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Inverse Correlation of Incidence Between Headache and Mental Impairment After Traumatic Head Injuries

Michio Yamaguchi and Taigou Yamada

A statistical study was performed using Chi square test on 371 patients, each of those claimed compensation for the various sequelae of the work-related head injury. Head injury was classified as the following two groups: Severe head injury (duration of coma for 6 hours or more in the accident, and/or long-term existence of neurologic deficit) and mild head injury (alert or had brief unconsciousness for less than 6 hours and non existence of neurologic deficit). The author interviewed all patients with neurological examination and routine checking of X-rays and CT (sometimes EEG and MRI were added). Additional psychological tests or interview by a psychiatrist were ordered in case of need. Dementia, severe memory disturbance, or personality change were considered to be mental impairment. As a result, incidence of headache was high in mild head injury group and low in severe head injury one: 167/223, and 76/148, respectively (p < 0.001). Incidence of mental impairment was low in mild head injury group and high in severe head injury: 11/223 and 81/148, respectively (P < 0.001). Incidence of mental impairment in headache group was 50/243 and that in non-HA group was 42/128 (P < 0.01). An inverse correlation was proved between incidence of headache and that of mental impairment. Moreover, the group of severe head injury was subdivided into diffuse axonal injury (DAI) and focal contusion. Incidence of headache in DAI was 37/56, and that in focal contusion was 21/51 (P < 0.02). Incidence of mental impairment was low in DAI and high in focal contusion: 27/56 and 38/51, respectively (P < 0.02). These results might be due to (1) the relation of posttraumatic complaint and compensation after the work-related head injury, and (2) the poverty of the psychological energy in severely head-injured patients.

Key words
Mental impairment, Headache, Head injury, Sequelae

INTRODUCTION

The incidence of posttraumatic headache in the patients with mild head injury is higher than that with severe head injury. To explain this paradoxical result, the participation of mental impairment was examined in this study. And also, the relation between types of severe head injuries and incidence of headache in addition to that of mental impairment was investigated.

MATERIALS AND METHODS

From July 1985 to January 1990, one of the authors have interviewed 371 patients who claimed compensation for the sequelae of work-related
head injury. They were ordered by the personnel of insurance system to visit an official place for an evaluation of their disabled condition.

Almost all patients could visit on foot the outpatient clinic of Neurosurgery Department of Kobe University Hospital or the local branch offices of Japanese Labor Department. After the history taking and the neurological examination, the skull and neck X-rays and cranial CT (sometimes EEG and MRI) at the initial and final (at the plateau level) stages were carefully reviewed.

1. Classification of Head Injury

The classification of head injury was based on the length of coma, the initial CT findings, and clinical condition. All patients were divided into severe head injury and mild head injury groups.

**Severe Head Injury**

Patients of severe head injuries were defined to have had coma for 6 hours or more and/or have long term neurologic deficit caused by traumatic brain injury.

The severe head injury group was divided again into 3 subgroups by the definition of Gennarelli's classification\(^3\): diffuse axonal injury (DAI), focal contusion, and the epidural or the acute subdural hematomas. However, cases of intracranial hematomas were excluded from this study, because the sample size of hematomas was not large enough to compare with those of DAI or focal contusion.

Since the traumatic case of the pure intracerebral hematoma without any parenchymal contusion could not be exist practically, all intracerebral hematoma cases in this series were classified into focal contusion group.

**Mild Head Injury**

The each case of mild head injury was to have been alert or had a brief unconsciousness (<6 hours) by the accident, and to have no residual neurologic deficit. Almost all cases in this group had the so-called cerebral concussion. Some had the laceration or the contusion of the scalp without long (6 hours or more) unconsciousness. In this mild head injury group did not include DAI, focal contusion, or hematoma practically, because of their definition.

2. Definition of Mental Impairment

Additional psychological tests or consultation by a psychiatrist were ordered if necessary. Dementia, severe memory disturbance, or personality change was considered to be mental impairment.


