Acute hemiplegia secondary to diffuse axonal injury after traumatic brain injury

Hemiplegia aguda secundária a lesão axonal difusa após trauma crânio-encefálico

Leonardo Abdala Giacomini†
Miguel San Martin Sepulveda†
Rodrigo Alves de C. Cavalcante†
Helder Tedeschi‡

† Resident of Neurosurgery, Division of Neurosurgery, Department of Neurology, Campinas State University (UNICAMP), Campinas SP, Brazil
‡ Professor of Neurosurgery, Division of Neurosurgery, Department of Neurology, Campinas State University (UNICAMP), Campinas SP, Brazil

RESUMO

A lesão axonal difusa (LAD) é uma das principais formas de lesão traumática encefálica, caracterizada pelo envolvimento das fibras axonais das fibras brancas cerebrais. O mecanismo dessa lesão é a somada de forças de aceleração, desaceleração e rotação, principalmente nas estruturas próximas da linha média, incluindo a região superior dorsal lateral da ponte e mesencéfalo, terço posterior do corpo caloso, substância branca parassagital e ocasionalmente a cápsula interna. Pela importância das estruturas envolvidas e a alta incidência, perto de 50% dos casos de trauma crânio-encefálico grave, a LAD é a principal causa e déficit cognitivo assim como estático vegetativo persistente associado ao trauma. Entretanto a presença de déficit motor associado a LAD é pouco comum sendo dependente da localização anatomática. O objetivo deste trabalho é descrever um caso de hemiplegia aguda relacionada a LAD.

Palavras-chave: lesão axonal difusa, trauma crânio-encefálico, déficit motor.

ABSTRACT

The diffuse axonal injury (DAI) is one of the main forms of traumatic brain injury, characterized by involvement of the axonal fibres of the white matter of the brain. The mechanism of such injury is the sum of forces of acceleration, deceleration and rotation, mainly in brain structures close to the middle line, including the dorsolateral superior region of the pons and midbrain, splenium of the corpus callosum, parassagittal white matter, and occasionally the internal capsule. Because of the importance of the structures commonly involved and its high incidence, close to 50% of cases of severe brain trauma, the DAI is a major cause of cognitive impairment as well as the persistent vegetative state related to trauma. However, the occurrence of motor deficit outside of this area is uncommon in literature, and it is obviously dependent on the anatomical region involved. The objective of this paper is to present a case of hemiplegia secondary to DAI.

Key-words: diffuse axonal injury, traumatic brain injury, motor deficit.

CLINICAL NOTE

ARM, 23 years-old, presented with trauma in the left frontoparietal region, and loss of consciousness after a bicycle accident. On admission to the emergency room of the Hospital das Clínicas da UNICAMP, he presented with psychomotor agitation, and no apparent movement of the left side of his body. On initial examination he showed 13 points in the Glasgow Coma Scale (best motor response: 6, best verbal response: 3, best visual response: 4), pupils isochoric and photo-reactive, and left hemiplegia as well as Babinski sign and clonus on the affected side. There was no evidence of sensory deficits. Initial laboratory tests showed no abnormalities.

A Computerized Tomography of the brain (CT) performed at admission showed a hyperdense lesion, apparently located in the right posterior limb of the internal capsule and left frontotemporo-parietal subgaleal edema (Fig 1).
Six days after the event, the patient was submitted to magnetic resonance imaging of the brain (MRI) showing in T2 a hemorrhagic injury in the right posterior limb of the internal capsule (Fig 2).

Once the patient was admitted he was under clinical observation, proceeding with lessening of mental confusion around 36 hours after the trauma event, showing at this time Glasgow Outcome Scale-15, but maintaining the left hemiplegia without sensory abnormality.

**DISCUSSION**

The range of neurological alterations caused by the DAI vary according to the affected anatomical areas. As shown in this case report, the presence of a single lesion shown on CT and MRI to be located in the posterior limb of the internal capsule, despite little change in the level of consciousness, was capable of producing a significant motor deficit reflected in pyramidal tract signs (motor deficit with spasticity, augmented reflexes, Babinski sign and clonus).

DAI is defined as a traumatic injury with changes in level of consciousness that last for more than 6 hours. It can be classified as mild, of low incidence with coma duration of 6 to 24 hours; moderate, lasting over 24 hours but without significant impairment of brain stem, being this one the most common; and severe where there is clear impairment of brainstem functions (about 36% of the cases) mostly as a result of car accidents, developed with prolonged period of coma of variable spectrum1,6,7. Taking into account the clinical history, neurological examination and evaluation of the images of this patient, we can classify this as moderate DAI, since approximately 36 hours after the trauma the patient presented only with left hemiplegia as the only alteration on neurological examination. After 10 days of hospitalization, the patient was discharged in good clinical condition but without improvement in the motor deficit.

The presence of visible injuries in the initial CT in cases of DAI is clearly dependent on the extent of the injuries, with about 20 – 50 % of cases already presenting initial alterations3,9. CT in this case demonstrated the presence of a punctiform lesion in the right posterior limb of the internal capsule. Although there were no other obvious changes, a MRI was performed, due to its superior sensitivity to detect punctiform lesions3,6,9. MRI clearly showed the lesion previously seen on CT, mainly in T2 and FLAIR showed cerebral edema, without other changes in brain tissue. DAI is detected in almost 90 % of cases of MRI showing greater sensitivity in T2-weighted and FLAIR9. Radiological correlation with the neurological examination of the patient is important in relation to the issue of the topography of the lesion, explaining the motor deficit in a more coherent way.

Although the definitive diagnosis of DAI is dependent on histopathological data, the current neuroimaging technologies, particularly MRI can adequately demonstrate particularly small lesions3. The injury seen in the patient in this case report, although present on CT, was better visualized on MRI, demonstrating specific involvement at the level of the right posterior limb of the internal capsule, thus explaining the deficit presented by the patient. No lesions were seen in the areas usually involved in DAI, such as the brain stem and corpus callosum, which correlated well with the minor alteration in state of consciousness and the rate of recuperation. We conclude that there are situations MRI is an important tool for evaluation of lesions in cases of alterations in consciousness and motor function as a result of DAI.
REFERENCES


CORRESPONDING AUTHOR

Dr. Hélder Tedeschi
Rua Mato Grosso, 128 / Conj 71
01239-040
São Paulo SP - Brasil
E-mail: hekamarated@mail.com