Neuropsychology and rehabilitation of patients with severe acquired brain injury: a complex relationship?

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Abstract

The complexity of simultaneous impairments in persons with severe acquired brain injury calls for coordinated work by a team of specialists in order to optimise residual potential and deal immediately with aspects that interfere with recovery. Here we propose a review of the main critical aspects that can interfere with neuropsychological rehabilitation in these subjects in the post-acute intensive rehabilitation stage: associated damage, complications, sensory and motor impairment and pharmacological treatment.

Keywords: Severe acquired brain injury; Rehabilitation; Disorders of consciousness; Pain; Sensory-motor impairment

1. Introduction

The term severe Acquired Brain Injury (sABI) includes a variety of traumatic and non-traumatic acute brain lesions, characterised by coma of variable duration (Glasgow Coma Scale ≤ 8) and simultaneous motor, sensory, cognitive and/or behavioural impairment. Rehabilitation of sABI is a major challenge that can only be met by coordinated work of a team of experienced specialists. The important role of a neuropsychologist includes differential diagnosis of disorders of consciousness, early assessment of behavioural cognitive impairment, implementation of rehabilitation to limit impairment, promotion of participation and activity, helping other members of the team and care-givers to know the patient, removal of cognitive-behavioural obsta-

cles interfering with the progress of rehabilitation and psychological support of family members (Ladavas, Paolucci & Umiltà, 2011). In turn, however, the neuropsychologist must work closely with the other team members to discover all aspects that may influence his work and to avoid diagnostic errors and ineffective rehabilitation procedures.

2. Method

The study is based on systematic study of the literature of the 3rd National Consensus Conference on rehabilitation of sABI (De Tanti, Zampolini & Pregno, 2015) and the jury's decision to draw up recommendations on the rehabilitation programs for sABI patients in the intensive hospital phase. We also researched scientific production after 2010 in PubMed and in the Grey Literature.

3. Results

The first aim of rehabilitation of a patient coming out of intensive care is to stabilise his general condition, wean him of invasive devices and progressively reduce drug therapy that could depress alertness/wakefulness and residual cognitive ability. Antibiotic-resistant infections that often arise in the respiratory tract and are associated with high risk of septicemia are a major complication, especially in the first months after the event, as well as a major risk factor for death and poor long-term recovery (Kesinger et al., 2015). Since patients with fever and even moderate internal complications show reduced cognitive performance, it is advisable to suspend neuropsychological diagnosis to avoid over-pessimistic judgements. Paroxysmal sympathetic hyperactivity is another frequent complication in post-acute phase. If not treated early it can cause secondary brain injury, especially when elements of instability of the vegetative nervous system take over, with simultaneous paroxysmal transient increases in sympathetic (elevated heart rate, blood pressure, respiratory rate, temperature, sweating) and motor (posturing) activity (Baguley et al., 2014). The neuropsychologist must recognise the procession of symptoms of the syndrome and learn to control all sensory and emotional stimulation that can trigger it. Only when irritative aspects are carefully controlled, drug therapy (such as benzodiazepine and opioids) can be reduced with negative effects on alertness and interactions with the environment.

Patients with sABI are at constant risk of exposure to pain-causing conditions and it is well known that prolonged pain has a negative effect on psychic well-being and cognition (IASP, 2007). The neuropsychologist must also participate in pain management through the use of specific scales (Chatelle, Majerus, Whyte, Laureys & Schnakers, 2012) designed to assess the presence, grade and response to therapy of pain, especially in persons with disorders of consciousness who cannot explicitly communicate their discomfort. The neuropsychologist can also take an active part in auxiliary non pharmacological therapy and psychological limitation of behavioural manifestations of patients who have regained consciousness but have poor capacity to manage their response, which manifests as psychomotor agitation, even to minor pain.

With regard to invasive devices, the items that most compromise neuropsychological rehabilitation are mechanical ventilation and tracheal intubation. Both prevent correct verbal communication and therefore verbal testing, even when consciousness has been significantly regained. It is therefore necessary to await good outcome when the patient is weaned (Bertolino et al., 2012) before completing assessment and embarking on full neuropsychological therapy.

A high risk of diagnostic error has been reported with regard to sensory deficit (Schnakers, 2009) in patients in vegetative state as distinct from minimally conscious state with severe visual deficit. Clinical and neuropsychological assessment should therefore always be preceded by eye examination with visual evoked potentials in subjects with disorders of consciousness. Later, visual field testing is useful to complete differential diagnosis between hemianopia and neglect. With regard to motor aspects, severe bilateral hemiplegia with cranial nerve deficits due to brainstem damage makes it difficult to analyse residual cognitive competence, to the point of doubting the presence of any consciousness at all. In such cases the whole team is involved in differential diagnosis between vegetative state and locked-in syndrome, aided by validated clinical scales such as CRS-R (Estraneo et al., 2014). High-grade diffuse spasticity further impairs the possibility of intentional movement and is also a possible cause of major pain. Cases have been described in which reduction of spasticity by means of an intrathecal baclofen infusion pump enabled signs of consciousness to manifest in persons hitherto regarded as being in vegetative state (Sarà et al., 2007), followed by activation of neuropsychological rehabilitation.

With regard to complications that may slow down rehabilitation in these patients, delayed hydrocephalus may manifest as a progressive slowing of recovery or worsening of patient performance (De Tanti et al., 2015). The neuropsychologist has the task of collecting clinical and psychometric ele-

ments documenting loss of cognitive performance, sustaining the need for a ventriculoperitoneal shunt and monitoring improvement.

Regarding the use of drugs in patients with sABI, it is worth recalling that the behavioural profile of patients can be strongly conditioned, positively or negatively, by the often over-generous polytherapies administered to these patients (De Tanti & Saviola, 2014) so that any clinical decision should be expressed bearing in mind the possible confounding effect of therapies. In fact, many molecules with a negative effect on cognitive performance are used in treating paroxysmal sympathetic hyperactivity, pain, spasticity, extreme behaviour (agitation, aggressiveness) and epileptic crises. Only knowledge of the possible side-effects of therapy makes it possible to picture to what extent patient performance is due to real competence or to the drugs administered. A similar argument applies positively to drugs administered to stimulate the patient, e.g. amantadine, or as antidepressant, after the neuropsychologist has completed differential diagnosis between depression and severe inertia/apathy due to frontal lesions.

4. Discussion

The present study fully confirms the hypothesis that rehabilitation of persons with sABI in intensive post-acute phase is a complex task. To this we can add the need to entrust the patient to a family member or care-giver in the double role of fragile person in need of support and fundamental resource for the patient, to all effects an additional member of the team (De Tanti et al., 2015).

The neuropsychologist plays a fundamental role but must adapt projects, tools and judgements to the many clinical and management questions related to patient fragility, multiple impairments and the need to work in collaboration with a large team of colleagues. Since the patient's cognitive-behavioural disorder is due to extensive brain injury and a period of coma, it is usually characterised by widespread impairment of higher functions with greater deficit of individual functions (Ladavas et al., 2011). In this context, the traditional "pencil and paper" rehabilitation model in the neuropsychologist's office is often ineffective, while new models based on involving the patient in more ecological and therefore more motivating rehabilitative settings are more stimulating and have a better possibility of becoming part of real life. The neuropsychologist plays the role of supervisor/programmer, leaving the task of the therapeutic session to other operators, occupational therapists and educators (Saviola & De Tanti, 2011). These new models of

rehabilitation seem more promising and further confirm the complexity of the relationship between neuropsychology and rehabilitation of patients with sABI. They call for evidence-based validation in the coming years.

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