

## Risks associated with your anaesthetic

# SECTION 11: NERVE DAMAGE ASSOCIATED WITH AN OPERATION UNDER GENERAL ANAESTHETIC

Significant nerve damage can be associated with a general anaesthetic. Peripheral nerve damage occurs uncommonly (less than 1 in 1,000).<sup>1</sup> Spinal cord damage is exceptionally rare. This article gives information as follows:

- ▶ How can nerves can be damaged during an operation under general anaesthesia?
- ▶ What kinds of nerve damage can happen?
- ▶ How likely is this?
- ▶ What recovery can be expected?

### What is the nervous system?

The nervous system consists of:

- ▶ **Peripheral nerves** run between the spinal cord and the rest of the body.
  - **Sensory nerves** bring information into the brain about touch, pain, position and hot or cold.
  - **Motor nerves** carry messages from the brain to control muscles.
  - **Mixed nerves** are partly motor and partly sensory.
- ▶ **The central nervous system**
  - The brain acts as the 'central processor' of the system.
  - The spinal cord carries electrical signals to and from the brain. It links the brain to the peripheral nerves.

### 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. Symptoms can start immediately after an injury to a nerve, or can sometimes not appear until several weeks after the initial injury.
- ▶ If motor nerves are damaged, there may be weakness or paralysis (loss of movement) of muscles in the area supplied by that nerve.
- ▶ If mixed nerves are damaged, there will be a mixture of symptoms.
- ▶ The area affected varies according to which nerves have been damaged. There could be anything between a very small patch of numbness and 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.

## What are the most common peripheral nerve injuries?

The ulnar nerve runs in the arm down to the fourth and fifth fingers. Ulnar nerve damage is by far the most commonly reported nerve injury.<sup>2-4</sup> Pressure can easily damage the nerve around 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 runs in the leg supplying muscles and skin of the foot. It can be damaged on the outside of the leg, just below the knee. This can cause numbness on the top of the foot and/or foot drop (an inability to bend the foot upwards at the ankle joint).<sup>6-8</sup>

## How long do these effects last?

### Peripheral nerves

- ▶ This is variable.
- ▶ If the changes you notice are slight, recovery may occur within a few days, but it may take several weeks. Most symptoms resolve within three months.
- ▶ Full recovery can sometimes take up to a year or even longer.
- ▶ Uncommonly, (around 1 in 1,000 anaesthetics)<sup>5</sup> 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.

## 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 electric currents are applied to the skin or muscles and recordings are 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
- ▶ exercise
- ▶ drugs that relieve pain. Drugs may be given which are normally used for treating epilepsy or depression. They help because they change electrical activity in nerves. Drug treatment is not always successful in relieving pain
- ▶ Occasionally an operation may be recommended, either to repair a nerve or to relieve pressure on a stretched nerve.

## Peripheral nerve damage

### How does peripheral nerve damage happen?

Mechanism	Cause
<b>Compression/stretch</b>	<p><b>Related to positioning</b></p> <p>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.</p> <p><b>Tourniquets</b></p> <p>If a tourniquet (a tight bandage) is used to reduce surgical bleeding there can be nerve damage due to pressure on the nerve. Your anaesthetist and surgeon will take care to limit the pressure and the length of time the tourniquet is used to reduce the chance of this happening.</p> <p><b>Airway tubes</b></p> <p>Very rarely, the nerves to your tongue can be compressed by the tube used in your throat during a general anaesthetic. These tubes are essential for a safe anaesthetic, to ensure that your airway is clear. You can find out more about this in Section 4 in this series.</p> <p><b>Surgical equipment</b></p> <p>Retractors are surgical instruments that may be used to hold structures in the body out of the way so that the surgeon can see more deeply into the body. They are used with care, aiming to avoid pressure on nerves.</p>
<b>Direct injury</b>	<p>The surgeon might damage a nerve as he/she operates. Surgical instruments can also compress and/or stretch a nerve. During some operations, this may be difficult or impossible to avoid. If this is a significant possibility, the surgeon should discuss it with you beforehand.</p>
<b>Inadequate blood supply</b>	<p>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. The surgeon will know about this and take as much care as possible.</p>
<b>Pre-existing</b>	<p>Nerves already compromised by co-existing diseases such as rheumatoid arthritis and diabetes are more likely to be injured. Your surgeon will know about these conditions and will take as much care as possible.</p>
<b>Insertion of a cannula</b>	<p>Nerves can be damaged by needles used to place a cannula ('a drip') into a vein or artery.</p>

