



## Peripheral Nerve Surgery

A guide for patients

A peripheral nerve is any nerve that is outside the brain and spinal cord. Peripheral nerves course through all parts of the body, supplying muscles and other organs. If a peripheral nerve becomes damaged and does not heal well, surgery may be the only treatment option with a good chance of restoring some or all of the nerve's function.

The most common causes of damage to a peripheral nerve are:

**entrapment and compression** – When a peripheral nerve runs through a very narrow area, it may become trapped and compressed.

If the nerve is compressed for some time, it can become irritable and inflamed. This causes chronic pain, numbness, tingling and poor muscle strength. If the compression and inflam-

mation worsen, the area can lose sensation and muscle strength.

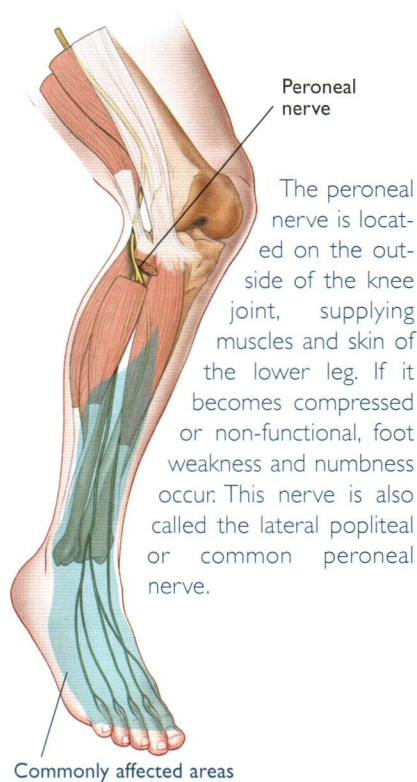
In severe cases, the compression can prevent adequate blood supply to the nerve, which may start to die unless the compression is relieved.

**acute trauma** – Typical examples are a stretch injury (usually to a limb, shoulder or the neck), a laceration due to a knife or other sharp object, or a missile wound.

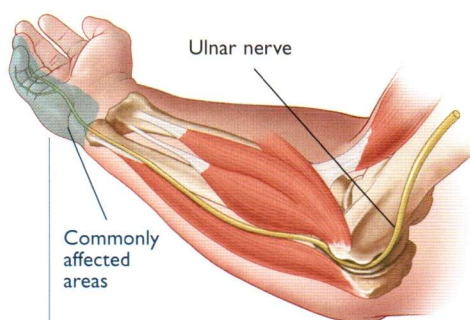
**tumour** – Whether a tumour is benign (non-cancerous) or malignant (cancerous), it can cause serious damage to a peripheral nerve.

Common surgical procedures to restore nerve function include neurolysis, nerve transposition, nerve repair, neuroma resection, and nerve graft, as described on page three.

### PERONEAL NERVE SYNDROME

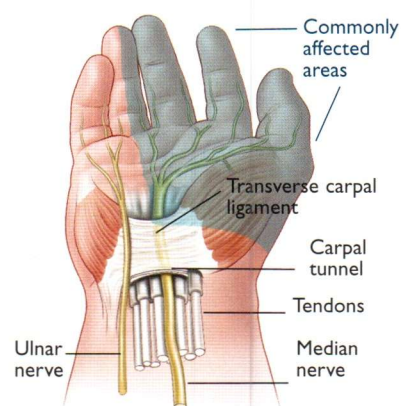


### CUBITAL TUNNEL SYNDROME



The ulnar nerve is vulnerable to compression where it passes behind the elbow. This is the same nerve that is aggravated when you strike your "funny bone". Compression of the ulnar nerve can cause hand pain (particularly in the ring and little fingers) and general weakness of the hand. In serious cases, the forearm is weakened. Surgery usually involves freeing the nerve from compression and/or moving (transposing) it.

### CARPAL TUNNEL SYNDROME



The carpal tunnel is a narrow passage through which the median nerve and nine tendons pass. Carpal tunnel syndrome occurs when the contents of the tunnel swell, or the ligament forming the roof of the tunnel thickens to compress the median nerve.

This syndrome is common, occurring most often in women and frequently aggravated by pregnancy. Repetitive activities that stress the hand and wrist may worsen the condition (although this has been a matter of debate). The objective of surgery is to open the carpal tunnel and relieve pressure on the median nerve.

