

God's mathematics: 1+1 equals more than what we know. Unexpected favorable progressive evolution, from vegetative state and severely deposturizing tetraplegia, to minimally conscious state, and finally independence in activities of daily living

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Abstract

The case reported a 21-year-old female patient, admitted and treated in the neurorehabilitation clinic, after traumatic vegetative state and severely deposturizing tetraplegia. She had an unexpected favorable progressive evolution to minimally conscious state, then post-traumatic encephalopathy and functional tetraparesis. Finally both functional and vocational prognosis were favorable, and she achieved independence in activities of daily living. She started her academic education as student, one year after the traumatic accident.

Keywords: *vegetative state, minimally conscious state, polytrauma, tetraplegia, neurorehabilitatio, outcome,*

Introduction

Survivors of severe brain trauma have marked disorders in the state of consciousness, from an initial coma, to vegetative state (VS), or minimally conscious state (MCS) (1).

The actual nosological name of the VS is unresponsive wakefulness syndrome (2). It is a pathological condition characterized by complete absence of any conscious activity (no self-awareness, no connection to the environment, psycho-sensory areactivity), with complete or partial preservation of the hypothalamus, and autonomic brain stem functions (3,4).

Only 14.29 % of the patients in VS managed to recover; good outcomes factors are male gender, the cause of brain injury, time elapsed between the traumatic brain injury (TBI) and starting the rehabilitation program (5).

Case report

A 21-year-old female patient, student, was admitted to the neurosurgical department of the Teaching Emergency Hospital "Bagdasar-Arseni". Subsequently she was transferred to the NeuroRehabilitation Clinic, in vegetative status and severe spastic tetraparesis, being fed through percutaneous endoscopic gastrostoma (PEG), having neurogenic bladder (with indwelling urinary catheter) and bowel disorders.

Personal medical history: On 20.08.2019 the patient suffered a polytrauma after accidental falling from heights (defenestration from 30 meters, falling from the 8th floor of the building - possible suicide attempt), followed by:

- severe brain trauma (GCS 6p at admission), and multiple cerebral haemorrhagic contusions (bilaterally in the frontal lobes, basal ganglia, in the left internal capsule, the right posterior parietal lobe), left temporal subarachnoid haemorrhage and left frontal hygroma, operated on 5.09.2019

- amielic spine trauma (C7 vertebral transverse process fracture, without surgical indications)

- right maxillary sinus cominutive fracture with hemosinus (subsequently reabsorbed)

- chest trauma and pulmonary contusions of the right upper lobe and apical segment of the right lower lobe (subsequently reabsorbed)

Between 21.08 and 09.10.2019 the patient was monitored in the intensive care unit. Tracheostomy with cannulation, and feeding by PEG were necessary. The neurologic evolution shaped an unresponsive wakefulness syndrome (VS).

On 9.10.2019 the patient was transferred to the NeuroRehabilitation Clinic.

Clinical aspects (at admission):

- vegetative state (unresponsive wakefulness syndrome)
- spastic tetraparesis, amyotrophies and myotendon retractions, with disabling deformations
- poor general condition and protein-calorie malnutrition
- PEG feeding
- neurogenic bladder, permanent urinary catheter

The upper limbs had severe spastic disabling deformations: quasi-irreducible flexion of the fingers and wrists, and limited possibility for passive

extension of the elbows (up to 90 degrees / on the left side and 110 degrees / on the right side). The deformities were corrected by local spasmolytic therapy with botulinum neurotoxin type A, combined with a sustained program of kinesiotherapy, posture correction, assistive devices and orthoses, electro-physiotherapy, laser and diapulse applications.

The therapeutically results were favorable: spasticity has decreased and the joints range of motion was improved (passive extension of left elbow augmented at 110 degrees and to 135 degrees on right).

The lower limbs presented disabling deformations, with severe mobility limitations of both knees and of the left hip (due to an incipient ectopic calcification, a left supratrochanteric traumatic paraosteoarthropathy).

The feet were deformed in equinovarus (120 degree), partially reducible after a mild dose of 250 units of neurotoxin type A injected in both solear muscles, kinetotherapy and posture correction using a permanent support device (fig.1).

Pathologic biological data (at admission):

- Normochromic, normocytic anaemia: Hb:10 g/dL, Ht: 30%, MCV:95.1 fL, MCH:31.6 pg
- Hypoproteinemia with hypoalbuminemia (total blood proteins: 5.9 g/dL, blood albumin: 3.0 g/dL)
- Urinary tract infection with *Escherichia coli*

Rehabilitation program. General objectives: Treating the basic diseases and preventing complications, improving the patient's psycho-cognitive status, both mentally and emotionally. Family and socio-professional reintegration with subsequent improvement of the quality of life is the "final piece of the puzzle", from "Cindarella to the wonder princess". (6)

Pharmaceutical treatment consisted in: prophylactic anticoagulant therapy, harmless analgic medication, antibiotic treatment of infections, gastro protection, probiotics, anticonvulsants, synergistic association of neurotrophic factors (infused and respectively through PEG), mucolytics, urinary antiseptic.

