Regenerative Peripheral Nerve Interface and Targeted Muscle Reinnervation: Surgical Techniques

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Neuromas occur in 6% to 25% of patients with an upper extremity amputation and may be painful, limit prosthetic use, and result in a lower quality of life. Regenerative peripheral nerve interface decreases residual stump pain, whereas targeted muscle reinnervation can manage painful neuromas and improve myoelectric prosthetic control.

The patient is a 22-year-old man who underwent right upper extremity transmetacarpal amputation after a firecracker injury. The patient suffered from hypersensitive neuromas and was unable to use a myoelectric prosthesis. Surgical management included revision amputation to the trans-radial level, regenerative peripheral nerve interface of the ulnar and radial sensory nerves, and targeted muscle reinnervation of the median nerve into a pedicled pronator quadratus muscle flap. The goal of the surgery was to alleviate the painful neuromas and improve myoelectric prosthetic control.

For regenerative peripheral nerve interface, the ulnar and radial sensory nerves are sharply transected and then suture repaired into a free muscle graft harvested from the extensor carpi radialis longus and brevis. Each regenerative peripheral nerve interface is secured into the forearm soft tissues. For targeted muscle reinnervation, the pronator quadratus is released from the distal radius and the ulna. The anterior interosseous nerve is transected as it enters the pronator quadratus. The median nerve is sharply transected and then sutured into the anterior interosseous nerve recipient. The median nerve and the anterior interosseous nerve epineurium are directly repaired into the pronator quadratus. The pedicled pronator quadratus is sutured into position over the end of the residual radius and ulna.
At 18 months postoperatively, the patient was pain free and able to wear a myoelectric prosthesis for more than 8 hours per day.