Common symptoms of carpal tunnel syndrome include:

- tingling and numbness of the thumb, index finger, middle and ring finger, especially at night
- pain running up the arm and shoulder
- pain when gripping
- a tendency to drop objects
- decrease in hand-motor skills.

### IMPORTANT: FILL IN ALL DETAILS ON THE STICKER

DEAR SURGEON: When you discuss this pamphlet with your patient, remove this sticker and put it on the patient's medical history or card. This will remind you and your patient that this pamphlet has been provided. Some surgeons ask their patients to sign the sticker to confirm receipt of the pamphlet.

#### TREATMENT INFORMATION PAMPHLET

PROCEDURE: \_\_\_\_\_

PATIENT'S NAME: \_\_\_\_\_

DOCTOR'S NAME: \_\_\_\_\_

EDITION NUMBER: \_\_\_\_\_ DATE: DD / MM / YYYY

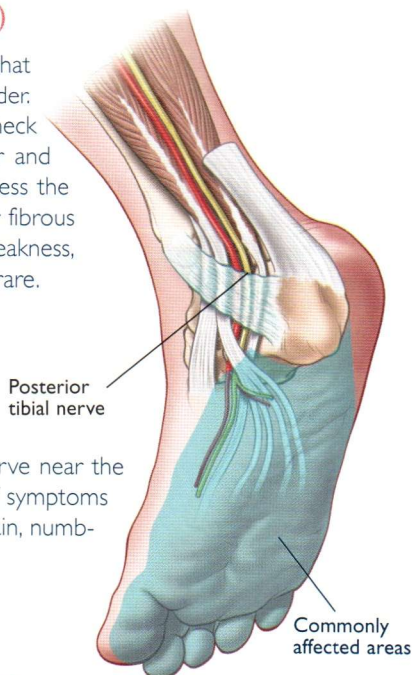
PEEL HERE

## THORACIC OUTLET SYNDROME (OR BRACHIAL PLEXUS COMPRESSION)

The brachial plexus is a complex group of nerves that supply the muscles and skin of the arm and shoulder. The brachial plexus lies on either side of the neck between two tight bands of muscles, the anterior and middle scalene muscles. These muscles may compress the brachial plexus, as can an extra rib (cervical rib) or fibrous band. The result is arm pain, numbness or weakness, especially when the arm is raised. This condition is rare.

## TARSAL TUNNEL SYNDROME

This condition occurs when the posterior tibial nerve near the ankle becomes compressed. This causes a range of symptoms in the foot such as persistent or sharp radiating pain, numbness, tingling, swelling, and hot-and-cold sensations.



## THE DECISION TO HAVE TREATMENT

The decision whether to have surgery should only be made after discussion with your surgeon.

Make the decision only when you are satisfied with the information you have received and believe you have been well informed.

Your surgeon will be pleased to discuss the benefits and risks of treatment.

Your surgeon cannot guarantee that the surgery will meet all of your expectations or that surgery has no risks. Read about the possible complications of surgery on page 4.

Seek the opinion of another surgeon if you are uncertain about your surgeon's advice.

**Realistic expectations:** Patients who are

healthy and have realistic expectations about what the surgery can achieve are suitable candidates for peripheral nerve surgery. Not everyone will get the same results.

**Consent form:** If you decide to have treatment, your surgeon will ask you to sign a consent form. Read it carefully. If you have any questions, ask your surgeon.

## BEFORE SURGERY

Your surgeon might recommend that you have nerve-conduction studies and electromyography (EMG) or other tests to confirm the diagnosis.

Your surgeon needs to know your medical history to plan the best treatment. Fully disclose any health problems you may have had. Some may interfere with surgery, anaesthesia or aftercare.

Before surgery, tell your surgeon if you have had:

- previous problems with blood clots in the legs or lungs
- psychological or psychiatric illness
- keloid scars or poor healing of scars after previous surgery.

Give the surgeon a list of ALL medicines you are taking or have recently taken. Include all prescription and over-the-counter medicines. Some medicines increase the risk of bleeding during and after surgery. Tell your surgeon if you take aspirin, anti-inflammatory medications (such as ibuprofen), vitamin E, herbal medications or garlic tablets. If you take a medication to help prevent a blood clot (aspirin, warfarin, clopidogrel or similar medicines), ask your surgeon and prescribing doctor whether the dose

should be changed or the medication stopped.

