

Neuropsychological Outcome After Traumatic Temporal Lobe Damage

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Summary

The most frequent sequelae after severe brain injury include changes in personality traits, disturbances of emotional behaviour and impairment of cognitive functions. In particular, emotional changes and/or verbal and non verbal dysfunctions were found in patients with bilateral or unilateral temporal lobe lesions. The aim of our study is to correlate the localization of the brain damage after severe brain injury, in particular of the temporal lobe, with the cognitive impairment and the emotional and behavioural changes resulting from these lesions.

The patients with right temporal lobe lesions showed significantly better scores in verbal intelligence and verbal memory in comparison with patients with left temporal lobe lesions and those with other focal brain lesions or diffuse brain damage. In contradistinction, study of the personality and the emotional changes (MMPI and FAF) failed to demonstrate pathological scores in the 3 groups with different CT lesions, without any significant difference being found between the groups with temporal lesions and those with other focal brain lesions or diffuse brain damage.

The severity of the brain injury and the prolongation of the disturbance of consciousness could, in our patients, account for prevalence of cognitive impairment on personality and emotional changes.

Keywords: Brain injury; temporal lobe lesions; neuropsychological outcome.

Introduction

Changes in personality traits, disturbances of emotional behaviour and impairment of cognitive functions after severe brain injury are recognized as the most important factors for insufficient social integration of the patients (Brooks 1972, Bond 1975, Jocheim 1975).

According to the clinical observations, the main problems are the lack of emotional control and adjustment, the enhancement of premorbid personality traits along with the intellectual impairment.

Emotional disorders are often observed as a transient or persistent syndrome, in the remission phase

after severe brain injury. In particular some authors have described persistent emotional changes in humans, after bilateral temporal excision, in association with behavioural alterations such as apathy, affective disorders and short term memory disturbances (Scoville 1957, Tazran 1958, Brierly 1960).

Such personality changes have not been observed in patients with unilateral temporal lobe lesions where, on the contrary, cognitive disorders were found. Milner *et al.*, in fact, demonstrated non verbal memory dysfunction after right temporal lobe lesions, whereas left temporal lobe lesions showed a reduction in verbal memory performance and verbal intelligence (Milner 1968, Beaumont 1983, Perret 1973, Milner 1972).

The aim of the study was to correlate the localization of the brain damage after severe brain injury, in particular of the temporal lobe, with the cognitive impairment and the emotional and behavioural changes resulting from these lesions.

Material and Methods

We studied 48 patients aged from 15 to 50 years (mean age: 22 yrs.), who had suffered severe brain injury and recovered from a traumatic apallic syndrome or prolonged midbrain syndrome (Gerstenbrand 1967), with a good clinical remission until the defect stage (Gerstenbrand' classification).

All the patients suffered post-traumatic disturbances of consciousness lasting from 3 weeks to 2 months with Innsbruck Coma Scale (Gerstenbrand 1982) score ranging from 15 to 20, corresponding to a Glasgow Coma Scale ranging from 3 to 9.

As inclusion criteria all the patients had to be able to perform a complete neuropsychological examination.

Exclusion criteria included the admission to a psychiatric hospital prior to the head injury, the surgical evacuation of the lesions in the post-traumatic acute phase and the presence of late sequelae such as communicating hydrocephalus and post-traumatic epilepsy.

The patients were studied 12 to 24 months (mean: 16 months) after the brain injury.

Out of the 48 patients, the 23 who sustained temporal lobe lesions (10 right, 13 left) were compared with 25 patients who suffered other focal brain lesions or diffuse brain damage.

The localization of the lesions was based on CT findings. CT scan images were independently judged by 3 different neuroradiologists, unaware to patients' identity. When disagreements among the 3 were found, patients were not included in the study. The psychological examination was performed by means of the following tests:

WIP (reduced Hamburg Wechsler Adult Intelligence Scale), consisting of the 4 subtypes:

1. General Knowledge (GK)
2. Similarities (S)
3. Picture completion (PC)
4. Block design (BD).

Values lower than 50 were considered as pathological;

Benton (BT), multiple choice form: for the evaluation of the visual retention; Values lower than 13 were considered as pathological;

WMS (Wechsler Memory Scale) with the subtests:

1. Logical Memory (LM)
2. Digit Span
3. Associated Learning.

Values lower than 85 were considered as pathological;

MMPI (Minnesota Multiphasic Personality Inventory), abbreviated form with 249 items. Values higher than 54 were considered as pathological, and values higher than 70 were considered severely pathological;

FAF (Fragebogen zur Erfassung von Aggressivitätsfaktoren): as Aggression Scale. Values higher than 6 were considered as pathological.

The last two tests were performed on the Vienna Computer-testing System.

The statistical analysis was performed by means of the following tests: Kruskal Wallis, Chi Square test, Wilcoxon and the Multiple Analysis of the Variance.

Results

All patients but one were living with their families, but unable to continue working.

We divided the patients into 3 groups according to the different brain lesions: 1. right temporal lobe lesions; 2. left temporal lobe lesions; 3. other focal brain lesions or diffuse brain damage.

None of the patients studied had pure bilateral temporal lobe lesions, but associated with other focal brain lesions or diffuse brain damage and therefore included in the third group.

The severity of the injury documented by the Innsbruck Coma Scale was similar in all 3 groups; the age and the education of the 3 groups were also comparable.

The patients with right temporal lobe lesions showed significantly better scores in verbal intelligence and verbal memory in comparison with the other 2 groups. In particular, the patients with right temporal lesions obtained the best results, while those with left temporal lesions obtained the lowest scores in the 2 subtests of the Wechsler Adult Intelligence scale (WIP): General Knowledge (GK) and Similarities (S) (Table 1).

