

## Spinal Cord Stimulation as A Treatment of Neuropathic Pain Can Also Have an Impact on The Quality of Sexual Life: A Case Report

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### Abstract

Spinal cord stimulation (SCS) is a technique of analgesia which is used in the treatment of neuropathic pain condition, and which consists of implantation of an epidural electrode over the dorsal columns at the spinal level of injured dermatomes. This technique is based in part on the gate control theory, but does not itself explain completely the neurophysiological mechanisms of SCS. We report here the case of a female patient who underwent a SCS, following a failed back surgery syndrome, and who recounts in addition to a pain relief, an improvement in her sexual life with SCS.

**Keywords:** Spinal cord stimulation-Neuropathic Pain-Action mechanism-Supraspinal effect.

### Introduction

Spinal cord stimulation (SCS) is a technique of analgesia, by implantation of an epidural electrode over the dorsal columns at the spinal level of injured dermatomes. The technique is based on the gate control theory which was highlighted by Wall and Melzack in 1965 [1]. Briefly, nociceptive afferents (A $\delta$  and C) are inhibited by stimulation of non-nociceptive fibers (A $\beta$ ). However, the neurophysiological mechanisms of SCS are not fully understood and cannot solely be explained by this theory. Indeed, the spinal stimulation recruits the afferents of peripheral nerves, the afferents of the spinal cord towards the supraspinal structures, the local neuronal circuits and the fibers of autonomic nervous system, thus going beyond the gate control mechanistic [2].

The main indication for a SCS is the chronic neuropathic pain after unsuccessful therapeutic alternatives, to treat a chronic radicular or truncal pain syndrome, in case of a persistent complex regional pain syndrome of type I or II and for chronic pain with ischemic origin such as a Buerger's disease [3]. SCS has no major side effects, but some complications have been reported: 13% of lead migration and 9% of lead break. In addition, infections might occur in 3 to 5% of the cases, inducing complete removal of the system [4].

Here, we report the case of a female patient who received a SCS following a failed back surgery syndrome, and who

recounted in addition to her pain relief, an improvement in her sexual life with SCS.

**Aim** - The aim of this article is to document a case of successful of spinal cord stimulation in chronic pain by highlighting its potential consequences at the supraspinal level.

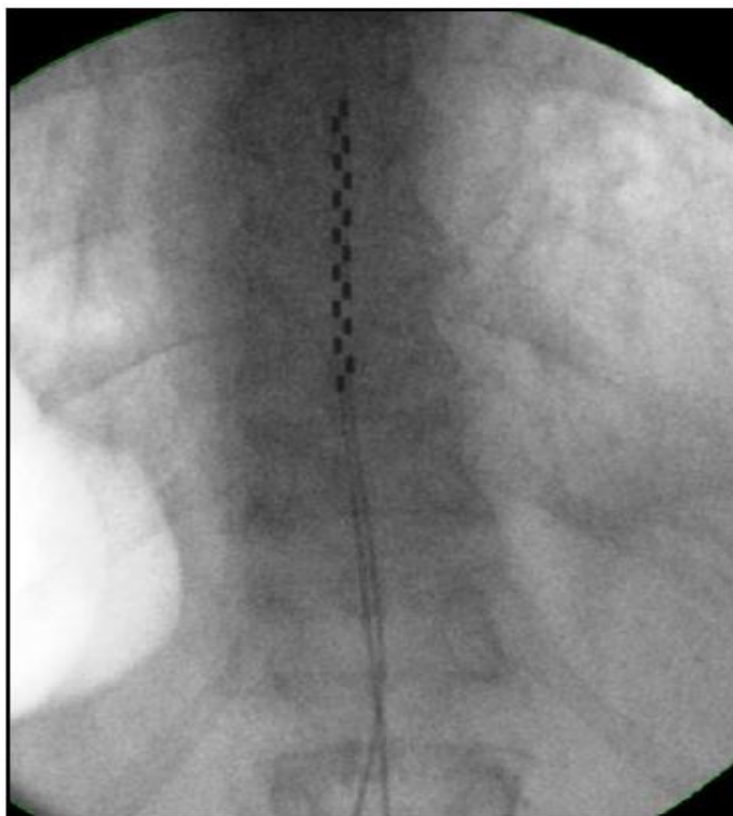
**Method** - After obtaining consent from the patient to report the case, the clinical notes of the patient were obtained and the contents related to the manifestation, clinical examination findings, results of all investigations, treatment and treatment outcome were summated. The key words that were used included: Spinal cord stimulation - Neuropathic pain - Action mechanism - Supraspinal effect. Sixteen references were identified which were used to provide support for the introduction and discussion sections of the article.