Chi square test was used for statistical analyses of data. Statistical significance was accepted where \(P<0.05\).

RESULTS

As shown in Table 1, incidence of headache was high in mild head injury group and low in severe head injury: 167/223, and 76/148, respectively. Statistical significance was proved by Chi square test (\(P<0.001\)).

Incidence of mental impairment was low in mild head injury group and high in severe head injury: 11/223 and 81/148, respectively (\(P<0.001\)). This easily acceptable result was shown in Table 2.

Incidence of mental impairment was compared using Chi square test in the
groups with or without headache. Fifty patients were mentally impaired in 243 cases of headache group (20.6%). While, 32.8% of no-headache group were found to be mentally impaired (42/128 cases). As shown in Table 3, the incidence of mental impairment in headache group was significantly different from that in non-headache group (P<0.01).

A negative (or inverse) correlation between incidence of headache and that of mental impairment (less mental impairment in headache group and more mental impairment in no-headache group) was, hereby, proved on 371 head-injured cases.

DAI and focal contusion in the severe head injury group were studied on incidence of mental impairment and/or headache. Incidence of headache in DAI was 37/56, and 21/51 in focal contusion (P<0.02). Cases with headache were more found in DAI group when compared with focal contusion as shown in Table 4. On the other hand, incidence of mental impairment was, as shown in Table 5, low in DAI and high in focal contusion: 27/56 and 38/51, respectively (P<0.02).
DISCUSSION

In severely head-injured group, the incidence of traumatic headache reduced inversely as shown above. Wilkinson and Gilchrist described the similar result.\textsuperscript{1} The similar tendency was also reported using smaller sample size\textsuperscript{2}. In that work, it was reported, as the incidence of headache, that 65 cases out of 121 patients suffered from headache. Annoni et al\textsuperscript{4} also described that the half of the survivors from head injury with neuro-radiologically visible lesion had headache. On the other hand, Yamaguchi experienced previously that only 20 cases out of 108 individuals of very lightly injured samples had headache after trauma.\textsuperscript{5} Patients in this report showed no abnormalities in CT scan. Almost all accidents had been involved in daily civilian's life. Those mild headache disappeared within 3 weeks after each accident. However, the victims involved in work-related accidents which happened full-insurance by employer or government gave different results as reported previously.\textsuperscript{2} Miller laid stress on a relation of posttraumatic complaint and compensation.\textsuperscript{6} By Packard et al\textsuperscript{7}, 65 % of patients with mild head injury had cognitive impairment. Those individuals complained of lack of concentration, memory disturbance, and/or disturbed thinking. If mildly injured cases with continuous posttraumatic headache faced individual psychosocial problem, each possible cognitive impairment of light grade might present more complicated state like neurotic reaction.

The reason why the severely head-injured patients complained less headache than the mildly injured ones remains unclear. As a possible explanation, the psychological energies could be less in the severely injured patients. They might not keep complaining of their own headache persistently. While, the mildly injured individuals could express their complaints freely and easily because their psychological energies were still plentiful in the less damaged brain. It is also well known that mentally impaired patients frequently and easily showed depressed reactions.

DAI and focal contusion in severely head injury group were studied on incidence of mental impairment and/or headache. Then, the relationship between headache and types of injuries was revealed as follows. Incidence of headache in DAI was 37/56, and that in focal contusion was 21/51 (P<0.02). Cases with headache were more found in DAI group when compared with focal contusion group as shown in Table 4. On the other hand, incidence of mental impairment was low in DAI and high in focal contusion: 27/56 and 38/51, respectively (P<0.02, Table 5). These results may be of importance in case of discussing the relation between traumatic sequelae and type of head injury. Although few reports of outcome of DAI has available\textsuperscript{8,9}, no work could be found so far as the author's knowledge concerning to the study of sequelae and outcome of focal contusion cases against that of DAI. The understanding of focal contusion as an opposite concept of DAI has not been universal in neurotraumatology field at this time. Further investigation about this issue will be done in fu-
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ture.

REFERENCES