

***Targeted Muscle Reinnervation to Improve Pain, Prosthetic Tolerance, and Bioprosthetic Outcomes in the Amputee.***

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**Abstract**

Scope and Significance: There are ~185,000 amputations each year and nearly 2 million amputees currently living in the United States. Approximately 25% of these amputees will experience chronic pain issues secondary to localized neuroma pain and/or phantom limb pain. Problem: The significant discomfort caused by neuroma and phantom limb pain interferes with prosthesis wear, subjecting amputees to the additional physical and psychological morbidity associated with chronic immobility. Although numerous neuroma treatments are described, none of these methods are consistently effective in eliminating symptoms.

Translational Relevance: Targeted muscle reinnervation (TMR) is a surgical technique involving the transfer of residual peripheral nerves to redundant target muscle motor nerves, restoring physiological continuity and encouraging organized nerve regeneration to decrease and potentially prevent the chaotic and misdirected nerve growth, which can contribute to pain experienced within the residual limb.

Clinical Relevance: TMR represents one of the more promising treatments for neuroma pain. Prior research into "secondary" TMR performed in a delayed manner after amputation has shown great improvement in treating amputee pain issues because of peripheral nerve dysfunction. "Primary" TMR performed at the time of amputation suggests that it may prevent neuroma formation while avoiding the risks associated with a delayed procedure. In addition, TMR permits the target muscles to act as bioamplifiers to direct bioprosthetic control and function.

Summary: TMR has the potential to treat pain from neuromas while enabling amputee patients to return to their activities of daily living and improve prosthetic use and tolerance. Recent research in the areas of secondary (i.e., delayed) and primary TMR aims to optimize efficacy and efficiency and demonstrates great potential for establishing a new standard of care for amputees.

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