HEAD INJURIES AND MENTAL DISORDER.*

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A. INJURY BEFORE MENTAL SYMPTOMS.

UNDER the heading of " Injury before Mental Symptoms " it is desirable to consider first the surgical conditions of concussion, cerebral irritability and states of compression with their associated mental symptoms, for these must form a solid background for our consideration of all those cases where there is a head injury and mental disorder supervenes. It is, of course, possible to get an unrecognized fracture of the skull following a slight injury which will cause no further disturbance than, say, a headache. An example of this is supplied in a recent report, where a prospective member of Parliament sustained a fissured fracture of the skull as a result of bumping his head against the roof of a car when going over a hump-backed bridge ; but nevertheless went about his business for a month afterwards, ignorant of the fact of the fracture, although experiencing a headache, which eventually sent him to a doctor who, by radiography, was able to make the diagnosis.

It is not necessary to set forth here the symptoms of the surgical conditions just referred to. They have a definite time-relation to the history, are usually accompanied by externally visible evidences of a clear-cut injury, and pass through a sequence in which the mental manifestations merge with the physical, in perhaps rapid succession. Especially are the truly mental symptoms of short duration.

However, in the non-syphilitic cases to which I am drawing attention there can be observed an increasing time during which mental symptoms are displayed after a head injury. These cases can be considered in various groups.

1. CONTINUED MENTAL SYMPTOMS CAUSED BY SURGICAL CONDITIONS.

There is a group of cases, relatively rare, where mental symptoms continue, and are prominent, although caused by purely surgical conditions.

A. *Mental Symptoms in Chronic, Venous, Subdural Hæmorrhage.*

Wilfred Trotter (1) has described cases due to chronic subdural hæmorrhage, pathologically resembling the medical condition of pachymeningitis hæmorrhagica, due to slowly developing venous hæmorrhage as a result of trauma, not

* Read at the Spring Meeting of the Northern and Midland Division of the Royal Medico-Psychological Association, April 21, 1938.

https://doi.org/10.1192/bjp.84.350-351.552 Published online by Cambridge University Press

infrequently unrecognized, e.g., by a succession of minor accidental knocks on the head against a beam, but without causing any obvious and dramatic states of immediate concussion or compression.

In such cases there can develop a low-grade state of mental confusion persisting for some weeks, varying in intensity from apparent simple absent-mindedness and inattention to a stupor state, and associated with headaches, the latter, perhaps, not complained of. Mental recovery can follow surgical removal of the subdural hæmorrhage.

B. *Residual Mental Symptoms, following Concussion, due to Slight Prefrontal Subdural Hæmorrhage.*

In a personal communication Mr. Trotter has described a case where, following concussion, apparent recovery ensued from the major symptoms of head trauma, leaving, however, a striking personality change of a paranoid type, but without any associated sensory disturbance, such as even a headache. This state continued, and appeared to be stabilized during several weeks, and was apparent to all with whom the patient came into contact. Operation found a slight subdural prefrontal blood-clot, which was removed, and following this the mental state became normal, with insight and full recognition of abnormal conduct and utterances.

These cases hold an intermediate position in the duration of the mental symptoms between the first group and those in the following group. It is well known that in cases of head injury there is an especial liability to incomplete recovery, leaving such residual conditions as headache, loss of memory, giddiness, changes in disposition, irritability, "traumatic neuroses" and conditions passing on to "traumatic insanity".

In relation to these residua it is desirable to consider the following questions: How far are such conditions due to persistent brain damage? How far may the effects of such injury be aggravated by extradural disease to cause these residual symptoms?

How far may such extradural disease be wholly responsible for such apparently residual symptoms?

How far is such extradural disease caused or aggravated by the original trauma?

Of possible forms of extradural disease I have found chronic infective processes to be of common occurrence in these cases, and it is the purpose of this communication to draw attention to certain groups of cases where there is a history of a head injury followed by mental symptoms, in which treatment of chronic infective processes has been followed by considerable amelioration of, or even complete recovery from, mental symptoms which might have been attributed wholly to the head injury.

https://doi.org/10.1192/bjp.84.350-351.552 Published online by Cambridge University Press

2. PERSISTENT MENTAL SYMPTOMS CLOSELY FOLLOWING BUT NOT CAUSED BY SURGICAL CONDITIONS.

In this group can be placed cases where mental symptoms persist after the surgical conditions resulting from severe head injury have abated, but disappear after treatment of chronic infective processes found to be present in the head, some of which may have been exacerbated by the head injury.

CASE 1.—F. O—, married, assembler, aged 29, was lawfully riding his pedal cycle along a public road on January 19, 1937, at 7.20 a.m., when he was knocked down by a motor van and sustained concussion, fractured base of the skull, fractured left clavicle, fractured lower jaw and loosening of teeth, fractured right first rib, fractured transverse processes of cervical spine, bruising, abrasions and shock. Following treatment he made a good recovery from these surgical conditions and proceeded to a convalescent home. On his return therefrom it was noted by his doctor on May 18 that his physical condition was very much improved, and might be considered normal except for persistent headaches of varying intensity. His mental condition was, however, peculiar —his temperament seemed to have changed, his memory for details was bad, and he was scared of machinery of any type and of moving vehicles. At the convalescent home he had been considered to be weak-minded.

Seen on June 12 there was evidence of early mental fatigue ; concentration capacity and memory were reduced. Fear of machinery was still present, but there were no fearful dreams. He had attacks of depression with feelings of indifference to living, and great muscular weakness associated with attacks of headache, inward pressure type, beginning at the back of the left side of the head and passing over to the left vertex and left temporo-parietal region. This headache had formerly recurred daily from 7 a.m. to 10 a.m., reappearing from 10 p.m. to midnight, but had become less frequent lately. Its intensity had also reduced, and whereas he had a burning sensation in the head until a fortnight ago, that had now passed away. The headache recurred with the hearing of a heavy noise. Discomfort in the clavicle, arm and neck regions had passed away and he could now wear a coat and overcoat comfortably. He could now carry his baby.

