Beike Biotech
& Better Being Hospital

Electrical Stimulation SCI Case Study

Case Presentation

Condition: Spinal Cord Injury T9 – 10, Complete

A female patient was involved in a motor vehicle accident 7 years ago. She was in a coma and suffered from a fracture of her left femur, shoulder, multiple ribs and T9-10 spine fracture/dislocation with complete paralysis of both lower limbs. She was intubated with control ventilation for 3 months. She eventually managed to recover and spinal fixation procedures were done afterward. She is currently well conscious with complete paralysis. She came for stem cell treatment and a comprehensive neurological rehabilitation program.

Investigations

Her laboratory result showed slight iron deficiency anemia and low creatinine levels. The modified Mediterranean food plan was prescribed and the nutritionists were working with her throughout the program to ensure enough knowledge and practical skill to carry on the dietary pattern after discharge.

Treatment

Hyperbaric Oxygen Sessions at 1.5 ATA, 100% oxygen by 45 min was prescribed for three sessions per week. Aquatic exercise, physical rehabilitation and occupational therapy were scheduled on a daily basis except Sundays.

We also provided 8 Umbilical cord derived Mesenchymal Stem Cells (uMSCs)(Beike Biotechnology Co., Ltd. ®) 3 intravenously and 5 intrathecally, at 4-5 days interval for the first 4 weeks.

The second month, we decided to implant the epidural electrode stimulating device, using the described procedure by Harkema, S., et al. in 2011(23). Restore ADVANCED device (Medtronic®) was placed together with a 16-electrode array (Specify 5-6-5) over spinal cord segments L1–S1.

Postoperative Training sessions

Training sessions were started right away after the first week of operation. The training methods and electrical stimulation configuration mapping and grouping method were adapted from the report of Sayenko, D.G., et al. (27) and Angeli, C.A., et al.(26)

A. **On-bed training sessions**

Set up: Patient on supine position with slightly knee flexion

Technique: Active assistive, manual facilitation. Voluntary control of motor training with conceptual, visual and auditory enhancement, while providing sub-threshold stimulation of specific muscle group.

B. Standing training sessions

Set up: Patient in standing position, with hoist (LiteGate®) support.

Technique: Active assistive with manual facilitation technique. Voluntary control of specific muscle group training, with conceptual, visual and auditory enhancement, while providing sub-threshold stimulation of specific muscle group.

C. Stepping training sessions

Set up: patient in standing position, with patient hoist (LiteGate®) support, worked on treadmill with 2 therapists on both sides of body.

Technique: Active assistive with manual facilitation technique. Voluntary control of specific muscle group training through step sequencings, with conceptual, visual and auditory enhancement, while providing sub-threshold stimulation of specific muscle group.

Outcome and Follow-Up

After eight weeks, during on-bed training sessions and standing training sessions, the patient regained partial voluntary control of her hip, knee and ankle dorsiflexion around 10-20% of maximal effort. Left side voluntary control is better than right side at the same level of stimulation.

In step training sessions, the patient gradually improved partial voluntary control of both sides of her body, around 10-20% of maximal effort, and helped motor coordinating fairly well with step sequencings.

Improvement of voluntary control continuously came along with increasing the accumulated number of training sessions.

Surface electromyography studies also confirmed the evoked potential corresponding to voluntary motor control.