Surgical Nuances and Complications Associated with Epidural Spinal Cord Stimulation for Chronic Traumatic Spinal Cord Injury

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Introduction

Traumatic spinal cord injury (tSCI) is a debilitating condition leading to chronic morbidity and mortality. Epidural spinal cord stimulation (eSCS) has been shown to enable return of some locomotion functions by activating lumbosacral spinal cord circuits. The aim of this paper is to describe our surgical technique, protocols, technical nuances, complications and management associated with the implantation of eSCSs.

Learning Objectives

By the conclusion of this session, participants should be able to:

1) Describe the potential for epidural spinal cord stimulation to enable regaining voluntary locomotor function in patients with chronic spinal cord injuries.

2) Discuss, in small groups, the fact that metabolic and immunologic alterations may make patients with chronic traumatic spinal cord injuries more susceptible to post operative infections

3) Identify changes made in our pre-operative and operative protocols to reduce the risk of infection when implanting epidural spinal cord stimulators.

Methods

Following IRB approval, this prospective study was conducted at the University of Louisville from 2009-2017. Clinical, radiological and follow-up data were collected from the database. Preoperative clinic visits, surgical procedures, and post-operative follow-ups were done using standardized protocols. eSCS was performed using a commercially available neurostimulator. Radiographic and electrophysiological monitoring were used to confirm appropriate placement.

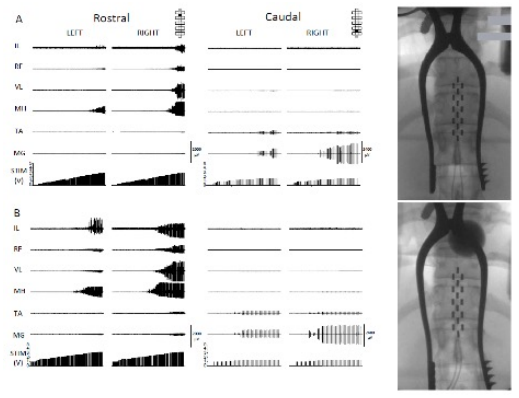
Results

Thirteen patients with chronic tSCI underwent placement of an eSCS. A majority of participants (n=10, 77%) were males with a median age of 28 years (range 22-32 years). The median interval from SCI to scES implant in this study was 4.42 years. All epidural stimulators were positioned between T11 and L1. The median operative time was 214 minutes (range: 133-256 min) and median blood loss was 30 cc (range: 20-50 cc). The median hospital length of stay was one day. Two participants (n=2, 15.38%) developed infections, one requiring explantation of the stimulator. The mean and median last clinical follow up was 28.5 and 21.5 months respectively. There were no cases of lead migration in this series. Additionally, all patients regained

Conclusions

The risk of infection in patients with chronic SCI may be higher than in non-paraplegic patients secondary to immunologic and metabolic abnormalities. Strict adherence to a protocol to reduce risk of infection is paramount. Preliminary results suggest there may be significant neuro-restorative potential of epidural spinal cord stimulation in the setting of chronic SCI.

Electrophysiological recording during epidural stimulator implant



(A) EMG output during rostral and caudal stimulations following the initial placement of the Specify 5-6-5 electrode array. Fluoroscopy image of the initial placement is shown on the far right. (B) EMG output during rostral and caudal stimulations following a recommended rostral move of the electrode array. Fluoroscopy image of the final placement is shown on the far right.

References

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