Reattachment of Severed Peripheral Nerves

The most severe form of injury to the peripheral nervous system is the complete transection (cutting) of a nerve through massive trauma, resulting in the complete paralysis of the dependent section of the body.

Unlike nerves of the central nervous system, the peripheral nervous system retains the ability to regrow severed axons. It has been observed since the 16th century that suturing a transected nerve together may eventually result in the return of some motor and sensory ability.

More recent studies have revealed that a nerve axon still connected to a living cell body will grow towards a separated length of axon, either reconnecting to it or using it as a guide for further growth. This works only over short distances and when the severed ends are placed in direct contact. The function regained varies greatly with age. Infants have been known to regain as much as 90% of their motor control.

The realization that the severed nerve axon acts a guide for the regenerating, live axon lead researchers to attempt nerve axon grafts in cases where the trauma was too great to allow the severed ends to be connected. This procedure is used mostly for reconnecting nerves in the hands and shoulder, an important and often injured area with relatively short nerves. The sensory nerves of the lower leg are the usual source of the nerve graft, chosen for their length and non-vital function. The transplanted nerve never functions itself and will be deconstructed by the body's immune system.

Nerve grafts are an uncertain operation and suffer from all the problems associated with other transplants. If the nerves are taken from the patient himself, the patient must undergo two delicate surgeries. All nerve grafts require the use of immunosuppresents to encourage axon growth.

In order to avoid the need for donor nerves, researches have been attempting to find an artificial replacement. Since the aim is a guide, not a functional replacement, research has focused on finding a suitable material that will encourage nerves to grow along it without triggering an immune response.

The only nerve graft substitute currently on the market is the SaluMedica Nerve Cuff. A simple tube, about 2 ½ inches long and between 2 and 10 mm in radius, it is made from a material almost identical to human tissue in strength, durability, and flexibility that does not trigger an immune response. SaluMedica received FDA approval in February of 2001. They plan to market further applications of the substance (Salubria) for cartilage replacement and drug delivery in the near future.

Surgeons perform approximately 220,000 nerve repairs every year in America, mostly on infants or young children who have by far the best chance of recovery. Nerve transection is common in cases of blunt and penetrative trauma. Unfortunately, despite advances in physical and pharmacological treatment, complete recovery of a transected nerve remains impossible.

http://www.salumedica.com/
http://www.emedicine.com/MED/topic2908.htm