“Recovery of pre-morbid level of functioning after grade II diffuse axonal injury (DAI) following severe TBI”

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INTRODUCTION:

Diffuse brain injury is dependent on inertial forces, result of rapid head rotation, which deform the white matter and lead to DAI, with a characteristic multifocal pattern of damage, appearing in the subcortical white matter (WM) and in midline structures including the splenium of the corpus callosum and the brainstem. Histological studies have identified 3 grades of DAI according to its distribution, and subsequent work described the currently accepted imaging diagnostic criteria. Hence, grade I DAI shows lesions involving the parasagittal regions of the frontal lobes, the periventricular regions of the temporal lobes, and occasionally parietal, occipital lobes, internal and external capsules and cerebellum; in grade II there is an added involvement of the Corpus Callosum (CC), most frequently found in the posterior body and splenium; finally the brain stem is also affected in grade III DAI. DAI is associated with a poor outcome, in terms of mortality, disability and cognitive impairment. Among diffuse axonal injury patients, 43% do not survive, 9% suffer from a persistent vegetative state or major handicap and less than 50% are able to lead an independent life. Thus, cognitive sequelae after DAI are common, dominated by memory dysfunction and executive problems. Longer reaction times and greater effects of interference (Go/noGo and Stroop), decreased recall of new information, semantic fluency and impairment in non-verbal concept formation, have all been reported, with the memory deficits as result of executive problems. The impact of the widespread and chronic abnormalities in the WM on cognitive function depends not on its number and chronicity but on damage to key pathways that link nodes supporting high level cognitive functions.

AIM & METHOD:

AIM:

• We present the case of a 32 year old, right handed manager of a shipping company who was referred to our unit for neuro-rehabilitation after sustaining a severe traumatic brain injury in a road traffic accident, 13 days previously.

METHOD:

• Within 24 hours post-TBI a brain CT Scan and a brain MRI (T1, T2, FLAIR and DWI sequences) at 2 weeks were performed.

• The patient underwent full neuropsychological assessment, 14 weeks post-TBI, to evaluate:
  - His premorbid IQ, using the Test of Word Accentuation (TWA, Spanish) and the Vocabulary subtest of the Wechsler Adult Intelligence Scale III version (WAIS-III).
  - His current IQ was assessed using the WAIS-III full scale.
  - The Barcelona Test –revised version assessed his language ability.
  - Executive function was evaluated using the Stoop Test, Trail B and the Wisconsin Card Sorting Test (WCST).

• He was discharged home, 3 weeks after the RTA, with out-patient neuropsychiatric and neuropsychology follow-up:
  - Out-patient neuropsychiatric review took place at 6, 20 weeks post-TBI and by telephone at 6 months.

RESULTS:

• The patient made an excellent physical recovery with no neurological focal signs detected on discharge. The initial brain CT Scan was reported within normal range. Brain MRI (T2, FLAIR, DWI) revealed bilateral frontal hyperintensities in subcortical white matter (WM), anterior splenium, posterior corpus callosum (CC), left internal capsule extending to the cerebral peduncle and left dorsolateral mesencephalon, compatible with non-haemorrhagic diffuse axonal damage (grade II).

• Neuropsychiatric assessment found no evidence of neuropsychiatric or behavioural problems, only referring mild fatigue at 20 weeks follow-up. He gradually returned to his old job and was working full time at 6 months follow-up, referring improvement in his fatigue.

• STROOP test: Revealed high interference resistance, and performance in the “high” range in speed of Information processing, reading speed and selective attention.

• TRAIL “B” test: Revealed no attentional deficits detected.

CONCLUSION:

• Complete functional recovery after grade II diffuse axonal damage, although not a common occurrence, can be achieved.

REFERENCES: