

HALLUCINOSIS FOLLOWING HEAD INJURY

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SUMMARY

Eleven patients who evinced hallucinations during the early recovery after head injury were studied in detail in comparison to the head injured controls. All of them had suffered from acceleration injuries. Among the clinical variables, post traumatic amnesia was significantly longer in these patients. Length of PTA was found to be correlated with duration of occurrence of hallucinations. Severity of coma, skull fracture, early seizures and alcohol dependence were not discriminatory between the hallucinated patients and the controls. The disorder tended to be self-limiting and patients recovered without the aid of psychopharmacological measures. Theoretical significance of the findings are discussed in the context of recent literature on head injury.

Hallucinations of any modality can occur during the recovery from head injury. Kleist (1934, quoted by Achte et al., 1969) described hallucination-like symptoms due to elementary cortical stimulations and opined that they were a part of the psychoses following brain injuries. Achte et al. (1969) in their follow-up of 3552 Finnish war victims, observed eight cases of hallucinosis with no other psychotic symptoms. But, their study was on patients during the late follow-up. Fahy et al. (1967) discussed about three patients with paranoid-hallucinatory symptoms, but, the patients were seen six years after the injury. Levin et al. (1982) noted that data bearing on the relative frequency of auditory, visual and tactile hallucinations were unavailable. The present study concerns with hallucinosis occurring in the early stages of recovery from head injury.

MATERIALS AND METHODS

The study was conducted in the Trauma Ward, Department of Neurosurgery, Govt. Rajaji Hospital, Madurai. A total of 174 patients admitted between Sept. 1984 and July 1985 were prospectively followed up daily during their hospital-stay by the psy-

chiatrist, along with the neurosurgery team. Patients were chosen for the present study if they satisfied the following criteria. :

- i. Hallucinations of any modality should be present in an alert individual, during the early recovery phase.
- ii. Hallucinations which were a part of post traumatic delirium were excluded. There were 20 such patients.
- iii. Hallucinations which were a part of post traumatic functional psychoses were left out. Thus, one patient with atypical psychosis was excluded.

Eleven patients were included as evincing features of hallucinosis. The following definitions were used in the comparison of clinical features.

- i. Severity of coma was defined by the length of time after injury when the patient reaches a Glasgow Coma Scale score of eight (Giannotta et al., 1982.)
- ii. Post traumatic amnesia was defined as the lapse of the time after the injury when the patient regained continuous memory (Jennett, 1977).

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- iii. Alcohol dependence was defined according to DSM III criteria (APA, 1980).
- iv. The modes of injury were classified on biomechanical principles as acceleration injuries and contact injuries (Gennarelli and Thibault, 1985).

The dynamics and pathophysiology of contact injuries are vastly different from those of acceleration injuries and all patients with hallucinations had suffered only acceleration injuries. Hence, 59 patients with contact injuries were not included as controls, and controls consisted of the rest of patients with acceleration injuries who did not suffer from hallucinations, defined as above. There were 104 control patients, against whom the clinical variables were compared.

Appropriate statistical methods were used in analysis of the data.

RESULTS

Unlike the predominantly visual hallucinations of the delirious state, those of the subacute phase were mostly auditory. Ten of the 11 patients suffered from auditory hallucinations, three had visual hallucinations and one evinced tactile hallucinations. All those with auditory hallucinations complained of phonemes. Two patients reported hearing the voices of dead relatives, three of known persons and the rest could not 'identify the owner of the voice'. Four of them described the voices as continuous and the rest experienced them as intermittent. The voices were described as commanding in six of the patients and threatening in three of them. In two patients, the voices kept commenting about their activities, in another two, the voices were conversing and in one, the voices mocked at him. None of them had audible thoughts. Other types of noises, such as those of barking of dogs in one patient, were occasionally noted.

Visual hallucinations consisted on known

people and occasional frightening figures. The only patient with tactile hallucinations described his being beaten up with a stick, particularly when he was about to sleep. Sleep related perceptual problems were seen in five other patients. Hallucinations evoked a sense of fear and anxiety in all patients and two patients ran away from the wards in response to the voices. Retrospective falsification was seen at times; one patient after hearing the voices of his dead brother, denied that he had ever died. Insight about the nature of the disorder was totally lacking in all patients.