### Case description

Here we report a 52-year-old female with a 5-year history of unrelenting radicular pain radiating from her lumbar spine to both of her lower extremities. The patient benefited in 2016 from a spinal cord surgery for a disc herniation in the left region L5-S1. She initially described a residual radicular neuropathic pain on her left leg and on both legs after some months. The pain had ranged from 4 to 7 on a visual analogue scale (VAS). Her response to her diagnostic questionnaire DN4 was seven out of ten (7/10). Imaging of

her spine by a magnetic resonance imaging (MRI) scan did not reveal any disc-radicular conflict on the lumbar segment. The patient was treated by (a) Amitriptyline (20mg per day), which failed to provide significant pain relief. And (b) Pregabalin (150mg per day) which was stop due to an adverse side effect. Following, she reported an exacerbation of the pain with emotional stress and poor sleep, impacting her quality of life. Finally, she benefited from two caudal epidural steroid injections at other facilities which causes a transient pain relief for only a week.

The final therapeutic option offered to the patient was the SCS. The patient opted for the SCS after satisfactory psychological evaluation. Lead implantation would be performed with patient conscious for assessment. Using radioscopic guidance, a standard Octopolar epidural lead was placed into the thoracic epidural position using a percutaneous approach at L2-L3. Substantial pain relief was obtained, implanting an additional lead. Two eight-electrode epidural leads were placed in the epidural position directing at T9 (Figure 1).



**Figure 1:** Thoracic epidural placement of two eight-electrode epidural leads showing the electrodes in position directing to T9. Right side corresponds with viewer's right side. Antero-posterior view.

The patient passed successful the 7-days trial of the percutaneous placement of the two eight-electrode standard Octopolar epidural leads (Vectris Medtronic). After this trial period, the battery was implanted and connected to the permanent lead for a long-term use.

Interestingly, the patient described rapidly a pleasant stimulation of the genitals during the postoperative period. She reported a nice throbbing sensation of the clitoris. She also noticed an increase of its volume. The SCS was unable to induce itself an orgasm but allowed her to reach the climax faster and longer than before during a sexual stimulation. We decided to modify the conventional SCS parameters however the frequency change induced a loss of the pain relief benefit. The modification of the intensity, especially its increase, produced adverse effects such as painful perineal contraction or urinary incontinence. In this case, the SCS seems to act on the spinal dorsal columns to alleviate the pain. But also, at the spinal level on the autonomic nervous system, which controls the pelviperineal vascularization [5]. Moreover, the increase of stimulation

intensity appears to recruit the pudendal nerve roots, which controls the contraction of the striated perineal muscles. The patient chooses to keep the SCS therapy in place, to alleviate her chronic pain and enhance her sexuality, which consequently improved her quality of life.

## Discussion

We describe for the first time an improvement of the sexuality due to a SCS therapy in a female patient with neuropathic pain. In a previous study, the SCS was already used in female patients with anorgasmia. The therapy demonstrates an improvement of sexual dysfunction [6].

From a physiological view, the sexual function can be evaluated by the presence of orgasm, which occurs at the height of arousal and reflects the expression of intense pleasure [7]. The peripheral origin of orgasm has been questioned. To date, the female orgasm seems to involve complexes of neural circuits. Indeed, orgasm would not only depend on ascending mechanisms for processing

information received at the peripheral level during sexual stimulation but also on descending cognitive and associative mechanisms that can inhibit or activate the sexual response [8]. A study showed that female orgasm could be induced by simple verbal suggestion, in the absence of any physical stimulation [9]. Orgasmic intensity was similar (increased heart rate, pupil diameter) for both genital stimulation and mental imagery-induced orgasm [8].

