FUNCTIONAL BRAIN STUDY OF CHRONIC TRAUMATIC HEAD INJURY

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ABSTRACT:

Explosive aggressive behaviour is a significant clinical and medico-legal problem in patients suffering from head injury. However, experts in neuropsychiatry have proposed a specific category for this disorder: the "organic aggressive syndrome.". The basic reason for proposing this diagnosis is that it describes the specificity of the violent conduct secondary to "brain damage" with greater precision.

Early diagnosis and treatment of the injury is critical. The impact of technetium-99m-hexamethylpropeluleneamine oxime (HMPAO) was examined for measuring brain damage in correlation to neuropsychological performance in patients with traumatic brain injury (TBI).

We thus report the case of a twelve-year-old child with a history of CET, who presents with serious episodes of heteroaggressiveness and suggest the usefulness of single photon emission computerized tomography (SPECT) to establish the validity of this psychiatric diagnosis. The appearance of modern functional neuro-image techniques (SPECT) may help to increase the validity of clinical diagnoses in the field of psychiatry in general and of forensic psychiatry in particularly, as the related findings may be used as demarcation
INTRODUCTION:

In the industrialized countries, physical injury and in particular cranioencephalic trauma (CET), is a significant clinical and social problem of epidemic proportion. According to Kraus (1), epidemiological studies on this pathology are incomplete, since none of them groups all CET patients within a defined population; however, in general it is considered that the annual incidence in the developed countries is from 200 to 300 per 100,000 inhabitants. In the different epidemiological studies, it has been found that the percentages of affected patients of pediatric age is around 20%; the accidents are mainly car crashes and sports falls (bicycles, skate-boards ...) involving a bang on the head in movement on a static surface.

Brain damage caused by head injury can have dramatic consequences for those affected; it has been reported in prospective studies that children with a history of CET suffer from twice as many psychiatric and cognitive disorders as controls (2). It has also been reported that CET patients, in particular very serious cases, make normal personality development more difficult, leaving people with serious deficits in areas such as introspection, planning, social judgment, emotional control, empathy and reasoning (3).

Furthermore, post-traumatic neuropsychiatric pathology appears as a great variety of disorders for which psychiatry imports terms and categories pertaining to the study of other groups of patients. This is a controversial subject in the field of the nosology of mental illness in general and therefore also in psychiatric disorders that arise in infancy, childhood or adolescence.

MATERIAL

CASE REPORT: We are dealing with a 12-year-old child who was involved in a serious traffic accident (he was knocked down by a bus) in April, 1992, and remained in coma (score of less than 8 on the Glasgow Scale) for two days, and in a state of confusion (duration of the post-traumatic amnesia period) for one month. Since then, the child has presented with episodes of heteroaggressiveness of the following kind: explosive, sudden, triggered by the slightest provocation, out of proportion with the trigger factor, unpredictable and surprising for those who surround him, unstructured, recurring and generally with an abrupt beginning and end. The crises have been almost entirely restricted to the school environment, triggered by small provocations on the part of his companions. The intensity, frequency and seriousness of these episodes have given rise to problems of school and social adaptation, causing him to be expelled from three schools and remain for a considerable time without schooling. His behaviour outside the school context, at home or in social interaction with friends who are aware of his problem, is fairly acceptable, with the occasional appearance of the crises referred to.

METHOD

In the general psychopathological exploration, no alterations in the general behaviour of the patient in the relation with the health personnel and his
parents have been observed. His affectivity, language, thought content, abstraction and judgment, motivity and ability to direct his activity towards a final goal are normal, although he is seen to be concerned about the consequences of his conduct. In the exploration of hyperkinetic activity using the Werry-Weis-Peters activity scale, the parents report that since the accident the child is somewhat more active; however he is capable of carrying out activities (eating, playing, studying, watching television ...) without interruption, he does not interrupt conversations, nor does he need supervision. After the accident the presence of moderate post-traumatic hypersomnia has also been observed. In the cognitive exploration by means of the W.I.S.C battery he obtained a verbal I.Q. of 128, a manipulative I.Q. of 124, for an overall I.Q. of 126. In the complementary explorations performed the following findings were obtained: EEG: normal; Cranial Tomography: normal; and in the SPECT (Single photon emission computerized tomography) performed with HMPAO-Tc 99 a slight hypocapture was observed in both prefrontal zones, becoming more acute in the left hemisphere (Figures 1 and 2).

