

# **VIRTUAL CLINIC DIAGNOSIS OF FRACTURED SPINAL CORD STIMULATOR LEADS IN A PATIENT LACKING DIRECT PHYSICIAN ACCESS - A NOVEL CASE REPORT**

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**Background:** Telemedicine incorporates use of technology for delivering health care services and has become an important tool for overcoming geographical barriers. It has the advantage of delivering quality real-time care through interactive audiovisual and digital technologies.

**Case Report:** A 63-year-old woman from South Asia reached out to pain physicians in the United States with an acute exacerbation of back pain. Patient's medical history was significant for chronic back pain for which she underwent implantation of a spinal cord stimulator 2 years back and was pain free till now. Upon evaluation, the cause of her increased back pain was found to be fractured leads, which was later managed in the United States.

**Conclusions:** Telemedicine can be pivotal in establishing a timely diagnosis, while also being able to transcend the geographical barriers to health care accessibility.

**Key words:** Spinal cord stimulators, chronic pain, interventional pain management, telemedicine, case report

## **BACKGROUND**

Since the introduction of commercially available spinal cord stimulator (SCS) in 1968, their application for the management of chronic pain has ushered a significant shift in the field of interventional pain management (1). These devices have made a significant difference in the quality of life in patients struggling with chronic pain, by providing adequate pain relief and enhancing treatment outcomes. As SCS continues to gain acceptance as an integral part of pain management strategies, their therapeutic advantages are being increasingly recognized worldwide. However, like all other medical innovations, the use of SCS has its own unique set of challenges. Approximately 30% to 40% of patients with SCSs can develop complications related to device failure or biological factors that require timely diagnosis and intervention (1). Sequelae of these complications may be

compounded by the unavailability of physicians trained in SCS management, thereby causing significant challenges for patients. This case report highlights a scenario where telemedicine was employed to manage complications related to SCS. We would like to discuss a pioneering case in which virtual clinic software was employed to diagnose fractured leads - a recognized hardware complication - in a patient with an SCS device who was thousands of miles away on a different continent where direct access to in-person physician consultation was unavailable. This virtual clinic software is the first of its kind, which enables the clinicians to remotely interrogate and program the SCS system (2,3). Utilization of similar virtual platforms might be able to bridge the gap between SCS patients in remote locations and provision of immediate diagnostic care, thereby, paving the way for digital health care expansion in interventional pain management.

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### **CASE PRESENTATION**

A 63-year-old woman with a cervical and thoracic SCS (implanted 2 years back for management of chronic cervical and low back pain) contacted her SCS representative in Houston, TX from her location in South Asia due to an exacerbation of her low back pain. Her past medical history was significant for vasovagal syncope treated with a permanent pacemaker, cirrhosis, hypothyroidism, immune thrombocytopenic purpura, anxiety, depression, fibromyalgia, and chronic cervical and low back pain. Patient reported to be pain free for 2 years after undergoing SCS implantation surgery for management of her chronic cervical and low back pain.

At the time of presentation, she stated her current pain to be similar to the pain previously mitigated by her thoracic SCS. She denied any history of recent trauma, sudden twisting movements, and lifting or carrying of heavy weight. During this episode of pain exacerbation, she was overseas in her home country and lacked immediate access to her pain physician. Utilizing the virtual clinic platform provided by her SCS manufacturer, an assessment revealed potential malfunctioning of her SCS, with detection of high impedance in all leads, which helped her pain physicians in the United States to make a diagnosis of potential lead fractures (Fig. 1). This assessment and diagnosis were made using the first US Food and Drug Administration (FDA)-approved virtual clinic software for SCSs developed by her SCS manufacturer (Abbott NeuroSphere™ Virtual Clinic, Abbott Park, IL). Consequently, she was advised to return to the United States for an SCS revision procedure. Upon her return, her pain physician in the United States extracted and revised the suspected fractured leads, thereby, restoring the functionality of her SCS and significantly relieving her pain symptoms.

### **DISCUSSION**

The use of SCS has significantly advanced the field of chronic pain management with better analgesia, improved patient-related outcomes, and less opioid consumption (4). It is a safe procedure with the most common reported complication being lead migration, lead fracture, generator failure, or unexpected device trouble (1,4). Often, patients who live in underserved areas or have limited access to health care facilities, are at a disadvantage when it comes to early identification

of potential complications and timely interventions. This is where remote monitoring of the SCS devices can be employed to offer a solution for management of these issues. Additionally, in the post-COVID era, demand for remote follow-up for SCSs has increased. Patients have also reported remote follow-up appointments to be more readily accessible, cost- and time-efficient (5). Our case report highlights the benefits and convenience of utilizing virtual health care platforms for managing SCSs, especially when diagnosing hardware issues, such as fractured leads.

