

Risks associated with your anaesthetic

Section 10: Nerve damage associated with an operation under general anaesthetic

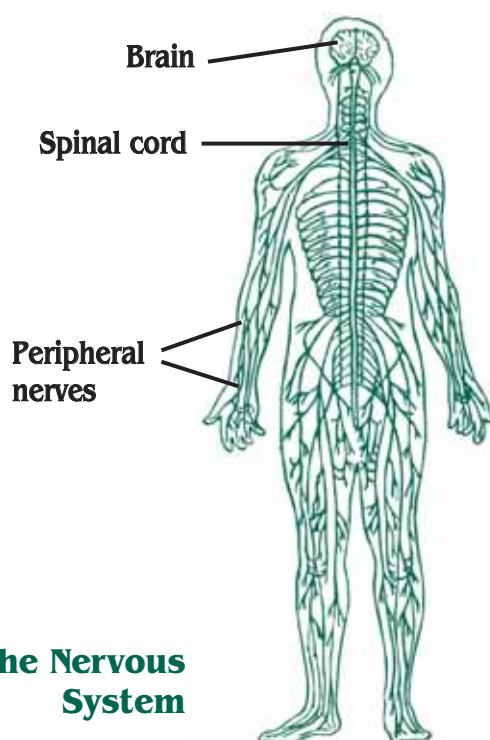
Significant nerve damage is uncommonly associated with a general anaesthetic (less than 1 in 1,000 patients). This article gives information about how nerves can be damaged during an operation under general anaesthesia, what kinds of nerve damage can happen, how likely this is, and what recovery can be expected.

What is the nervous system?

The nervous system consists of:

► The Central Nervous System

- The brain, which acts as the 'central processor' of the system.
- The spinal cord. This carries electrical signals away from the brain to nerves supplying muscles and organs. It also carries signals from nerves which supply the sense organs towards the brain. These signals allow you to feel touch, pain, position and hot or cold.



► The Peripheral Nervous System

- The peripheral nerves include motor nerves (controlling muscles) and sensory nerves (bringing information about touch, pain, and other sensations).
- Some nerves are mixed nerves – partly motor and partly sensory.

What symptoms can be caused by nerve damage?

Peripheral nerve damage

- If sensory nerves are damaged, you may feel numbness, tingling or pain. The pain can be a continuous aching pain or a sharp shooting pain. You may also get inappropriate warm or cold sensations.
- If motor nerves are damaged, there may be weakness or paralysis (loss of movement) of muscles in that area.
- If mixed nerves are damaged, there will be a mixture of the symptoms given above.

The area varies according to the nerves affected, from a very small patch of numbness, to most of a limb being affected.

Spinal cord damage

- Damage to the spinal cord usually affects both muscle power and sensation, depending on where the

damage has happened. Unfortunately, spinal cord damage is often extensive, with pain being a frequent feature. Control of the bowels and the bladder can also be affected.

How long do these effects last?

Peripheral nerves

- ▶ This is variable.
- ▶ If the changes you notice are slight, they may resolve within a few days, but often it will take several weeks. Most symptoms resolve within three months.
- ▶ Full recovery can sometimes take up to a year or even longer.
- ▶ Rarely, (less than 1 in 10,000 general anaesthetics) nerve damage occurs that is permanent.

Spinal cord

- ▶ Unfortunately, damage caused by an injury to the spinal cord is usually permanent. This is very rare, occurring in less than 1 in 50,000 anaesthetics (see later for more information on the risk).

What are the most common nerve injuries?

- ▶ The ulnar nerve at the elbow.
- ▶ The common peroneal nerve at the knee.

The ulnar nerve of the arm is by far the most commonly reported nerve injury.¹⁻³ It can be compressed at the elbow, where it is very close to the skin. Ulnar nerve damage causes numbness in the fourth and fifth fingers and/or weakness of the hand muscles.

The common peroneal nerve can be damaged on the outside of the leg, just below the knee. This can cause foot drop (an inability to raise the foot off the ground), and/or numbness on the front of the foot.⁴⁻⁶

What can be done if there is nerve damage?

