

# Epidural Stimulation Surgery / C5, Canada

Patient Case Report  
# ES180035 / 6 Months

## Patient Overview

**Age:** 22

**Sex:** Male

**Nationality:** Canadian

**Diagnosis on Admission:** Spinal cord Injury, C5

**Treatment Received:** Epidural Stimulation Surgery, Medtronic Restore Advance 16-electrode MRI Compatible Device

**Date of Admission:** 23/06/2018

**Date of Discharge:** 21/07/2018

## Patient's Condition on Admission

Patient sustained a C5 spinal cord injury on November 12th, 2015, during a hockey game. Initial diagnosis of ASIA A score was changed to ASIA B within a few weeks of the trauma. Patient has no hand or leg function. Triceps and core strength were initially very weak, but have improved with time. No bowel and bladder function. The patient is otherwise a healthy individual with no secondary injuries or diagnoses present.

## Previous Therapies and Treatments

Patient had not received any surgery since his injury besides broken vertebrae repair. Patient received mesenchymal stem cells and allogenic stem cells, in the form of IV infusion and lumbar punctures, as well as physical rehabilitation. Minor improvements in his functions appeared.

## Treatment Received

After completing a Spinal MRI scan, an EMG, and comprehensive blood work, patient underwent laminectomy and Epidural Spinal Cord Stimulator implantation on June 25th, 2018. The surgery was completed without issue and no serious complications were reported during the postoperative hospital stay. Surgical wounds healed normally and no spinal cord or superficial wound infection was reported.

Device Mapping and therapy were carried out after surgery for 35 days, then patient was discharged.

Post-Surgical Care	Total Sessions	Sessions Per Week	Time (Hr) Per Session
Mapping	82	24	1
Physical Therapy	17	6	1
Occupational Therapy	-	-	-



# Symptoms Improvement Post-Surgery

Abilities & Symptoms	Motor & Sensory Function (below injury level, before ES surgery)	Improvement Observed (35 days after admission)
<b>Motor Function</b>		
Standing with support	Not possible	Yes
Stepping with support	Not possible	Yes
Gross motor Skills	Not present	Yes
Fine Motor skills	Not present	No
Balance	Poor	Yes
Coordination	Poor	Yes
Muscle Mass	Low	Yes
Stamina	Low	Yes
Fatigue	Present	Yes
Spasms	Present	Yes
Spasticity	Present	Yes
<b>Sensory Function</b>		
Neuropathic pain	Not Applicable - no pain	Not Applicable
Bladder Function	No	No
Bowel Function	No	No
Sweating Ability	No	No

Improvement is monitored in 15 targeted areas: 11 Motor Functions and 4 Sensory Functions. However, the number of targeted areas may vary depending on patient's condition prior to admission. If patient experiences Motor/Sensory functions, or is not impaired in a specific targeted area prior to surgery, it is excluded from the report (Not Applicable). If there is progress in any given area -- either mild, moderate, or significant -- it is measured and reported as positive ("Yes"). No improvement, the existence of pain or spasms, or an inability to perform a measured function is reported as "No".

## Motor Functions



## Sensory Functions



## Overall Functions



## Results Interpretation

In this patient, Neuropathic Pain was not present, therefore 14 areas instead of 15 were reviewed. Motor Function improved in 10 out of 11 targeted areas when the Epidural Stimulation device was switched on. Patient did not receive any cytotherapy therefore no improvements were visible in the 3 Sensory Function Areas. The primary treatment focus was to regain motor functions, no improvements were visible in Sensory Function Areas. Patient saw an overall improvement in 10 of the 11 Motor Function areas.

## Summary

After the Epidural Stimulation surgery, patient received 82 Mapping sessions and 17 physical therapy sessions. Improvements were noticed in gross motor skills, including the ability to stand and step with support. Balance and coordination improved significantly with treatment and training, and physical therapy led to improvements in patient’s stamina and muscle mass. Improvement in Sensory Function was neither observed, nor expected, as patient’s treatment did not include cytotherapy. After 35 days, patient was discharged to continue his physiotherapy back home.

## One-Month & Six Month Follow-Up Assessment

Ability	Improvement Assessment 1 Month After Discharge from UAM	Improvement Assessment 6 Month After Discharge from UAM
<b>Motor Functions</b>		
Standing with support	Small improvement	Moderate Improvement
Stepping with support	Moderate improvement	Significant Improvement
Gross motor Skills	No Improvement Visible	Small Improvement Visible
Fine Motor skills	No Improvement Visible	No Improvement Visible
Balance	Moderate improvement	Same as 1 month assessment
Coordination	Moderate improvement	Moderate Improvement
Muscle Mass	Small improvement	Same as 1 month assessment
Fatigue	Moderate improvement	Same as 1 month assessment
Stamina	Small improvement	Mild Improvement
Spasms	Small improvement	Mild Improvement
Spasticity	Small improvement	Mild Improvement
<b>Sensory Functions</b>		
Neuropathic pain	No change	No change
Bladder Function	No change	No change
Bowel Function	No change	No change
Sweating Ability	No change	No change

## One-Month Follow-Up Summary

One month after discharge, patient exhibited moderate improvement in Stepping With Support with less pronounced improvement observed in Standing With Support. And while there were no discernable improvements to gross or fine motor skills, the remaining Motor Function categories all showed small-to-moderate improvement. Patient did not participate in any physical therapy after returning back home, which resulted in weaker upper limb and trunk control.

Balance and coordination improved moderately, and further improvements in muscle mass and stamina are anticipated with continued physical therapy. Patient can now sit up straight in his wheelchair and coordinate movement of his left and right foot during physical therapy. Patient is not able to lock knees yet and needs assistance in foot placement when stepping.

Spasms are reduced when the stimulator is on, but when it isn't, hip flexor and quad-extension spasms are still present with the same frequency as prior to surgery. Spasticity is also reduced during sleep, and patient experiences stronger hip abduction and knee bend due to increased muscle strength.

As expected, since the patient's treatment did not include cytotherapy, there was no improvement in Sensory Function at the one-month follow-up evaluation.

## Six-Month Follow-Up Summary

Six months after discharge and the patient still does 18 to 19 hours of therapy per week.

Patient still requires assistance when changing position from sitting to standing. When standing, patient still requires assistance in locking his knees, but is able to lock his hips.

He has noticed significant improvements during stepping training and is able to use a hoist to take assisted steps on a treadmill. Patient is able to lift his feet by himself and is more consistent and coordinated, but requires assistance in foot placement and locking his knees.

There is no visible change in the patient's muscle mass, but he reports that his core muscles are getting stronger. Patient noticed that when he switches on Program N, which contracts his abdominal area, he is able to empty his bowel faster, resulting in shorter time spent in the bathroom.

Patient also noticed that when the stimulator is on there is a decrease in spasms. However, during UTI, patient experiences bladder spasms and has less control when the Epidural Stimulation device is switched on. Patient has not seen any changes in neuropathic pain and is still taking the same dose of Nabilone.

Overall, patient is very satisfied with his outcomes after the Epidural Stimulation surgery. He will continue his physical therapy and another feedback call will be made in 3 months time.

Patient says ***"Since the treatment I've had new hope and energy towards my recovery. The epidural stimulator has been a great tool for exercise therapy and has had multiple benefits in my daily life. The potential to stand and take steps is extremely exciting. It keeps me motivated everyday and hopeful about the future."***



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