Abbott NeuroSphere Virtual Clinic was launched in the United States in 2021, and since then, it has facilitated better communication between patients and physicians. It has ensured proper settings and SCS functionality, while also making as needed new treatment settings remotely available (3). Approved by the FDA, the NeuroSphere Virtual Clinic has the potential to increase access to optimal treatment for patients suffering from chronic pain or movement disorders who don't live close to a care provider, have difficulty accessing care, or are unable to go to the doctor because of circumstances like being ill, unable to get leave from work, and unavailability of transport options (6). It is essentially an in-app chat platform that allows physicians to communicate with patients about symptoms and outcomes and make real-time therapy adjustments along with routine device checks without requiring in-person appointments. This app also facilitates patients to initiate conversation with their care team for any issue that may arise in between follow-up appointments. This virtual clinic also demonstrates how digital advancements can potentially revolutionize patient care in interventional pain management. For our patient, despite being overseas, the virtual clinic allowed for an accurate diagnosis and subsequently guided her toward immediate intervention. This remote diagnostic capability not only ensures continuity of care but also reduces delays in addressing other potential complications, thereby preventing further pain or device malfunction from worsening.

Remote health monitoring varies from a simple telephone call to various application-based platforms which may provide a visual option, which in turn increases feedback for the patient and health care professionals (7). Remote health monitoring helps to bridge the gap between disparities in access and patient demand and is part of the decades-long push to get health care out of the hospitals and clinics and into the community.

Additionally, they also have the advantage of being time and cost efficient. The human touch, often cited as a crucial aspect of health care, is seemingly decreased in remote health monitoring. While the virtual format offers convenience, face-to-face interactions cannot be disregarded in building trust and understanding between the physician and the patient. Therefore, striking a balance between virtual and in-person visits could be the key.

Currently, only 2 neuromodulation devices, Prospera™ SCS system (Biotronik, Berlin, Germany) and Proclaim™ Plus/XR SCS systems (Abbott, Lake County, IL) provide the facility of remote programming. While Prospera permits the data to be automatically shared with health care professionals through a secure web portal, Proclaim relies on patients to enter the data manually into a mobile application, which then becomes available to the health care professionals on a secure web portal (8).

To the best of our knowledge, this case report is the first case that utilized a specialized virtual clinic platform to diagnose SCS malfunction. We used PubMed, Google Scholar, and the Texas Medical Center Library search engines with the years running from 1981 to 2023 to verify our claim. Although this particular case demonstrates the benefits of using virtual clinic platforms to address SCS-related issues, further studies are still needed to validate their overall effectiveness, reliability, and safety. It is worth mentioning that these virtual clinics remain vulnerable to cyberattacks, which could result in compromise of patient data. Therefore, the use of robust encryption techniques and regular cybersecurity audits is necessary to ensure that patient data remains uncompromised.

Education and training are another crucial area. For a successful transition toward a more remote/virtual-centered care model, both health care providers and patients require adequate training to use these platforms optimally. This is especially true in cases where the patient demographic is not as techsavvy, and this transition might present a steep learning curve. Nevertheless, as digital health care continues to evolve, the

Port	Contacts	Lead Model	Lead Location
1:	1-8	Octrode (3186)	
2:	9-16	Octrode (3186)	

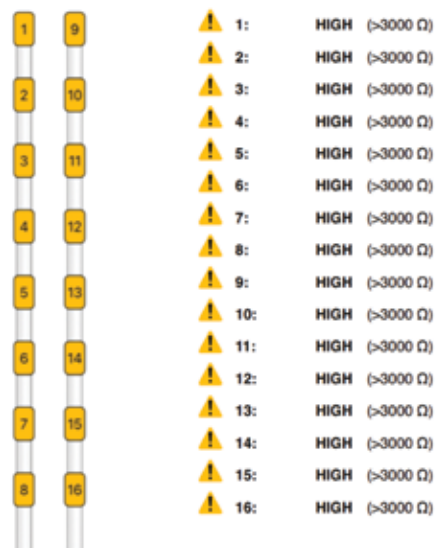


Fig. 1. The report of patient leads generated via the patient's SCS manufacturer's virtual clinic platform showed the 2 leads were not working properly due to lead fracture. SCS, spinal cord stimulator.

integration of virtual clinics is gaining popularity within the field of interventional pain management, especially for SCS implantation. Leveraging these virtual platforms could advance pain management and improve patient outcomes by overcoming geographical and logistical barriers.

## CONCLUSIONS

This case report demonstrates that virtual clinic platforms provide an innovative way to manage SCS-related complications, such as making accurate remote diagnoses to ensure uninterrupted patient care, emphasizing digital health care potential in advancing interventional pain management. Nevertheless, further research is imperative to validate its broader efficacy and reliability.

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