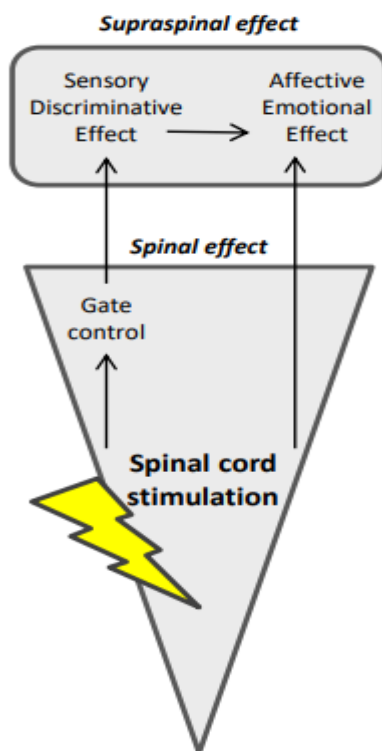
In our case, the SCS seemed to have acted upon the autonomic nervous system for local modifications such as increased blood flow to the clitoris. The SCS is not sufficient to provoke an orgasmic stimulation but could facilitate the orgasmic phase by increasing its intensity and duration. Indeed, the physiology of orgasm requires the integration of the spinal effect to the supraspinal level. Neuroimaging studies have demonstrated that human sexual response involves a variety of cortical and subcortical brain areas. In fact, sexual behavior is attributed to recruitment of subcortical structures of the limbic system and several nuclei of the brainstem [8].

Chronic pain condition is defined by its physical pain and its psychological repercussion. The chronic pain has major emotional consequences, such as sleep and mood disorders or sexual dysfunction, leading to deterioration in the quality of life [10]. The SCS acts directly at the segmental spinal level by providing a pain relief, but also at the supraspinal level as previously suggested in our case with the SCS facilitating orgasm [11]. The supraspinal effect could explain the emotional and psychological changes induced by spinal

electrical stimulation. There are supporting evidences that the SCS provide a pain relief but also improves sleep disorders and patient quality of life [12]. Thus, we can suggest an indirect mechanism of the SCS on the emotional consequences of chronic pain. Indeed, the SCS would firstly improve pain perception and then ameliorate the patient quality of life by decreasing psychological disorders due to the chronic pain.

We can emphasize the importance of an indirect supraspinal action of the SCS. Indeed, clinical studies showed that the SCS induced a significant modulation of cortical excitability [13]. These findings support that the stimulation can modify directly the supraspinal neural circuits. Interestingly, a study reports the case of patient with central chronic pain for whom the SCS failed to alleviate pain but improve the sleep disorder [14]. Thus, several effects of the SCS could be in part of a cortical origin.

Furthermore, a case of a SCS that induced important behavioral modifications has already been reported. Indeed, a patient developed a Dejerine-Roussy syndrome, two weeks after the beginning of the SCS [15]. Usually, the central post-stroke pain occurs after infarction of the thalamus or the spinothalamic tract [16]. All organic factors were excluded in the study, highlighting a remaining psychological cause. Cause which was diagnosed by the involved psychiatrists as a conversion disorder. Interestingly, the stimulator was then removed, and the patient had completely reversed his sensory-motor symptoms within 6 months [15].



**Figure 2:** In neuropathic pain condition, spinal cord stimulation seems to act by different mechanisms: At the spinal level directly on local circuits or peripheral or central projections (such as gate control theory). At the supraspinal level directly on the emotional consequences of chronic pain or indirectly through the improvement of the sensory discriminative component.

## Conclusion

Spinal cord stimulation is a major therapeutic tool in the treatment of chronic neuropathic pain. All stimulation parameters play a decisive role in obtaining an optimal analgesic effect: location of the stimulation lead, the frequency, duration, intensity or the pattern of stimulation. However, this technique has significant spinal and supraspinal consequences, leading to potential psychiatric disorders or neural increasing of sexuality (Figure 2). It therefore seems important on the one hand to have a good match between the proposed technique and the patient's expectations, which should be assessed by a psychological evaluation. On the other hand, once the SCS is implanted it remains important to regularly assess the emotional consequences as well as the appearance of side or pleasant effects.

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## Conflict Of Interest

The authors state that they do not have any conflict of interest.

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