

## **NERVE TRANSFERS IN PATIENTS WITH SPINAL CORD INJURY EDUCATIONAL PACKET**

Cervical level spinal cord injury can significantly affect hand function. Depending on the level and type of injury, surgery to improve hand and arm function may be an option. Surgical treatment may include nerve transfers or other procedures. To help you understand the treatment options and what to expect, we have prepared this handout.

This surgery can only provide benefits to patients with certain types of spinal cord injury. To be eligible, a patient must have quadriplegia with a **motor level C6 or C7 spinal cord injury**. Because the procedure relies on working nerves above the C6 and C7 level; the procedure will not benefit patients with C1 through C5 level injuries.

Please note that while these options may provide some improved hand and finger function, they will *not* provide anything approaching pre-spinal cord injury function.

Please let us know if anything is confusing and ask questions!

### **General Information**

#### Peripheral Nerve Injury:

- Is different from spinal cord injury.
- If the nerve fiber is cut in the peripheral nervous system it *CAN* regrow and recover function in a process called ‘nerve regeneration.’
- However, if the regeneration takes too long to reach the muscle (more than one year) then the muscle itself deteriorates and can’t recover function.

#### Spinal Cord Injury:

- Is different from peripheral nerve injury.
- The spinal cord is part of the central nervous system; when cells in the spinal cord are injured, they cannot be regenerated or repaired.
- Nerves leaving the spinal cord above the level of an injury to the spinal cord injury continue to work following that injury. You can control those muscles and feel sensation in the skin to which those nerves connect.
- Nerves that leave the spinal cord below the level of the spinal cord injury are no longer connected to the brain, and can no longer be connected through volition—meaning you can’t send a signal from the brain to the nerve to the muscle to make it work.
- However, below the cord injury the cells that control both movement and sensation are connected to the muscles and skin so that the muscle does not deteriorate like in a nerve injury. The muscles are “healthy”; they just cannot be controlled by the brain.

## General information about nerve transfers:

- A nerve transfer procedure can be used to rewire the system to make some muscles work again following specific kinds of injury.
- A donor nerve is taken from another muscle whose use is not essential and then transferred to help in providing more a more critical function.
- The transferred nerve goes into a muscle that was no longer working following the injury. The nerve transfer restores lost function to this muscle and will permit you to resume activities that were lost following the injury.
- Following the transfer procedure, you can expect significant time of many months before function returns:
  - The nerve transfer procedure involves cutting and reattaching nerve and muscle tissues, meaning times is required to regenerate working connections between the nerves and muscle.
  - After the procedure, your brain will need to relearn how to use and re-strengthen that muscle, which takes time and physical/occupational therapy.
- Following spinal cord injury, we can use nerve transfers to bypass the damaged area and to deliver a signal from the brain to a muscle that became disconnected following that injury.
- The nerve transfer can be done at any time after spinal cord injury (this is unlike peripheral nerve injury where the damaged nerve regenerate and reach the muscle in less than a year).
- A nerve transfer can only be done if the following is true:
  - The segment of spinal cord injured must be short (no syrinx in the cord on x-rays; this is also confirmed by electrodiagnostic testing).
  - The joints must be supple (not stiff).
  - There must be available expendable donor nerves to use.
  - Postoperative physical therapy must be available.

## Surgery and Recovery Information:

- Usually, surgery for the right and left arm will be staged and not done simultaneously.
- All surgeries are done in the operating room under general anesthesia.
- The time required to gain function is approximately a year (the nerve grows at 1 inch a month) and then therapy will be required to help in relearning how to control and strengthen those muscles
- The time required to heal and recover from surgery is shorter:
  - You will stay in the hospital for two nights.
  - A drain (if placed) is removed at about one week after surgery.
  - Once the skin is healed (after 2-4 weeks), pre-surgery arm and other activities may be resumed.

## Nerve Transfer Surgery in Spinal Cord Injury (Quadriplegia)

The specific nerve transfer surgery that can be used to restore function is described below.

**Standard Procedure:** We call this the “Brachialis to AIN (anterior interosseous nerve) Transfer.”

The donor nerve is attached to the brachialis muscle:

- In C6 and C7 level quadriplegia patients this muscle is working to help flex the elbow.

- It can be sacrificed because the biceps muscle is also working to flex the elbow.

This donor nerve is cut and then re-attached to the muscles that bend your thumb and index finger:

- An incision is made in the upper arm and the donor nerve is cut.
- The nerve is then re-attached to the muscles in the forearm that provide pinch by bending the tips of the thumb and index finger.

Further nerve or tendon transfer surgery may be offered as well depending on what is working in your arm.