Quadriplegics - hand surgery

There are approximately 8,000 quadriplegic people living in Australia. Without the use of their hands to move or to grasp, living independently is difficult. Many quadriplegics rely on their family or carers to help them to do even the most basic activities of daily living, like eating, bathing and writing. Many quadriplegics could regain hand movements, and live more independent lives, with a highly specialised operation called tendon transfer surgery.

Spinal cord injury
Quadriplegia is paralysis of the body. It is usually the result of an injury to the spinal cord, which affects both the arms and lower limbs. A message from the central nervous system is not relayed to the muscles, so that movement is either limited or impossible. About 75 per cent of Australian quadriplegics are men. The most common causes of quadriplegia are:

- Road accidents (car, motorbike, bicycle, pedestrian)
- Falls
- Diving or surfing
- Sports (football, gymnastics, horse riding)
- Aircraft accidents
- Crush injuries.

Tendon transfer surgery
Tendon transfer surgery (TTS) is used to move muscles which have retained their central nervous system connections. TTS is designed to restore function to either the elbow or to the wrist and hand, to improve a quadriplegic person's control.

Elbow tendon transfer surgery
Most quadriplegics retain the ability to move their shoulders. During elbow TTS, the large shoulder muscle (deltoid muscle) is partially detached and grafted to the elbow, using a tendon or Dacron graft. This allows the quadriplegic person to straighten their arm, by restoring the function of their triceps muscle.

Wrist and hand tendon transfer surgery
Wrist and hand TTS involves re-routing the forearm muscles that have retained movements and power, and grafting them to the tendons used for moving the wrist, fingers and thumb. This allows the patient to both open and close their fingers and, so, to grasp objects securely.

These two operations combined have restored a significant amount of upper limb and hand function in many people and, in doing so, restored their ability to independently perform many activities of daily living.

Electronic implants
If the level of injury is higher up the spine, the quadriplegic person has no muscle control at all, apart from slight shoulder movements. In those cases, an electronic (bionics) implant can be used to restore function. A controlling device (like a pacemaker) is implanted in the front of the chest; this device has electronic wires attached to electrodes, which are placed selectively on appropriate muscles in the forearm and hand.

By using this device and shoulder movement, the electrodes on the arms are stimulated in a controlled fashion to allow the patient to open and close their hands, thereby regaining grasp. There has been some early work done on bionic implants for the lower limbs as well.

A big difference
Hand control gives quadriplegics much greater independence. They can do everyday activities like feeding themselves, brushing their teeth, shaving or answering the telephone. Many can return to living independently in their own homes and, in some cases, can obtain a driver's licence and return to work.

The costs are high
Only a limited number of patients in Australia have had these operations because of the costs associated with hospitalisation and the surgery required (in the order of $20,000 per patient). If an electronic (bionic functional nerve stimulating) implant is required, then the cost is an additional $50,000. Government and private health funds offer limited financial help.

Where to get help

- Your doctor
- Spinal Cord Injuries Australia (02) 9661 8855
- Australian Quadraplegic Association, Tel. 1800 819 775
- Independence Australia (formerly ParaQuad Vic.) Tel. 1300 704 456
- AQA Victoria Ltd Tel. (03) 9489 0777

Things to remember

- Hand control allows a quadriplegic person to live a more independent life.
- Tendon transfer surgery can restore movement to the elbow, wrist and hand.
- Quadriplegics with no muscle control can have electronic implants inserted to help them regain hand function.

This page has been produced in consultation with, and approved by:

AQA Victoria Ltd