

A complex case of neuro-muscular rehabilitation with favorable evolution, in a patient with incomplete tetraplegia post cervical and thoracic spinal cord injury - surgically treated, in a polytraumatic context, by car accident

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Abstract

Introduction: Spinal cord injuries (SCI) are major conditions that usually determine severe and permanent dysfunctions, or even important loss of basic functions, generating severe or rather permanent sequels. They can have important chronic consequences such as: tetraplegia or paraplegia.(1). **Materials and Methods:** This paper presents the case of a young 19-year-old patient who suffered in March 2019, a car accident (passenger) with spinal cord injury (SCI) at cervical and thoracic level in a polytraumatic context, hospitalized at the Neurosurgery Clinic (NS) II of TEHBA in a severe condition, for complete AIS/Frankel A tetraplegia, with a C7 fracture, T3, T4, T5 cominutive fractures with fragments in the medullary channel, minor traumatic brain injury, multiple costal fractures, abdominal trauma and respiratory failure. When the patient became hemodynamic and respiratory stable it was decided a neuro-surgical intervention, initially at cervical level through an anterior approach, with mixed osteo-synthesis and C7 discectomy. Because of the spine instability, thoracic surgical treatment was delayed with 11 days, when he suffers a neurosurgery for medullary decompression, drainage and stabilization of the spine. In our clinical division, the patient was admitted with an incomplete AIS/Frankel B tetraplegia and initially followed a rehabilitation nursing program and subsequently continued with a recovery therapy according to clinical stages. The patient was assessed functionally using the following scales: AIS/Frankel, modified Ashworth, Functional Independence Measure (FIM), Life Quality Assessment (QOL), FAC International Scale, Independence Assessment Scale in Daily Activities (ADL / IADL), Walking Scale for Spinal Cord Injury (WISCI). **Results:** The patient benefited from a complex neuro-muscular rehabilitation program, having a favorable evolution, with an increase in the evaluated scales scores – passing from AIS/Frankel B classification to a severe AIS/Frankel C stage, and thus, at the moment he is performing walking on short distances, through parallel bars, with long left leg orthosis and support from another person. It was tried a sphincter re-education, but, after urologic examination, because of the important spasticity in the lower limbs and of the urinary catheterization discomfort, it was decided that for a while the patient to remain with fixed urinary catheterization. **Conclusions:** Even if there is still no cure for SCI sequels, the accurate clinical-functional evaluation, the neurosurgical prompt therapeutic approach, adding complex nursing measures, personalized rehabilitative and kinetotherapy programs, in a young patient with SCI by car accident, determined neuro-locomotor improvements with an increase in patient's quality of life.(1),(2).

Keywords: *spinal cord injuries, tetraplegia, traumatism, rehabilitation,*

Introduction

Spinal cord injuries (SCI) are major conditions that usually determine severe and permanent dysfunctions, or even important loss of basic functions, generating severe or rather permanent sequels. They can have important chronic consequences such as: tetraplegia or paraplegia.(1)

Spinal cord injuries are unpredictable, the ability to predict the extent of neurologic recovery after a traumatic spinal cord injury is important. Doctors can determine if is necessary to do various interventions in the acute or chronic period. Pharmacologic, rehabilitation treatment protocols and good medical care can all help for moving toward wholeness and wellness.

A complete or incomplete spinal cord injury, it does not mean that recovery is impossible. (1,2)

Materials and Methods: This paper (having the patient and the THEBA Bioethics Committee approval no.3159/30.01.2020) presents the case of a young 19-year-old patient who suffered in March 2019, a car

accident (passenger) with spinal cord injury (SCI) at cervical and thoracic level in a polytraumatic context, hospitalized at the Neurosurgery Clinic (NS) II of TEHBA in a severe condition, for complete AIS/Frankel A tetraplegia, with a C7 fracture, T3, T4, T5 cominutive fractures with fragments in the medullary channel, minor traumatic brain injury, multiple costal fractures, abdominal trauma and respiratory failure. When the patient became hemodynamic and respiratory stable it was decided a neuro-surgical intervention initially at cervical level through an anterior approach, with mixed osteo-synthesis and C7 discectomy. Because of the spine instability, thoracic surgical treatment was delayed with 11 days, when he suffers a neurosurgery for medullary decompression, drainage and stabilization of the spine.

In our clinical division, the patient was admitted with an incomplete AIS/Frankel B tetraplegia and initially followed a rehabilitation nursing program and subsequently continued with a recovery therapy

according to clinical stages. The patient was assessed functionally using the following scales: AIS/Frankel, modified Ashworth score 2, Functional Independence Measure (FIM) 34 motor points and 35 cognitively points, Life Quality Assessment (QOL) 61/112 points, FAC International Scale 0 category, Independence Assessment Scale in Daily Activities (ADL / IADL), Walking Scale for Spinal Cord Injury (WISCI) level 0.

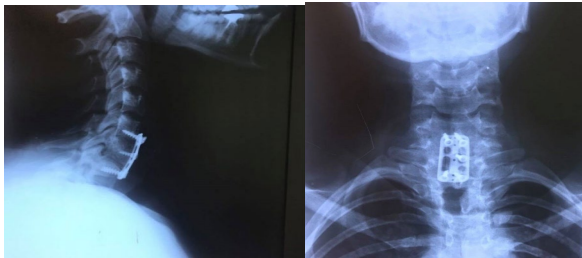


Fig no. 1 and 2: Radiography of the patient after the intervention: mixed osteo-synthesis and C7 discectomy. The Teaching Emergency Hospital “Bagdasar-Arseni” (TEHBA), Bucharest, Romania.

