

## The Effect of an Interdisciplinary Team and Multiple Uses of Erigo Robotic Machine in Cervical Spinal Cord Injury Incomplete Case

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### Abstract

**Case Information:** Interdisciplinary rehabilitation gathered for a 26-year-old male recovering from incomplete Cervical Spinal Cord Injury (SCI) and interventions been used. Several specialties functioning within an interdisciplinary team fulfilled complementary roles to support rehabilitation for a patient with SCI C8 ASIA C.

**Team Goals & Treatment Plans:** The interdisciplinary team formally coordinated rehabilitative care from multiple disciplines by weekly meetings. Internal medicine exclusively physiatry team managed medications and overall progress. Physical therapy addressed upright tolerance, transfer, gait, and strength training using a tilting table than an Erigo machine. Occupational therapy focused on hand coordination and feeding/dressing activities. Psychology assisted with coping strategies. Nursing ensured medication adherence, nutrient intake, wound prevention, and incontinence management, whereas physiatry addressed abnormal muscle tone and add anti-spasticity medications.

**Discussion:** Four months post-admission the patient's progress allowed him to reach his main goal of ambulation with an elbow crutch on the right elbow. The patient developed orthostatic hypotension managed by TED stocking and abdominal binder physiotherapist & nurse specialists, bilateral lower limbs and upper limbs pain symptoms were also resolved by physiatry team while bowel/ bladder incontinence and upper extremity motor strength impairment remained the same. The patient reached 100% independent in transferring from bed to wheelchair and in upper body dressing also at lower body dressing/bathing managed by Occupational Therapist. Gait with elbow crutch at the right elbow was possible to reach more than 200 feet. Three months/12 weeks of using the Erigo machine show improvement in upright standing and transfer bed to wheelchair or chair.

**Conclusion:** Rehabilitation team members from multiple specialties can fulfil synergistic roles when working collaboratively within the context of a regularly updated comprehensive management plan and achieved such great result following 4 months show how Erigo play the main role from physiotherapist point of view in such case but I still insist to keep digging for more examination as possible systemic errors could not be avoided during new technology device like Erigo machine.

### **Keywords**

Rehabilitation care; Interdisciplinary team; Occupational therapy; Physical therapy; Rehabilitation; Spinal cord injury

## **Abbreviations**

ASIA: American Spinal Injury Association; Min: Minutes; OT: Occupational Therapy; PT: Physical Therapy; SCI: Spinal Cord Injury; C: Cervical Area/Spine Region

## **Introduction**

Rehabilitative care programs for patients with SCI expect multi-specialties coordination to direct the common presence of multiple overlapping conditions overcome SCI from ASIA A type of injury to ASIA C in four months. [1,2]. This case described interdisciplinary care for a patient with an incomplete cervical SCI C8 ASIA C resulting in injury to the spinal cord a type of posterior cord syndrome post motor vehicle accident [3]. Physical therapist within a team of providers serving at a rehabilitation hospital with other specialties represented in the interdisciplinary team caring for this patient included primary care (internist and nurse practitioner), physical therapy, occupational therapy, physiatry, therapeutic recreation, assistive technology, registered dietician, nursing, and psychiatry.

Almost 70% of patients suffering from spinal cord injury (SCI) experience persistent pain, which can extensively influence cognition, emotional status, activities of daily living, and quality of life [4]. There was musculoskeletal pain which is commonly experienced by patients with SCI in both acute and chronic

post-injury phases, due to factors such as neuropathic pain, poor seated posture, spasticity, subluxation, and bedsores below the level of injury [5]. Pharmacotherapy was the main tool in the rehabilitation and management of patients with complicated neurological conditions, often an insufficient pain management strategy brings up the persistence and unresponsiveness of neuropathic pain symptoms, 's due to the presence of numerous underlying pain mechanisms, and the limitations of available pain control medications [5-8].

The limited mobility and sensory capacity accomplished by persons with SCI largely increases the risk of pressure bed sores [9]. Bedsores are common conditions associated with SCI requiring regular supervision, preventive actions, side to side with other conditions include bowel and bladder incontinence, depression, and urinary tract infection [10-12]. Motivation of the patient was present and so cognitively without him been physically engaging in rehabilitative activities with pharmacological management, that could have caused dependence and secondary side-effects, which can be more challenging.

## **Case Presentation**

### **Clinical History**

A 26-year-old male medically free was admitted to a local hospital in Riyadh, Saudi Arabia approximately 4 months following a motor vehicle accident, which resulted in broken cervical spine fractures and incomplete SCI. Injuries included Left C6-C7 facet joints fracture-dislocation. Acute C6-C7 central and left paracentral disk herniation associated with spinal canal stenosis and Left C7 neural for aminal narrowing. Spinal cord injury level C6-C7. Initial hospitalization lasted approximately 16 weeks at which time the patient was transferred to an acute rehabilitation facility for nearly 12 weeks.

### **Assessment**

The patient was classified with posterior cord syndrome, exhibiting multiple category characteristics of the American Spinal Injury Association (ASIA) classification system as ASIA B C8 incomplete then later ASIA C C8 incomplete [13].

Initial evaluation of the head, cranial nerves, lungs/thorax was normal only the heart revealed sinus bradycardia. The patient was cognitively intact and able to interact normally with hospital staff. Upper and lower extremity muscle weakness left the patient with a very minor ability to move independently, requiring assistance for most movements such as turning in bed. No muscle contractures were present in both lower limbs. The patient was restricted to a tilt-in-place wheelchair due to mild orthostatic hypotension which prevented maintaining an upright position in bed.

