# NERVE TAPE ASSISTED NERVE GRAFTING IN A RABBIT MODEL

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## Introduction

- Over 2 million upper extremity injuries occur each year leading to a high volume of peripheral nerve trauma
- Nerve injuries that result in large gaps between severed nerve stumps require graft bridging
  - Autografts are considered the gold standard – abundant growth factors, guidance cues, neurotrophic Schwann cells, etc.
- Conventional microsuture-based autografting requires high microsurgical proficiency and often results in suboptimal nerve alignment and functional outcomes.
- Nerve Tape, an FDA-approved device for end-to-end repair of nerve injuries, offers a sutureless, microhook-based alternative to microsuture.

**In this study, we investigated the efficacy of Nerve Tape for graft repairs.**

Fig. 1

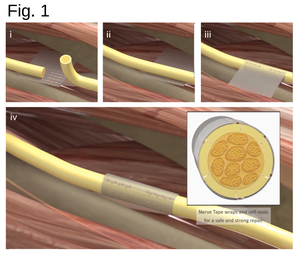


Fig. 2

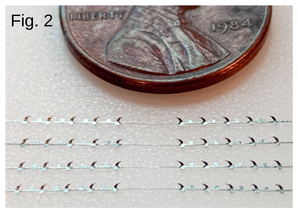

Fig. 1. Illustration of end-to-end nerve repair with application of Nerve Tape.
Fig. 2. High magnification image of Nerve Tape microhooks

## Methods

Twenty, 5-month-old, female **New Zealand White rabbits** received tibial nerve injuries. For each animal, a 30 mm segment of the tibial nerve was excised, reversed, and re-inset as an autograft. Autografts were re-inset with either (1) four, 9-0 nylon epineural sutures at both coaptations (n=10) or (2) Nerve Tape devices applied at both coaptations (n=10).

**Suture Repair**


**Nerve Tape Repair**


At **4 months** post-repair, functional and neuroanatomical outcomes were assessed using

- Adhesion/scar tissue scoring – both coaptations and the mid-graft were scored during explantation (see Table 1)
- Electrophysiology – compound nerve action potentials across injury/repair
- Gastrocnemius muscle mass and girth as a ratio of the healthy control muscle
- Toluidine blue staining - assessed axon morphometry (axon counts, g-ratio) from tibial nerve segments proximal, middle, and distal to autograft.

Table 1. Adhesion Score Scale

| Score | Description of adhesions |
|---|---|
| None (1) | no adhesions |
| Mild (2) | filmy, easily dissected |
| Moderate (3) | thicker, mostly blunt/some sharp dissection |
| Severe (4) | very thick, require substantial sharp dissection |

## Results

### NERVE TAPE ASSOCIATED WITH LESS ADHESION/SCAR FORMATION AT COAPTATIONS THAN MICROSUTURES

Fig. 3

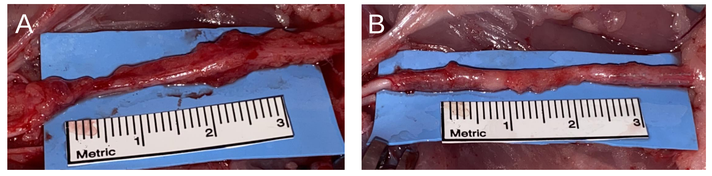


Fig. 4

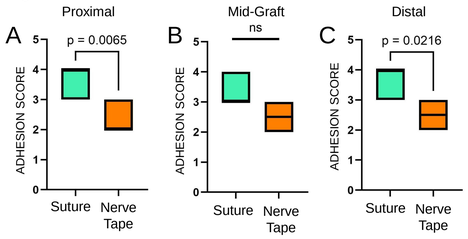


Fig. 3. Surgical images of (A) microsuture- and (B) Nerve Tape-repaired tibial nerves 4 months post-injury.
Fig. 4. Adhesion/scar tissue score for (A) proximal, (B) middle, or (C) distal to graft as observed at 4 months post-injury. Nerve Tape-repaired animals exhibited significantly less adhesions at both coaptation sites than animals repaired with microsutures.