Some doctors recommend stopping the contraceptive pill for a time before surgery to reduce the risk of blood clot problems. Also, if you take any medication, it could affect or reduce the efficacy of the contraceptive pill. Check with your surgeon or general practitioner.

Your surgeon may prescribe drugs, such as antibiotics and small doses of blood-thinning agents, to be administered prior to surgery.

**Smoking:** Stop smoking at least two weeks before surgery. Smoking increases surgical and anaesthetic risk and impairs healing. It is best to quit.

## ANAESTHESIA

Peripheral nerve surgery can be performed under general anaesthesia or local anaesthesia, depending on the condition and the necessary treatment.

Modern anaesthesia is safe and effective but does have risks. Rarely, side effects from an anaesthetic can be life threatening. You can ask your anaesthetist for more information.

## COSTS OF TREATMENT

Ask your surgeon to provide an estimate of the surgical fees. This can only be an estimate because the actual treatment may differ from the proposed treatment. If further treatment is needed due to complications or you choose other options, extra costs are likely to apply. You should discuss costs before treatment rather than afterwards.

## TALK TO YOUR SURGEON

This pamphlet is intended to provide you with general information. It is not a substitute for advice from your surgeon and does not contain all the known facts about peripheral nerve surgery.

It is important that you have enough information about surgery to enable you to compare the benefits and risks. If you are not sure about the benefits, risks and limitations of treatment, the terms used in this pamphlet, or anything else, ask your surgeon.

Read all of this pamphlet. Some technical terms are used that may require further explanation from your surgeon. Write down questions that you want to ask.

Discuss with your surgeon:

- the results you want
- the surgery to be done and why
- the outcome you can expect.

Use this pamphlet only in consultation with your surgeon.

## YOUR SURGEON



# Surgical Procedures

## NEUROLYSIS

The surgeon makes an incision in the skin above the nerve and then deepens the incision into underlying tissues. Making sure that the compressed nerve is out of the way, the surgeon cuts the tissue (usually a ligament, tendon or scar tissue) that is compressing the nerve. This immediately relieves pressure on the nerve by providing more space. The surgeon also removes any other tissue that appears to be compressing the nerve.

Freeing up the nerve provides it with better blood flow and room to move, especially when close to a joint.

The skin is sutured, and a firm bandage applied. Most neurolysis procedures take about 30 to 45 minutes.

Decompression usually stops the symptoms of nerve irritation, such as tingling and "pins-and-needles". However, numbness and weakness may persist, depending on the nerve's severity of injury before the operation. If there is an underlying cause for the nerve compression, such as arthritis or inflammation of a tendon, then the underlying discomfort is not relieved.

## NERVE TRANSPOSITION

Due to the anatomy of the area, the compression may be best relieved by freeing the nerve and then moving it several centimetres to a nearby site. For example, an effective treatment option in Cubital Tunnel Syndrome is to free the ulnar nerve and move it to a safe spot under a nearby muscle. Also, the ulnar nerve can be moved from behind the "funny bone" (medial epicondyle of the humerus) to the front. Transposition can provide the nerve with some slack and decreases stretching of the nerve.

## NERVE REPAIR

The two ends of a cut nerve are aligned and matched as closely as possible using an operating microscope. The ends are sewn in place with, most commonly, a series of simple sutures through the outer membrane of the nerves.

**Nerve cuff:** In some cases, a silicon-rubber cuff may then be centred over the repair site and fixed in position with one suture at each end. The cuff is used to protect the nerve junction during healing and to improve nerve regrowth and function.

## NERVE GRAFT

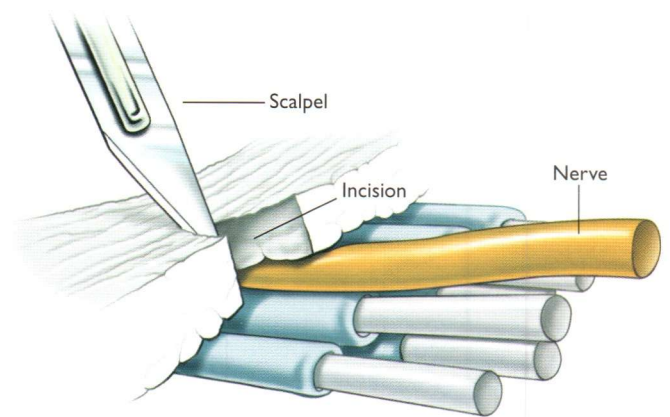
If injury to a nerve is extensive, the gap may be so long that the nerve's two ends cannot be pulled together. The gap can be bridged using a graft from another nerve. The donor nerve is selected so that the graft's diameter will be close to that of the injured nerve. The length of the graft is significantly longer than the gap to allow for healing and mobility. In some cases, a nerve cuff may be used.

