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Spinal cord stimulation has a place in the treatment of chronic pain conditions

PERSPECTIVES

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Spinal cord stimulation is an important modality of treatment for some patients with chronic pain. Patient satisfaction following this treatment is comparable to outcomes from spine surgery in Norway.

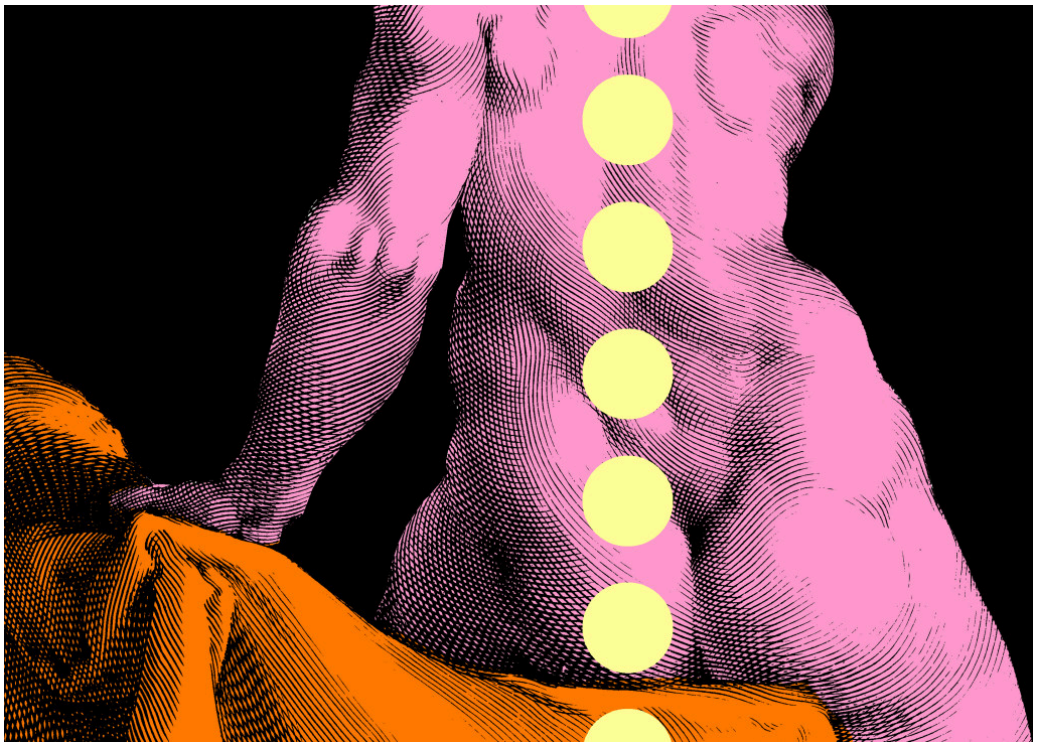

Illustration: Journal of the Norwegian Medical Association

Spinal cord stimulation is a treatment modality that can provide symptom relief and improve function and quality of life for patients with chronic neuropathic pain and certain other pain conditions (see Table 1 for indications). Modern spinal cord stimulators offer a range of electrical waveforms that patients can choose from. At the Department of Pain Management at Oslo University Hospital, spinal cord stimulation is one of

several adjunctive modalities in the rehabilitation of patients with chronic pain conditions as opposed to a stand-alone intervention. We are in the process of improving our interdisciplinary follow-up to ensure that patients derive even greater benefit from the treatment.

Table 1

Indications for spinal cord stimulation

Indications	Contraindications
Chronic pain over 6-month period	Pregnancy
Pain that significantly impacts on daily function and quality of life	Active infection
Peripheral neuropathic pain	Coagulation disorders
Radiculopathy	Mental/cognitive condition affecting treatment
Polyneuropathy	Poor compliance
Peripheral neuropathy	Substance use
Complex regional pain syndrome (CRPS)	Widespread pain conditions
Refractory angina pectoris/certain peripheral vascular diseases	Inappropriate opioid treatment that the patient does not want to taper off

Spinal cord stimulation

In spinal cord stimulation, an electrode placed in the epidural space is connected to a pulse generator. In 2021, doctors and researchers at our department published a clinical review article on this treatment modality (1).

Spinal cord stimulators resemble pacemakers and are programmed to transmit an electrical current to the spinal cord to provide pain relief. With traditional programming, patients experience paraesthesia. Various new stimulation methods have been developed in the last decade, and with many of these, patients do not notice the treatment being administered. The pulse generators we use can provide both traditional and newer types of stimulation. Patients can adjust the settings themselves, giving them more pain control.

> ***«Spinal cord stimulation is not an experimental modality but an established treatment option in public health services throughout Europe»***

What about the evidence base?

Spinal cord stimulation is not an experimental modality but an established treatment option in public health services throughout Europe. Worldwide, an estimated 34,000 of these implantations were performed in 2019, and the number is increasing (2). Several studies have been conducted showing that spinal cord stimulation reduces symptoms of neuropathic pain, and systematic reviews have demonstrated good efficacy compared to conventional medical treatment, reoperation and various stimulation methods (3–5). Notably, one critical Cochrane Review grades the evidence for spinal cord stimulation compared to placebo as low (6). This review, however, has been criticised, partly because the authors are not involved in spinal cord stimulation in a clinical setting.