### 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

- ▶ the surgeon being aware of the risk of damaging nerves
- ▶ avoiding prolonged bed rest.

Sometimes nerve damage can happen even if the team looking after you have taken the best possible care of you.

## What increases the risk of peripheral nerve damage?

### Patient factors

- ▶ Medical conditions – diabetes, smoking, vascular disease
- ▶ Being male
- ▶ Increasing age
- ▶ Being very overweight or extremely thin.

### Surgical factors

- ▶ More complicated operations which involve more instruments are more likely to damage nerves than simpler 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 (a tight band around a limb) is used to reduce bleeding.

### Positioning

- ▶ You are more likely to get nerve damage if you have been placed in certain positions:
  - lying on your front
  - 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.

## Spinal cord damage

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 repair itself.

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?

### Inadequate blood supply to the spinal cord

This is the main cause of spinal cord damage associated with a general anaesthetic. The following factors may cause oxygen starvation of the spinal cord:

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

The 'anterior spinal artery syndrome' is caused by reduced blood flow in this artery. Part of the spinal cord becomes starved of oxygen and may be damaged. This can 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 slightly higher, but the risk remains very rare (see later for estimated figures). Your anaesthetist will 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.<sup>9</sup> Permanent damage, lasting more than a year, is estimated to be less than 1.2 in 5,000.<sup>5</sup>
- ▶ Spinal cord damage occurs in less than 1 in 50,000 patients having a general anaesthetic.<sup>10</sup>
- ▶ More minor symptoms occur much more frequently, perhaps as high as 1 in 100 people having a general anaesthetic. Most of these 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.

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

The precise risk of significant and disabling peripheral nerve damage occurring after surgery and anaesthesia in the United Kingdom is unknown. Many cases of nerve damage have been reported, but we do not know how many anaesthetics there were during the same time without problems. Therefore we cannot work out how frequently the damage is occurring.

From the USA, two surveys of cases which have been settled in a court of law (called closed claim studies) were conducted a decade apart. They showed that nerve injury was the third most common cause of anaesthetic-related litigation, making 16% of total claims. These cases include all types of anaesthetic – general anaesthetic, peripheral nerve blocks, spinal and epidural injections.

In these closed claim studies from the USA:

- ▶ 48% of the injuries were to nerves in the arm. Most 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.
- ▶ 13% of the injuries were spinal cord injuries. Over half of these had a spinal or epidural injection as well as a general anaesthetic. Of those having a general anaesthetic alone, approximately half were having operations on their spine.

It is helpful to remember that:

- ▶ Many millions of anaesthetics were given in the 30 years covered by these closed claim studies.
- ▶ This information only includes cases reported and settled in a court of law.
- ▶ Considerable improvements have been made in the care given during and after operations since then.
- ▶ Most UK anaesthetists and surgeons would consider the risks now to be less than those quoted here, but this view remains to be proven.

## Authors

**Dr Sean Tighe**, MRCS, LRCP, FRCA  
Consultant Anaesthetist  
The Countess of Chester Hospital  
Foundation NHS Trust, Chester

**Dr Ravinda Sandu**, FRCA  
Registrar  
The Countess of Chester Hospital  
Foundation NHS Trust, Chester

## Editor

**Dr Barrie Fischer**, FRCA  
Consultant Anaesthetist  
Alexandra Hospital, Redditch  
Past President, European Society of  
Regional Anaesthesia (GB&I zone) and  
ESRA Board Member 1997–2004

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email: [comms@rcoa.ac.uk](mailto:comms@rcoa.ac.uk)

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