

FACT SHEET

Neuromodulation

Spinal Cord Stimulation (SCS), Peripheral Nerve Stimulation (PNS), and Dorsal Root Ganglion (DRG) Stimulation



WHAT IS NEUROMODULATION?

Neuromodulation is a proven therapy to manage chronic pain and improve quality of life. Neuromodulation systems deliver electrical pulses to the spinal cord or peripheral nerves, modulating (changing) the transmission of pain signals to the brain.

Implantable neuromodulation processes include:

- spinal cord stimulation (SCS), where leads are placed in the epidural space adjacent to the sensory pathways
- peripheral nerve stimulation (PNS), where leads are placed in the region of a peripheral nerve
- dorsal root ganglion (DRG), where leads are placed near the dorsal root ganglion

These leads are connected to implantable pulse generators, which are known as IPGs.

NEUROMODULATION IS A TWO STEP PROCEDURE

Step 1: Trial Stimulation

An important feature of Neuromodulation is the ability to trial the therapy. This enables the patient to experience Neuromodulation

and get a good indication of how much pain reduction is possible.

The trial involves a minor operation where leads are placed via an epidural Tuohy needle and connected to a temporary external stimulator. These leads are easily removed at the end of the trial.

Step 2: Implantation of Permanent System

If the trial is successful, the permanent procedure requires small incisions to implant the leads. A subcutaneous pocket is created in the abdomen or buttock area. The leads are connected to the IPG and secured in the pocket. The patient is able to control the therapy with a wireless programmer.

SPINAL CORD STIMULATION (SCS)

What it is

Spinal cord stimulation involves delivering a low voltage electrical impulse to the spinal cord to block the sensation of pain. The stimulation is provided by way of two small wires that are inserted into the spinal canal under x-ray control. These small wires are connected to a lead that runs around the side of the trunk to the stimulator unit itself, which is implanted into the fatty layer of the abdomen, deep to the skin.

The unit can be programmed to deliver either intermittent or continuous impulses to the spinal cord, which block the usual sensations of pain.

What is SCS used for?

It is a treatment generally reserved for severe intractable lower back and leg pains that have not responded to the usual conservative treatment.

Side effects and complications

SCS is generally a well-tolerated procedure with few long-term side effects. However, the following adverse reactions have been recorded:

- Technical problems related to the implantation of the device may occur leading to leakage of spinal cord fluid, possible spinal nerve damage, or excessive bleeding at the site of surgery either anteriorly or posteriorly around the spinal cord.
- Infection is quite uncommon, but when it does occur, it may involve the spinal canal. Symptoms usually involve fever, sweats, headaches, and increasing pain. Infection involving any foreign material inserted in the body requires that material usually to be removed and a course of anti-biotics given.
- In the longer term, it is possible there may be malfunction of the hardware or loss of pain relief. The loss of pain relief may be due to either the body getting used to the stimulation (tolerance) or it's possible that the wires may have moved and need to be re-sited. Due to movement of wires, some patients may experience uncomfortable jolting or sensations of electric shocks that occur with stimulation. Re-positioning of the wires usually rectifies this problem.

PERIPHERAL NERVE STIMULATION (PNS)

What is it?

Peripheral nerve stimulation (PNS) is increasingly recognised as a safe, minimally invasive and easily reversible treatment for a variety of chronic pain conditions.

The exact mechanism by which PNS works is unknown. However, the main theory is that the electrical current and magnetic fields from

the stimulator block the firing of the nociceptive (pain) fibres in the area. Even a widespread area of pain can be generated from a relatively small area of nociceptive fibres.

What is PNS used for?

