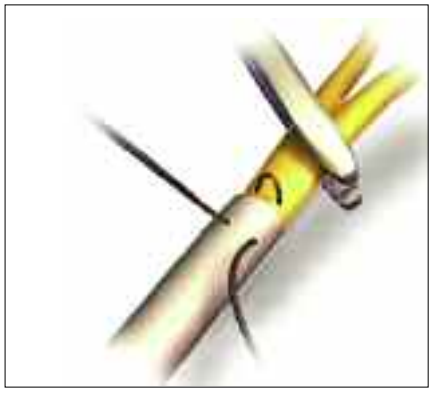

Figure 5

Figure 6

Figure 7

Figure 8

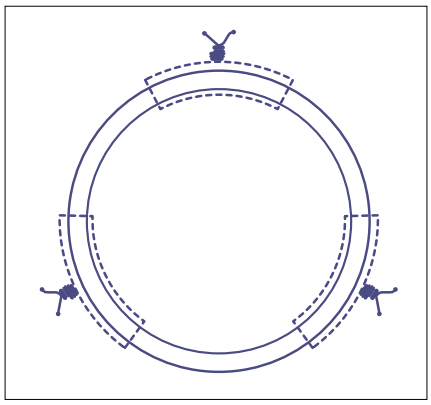

Figure 9

### Step 5: Post-operative Considerations

Closure of the surgical field by layers is routine. Excessive and uncontrolled movement of the extremity where nerve repair was performed must be avoided to prevent possible migration of the device and failure of the repair.

Figure 10

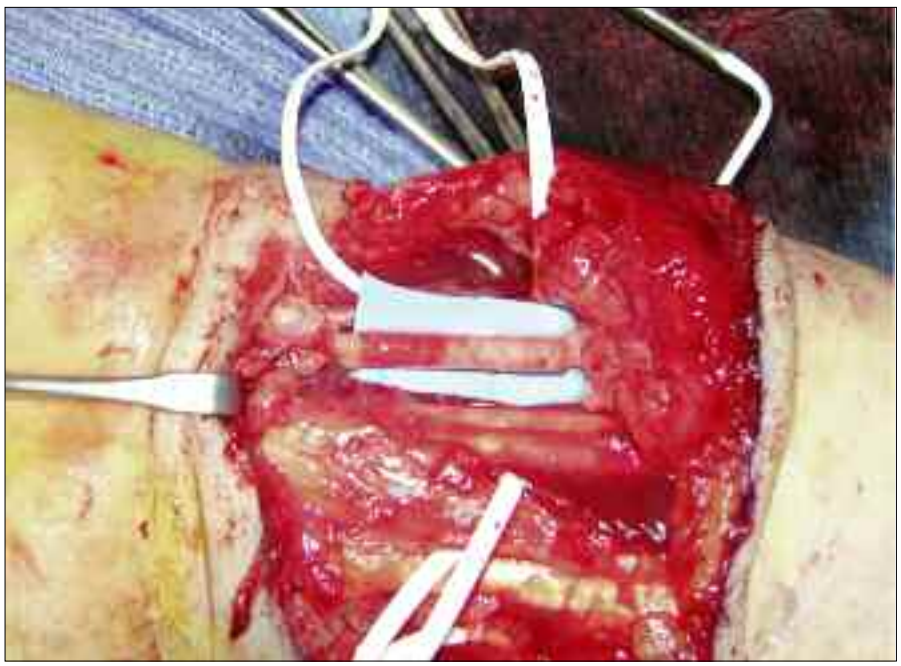

Figure 11

**Ulnar nerve repaired with Type 1 Collagen Conduit**

# Ordering Information

### NeuroMatrix Type 1 Collagen Conduit

| REF | Inner Diameter | Length |
|---|---|---|
| CNC2025 | 2.0 mm | 2.5 cm |
| CNC2525 | 2.5 mm | 2.5 cm |
| CNC3025 | 3.0 mm | 2.5 cm |
| CNC4025 | 4.0 mm | 2.5 cm |
| CNC5025 | 5.0 mm | 2.5 cm |
| CNC6025 | 6.0 mm | 2.5 cm |

# References


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www.stryker.com

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Literature Number: **90-07559**
LOT **A1608**