A Norwegian randomised clinical trial (7) has received considerable attention recently, also internationally. It concluded that there was no difference in pain intensity or physical function when using a placebo or spinal cord stimulation. The Journal of the Norwegian Medical Association followed up the trial with the article 'No effect of epidural spinal cord stimulation compared to placebo' (8); a title that we think is misleading. The trial, which received criticism from many quarters (9, 10), only examines one stimulation method (a specific type of what is known as the 'burst waveform', where the patient does not experience paraesthesia), and thus does not capitalise on the patient's ability to actively control the pain by guiding the current and switching between stimulation types. Erik Werner and Jens Ivar Brox recently wrote that back pain must be treated with cognitive techniques and that spinal cord stimulation does not work (11). We would like to clarify that back pain is *not* an indication for spinal cord stimulation in our department.

The aforementioned Norwegian trial (7) investigated one specific type of electrical waveform that the patient cannot feel, which made it possible to carry out a placebo-controlled trial. Placebo-controlled trials *are* the gold standard for investigating the efficacy of medical interventions, and a systematic review of placebo-controlled trials showed a statistically significant reduction in pain intensity (12). It is not possible to conduct blinded trials for paraesthesia-based stimulation. In our experience, the vast majority of patients prefer a combination of paraesthesia-based and paraesthesia-free stimulation, as also shown in a multicentre registry study from the Netherlands (13).

> ***«Several thousand spine surgeries are performed in Norway annually without any evidence from placebo-controlled trials»***

Spinal cord stimulation compared to spine surgery

Surgery can be a viable solution for patients with various pain conditions. According to the annual report from the Norwegian Registry for Spine Surgery (14), 6316 spine surgeries were registered in 2022 (2297 disc prolapse surgeries and 3030 decompression surgeries). Patients undergoing such surgery often experience radicular leg pain, which can be a neuropathic pain condition. As far as we know, no placebo-controlled trials have been conducted on surgical decompression of lumbar spinal stenosis (a current trial claims to be the first of its kind (15)).

Several thousand spine surgeries are thus performed in Norway annually without any evidence from placebo-controlled trials. This may be due to various factors, such as ethical, financial, organisational or recruitment challenges in carrying out such trials. Additionally, these types of trials will employ stringent patient selection criteria that may not accurately reflect the characteristics of a real-world population. It is therefore important to use other sources to supplement existing knowledge. Medical quality registries can help meet this need.

> ***«Spinal cord stimulation may be an option for some patients with neuropathic pain, both before and after spine surgery»***

A systematic review (5) conducted a meta-analysis of patient satisfaction with spinal cord stimulation, and showed that 82 % of patients who had received spinal cord stimulation reported being at least moderately satisfied with the treatment. The perceived benefit of surgery is presented in the 2022 annual report of the Norwegian Registry for Spine Surgery. A total of 61 % patients reported being 'completely recovered' or 'much better' (Table 2) (14. 44). The figures presented in the two publications are not entirely analogous, but we believe that the comparison can provide useful insight into the benefits patient derive from spinal cord stimulation. We have not yet published this data from our registry (16), but preliminary analyses suggest similar patient satisfaction as in the Norwegian Registry for Spine Surgery. Many of our patients with painful radiculopathy have undergone spine surgery that has not resulted in clinical improvement, and therefore constitute a subgroup with a relatively poor prognosis. Painful radiculopathy is an indication in 30–40 % of patients who receive a spinal cord stimulator at our department.

Table 2

Figures from the Norwegian Registry for Spine Surgery's annual report for 2022 (14), Table 3,5 p. 44.

How much benefit has the patient derived from the surgery?	Percentage (%)
Completely recovered	17.2

How much benefit has the patient derived from the surgery?	Percentage (%)
Much better	43.5
Slightly better	21.0
No change	7.7
Slightly worse	5.7
Much worse	3.6
Worse than ever	1.3

Spinal cord stimulation may be an option for some patients with neuropathic pain, both before and after spine surgery. A randomised controlled trial (17) comparing spinal cord stimulation with repeated lumbosacral spine surgery showed that a significant majority of patients experienced more than a 50 % reduction in pain intensity with spinal cord stimulation. There were also far fewer patients who wanted to switch from spinal cord stimulation to spine surgery compared to the other way around.

Spinal cord stimulation is associated with a low risk of serious complications. The most common complications are pain over the pulse generator and electrode dislocation (18). Furthermore, spinal cord stimulation is a reversible intervention, and the percutaneous technique causes little tissue trauma compared to other surgeries. We therefore believe that spinal cord stimulation should be seen as a treatment option for more patients with chronic peripheral neuropathic pain, regardless of the underlying aetiology.

Who, what, where

Internationally, there is an increasing focus on appropriate patient selection for spinal cord stimulation (19), and an online validated tool has been developed as an aid for selection, and also for referral decisions (20). The most common indication for spinal cord stimulation is peripheral neuropathic pain (see Table 1).

The Department of Pain Management at Oslo University Hospital has been offering spinal cord stimulation since 1998, and is the only pain clinic in Norway to do so. We recognise that patients with chronic pain often have complex conditions, necessitating support beyond mere symptom relief to improve function and quality of life. At our facility, doctors, psychologists, physiotherapists and nurses are involved in the assessment and treatment of these patients in order to address all aspects of the biopsychosocial model. This is in line with international guidelines (21, 22), which point out that spinal cord stimulation assessment and treatment must be carried out within the framework of a multidisciplinary team with expertise in pain medicine.

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