The patient had been treated by means of behavioural techniques (positive reinforcement, extinction and differential reinforcement) for a year without achieving control of the aggressive episodes. In the past months a decrease in the frequency of the crises has been achieved by means of strict control of the environmental contingencies in the school atmosphere. In accordance with the family's wishes, none of the possible pharmacological treatments indicated in the treatment of this kind of aggressiveness has yet been tried.

DISCUSSION:

The neurologist Frank Elliot is the author who has devoted most time to the study of the association between "brain damage" and the appearance of isolated or repeated episodes of loss of control and disproportionate and unusual violent behaviour without any relation with a possible trigger stimulus (4). In 1982, this author published the results of a study of a sample of 286 patients with a history of recurring aggressiveness, describing how in 94% of cases the existence of brain damage was observed (5).

In the case presented there is a clear time relation between the presence of "brain damage" and the appearance of episodic violent behaviour. Furthermore, the clinical characteristics of these episodes coincide with those described in the aggressiveness associated with cerebral or "organic" lesions (6). These characteristics are as follows: the episodic nature and the sudden appearance, usually without being preceded by external signs of tension or irritability; being triggered by the slightest provocation and surprising for those surrounding the patient. The episodes are intense, unstructured, recurring,
well delimited in time, and generally with an abrupt beginning and end; "organic" aggressiveness is also typically "egodistonic", that is, after each episode, the patient is calm and does not sincerely regret the consequences of his conduct. All these characteristics associated with impulsive aggressiveness distinguish it from planned or premeditated aggressiveness in which there is a time lapse between the planning of the aggressive conduct, which has an apparent aim, and its implementation (7).

From the nosological viewpoint, these disorders have received different names: "episodic dyscontrol"; "explosive personality"; "episodic behavioural disorders"; "dyscontrol syndrome" ... This terminological ambiguity has been maintained in the different mental disorder classification systems; thus, in DSM-III this disorder was conceptualized as an "intermittent explosive disorder" (IED) and it was mentioned that brain damage was a fairly frequent predisposing factor for this alteration, which contrasted with the clinical experience that indicated that organic factors seem fundamental in the etiopathogeny of this syndrome. In DSM-III-R and DSM-IV this disorder is included within "organic disorders and syndromes" with the denomination of "organic syndrome of the personality, of the explosive type" and "personality change due to a clinical illness, of the aggressive type". This inclusion may be submitted to the following criticism, among others: from the perspective of the phenomenological description of the clinical picture of this kind of disorder, especially when, as is our case, it is not associated to other behavioural disorders in the period between the aggressive episodes, it coincides with the operational definition which the successive classifications of mental disorders made by the APA have made of "intermittent explosive disorder" Nonetheless, this diagnosis is not applicable in this case, since the presence of a clinical illness, brain damage, is one of the exclusion criteria for the diagnosis. On the other hand, the diagnosis of "personality change due to a clinical illness of the aggressive type" is questionable since the associated violent behaviour in the intercritical phase is not among the features included in the operational definition of this clinical condition. These arguments, derived from the clinical characteristics of the case presented, support those of Silver and Yudofsky in the sense that they conceptualize the "organic aggressive syndrome" as an isolated entity within the organic mental disorders. For this purpose they present the following arguments: a) aggression may appear in an isolated fashion without being associated to the rest of the symptoms included in the operational definition of the organic personality syndrome (8); and b) the appearance of aggressive behaviour may be secondary to the brain injuries of different location, with a cause-effect relation between these and the appearance of the aggressive behaviour (9).

Furthermore, the case reported contributes the viewpoint of etiopathogeny; without losing sight of the biopsychosocial nature of the violent behaviour, it contributes the findings obtained through the SPECT study, which coincide with the theoretic knowledge on the subject as regards the inhibiting and regulating role of the prefrontal cortex on human aggressiveness (10,11). In this sense it is worth noting that the appearance of modern functional neuro-image techniques (SPECT and PET) (12-15) y help to increase the validity of clinical diagnoses in the field of psychiatry (16) in general and of forensic psychiatry (17, 18) in particularly, as the related findings may be used as demarcation criteria to establish syndromic diagnoses, which, as in the case of "intermittent explosive disorder" are maintained with substantial theoretical reservations. Regarding this condition, one must remember that in the limited amount of studies performed using the diagnostic criteria of TEI, such as that of Felthous et al. (quoted by Wise and Tierney) (19), these neuro-image techniques have by no means discarded the presence of a dysfunction of the Central Nervous System (20).
BIBLIOGRAPHY.


FIGURE 1 and 1a: Brain SPECT demonstrated a bilateral diminution of the blood flow
at the prefrontal areas.
FIGURE 2: Tridimensional reconstruction.