PNS is a treatment option for anyone with singular or multiple areas of relatively circumscribed pain. PNS can also be used even if the pain is over a more widespread area, as long as there is a more severe central area. Significant success has been reported for:

- Low back pain – particularly for patients who have disabling back pain despite surgery or following other failed treatments such as radiofrequency neurotomy^{5,6}
- Headache:
 - particularly occipital and high cervical spine (i.e. upper neck and back of head)⁷⁻¹², but also
 - frontal (particularly around the eye and temple) including cluster headache and migraine¹¹⁻¹⁴
 - in association with fibromyalgia¹⁵
- Trunk – particularly in narrow bands of pain (e.g. along old scars)¹⁶
- Groin – particularly for patients who have ongoing pain after hernia repairs¹⁷
- Other focal areas of pain: e.g. following shingles¹⁸

Side effects and complications

The main issue, as with any implantable device, is the risk of infection, although this appears to be less than five per cent and is not as serious or dangerous as it is for SCS. Often the infection can be simply controlled with antibiotics. If not, the system can be removed. PNS is considered to be safe than SCS in terms of neurological risk of complication. As anaesthetic agents are used, there is an exceedingly rare risk of serious complications, including brain injury and death.

Similar to SCS, leads may move and need repositioning, or they may become damaged and fail to provide stimulation, or create unwanted spasms and irritation. Occasionally the leads perforate the skin, as they are placed just under the skin surface. This is rare, and requires temporary removal of the lead.

The site can at times be tender to touch or can become swollen. The battery can fail earlier than predicted and need to be removed and replaced.

DORSAL ROOT GANGLION (DRG) STIMULATION

What is it?

Dorsal root ganglion stimulation is a form of neuromodulation, targeting the Dorsal Root Ganglion (DRG). The DRG plays a key role in modulating sensory input and is responsible for generating ectopic firing, increasing neuropathic pain after injury. Stimulation of the DRG can interrupt this process, preventing pain signals from traveling to the brain.

What is DRG used for?

DRG has been found to be beneficial to patients who suffer from:

- complex regional pain syndrome (CRPS)^a
- post-surgical groin pain (e.g. hernia repair)^b
- post-surgical knee pain (e.g. knee replacement)^c
- post-surgical hip pain (e.g. total hip joint replacement)^d
- post-surgical foot and ankle pain^e
- phantom limb pain (following amputation).^f

KEY MANAGEMENT POINTS TO KNOW

- Recovery times vary among patients. The stimulation therapy will start to work within the first week following lead placement. The wounds will take one to two weeks to heal. Any discomfort from the stimulator placement will decrease over a two to three month period.
- The patient must not shower or get incisions wet throughout the entire duration of the trial or up to seven days post permanent implant.
- Patients can have all forms of imaging investigation except MRI's at this time
- Patients should avoid twisting, bending, stretching, or lifting anything heavier than five kilograms until the leads have healed in place.

These movements may cause the leads to move and possibly cause an unpleasant sensation.

- Pain medication can be reduced once stimulation parameters have stabilized.

PRECAUTIONS FOR NEUROMODULATION

Extra care will be required in the presence of cardiac pacemaker or the use of other implantable electrical devices. Following the insertion of the unit, patients will be made aware of precautions required with outside electrical equipment, such as diathermy.

Other external devices that employ large magnets may also affect the unit and as such, care should be taken near magnetic fields such as close to arc welding equipment. If implanted with a stimulation system, you will be able to bypass through the security gate. You will be given a patient identification card after your implant. Show this card to the security officer before you enter a security gate. If requiring an MRI machine please speak with your physician as some devices are not compatible with the magnets from the MRI scanner

It is also suggested that you turn the stimulator off when you are operating a motor vehicle or other heavy equipment.

DISCLAIMER

Please note the contents contained in this Patient Fact Sheet are not intended as a substitute for your own independent health professional's advice, diagnosis or treatment. At Metro Pain Group, we assess every patient's condition individually. As leaders in pain intervention, we aim to provide advanced, innovative, and evidence-based treatments tailored to suit each patient. As such, recommended treatments and their outcomes will vary from patient to patient. If you would like to find out whether our treatments are suitable for your specific condition, please speak to one of our doctors at the time of your consultation.

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