



Problem Statement

There is a need to prevent neuroma and symptomatic neuroma formation, which is a common and impairing sequela of peripheral nerve injury.

Background

Painful neuroma is reported in over 80 percent of amputees. This pain leads to numerous effects such as making it difficult to mold a well-fitting prosthesis socket; can prevent the successful use of the prosthetic.

Neuromas are understood to result from axonal outgrowth through Schwann cell proliferation as the cells attempt to reinstate axonal continuity of the disrupted nerve end. In tissue damage, regenerating axons may not reach their target and instead form a tangled, bulbous mass which can cause pain.

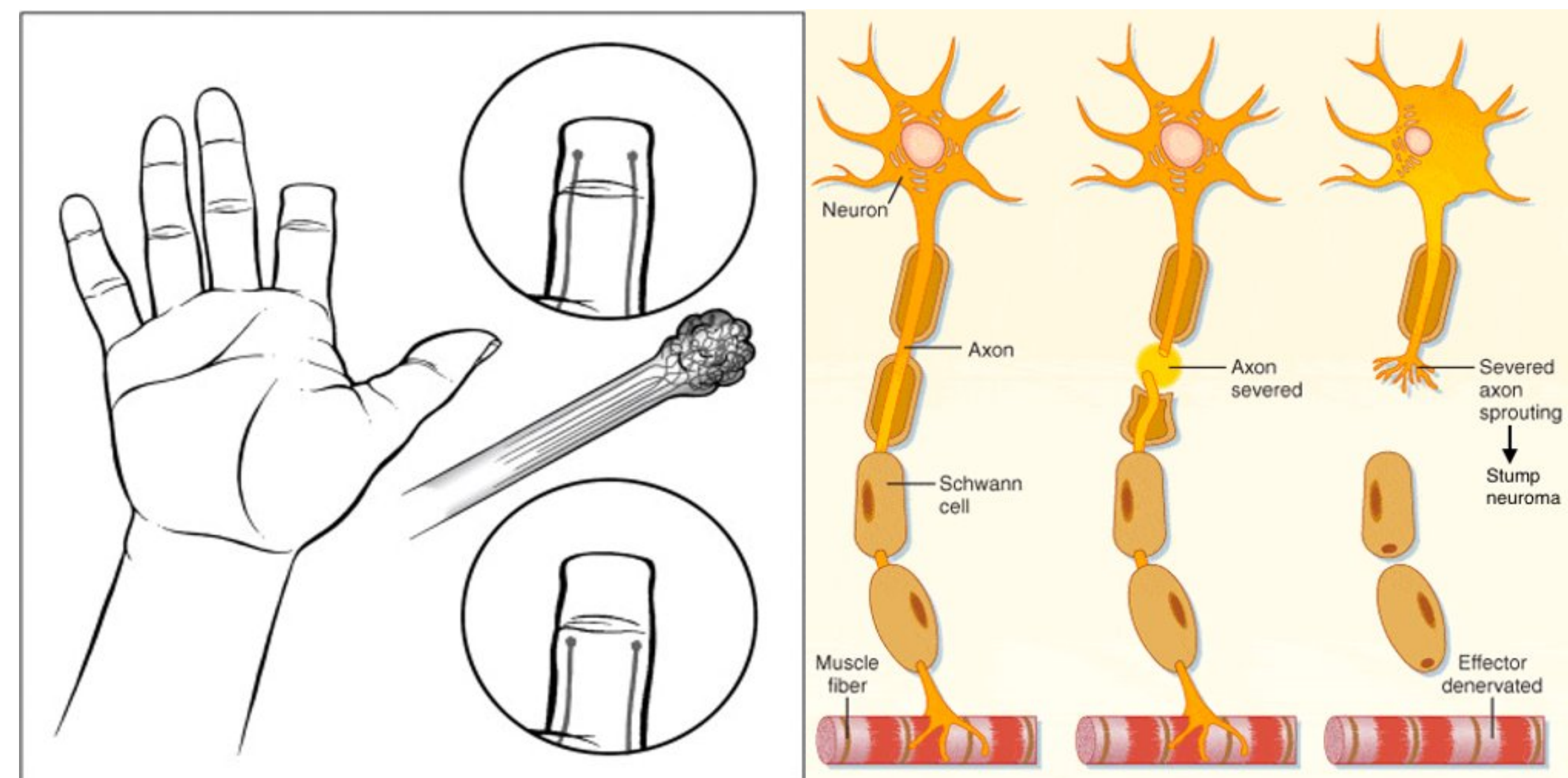
Current Solution

The current approach to remediating symptomatic neuroma is via surgery to trim the neuroma. This technique may not address the potential of neuroma to re-develop.



User Needs

Corrective regeneration of nerve	Biocompatible
Develop viable environment	Sterilization
Minimal complications	Durable
Stable control mechanism	Low-cost
Comprehensive surgical technique	Patient specific



Right image - Depiction of neuroma formation at the nerve end of an amputated digit.

Left image - (From left to right) normal nerve, axonotmesis or axon discontinuity, and neurotmesis (complete disruption).

User Need Statement

Design a biocompatible, implantable device to reduce neuroma formation in persons with peripheral nerve injury or neuroma.

Interview

Dr. Sundararaghavan discussed the research currently available on neuroma. She noted that neurons are difficult to culture because they are a terminally differentiated cell. Due to resource, time, and capability limitations it is recommended to take a theoretical approach to a solution.

References

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- van der Avoort, D. J., Hovius, S. E., Selles, R. W., van Neck, J. W., & Coert, J. H. (2013). The incidence of symptomatic neuroma in amputation and neurotomy patients. *Journal of plastic, reconstructive & aesthetic surgery : JPRAS*, 66(10), 1330–1334. <https://doi.org/10.1016/j.bjps.2013.06.019>

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