The surgeon optimises the graft's diameter and length as much as possible, but obtaining a functional graft from the patient can be a difficult process. In harvesting the nerve graft, the surgeon may have to make a long incision at the donor site.

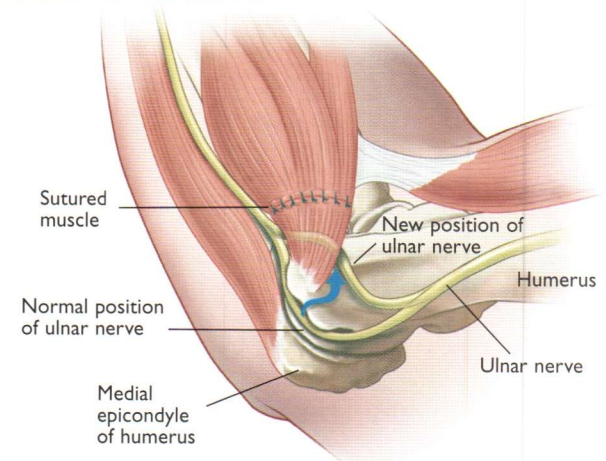
## NEUROMA RESECTION

A neuroma is an area of diseased nerve that may have abnormal scarring and swelling. If tests show that the nerve is dysfunctional or non-functional, it may be best to remove the neuroma. It is removed by cutting, and the ends of the cut nerve may or may not be repaired, as described above.

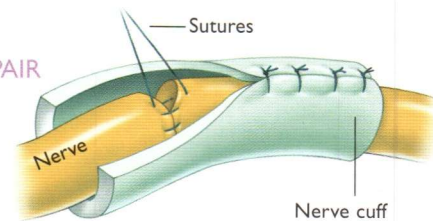
## NEUROLYSIS



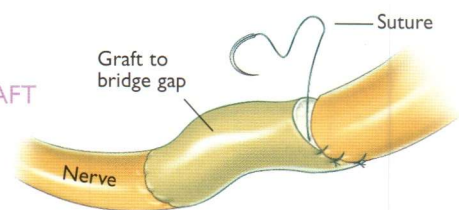
## NERVE TRANSPOSITION



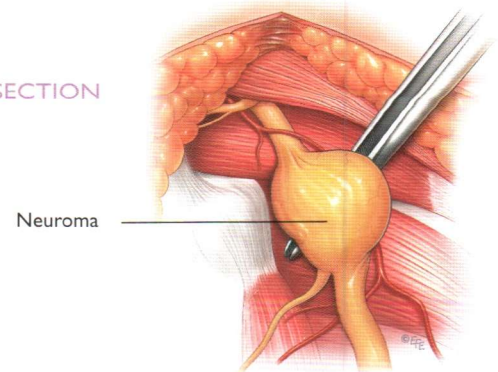
## NERVE REPAIR



## NERVE GRAFT



## NEUROMA RESECTION



## RECOVERY FROM SURGERY

Immediately after surgery, you are transferred from the operating theatre to the recovery room. Nursing staff monitor your recovery. Many procedures can be done as day procedures. Depending on how you feel, you may be able to go home after a few hours. You may be given a prescription for pain relief.

For upper-limb surgery, you may require a sling. For lower-limb surgery, you may need crutches. Tingling in the limb can persist for some weeks. You may have to wear a splint until the tissues are healed and muscle strength has returned. During healing, the area may be tender and sensitive to pressure for some weeks. The muscles may be weaker and slightly painful, although discomfort gradually improves with time and physiotherapy.

Physiotherapy or occupational therapy is often required. Treatment may include exercises, heat and massage, nerve stimulation, and splinting or wrappings to control swelling. Physiotherapy is usually arranged in consultation with your surgeon.

Keep the dressing and the stitches dry. During a shower or bath, keep the operated area dry. If possible, tape a large plastic bag over the operated area. Remove the plastic bag after the limb is dry.

Stitches and dressings are removed 10 to 14 days after surgery. Bruising of the operated area is common. You can immediately use your limb for very light duties, such as eating and dressing.