Functional capacity limitations, including strict precautions for trunk and extremity weakness, absent proprioception in the upper and lower body, and orthostatic hypotension, were factors of residual tissue damage and edema from the spinal cord injury managed surgically with one subsequent fusion type of surgery. The patient wore a hard cervical collar for 6 weeks post-surgery required total dependant assistance to transfer to and from his wheelchair. The patient has anxiety, depression, bowel and

bladder incontinence and not to forget the patient was having a high risk of developed autonomic dysreflexia.

### **Initial Plan of Care**

The nurse practitioner and internist ordered medication and served on the interdisciplinary care team. Occupational therapy (OT) management concentrate on improving hand/finger coordination and control, feeding, dressing, and brushing teeth. Education about strategies and the importance of developing self-functional skills was also integrated into 1-hour sessions, 5 days per week. The physical therapy (PT) program included physical and educational training on transferability from the wheelchair to a mat using a slide-board. Gradual upright tolerance practice was also used with help of the Erigo machine to accomplish the dual goals of sitting fully upright in a wheelchair for 30 minutes and to facilitate upright rehabilitation activities without signs/symptoms of orthostatic hypotension. The physical therapy program contained approximately 2-hour sessions, 5 days per week besides focusing on major muscles group in hips, knees, and ankles at both sides. The patient met once monthly with psychology professionals who were providing counseling to help the patient cope with the effects of his SCI [8,14,15].

### **Achieved Rehabilitation Goals**

After approximately 4 months or 16 weeks as acute and sub-acute of rehabilitative care included intensive ex's with gradual resistance using weight dumbbells 1-3 Kg (kilogram), Erigo machine was daily from 5<sup>th</sup> week and keep it until 12<sup>th</sup> week before discharge and static tilting table from 1st to 4<sup>th</sup> week patient reach ambulation using one elbow crutch placed on right elbow only that was the main goal by the 16<sup>th</sup> week. Also, he was able to perform complete transfer by himself from bed to wheelchair and stair climbing as well. The patient had was 3/4 on the Modified Ashworth rating scale making passive movement difficult in the right foot, gastrocnemius/soleus, and thigh adductors due to that 5 mg of Baclofen was prescribed to lessen the abnormal muscle tone and relieve stiffness [16]. Baclofen was prescribed over botulinum toxin as a less invasive intervention, due to patient desire, and because some increased lower extremity muscle tone is providing the stability that is needed during gait. Botulinum toxin could harm mobility by reducing muscle tone to flaccid type.

Four weeks following Baclofen administration, lower extremity muscle tone was reduced to a rating of 1/4 on the Modified Ashworth scale (measurement tool for Spasticity). Physical and occupational therapies modified their rehabilitation focus toward achieving functional independence. Pain post-SCI was controlled by Pregabalin 75-15.

### **Discussion**

Spinal cord injuries are unique due to the extensive variability of injury possible at many spinal cord levels. In this case, incomplete SCI C8 ASIA C which was started at week 1 with ASIA A type means that mobility limitation of all extremities, bowel/bladder incontinence, and reduced or absent muscle strength in the trunk and all extremities with absent sensation below C8 had resumed motor and sensory skills back unless few limitations mentioned above all due to a major reason which are multiple

disciplines that run appropriate care and rehabilitation for 16 weeks from an interdisciplinary team [1,2].

This case demonstrates rehabilitation as a performer within an interdisciplinary team and my job as Physiotherapist where Erigo machine was main interventions and most effective tools due to the multiple times patient were used it also it has been used to the patient while monitored achieving goals that set by the team. To address this and other challenges, management planning occurred via routine discussions of patient status, identifying specialty-specific goals, setting rehabilitation benchmarks, which were documented informal plans in the advanced electronic system. In this case, coordination happened formally, during weekly interdisciplinary team meetings, and informally, during the normal daily interactions of the various providers. Coordination among interdisciplinary management emphasizing and supporting the care of other providers within a team is constructed and built to augment the advantages for the patient and his family members by avoiding redundant and unnecessary care and generating a synergistically positive therapeutic effect.

Little research has been conducted to elucidate the specific benefits of the Erigo machine for persons suffering from SCI. In this case, care was provided to reach maximal functional abilities and daily activities. The patient took benefits of psychology and psychiatric resources and therapies to facilitate coping strategies, support well-being, and process concerns related to managing the physical challenges and needs resulting from his injury. Each discipline specialist showed on this interdisciplinary team had engaged in patient education, monitored and recorded observations of the patient's emotional status, and reinforced care goals of others when possible. Every health organization facility dedicated to supporting this level of care coordination is required to facilitate the interdisciplinary process described in this article.

A well-functioning Erigo machine is present potential effects on the goals and strategies of the patient, other team providers, and the overall rehabilitation plan had worked so well too. I presented here, members of each professional group worked collaboratively to support and/or facilitate the care of other team members by adapting methods to avoid redundant therapies and enlist the evaluation and/or treatment of needed specialties. Erigo machine was one of the choices in my opinion had made the impossible became possible for the patient's functional abilities and made him reach his chief goals of ambulation using one elbow crutch on the right side.

## Conclusion

This case describes the rehabilitation management of a patient suffering from incomplete SCI C8 by an interdisciplinary team. Rehabilitation team members from multiple specialties can fulfil synergistic roles when working collaboratively within the context of a regularly updated comprehensive management plan and achieved such great result following 4 months show how Erigo play the main role from physiotherapist point of view in such case but I still insist to keep digging for more examination as possible systemic errors could not be avoided during new technology device like Erigo machine [1,2,17,18].

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