Kinetotherapy: assisted thoracic therapy to facilitate expectoration, restoring/ maintaining ROM joint mobility, prevention of irreversible joint deformities, transfer training, promoting proximal and intermediary motor control (progressive passive verticalization, re-education of orthostatic posture),

then promote and train walking (rehabilitation of a more-or less physiological walking pattern (7).

Physiotherapy: laser therapy promotes analgesia, is effective in pain treatment and fibromyalgia, improves the muscle repair process and can modulate nerve impulses by reducing electrical excitability of cultured nerve cells (8).

Diapulse therapy relieves pain and improves physical function, modifies the evolution of degenerative process in hip joint cartilage by improving the chondrocyte viability and capacity to maintain extracellular matrix integrity and structure (9).



Fig.1 Spastic tetraparesis, amyotrophies and myo-tendon retractions with disabling deformations, in the young female with unresponsive wakefulness syndrome (VS) after severe TBI

Evolution and outcomes: The patient was mobilized in a specially adapted wheelchair, wearing a Philadelphia semi-rigid cervical collar.

She gradually began to vocalize, her face became more expressive, and she voluntarily mobilized her limb. Her cognitive and executive cerebral functions showed a remarkable evolution (MMSE was 22/30). She improved from vegetative state to a minimal state of consciousness, then to post-traumatic encephalopathy with functionally tetraparesis.

At discharge she was able to walk on short distances with bilateral support on the parallel bars, assisted by the therapist.

Ad vitam prognosis of *ad functionem* outcomes depend on a long-term rehabilitative treatment, and sustained psychological support.

In December 2019 she was admitted for clinical and imagery control (fig.2), in a real improvement status.

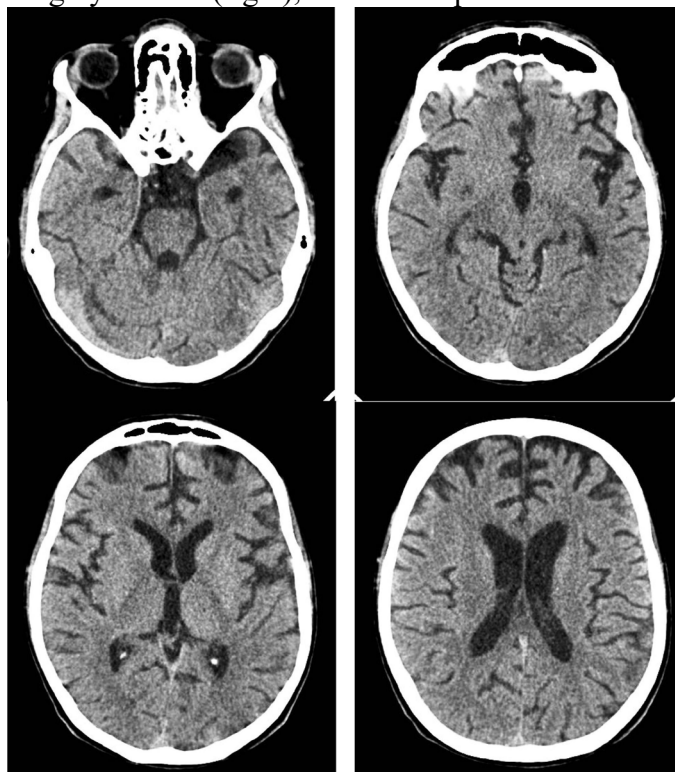


Fig.2 Cerebral CT scan: TBI sequels, with cortical atrophy (mainly in the fronto-temporal lobes). A small lacunar lesion is noticed in the right insular lobe.

The subject was followed-up using telemedicine methods (in the actual pandemic context). She can walk independently and has achieved an incredible independence in daily life activities. In October 2020 she has started her academic student education.

Conclusions:

Management of patients in vegetative state (unresponsive wakefulness syndrome) is realized by an inter-/ multidisciplinary team, having in epicenter rigorous measures of neuro-rehabilitative nursing objectives, to overcome complications and improve the patient's biological status.

Treating a patient in VS, one must have the tenacity of the wave that grinds the rock, and the imagination to see the ocean in the cochlea of a snail.

Along with the complex recovery program, the family and the spiritual, religious assistance have a major supportive role. The main objective, the “final piece of the puzzle” is represented by the educational and socio-vocational reintegration.

Disclosure Statement

The authors have no conflicts of interest to disclose.

Statement of Ethics

The manuscript was prepared in compliance with all ethical and confidentiality guidelines and principles. Written informed consent was obtained from the patient's next of kin for publication of this case report and accompanying images.

The Ethic Committee of Teaching Emergency Hospital Bagdasar-Arseni approved publishing.

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