Your anaesthetist or surgeon may arrange for you to see a neurologist (a doctor specialising in nerve diseases). Tests may be done to try and find out exactly where and how the damage has occurred. This might involve:

- ▶ nerve conduction studies (very small electrical currents are applied to the skin or muscles and recordings made further up the nerve. This shows whether the nerve is working or not)
- ▶ Magnetic Resonance Imaging (MRI)
- ▶ Computed Tomography (CT) scanning.

The neurologist will suggest a treatment plan, which might include physiotherapy and exercise. If you have pain, drugs that relieve pain will be used. This may include drugs that are normally used for treating epilepsy or depression. These drugs help because of the way in which they change electrical activity in nerves. Drug treatment is not always successful in relieving pain. Occasionally an operation can be done, either to repair a nerve or to relieve pressure on a stretched nerve.

How does peripheral nerve damage happen?

The ways in which nerve damage can happen are listed here and explained below.⁷

- ▶ Compression.
- ▶ Stretching.
- ▶ Surgical damage.
- ▶ Inadequate blood supply.
- ▶ Insertion of a cannula.
- ▶ Not known.

Compression and stretching

During the operation, you will be placed in a certain position to allow the operation to be done. For example, you may need to lie on your front to allow surgery on your back. If a nerve is stretched or compressed (pressed on or squashed),

there can be nerve damage. If you were awake, you would feel this and move to relieve the discomfort. During an anaesthetic, you cannot do this.

If a tourniquet is used to reduce surgical bleeding there can be nerve damage due to compression. The pressure of the tourniquet and the time it is used should be carefully controlled to reduce the chance of this happening.

Very rarely, the nerves to your tongue can be compressed by the tube used to ensure your airway is clear, or by the process used to place the tube. You can find out more about this in Section 4 in this series.

Surgical damage

The surgeon might cut a nerve, or injure it with the diathermy (cautery) instrument used to stop bleeding. Surgical instruments can also compress and/or stretch a nerve. During some operations, this may be difficult or impossible to avoid. If this is likely, the surgeon should discuss it with you beforehand.

Local anaesthetic injections including spinal and epidural injections

This is discussed in Sections 11 and 12 in this series.

Inadequate blood supply

Every nerve is supplied by blood vessels which keep it healthy. If these blood vessels are damaged during the operation, or if the blood supply is reduced due to pressure or stretching, the nerve can be starved of oxygen. This type of damage is slightly more likely if you have narrowing of your blood vessels generally – you may know that you have coronary heart disease or narrowed blood vessels elsewhere.

Insertion of a cannula or a 'drip'

Nerves can be damaged by needles used to place an intra-venous cannula ('your drip') or a cannula into large veins or arteries.

Cause unknown

Unfortunately, the mechanism of injury is unclear in the majority of cases of nerve injury² associated with surgery and general anaesthesia.

What is done to prevent peripheral nerve damage?

Your anaesthetist, surgeon and theatre staff take care to try and prevent nerve damage. They share the responsibility of minimising the risks by:

- ▶ careful padding of vulnerable areas
- ▶ positioning you in a way which avoids stretching nerves as much as possible
- ▶ surgical awareness of the risk
- ▶ avoiding prolonged bed rest.

What increases the risk of nerve damage?

- ▶ Certain positions required for the operation, for example:
 - lying on your front for an operation on your back
 - lying on your side for some operations on the chest or kidney
 - lying on your back with your legs raised and separated – for operations in the genital area (this is called the lithotomy position)
 - your arm being placed in position for some shoulder operations.
- ▶ Certain operations, including:
 - operations on the spine or brain
 - cardiac or vascular operations (on the heart or major blood vessels)
 - operations on the neck or parotid (a gland in the face)
 - some kinds of breast operation
 - operations where a tourniquet is used to reduce bleeding (knee, foot, hand operations mainly).
- ▶ Previous disease – here are a few examples.
 - Diabetes
 - Rheumatoid or osteo-arthritis

- Atherosclerosis (hardening and/or narrowing of the arteries).
- ▶ Increasing age.
- ▶ Being very overweight or extremely thin.
- ▶ Being male – men have a higher risk of ulnar nerve damage. The reason for this is not known.