Hallucinations emerged two to eight days after the injury and the duration of their occurrence ranged from 2 to 28 days, with a median of 20 days. They reduced in their frequency before their eventual disappearance. Auditory hallucinations in three patients and visual hallucinations in two patients persisted a little beyond the PTA period. Ages of patients with hallucinations ranged from 19 to 61 years, with a median of 25 years. Only three patients were above 30 years. All of them were males. Comparison of clinical variables with those of controls was as given in Table 1. Neurological deficits were seen in the right side in two patients and in the left side in the other two. Among the controls, the deficits were on the right side in 10 patients, on the left side in five patients, and bilateral in two. Side of the neurological deficits among the hallucinated patients was not statistically different from that of the controls ($\chi^2 = 0.001$; *d. f.* = 1; N.S.). Duration of coma in the hallucinated group ranged from 1 hour to 22 hours, with a median of three hours. Only two patients suffered from a coma of more than 10 hours. Post traumatic amnesia was not measurable in four patients; one in the hallucinated group and three among the controls. Among the former group, PTA ranged from 2 to 45 days, and their mean PTA was significantly

TABLE 1. Comparison of clinical variables of hallucinated patients and those of controls

| | Hallucinated patients (n=11) | Control group (n=104) | Statistical significance |
|---|------------------------------|-----------------------|--------------------------|
| Age : | | | |
| Below 30 years | 8 | 51 | p=0.26 |
| 30 to 45 years | 2 | 29 | |
| Above 45 years | 1 | 24 | |
| History of alcohol dependence* : | | | |
| Present | 6 | 33 | X ² =1.40 |
| Absent | 5 | 71 | |
| Cause of head injury** : | | | |
| Traffic accident | 10 | 76 | p=0.009 |
| Fall from height | 1 | 28 | |
| Assault | 0 | 51 | |
| Others | 0 | 8 | |
| Severity of coma*** : | | | |
| Mild | 3 | 35 | p=0.56 |
| Moderate | 4 | 31 | |
| Severe | 3 | 25 | |
| Fracture of skull : | | | |
| Present | 4 | 33 | p=0.47 |
| Absent | 7 | 71 | |
| Neurological deficit : | | | |
| Present | 4 | 17 | p=0.11 |
| Absent | 7 | 87 | |
| Early seizures : | | | |
| Present | 0 | 9 | p=0.39 |
| Absent | 11 | 95 | |

*Test refer either to Chi-square test with Yate's correction or Fisher's Exact Probability.

**Acceleration injuries (traffic accidents and falls) were compared against contact injuries (assaults and others) in 2X2 contingency table.

***Severity of coma was considered only in patients with acceleration injuries in whom Glasgow Coma Scale was applicable.

longer than that of the controls ($t = 2.92$; d. f. = 109; $p < .01$). Duration of hallucinations, measured from their first occurrence to their eventual disappearance, was found to correlate significantly with the length of PTA

(Spearman's $r = 0.91$; $N = 10$; $p < .01$), but not with the duration of coma (Spearman's $r = 0.52$; $N = 10$; N. S.).

DISCUSSION

Detailed observations on the hallucinations during the early recovery period are relatively sparse. Levin and Grossman (1978) in their study of behavioural sequelae of closed head injury with BPRS, grouped hallucinations with conceptual disorganization and unusual thought content. Hallucinations were reported in nearly one-half of the patients with post traumatic psychoses (Levin et al., 1982). Bond (1985) described hallucinations and delusions as less common patterns of disturbed mental functions, observed during the early recovery phase. Among the three cases described, two resolved without any pharmacological intervention.

The neurological basis of the hallucinations had been attributed to both focal and diffuse pathology. Lipowaski (1975) classified organic hallucinosis under 'selective brain syndromes', which pointed to focal rather than diffuse cerebral pathology, and thus, had a limited localizing diagnostic value. But, in the present study, none of the 59 patients with contact injuries evinced hallucinations. Occurrence only in relation to closed head injuries with acceleration-deacceleration deformations, indicated that diffuse cerebral pathology was more significant. No consistent neurological deficit was seen in the patients with hallucinations and those which were present could not be specifically lateralized or regionalized. Toxic, metabolic and other diffuse disturbances had been described as related to organic hallucinosis (Benson and Geschwind, 1975; Fauman, 1983). Though aetiological relation to alcohol dependence might be assumed from a metabolic angle, lack of significant association made the possibility untenable.

The prolonged PTA in the hallucinated patients in comparison to the controls indicated that their neuropsychological disorganization (of which memory is only one function), was fairly severe. The disappearance of hallucinations was phenomenologically related to the recovery of insight. Differentiation of internal stimuli from the external events was a part of the reality judgement (Bellak et al., 1973). Neuropsychological recovery of the 'psychotic component' enabled the reorganization of normal reality testing, and hence, of normal perceptual processes, resulting in the eventual disappearance of the hallucinations. Significant correlation between the duration of occurrence of hallucinations and the length of PTA pointed to an element of commonality of their recovery processes, either in terms of physiological recovery or merely in the temporality of the events. The association suggested that like amnesia, abnormal perception was anatomically related to the diffuse injury.

It was observed that phenomenologically, hallucinations of the early recovery phase were indistinguishable from those of functional psychoses, except that they were self-limited. None of the patients in the present study were treated with psychopharmacological measures, and yet, none of them ended up with residual perceptual disorders, as in the cases reported by Bond (1985).

Hallucinoses during the early recovery phase represented temporary dyscontrol of higher order perceptual synthesis and the outcome in the present study indicated that the dyscontrol was self-limited and spontaneously recovering.

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