Evolution

The patient had multiple admissions in our Rehabilitation Clinical Division, he went from a Frankel B tetraplegia to a Frankel C by going through an intensive rehabilitation program.

During his hospitalization, the patient underwent a complex recovery program that included pharmaceutical treatment with antibiotics, antimicrobics, antialgic-antipyretics, gastric protectors, anxiolytic medication, neurotrophics, vitamin B supplements, amino acid supplements, probiotics, anticoagulants, magnesium supplements, urinary antiseptics, antidepressants, prokinetic, iron supplements and physical treatment (kinesiotherapy). The rehabilitation team had an interdisciplinary collaboration with other specialists and succeeded in providing to the patient a complete, individualized recovery plan, based on the particularities of the case.

Our main goal for this patient was the walking recovery, knowing by experience that walking is rated at first place (together with bladder and bowel function) at least by patients with incomplete lesions. (4)

The program started with some functional activities that C6 tetraplegia and paraplegia should be able to perform: rolling, mobilizing from supine to long sitting, unsupported sitting, vertically lifting and transferring.(5)

The family/ the caregivers have an important role in this team, they should be well trained as well as the patient about the procedures for all activities that the patient will perform. One of the important maneuver from the nursery program is the pressure relief and learn to change the position in bed to avoid developing atrophic bedsores and ecchymosis.(6) Vertically lifting can also lead to pressure relief and help to learn transferring. Patients will become

more independent and will do more day by day tasks if they learn to transfer from the floor/bed/car in the wheelchair and vice versa.(6) At the same time, the aim is to gain as much independence as possible for the patient by training some skills required by ordinary life, performing useful activities.(6)

Gait re-education is very important in the rehabilitation program because the patient can learn how to walk again. The main stages of gait re-education are the following: lifting in an orthostatic position, walking between parallel bars, walking with axillary crutches or with Canadian crutches, walking with a cane, walking without support and walking on rough terrain.(1), (7)

Our patient had a favorable evolution during hospitalization from AIS/Frankel B to severe AIS/Frankel C, being able to practice walking between parallel bars for short distances with the help of the leg-ankle-foot orthosis and support from another person. The sphincter re-education was tried, but, after urologic examination, because of the important spasticity in the lower limbs and of the urinary catheterization discomfort, it was decided that for a while the patient to remain with fixed urinary catheterization.



Fig no. 3: Image of patient practicing walking between parallel bars for short distances with the help of the leg-ankle-foot orthosis and support from another person. The Teaching Emergency Hospital “Bagdasar-Arseni” (TEHBA), Bucharest, Romania.

The evolution of the patient showed improvement in the following scales: AIS / Frankel, modified Ashworth score 2, Functional Independence Measure (FIM) 46 motor points and 35 cognitively points, Life Quality Assessment (QOL) 67/112 points, Walking Scale for Spinal Cord Injury (WISCI) level 3.

Fig no.4: Image of the patient practicing walking between parallel bars for short distances with the help of the leg-ankle-foot orthosis and support from another person. The Teaching Emergency Hospital “Bagdasar-Arseni” (TEHBA), Bucharest, Romania

Results: The patient benefited from a complex neuromuscular rehabilitation program, having a favorable evolution, with an increase in the evaluated scales scores – passing from AIS/Frankel B classification to a severe AIS/Frankel C stage.

“Patients with motor and sensory complete lesion at their first examination have very few chances of neurological recovery below the lesion the studies show, only 10% are converting to a AIS B having some sensory function and about 10% converting to AIS C with some motor recovery below the lesion.” (6) The conversion from complete to incomplete between 1-3 months after the accident has a better prognosis in motor recovery.

For walking recovery AIS/Frankel C patients have a better prognosis than sensory incomplete ones. The overall rate of recovery is about 75%. (8),(9)

The factors that influence the walking recovery for tetraplegic patients are: lower extremity strength, motor recovery timing, age and upper extremity strength. (8),(9) Age seems to be a strong prognostic factor in walking recovery: a negative prognostic is if a patient is over 50 (they recover functional walking in 30-40% cases) but AIS/Frankel C patients younger than 50 years recover functional walking 80-90%. (3)

Conclusions: Even if there is still no cure for SCI sequels, the accurate clinical-functional evaluation, the neurosurgical prompt therapeutic approach, adding complex nursing measures, personalized rehabilitation kinethotherapy programs, in a young patient with SCI by car accident, determined neuro-locomotor improvements with an increase in patient’s quality of life. (1),(2)

Rapid decompression (within 24 hours) of neurological structures has brought an important benefit in neurological recovery compared to delayed surgery. (10) Incomplete spinal cord injuries allow the spinal cord to retain some function and often have quickly recovery progress, but this is not the only factor that can influence this process. One of the factors that can also have a contribution in prognosis is location of the lesion, the higher level the lesion has, the more difficult or unlikely recovery is. Other factors can contribute to a unfavorable evolution, and can complicate the patient's recovery process, for example an infection can increase inflammation and spasticity affecting the recovery process.

Patient adherence to rehabilitation program is very important, because even if the kinethotherapy sessions can be often difficult to execute and also painful, represents a challenge and is the most effective way to teach the brain to communicate with the rest of the body.

The peculiarity of the case is the conversion from complete to incomplete injury and the relatively rapid and favorable progress of the patient in terms of recovery and the possibility of re-education of gait. (1),(2) Dedication to therapy and good medical services, also family implication - being a part of the rehabilitation team - helped the patient to move towards integrity and well-being.

There are a lot of unknown things that remains to be discovered regarding spinal cord injuries, including their

treatment which is limited in the present, but continuing with an advanced level of technology and research, the doctors will be able to develop new ways to treat even the most severe bone marrow damage. (7).

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