### COMPARABLE CONDUCTION VELOCITY AND AMPLITUDE BETWEEN REPAIR TYPES

Fig. 5

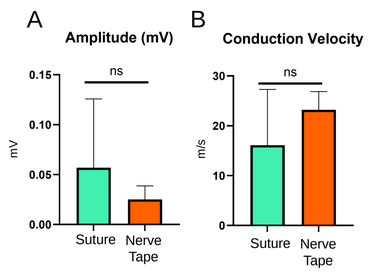


Fig. 5. Electrophysiological outcome measures suggest suture- and Nerve Tape-repaired animals are similarly capable of conducting action potentials across the injury/repair site. Average peak amplitude (A) and conduction velocity (B) did not differ between repair types.

### COMPARABLE MUSCLE MORPHOLOGY BETWEEN REPAIR TYPES

Fig. 6

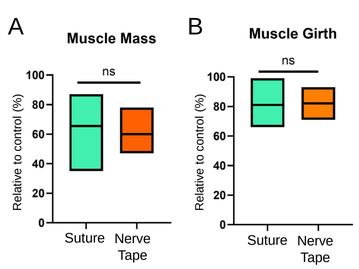


Fig. 6. Gross morphology measures of the gastrocnemius muscle including (A) muscle mass and (B) muscle girth were not significantly different between repair types. Values measured from the muscle ipsilateral to the injury are normalized to contralateral (uninjured) values. Data is displayed as % of control.

### COMPARABLE AXON REGENERATION AND REMYELINATION BETWEEN REPAIR TYPES

Fig. 7

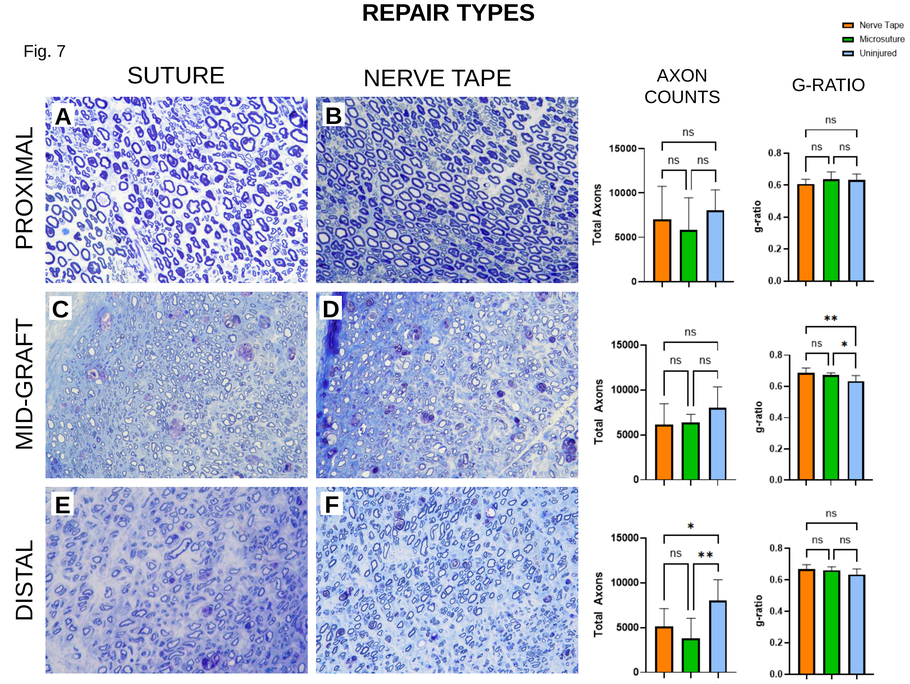


Fig. 7. Representative images of toluidine blue-stained transverse tibial nerve sections (A & B) proximal, (C & D) middle, and (E & F) distal to the autograft in suture- and Nerve Tape-repaired animals. Analysis of axon morphometry suggests comparable regeneration (axon counts) and remyelination (g-ratio) between repair types at all locations of the injured/repaired tibial nerve.

## Conclusions

- Nerve Tape results in significantly less adhesions at coaptation sites compared to microsuture repairs.
- Multiple functional and morphological analyses suggest comparable recovery outcomes between repair types.

**Overall, results demonstrate the feasibility of using Nerve Tape for graft-based nerve repair and has the potential to establish Nerve Tape as a reliable, efficient alternative to microsutures for graft insetting.**

## Acknowledgements

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