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# Internal Neurolysis and Grafting of the Superficial Peroneal Nerve in the Treatment of Nerve Injury due to Compression using Avance® Nerve Graft

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## Introduction

Peripheral entrapment neuropathy in the lower extremity is caused by some anatomical configuration constricting the nerve, or in the case of trauma, some anatomical disposition rendering the nerve in an inflammatory state. In cases of multiple reconstructive surgeries of the lower extremity, scar tissue develops along the course of surgical incisions that can eventually impede on the normal function of surrounding nerve. The nerves affected can cause intractable pain that is unresponsive to conservative treatments. Surgeons may choose to perform surgical decompression with an external and or internal neurolysis.

AxoGuard® Nerve Connector is a commonly used in combination with nerve allograft to reinforce coaptation and promote directional axonal growth through the graft (Figure 1). Avance® Nerve Graft is an allograft tissue that provides an option for peripheral nerve reconstruction of the lower extremities (Figure 2). Structurally, the Avance nerve graft provides an epineurium to suture the graft in place, and endoneurial tubes to provide an environment for axonal growth (Figure 3).

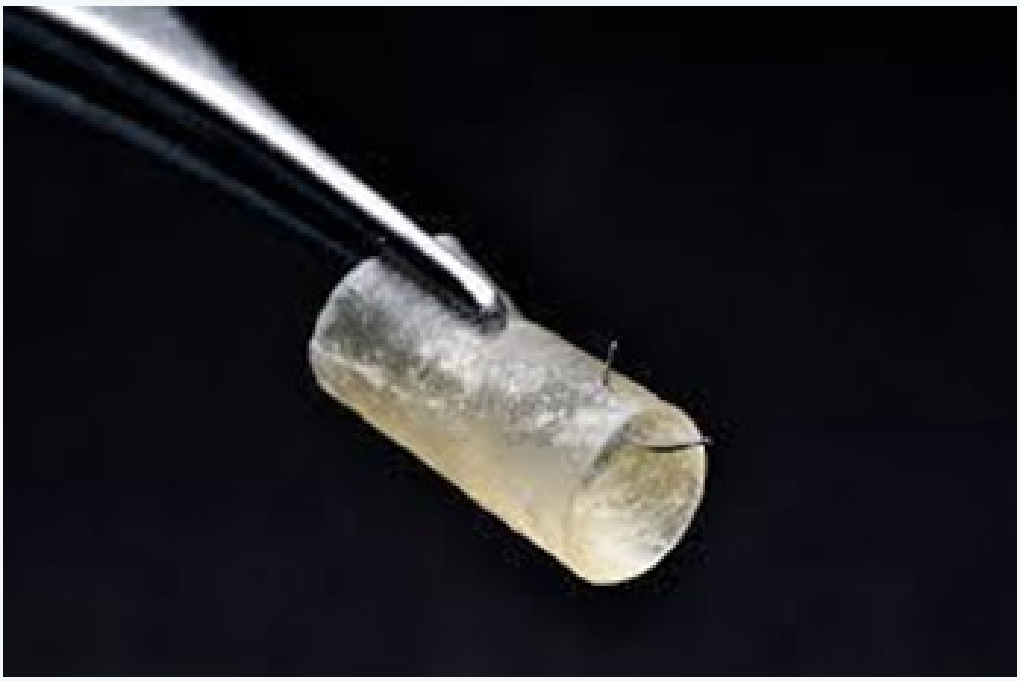

**Figure 1:** AxoGuard Nerve Protector.

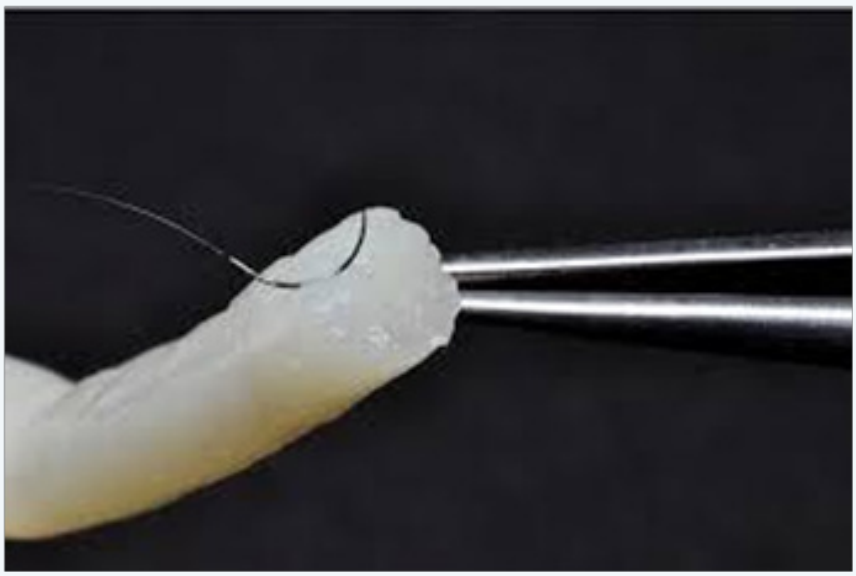

**Figure 2:** Avance Nerve Graft.

| GAP LENGTH | SURGICAL APPROACH[a] | APPLICATION |
|---|---|---|
| No Transection[1,2] | Nerve Protector | AXOGUARD Nerve Protector |
| 0mm to 5mm[1,3] | Direct Repair[b] | |
| | Direct Repair[b] with Nerve Conduit | AXOGUARD Nerve Connector |
| | Nerve Conduit | AXOGUARD Nerve Connector |
| 5mm to 70mm[1,4] | Processed Nerve Allograft or Autograft | Avance Nerve Graft |
| | Processed Nerve Allograft or Autograft with Nerve Connector | Avance Nerve Graft + AXOGUARD Nerve Connector |
| | Processed Nerve Allograft or Autograft with Nerve Protector | Avance Nerve Graft + AXOGUARD Nerve Protector |
| 70mm+[1,3,5] | Autograft | |
| | Autograft with Nerve Connector | AXOGUARD Nerve Connector |
| | Autograft with Nerve Protector | AXOGUARD Nerve Protector |

**Figure 3:** Surgical options to Repair using Nerve Allograft or Autograft.



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## Case Description

25 y/o Male who has a significant history of multiple reconstructive surgeries for residual clubfoot. Patient continues to have severe pain due to nerve entrapment and neuritis that has been confirmed with segmental nerve conduction velocity examinations of the superficial peroneal nerve. Entrapment was identified approximately 6 cm above the lateral malleolus. Patient has been unresponsive to conservative treatment. Patient continues to have difficulty ambulating due to pain. Patient has failed conservative treatment and understands that this procedure is a salvage attempt to relieve the constant pain.