Similarly, the analysis of the verbal memory showed the best scores for the patients with right temporal lesions and the worst in the group with left temporal lesions in the Logical Memory subtest of the Wechsler Memory Scale (WMS) (Table 2).

Table 1. *Wechsler Intelligence Scale (reduced form)*

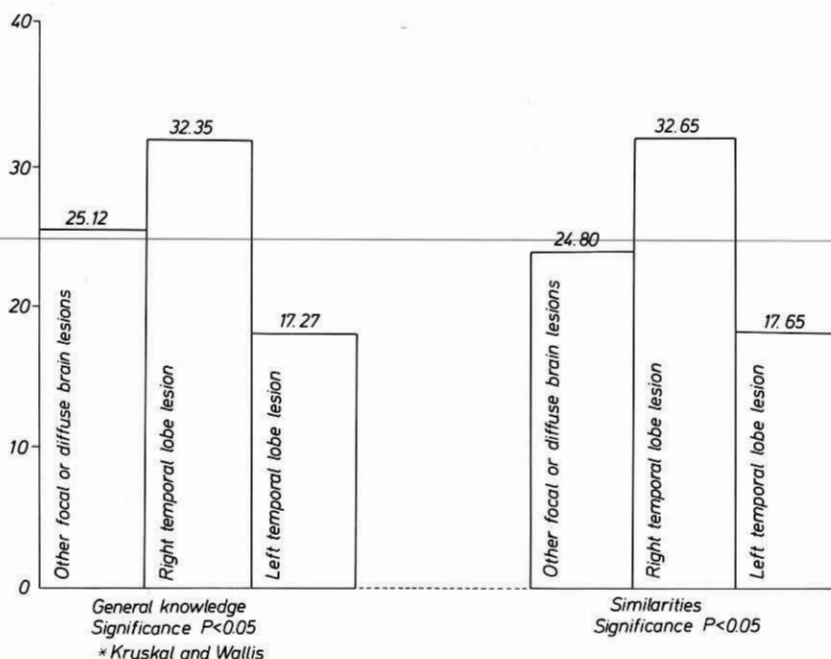
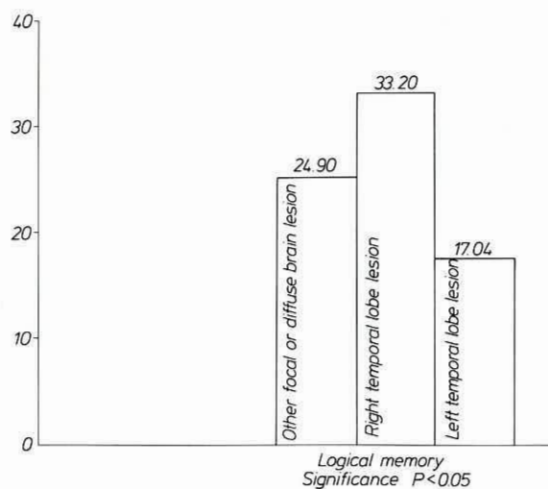


Table 2. *Wechsler Memory Scale*

On the contrary, the evaluation of the visual memory, performed by means of the Benton test and the Performance IQ (Picture completion and Block design) did not show any significant difference among the 3 groups of patients.

Finally, study of the personality and the emotional changes (MMPI and FAF) failed to demonstrate pathological scores in the 3 groups, without any significant difference being found between the groups with temporal lesions and those with other focal brain lesions or diffuse brain damage.

Discussion

The neuropsychological sequelae after severe head injury have often been described as more disabling than the physical sequelae, in that cognitive and behavioural disorders most commonly restrict the social integration of the patients (Brooks 1986, Jennet 1981, Teasdale 1984, Thomsen 1984).

The prognostic importance of the different focal brain lesions have been widely discussed in the literature. In particular the transient post-traumatic Klüver-Bucy syndrome (Gerstenbrand 1971) and Luria's frontal lobe syndrome (Luria 1963) have been described as depending on localized lobe damage. More recently some authors have challenged the influence of focal brain lesions on the incidence of some organic brain syndromes, concluding that such syndromes could arise only under conditions of more global cerebral dysfunction (Canavan 1985).

It is well known that bilateral anterior temporal lobectomy could be responsible for emotional, mood and behavioural changes consisting of apathy and loss

of interest along with short term memory disturbances (Scoville 1957, Tazran 1958, Brierly 1960). Nevertheless, personality and cognitive changes have been described only in a few cases after unilateral temporal lobe lesions (Beautmont 1983, Perret 1973, Milner 1972, Williams 1969).

According to Perret (Perret 1973), we also found a significant cognitive impairment in verbal intelligence and verbal memory in patients with left temporal lesions without any changes in personality and emotional traits. On the contrary, we found no change in visual memory and IQ performances in any of the patients, as has instead been previously described by other authors (Beautmont 1983, Perret 1973, Milner 1970).

Interestingly enough, the patients we studied had all suffered severe brain injury with prolonged disturbance of consciousness such as prolonged midbrain syndrome or apallic syndrome, using Gerstenbrand's classification (Gerstenbrand 1967).

The severity of the brain injury could, in our opinion, account for the higher frequency of cognitive impairment than that of the personality and emotional changes.

In fact, a global cerebral dysfunction could also be hypothesized in our patients, as suggested by Canavan (Canavan 1985), although significant differences in the cognitive impairment were found in patients with different focal or diffuse brain lesions.

In conclusion, from our results we can suggest that traumatic right temporal lesions could lead to a better prognosis, with respect to social integration, than those with other focal or diffuse brain damage, whereas left temporal lesions have shown the greatest neuropsychological impairment with the lowest scores in most of the cognitive functions.

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