Avoid heavy lifting and repetitive activities for six to eight weeks after surgery. Your return to work will depend on your occupation. Your surgeon will advise you when you can resume driving.

Depending on your case, the following suggestions may assist recovery.

- Using pillows, always keep your limb elevated when sitting or lying down.
- If the arm or hand has had surgery, keep it elevated in a sling while standing or walking. To help prevent shoulder stiffness, raise the arm or hand high above your head at least five times daily; however, do NOT make this movement if you've had brachial plexus surgery.
- Move all unsplinted joints every hour

by stretching the arms and legs.

The first sign of the nerve's recovery is "pins and needles", but this may take some weeks or months. Ongoing recovery may take a further 12 months. Factors that influence a successful outcome are:

- age of the patient (younger patients tend to recover more nerve function more quickly)
- the degree of nerve injury prior to surgery (small injuries respond better to surgery than more extensive injuries)
- minimum tension on the healing nerve
- presence of healthy tissue surrounding the nerve repair
- the site of the nerve surgery; the closer the injury is to the skin or muscle supplied by that nerve, the better the outcome
- the specific nerve involved; some nerves recover better from injury than others
- the length of time that has elapsed from onset of symptoms to surgery (if more than 18 months, results are generally less satisfactory).

Be certain to keep your follow-up appointments.

## THE POSSIBLE COMPLICATIONS OF PERIPHERAL NERVE SURGERY

As with all surgical procedures, peripheral nerve surgery does have risks, despite the highest standards of practice. While your surgeon makes every attempt to minimise risks, complications can occur that may have permanent effects.

It is not usual for a surgeon to outline every possible side effect or rare complication of a surgical procedure. However, it is important that you have enough information about possible complications to fully weigh up the benefits, risks and limitations of surgery.

The following possible complications are listed to inform and not to alarm you. There may be other risks that are not listed.

### General risks of surgery

- Wound infection (treatment with antibiotics may be needed).
- Pain and discomfort in treated areas.
- Excessive swelling and stiffness.
- Haematoma (an accumulation of blood around the surgical site that may require drainage).
- Heavy bleeding from an incision.
- Keloid or hypertrophic scars. Most scars fade or flatten, but some may become raised, itchy, thick and red. Such scars can be annoying but are not a threat to health. Additional surgery or chemical treatment may be needed to try to improve the scar.
- Separation of wound edges.
- Allergies to anaesthetic agents, antiseptic solutions, suture material or dressings.

- Long-term disability, weakness or numbness of the limb, requiring physiotherapy.
- General anaesthesia carries risks of chest infection, pneumonia, blood clots in the leg or lungs (deep venous thrombosis or pulmonary embolus), or drug sensitivity that can be life-threatening; anaesthetic deaths have occurred but are rare.

### Specific risks

- The nerve may recover incompletely or not at all, even if the operation was technically perfect. Your surgeon cannot predict with certainty the amount of nerve recovery that is likely. Recovery often depends on the extent of nerve damage that occurred before surgery.
- The treated nerve and operated site can be slow to heal. This may delay a return to normal work activities.
- Damage to a nerve, leading to further weakness and numbness.
- Failure to completely release the nerve from compression, so symptoms may persist.
- A small number of patients may develop excessive swelling and stiffness near the joint. This may be corrected with prolonged physiotherapy.
- There may be some permanent numbness around the operated site.
- Risk of Complex Regional Pain Syndrome (also called reflex sympathetic dystrophy). This is the development of a burning sensation and sharp pain that

becomes much worse than normally expected for the degree of surgery. If it occurs, the syndrome usually settles down in a few days or weeks; in some cases, it may persist and require pain management.

- Excessive blood loss may require a transfusion.
- Adjacent structures and organs may be injured, for example, blood vessels, other nerves, or larger structures such as a lung in the case of brachial plexus surgery.
- If a nerve graft is taken, permanent numbness will persist at the donor site.

### REPORT TO YOUR SURGEON

Tell your surgeon at once if you develop any of the following:

- temperature higher than 38°C or chills
- severe pain, tenderness or increased swelling
- unusual amount of drainage on the dressing, or a foul odour at the dressing site
- a dressing or plaster that is uncomfortable, tight, wet or broken
- any change in movement, colour, warmth or sensation in the fingertips
- nausea or vomiting
- if you need more than six tablets per day for pain relief
- any concerns you have regarding your surgery.