**Internal Neurolysis and Neurectomy of the Superficial Peroneal Nerve:** A 3cm longitudinal incision was placed at the lower 1/3 of the anterior lateral leg along the course of the superficial peroneal nerve. Blunt dissection was performed to identify the superficial peroneal nerve. At this time an Internal and external neurolysis of the nerve was performed under loop magnification removing a surround adhesions (Figure 4). A complete neurotomy was performed measuring approximately 3cm in length that corresponded to the area of damaged nerve. Damaged nerve was localized using direct visualization and results from segmental nerve conduction velocity examinations. All proliferated nerve tissue was removed from the ends of the native nerve until only healthy nerve was noted.

**Figure 4:** External/Internal Neurolysis of Superficial Peroneal Nerve.

**Preparation and Implantation of Avance Nerve Graft:** Room temperature sterile saline was applied to the product tray and the allograft was then thawed for 10 minutes. One 3cm portion Avance allografts was measured and introduced into the surgical field adjacent to the remaining nerve.

The allograft was positioned and sutured to the native nerve using 8-0 nylon under loop magnification in order to create a tensionless re-approximation. A 1mm gap between the native nerve and graft was considered adequate.

**Wrapping of Nerve and Graft with AxoGuard® Nerve Connector:** The appropriate size AxoGuard® Nerve Connector was selected based on the diameters of the native nerve and graft, so as not to constrict or compress the nerve following wrapping. A Nerve Protector of 10 mm diameter and 10 mm length was selected. The wraps were briefly hydrated in the pre-molded hydration reservoir of the packaging tray with room temperature sterile saline just prior to implantation.

**a.** AxoGuard® Nerve Connectors were placed around both ends of the allograft. The connectors were the sutured to both the native nerve and graft to allow extra support to the re-approximation sites (Figure 5).

**Figure 5:** Superficial Peroneal Nerve with Avance® Nerve Graft and AxoGuard® Nerve Connectors.

**b.** Platelet rich plasma and platelet poor plasma, which was processed from peripheral blood taken from the patient at the start of surgery, was applied along the tibial nerve. Upon completion of the procedure, the wound was thoroughly irrigated and the incision was closed in normal fashion.

## Feedback on Intra-Operative Handling/Conclusion

AxoGuard Nerve Connector® and Avance Nerve graft are both technically feasible for treatment in nerve trauma due to compression or in cases of residual trauma due to multiple surgical interventions. These products are commonly used in protecting nerves after decompression and used in internal neurolysis with interpositional nerve graft repair. When used in combination, these products can promote axonal re-growth through peripheral nerve allografts.


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