How does spinal cord damage happen?

Spinal cord damage is very rare. Unfortunately, compared to peripheral nerve injury, it is more likely to result in permanent serious disability. This is because the spinal cord cannot grow back and heal, unlike peripheral nerves which can re-grow.

Compared to peripheral nerve injury, spinal cord damage is:

- ▶ much more rare
- ▶ more likely to be disabling
- ▶ more likely to be permanent
- ▶ more often associated with pre-existing disease.

How does it happen?

The main cause of spinal cord damage associated with a general anaesthetic is an inadequate blood supply to the spinal cord. Other causes of spinal cord damage during an operation are not related to the anaesthetic and happen during surgery on or near the spine itself.

Inadequate blood supply to the spinal cord

This can happen due to:

- ▶ low blood pressure
- ▶ a clot blocking the blood vessels
- ▶ compression or stretch of blood vessels, making them narrower.

These may cause oxygen starvation of the spinal cord, leading to damage.

The 'anterior spinal artery syndrome' is caused by one or more of these factors reducing blood flow in the anterior spinal

artery. If the flow of blood in this artery is very low, the front part of the spinal cord becomes starved of oxygen and may be damaged. If this is not corrected, nerve cells will die. This will result in permanent lower limb paralysis.

If you have disease of your blood vessels elsewhere (for example coronary heart disease) the risk of this happening is higher. But the risk remains very rare (see later for estimated figures). Your anaesthetist can adjust your anaesthetic to keep your blood pressure at a level that he/she considers safe.

How likely is peripheral nerve and spinal cord damage?

The exact risk of nerve damage is not known. The following figures are the best information available.

- ▶ The risk of a significant peripheral nerve injury lasting more than three months, is estimated to be less than 1 in 2,000 patients having a general anaesthetic.⁷ Permanent damage, lasting more than a year, is estimated to be less than 1 in 5,000.
- ▶ Spinal cord damage occurs in less than 1 in 50,000 patients having a general anaesthetic.⁸
- ▶ More minor symptoms may occur much more frequently, perhaps as high as 1 in 100 people having a general anaesthetic, but most recover completely.

Who should I go to for help if I think I may have nerve damage and I have left hospital?

- ▶ Your GP.
- ▶ Your surgeon.
- ▶ Your anaesthetist.

You should go to your GP initially, who may refer you back to your surgeon or to your anaesthetist, depending on the area affected.

More detailed information about the risk of nerve and spinal cord damage

The risk of significant and disabling peripheral nerve damage occurring in association with surgery and anaesthesia in the United Kingdom is unknown. Many cases of nerve damage have been reported, but the denominator is not usually known. This means that although we know that there are a certain number of reports of problems, we do not know how many anaesthetics there were during the same time without problems, so we don't know how frequently the damage is occurring.

From the USA, a report of closed claims (cases which have been settled in a court of law) gives some indication of the overall risks in the USA.² Between 1975 and 1995, there were 670 closed claims in the USA involving nerve damage and anaesthesia. These cases include all types of anaesthetic – general anaesthetic, peripheral nerve blocks, spinal and epidural injections. You can find out more about nerve damage and local anaesthetic injections in Sections 11 and 12 in this series.

Of these closed claims:

- Just over half of the injuries (373 out of 670, or 55%) were to nerves in the arm. The majority of these involved only a general anaesthetic, without any kind of peripheral nerve block. Some were thought to be associated with the position of the arm during the anaesthetic, but the exact cause of many injuries was not known.
- Just over a tenth of the injuries (84 out of 670, or 13%) were spinal cord injuries. Those affected were more likely to have had a spinal or epidural injection than a general anaesthetic alone. There were 23 people with spinal cord damage who had only had a general anaesthetic, but about half of these people were having operations on their spine.

It is helpful to remember that:

- **Many millions** of anaesthetics were given in this 20 year period.
- This information only includes cases reported and settled in a court of law.
- The information is now quite old, and considerable improvements have been made in the care given during and after operations.
- Most UK anaesthetists and surgeons would consider the risks now to be less than those quoted here, but this view remains to be proven.

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