

Spinal Cord Stimulation

This is a technique for the treatment of chronic pain. It is used when the primary problem causing the pain (such as damaged nerves) cannot be dealt with. It is a technique rather like Trans-cutaneous Electrical Nerve Stimulation (TENS) which masks pain by causing a tingling sensation in the painful area of the body. This is achieved by implanting an electrode into the spinal canal behind the spinal cord (in the epidural space) which is then connected to a pacemaker which will stimulate the spine electrically. The precise mechanism of action (i.e. the way it works) is unknown, but many thousands of patients have been treated around the world, and the results are well known.

In our practice around 75% of patients with chronic pain will be rendered pain free or have 90% improvement in their pain. That means 25% will not. The biggest difficulty we have is identifying this 25%, and this is the subject of much on-going research.

The Operation

This is performed under local anaesthetic, often with general anaesthesia for the "opening and closing" stages. The patient is positioned sitting in the operating theatre, leaning on a padded table and can then fall asleep on their arms. A small incision (5 -6cm) is made over the spine at a level above the level of the pain and a small opening (0.5 x 1cm) is created into the spine to allow the electrode insertion (actually a paddle of 4 electrodes). The patient is then allowed to wake up and the device is tested. Small electrical currents are passed between pairs of electrodes and the electrode paddle is moved around within the spine to get the tingling into the desired area. Once this is achieved the paddle is secured in position using glue and sutures and the pacemaker may then be connected. This is sited in a pocket created in the flank or chest wall in a position previously discussed with the patient. Alternatively the wire can be brought out through the skin and connected to a small device the size of a TENS machine, to externally test the system for a few days. If successful, a second operation, under general anaesthetic is performed to implant the pacemaker.

Results of Surgery

Three quarters of patients will obtain satisfactory pain relief with this technique. The remaining quarter may have enough benefit to make it a worthwhile adjunct in their fight against chronic pain, but some will not. The stimulator may then be removed, a quick procedure under general anaesthetic, or simply left in position and switched off.

The patients with a system in place will attend the neurostimulator clinic to have the device re-programmed and checked on an infrequent basis. The pacemaker runs on an internal battery and this will eventually run out. A replacement pacemaker will then be needed; this is a simple procedure under local anaesthetic to replace the pacemaker, but is costly as this is the main expense of the device. The typical life-span of such a system is around 5 - 7 years, but obviously will be shortened by excessive use, high current requirements or certain complex electrode combinations.

The patients are generally able to control the stimulator to some extent by means of a small hand held controller about the size of a mobile telephone. The pacemaker can be switched on and off and the current may be turned up or down (within pre-set limits) to make it more user-friendly.

What are the risks of this operation?

Risk	Cause	% Risk (note figures vary)
Nerve or spinal cord injury/paralysis	Damage to the nerve or spinal cord whilst removing disc/bone or inserting the electrodes	<1
Fluid leak	Small tear in the nerve sheath allowing leakage of cerebrospinal fluid	<1 (But higher if previous surgery)
Infection	Contamination during surgery or, rarely, late infection via the blood	Up to 25% in some series
Electrical Failure	If the insulation becomes damaged current will leak and require revision surgery	Up to 25% but rarer more recently
Battery Failure	If the system runs on an internal battery it will run out	Average life 5 - 7 years
Skin Erosion	If the patient is thin and the system is near the surface the skin may be damaged from inside	1 - 5
Wound pain	Surgery	All to some extent