

# Epidural Stimulation Surgery / C6, USA

Patient Case Report  
#ES170044 / 1 Year

## Patient Overview

**Age:** 20

**Sex:** Male

**Nationality:** American

**Diagnosis on Admission:** Spinal Cord Injury, C6

**Treatment Received:** Epidural Stimulation Surgery, Medtronic Restore Advance 16-electrode MRI Compatible Device. Mesenchymal Stem Cells (MSCs), 120 million cells.

**Date of Admission:** 30/05/2017

**Date of Discharge:** 08/07/2017

## Patient's Condition on Admission

Patient sustained a C6 burst fracture that was treated with emergent anterior corpectomy and C5-C7 spinal fusion in October, 2014. Patient noticed improvements from the procedures in core muscles, but is still very weak.

Patient is a C6 incomplete quadriplegic, therefore he has limited fine motor skills, but no motor function in lower limbs. He has minimal sensory functions and suffers from neurogenic bowel and bladder as well as spasms and spasticity. Patient takes Neurontin and Gabapentin for neuropathic pain, but does not feel any relief from the medication.

## Previous Therapies and Treatments

Patient received 3 months of inpatient rehabilitation, followed by 18 months of outpatient aqua therapy and locomotor training.

## Treatment Received

After a Spinal MRI scan and comprehensive blood work, patient underwent Laminectomy and implantation of the Epidural Stimulation device on June 2, 2017. The surgery was completed without significant adverse effects and the surgical wound healed normally. No serious complications were reported during the postoperative hospital stay.

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	46	10	1
Physical Therapy	38	7	1
Occupational Therapy	9	2	1

## Regenerative Medicine Treatment

Type of Stem Cells	Quantity of Stem Cells	Delivery Method	Number of Applications
Mesenchymal Stem Cells (MSCs)	20 Million Cells	IV Injection	1
Mesenchymal Stem Cells (MSCs)	100 Million Cells	Lumbar Puncture Injection	3



# Symptoms Improvement Post-Surgery

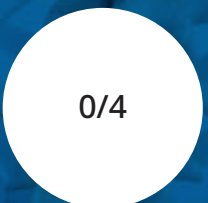
Abilities & Symptoms	Motor & Sensory Function (below injury level, before ES surgery)	Improvement Observed (35 days after admission)
<b>Motor Function</b>		
Standing with support	Not Possible	Yes
Stepping with support	Not possible	Yes
Gross motor Skills	Not Present	Yes
Fine Motor skills	Limited	Yes
Balance	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	Present	No
Bladder Function	No	No
Bowel Function	No	No
Sweating Ability	No	No

Improvements are monitored in 15 targeted areas: 11 Motor areas and 4 Sensory areas. However, the number of targeted areas may vary depending on patient's condition prior to admission. If patient does not experience symptoms in certain 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, 15 of 15 Motor and Sensory Functions were targeted. Overall, improvements were recorded in 11 out of 15 targeted Motor and Sensory Function areas. Motor Function improved in 11 out of 11 targeted areas when the Epidural Stimulation device was switched on, but there were no improvements in Sensory Function. More feedback will be collected to note any improvements made by the Regenerative Medicine treatments.

## Treatment Summary

After the Epidural Stimulation surgery, patient received 46 Mapping sessions, 38 Physical Therapy and 9 Occupational Therapy sessions. Patient also received 120 million Mesenchymal Stem Cells (MSCs) through three lumbar puncture injections and one IV injection. All four stem-cell treatments went well without adverse effects and no short-term or acute complications have been reported.

Patient's static sitting and standing balance improved. Patient is able to stand at the parallel bar and is able to lock his knees when doing so, however, he has limited trunk control and weak upper body so he is not able to stand for long periods of time. Patient's motor function improved, including ankle, knee, and hip flexion, as well as knee extension.

Patient is able to take assisted steps with the use of a hoist and walking frame. Patient is able to lift his feet by himself and his coordination has improved in both legs, but he requires assistance in foot placement and knee locking.

Patient's spasms and spasticity are lessened when Epidural Stimulation device is switched on, but there was no noticeable change in bladder and bowel functions. More feedback needs to be collected on patient's neuropathic pain.

After 35 days, patient was discharged and will continue his physiotherapy back home.

## One Year Follow-Up Assessment

Abilities & Symptoms	Observations (1 Year after Discharge)
<b>Motor Functions</b>	
Standing with support	Moderate Improvement
Stepping with support	Significant Improvement
Gross motor Skills	Moderate Improvement
Fine Motor skills	No Change
Balance	Mild Improvement
Coordination	No Change
Muscle Mass	Moderate Improvement
Fatigue	Moderate Improvement
Stamina	Moderate Improvement
Spasms	Increased
Spasticity	Increased
<b>Sensory Functions</b>	
Neuropathic pain	No Improvement
Bladder Function	No Improvement
Bowel Function	Mild Improvement
Sweating Ability	Mild improvement

## One-Year Follow-Up Summary

One year after the Epidural Stimulation device was implanted and stem cells injected, patient is carrying out 10 hours of physical therapy per week.

Patient's gross motor functions such as flexing and extending his hips and knees have improved moderately. The programs provided by UAM for gross motor functions are still working very well. On a scale of 1-5, 1 being worse than before surgery and 5 being significantly better, patient rates his gross motor functions as a 3 -- Moderate improvement.

Patient has noticed moderate improvement when standing with support and he is able to stand for longer periods of time. Patient is able to lock his knees by himself on certain occasions and his standing balance is good when he received arm support. Patient has moderate trunk control while standing. On a scale of 1-5, 1 being worse than before surgery and 5 being significantly better, patient rates his standing with support as a 3 -- Moderate improvement.

Patient has noticed significant improvement during stepping exercises when using a walking frame. He is able to lift his legs by himself while taking steps, but sometimes requires assistance in foot placement. He is also able to lock his knees on his own when taking steps, but sometimes requires assistance. Patient has moderate trunk control and the coordination of legs when taking steps is the same since he left UAM after his 35-day post-operative rehabilitation.

Patient states that due to his studies he is unable to do as much standing and stepping exercises as his therapists would like, but this is will resume once he is back home.

Patient notices slight improvement in muscle mass, with the biggest gains in his quadriceps and calves. Patient also noticed moderate improvement in his stamina and is not fatigued easily.

Patient does state that spasms and spasticity have increased slightly since he was discharged from UAM. However, patient is not taking any medication for spasms or spasticity. Patient was provided with an overnight program on the Epidural Stimulation device to help ease spasms and spasticity, however he does not use it due to the sensations it creates when he is trying to fall asleep, which is not painful but distracting.

Patient has not noticed any improvement in bladder function, but has noticed slight improvement in bowel function. Patient has not regained sensation in bowel function, but has noticed improvement in bowel control and is able to empty his bowel faster. Patient has noticed mild improvement in sweating ability. Previously, patient was not able to sweat below his injury level, but now he is able to sweat slightly in his arms and elbows.

Patient also reported that his blood pressure has improved with the Epidural Stimulation device switched on. Patient has orthostatic hypotension and states that since his surgery, his blood pressure has increased to normal levels, allowing him to carry out his daily activities without feeling light headed.

Overall, patient is very satisfied with the Epidural Stimulation device and the regenerative-medicine treatment he received at Unique Access Medical.

Patient states: ***"The Epidural Stimulation has improved my quality of life. As a result, I feel and look happier and have more function. I am glad I went."***



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