Some bilateral tinnitus aurium (buzzing) still recurred for short periods. The capacity to name the test odours was lacking, although he could recognize they were different, and he separated pleasant from unpleasant. Attacks of giddiness still persisted, lasting for a quarter of an hour, during which everything went round and round him and he was not able to bend down, even to the extent required for working in the garden. He was quite incapable mentally and physically of returning to his work.

Investigation found gross dental sepsis and bilateral purulent antra. These were treated and he made rapid progress. His doctor reported on his condition at the beginning of 1938 as follows : " The removal of the sepsis and the settlement of the claim has improved his condition considerably. He returned to full-time work, but is kept away from noisy machinery. He was quite cheerful, but his mental faculties are still below his usual normal standard. He is more courteous and obliging. Physically he is perfectly normal."

CASE 2.—H. W— (see Case 9, p. 24, *Board of Control Annual Report*, Part II, 1934). Here a single male telegraph messenger, aged 16, was, on February

https://doi.org/10.1192/bjp.84.350-351.552 Published online by Cambridge University Press

11, 1933, knocked down by a motor-car and sustained a scalp wound and concussion. Treated in general hospital, he was discharged therefrom to home care on March 5 and returned to work on March 20, but collapsed on the 23rd with rheumatic fever, for which he was treated in general hospital.

Mental confusion later developed, and on July 13 he was admitted to a mental hospital, where radiographic examination found no evidence of head injury, but further examination found evidence of cardiac disease. There was septic disease of the tonsils, ethmoids and antra, which was treated surgically and by non-specific protein therapy. Gradually improvement in his profoundly toxic state took place, and he was discharged recovered on December 13, 1934. There has been no mental relapse since that date.

In the first of these two cases there was a continuity between the state caused by the surgical conditions and the residual state of traumatic neurosis, with which was associated chronic infective disease. The improvement in the neurosis, which was otherwise stationary, following the treatment of the chronic infective disease demonstrated their causal relation.

In the second case chronic infective processes were doubtless present before the accident, but manifested themselves as rheumatic fever, as soon as any physical and/or mental effort was made on recovery from the trauma, and then further, as a condition of apparent post-traumatic psychosis. Treatment of sepsis, however, was followed by mental recovery, which did not appear likely until these disease processes were treated.

3. Mental Symptoms Developing Remote from the Subsidence of Surgical Conditions.

From the preceding cases it is clear that there may be a tendency, and a quite understandable tendency, in cases of injury, and especially where surgical conditions have been present, to leave septic disease in the mouth, nose and throat untreated. This tendency may also continue for years after stabilization following the injury has occurred, and, as the following cases demonstrate, this untreated sepsis may later intensify and produce a psychotic state.

In both these recent and remote psychotic states relatives usually stress the fact of the head injury and thus may influence treatment, so that sepsis is not dealt with.

Case 3.—A. W. C— (see Case 10, p. 25, *Board of Control Annual Report*, Part II, 1934). In this case a married male traveller, aged 32, developed a state of confusion with anger, excitement, violence and severe auditory hallucinations in 1934, having in the April of the preceding year attempted suicide by severing both radial arteries. In 1922 he had sustained a fractured base of the skull and facial paralysis, with perforation of the right ear-drum during a motor-cycle accident. Since then he never had the same confidence in himself. He did various odd jobs until 1932, after which he became incapable of employment.

There was gross dental and tonsillar sepsis present when he was seen in

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September, 1933. The dental disease was treated first by extractions in stages ; as a result the severe auditory hallucinations completely ceased, the anger subsided and he became much more amenable. The old post-traumatic symptom of lack of confidence was still present with depression in June, 1934, and practical tests showed much reduction in concentration capacity. Purulent tonsils were now removed by dissection, bowel infection treated by hydrotherapy and residual sepsis by non-specific therapy. By September, 1934, he had lost the depression, becoming cheerful and contented ; said he felt, and certainly appeared objectively, " different altogether " ; he now had regained confidence in himself, and was able to perform physical and mental work without displaying the loss of concentration capacity he formerly exhibited. He has, since discharge in September, 1934, kept well.

In this last case the loss of confidence symptom connected the trauma and the psychosis, but it disappeared after treatment of sepsis, showing that sepsis was operative in the immediate post-traumatic, and was probably present in the pre-traumatic state.

CASE 4.—D. C. L—, a single male lecturer, aged 25, was first admitted to mental hospital in July, 1936. There was a family history of mental weakness and illness, alcoholism and nasal catarrh. Patient had always been subject to colds and catarrh. Had been concussed at thirteen years of age.

Always reserved, but very intelligent. He had qualified B.Sc.(Hons.) and obtained the Teachers' Diploma. In early 1934 he quarrelled while at a youth hostel, fled to the police, and made a written statement of a plot against his family. Treated then for " glandular backwardness ".

In April, 1936, severely depressed. Fits of crying. Insomnia. Excessive thirst. Impatient, threatening, fearful. Bolted bedroom door at home. Then developed excessive desire to be out in open. Frequent quarrels with father. Worry over debts and disappointment over love affairs. Began to devote all his time to study of sexual psychology. Developed auditory and visual hallucinations. Admitted to mental hospital, where he was found to be apathetic, depressed, persecuted, subject to auditory and visual hallucinations. Said he was the victim of a Black-Hand gang, that his father had tried to kill him. Irresponsible, vague, self-centred, evasive.

Treatment of oro-naso-pharyngeal sepsis, including removal of diseased and both lower impacted unerupted wisdom teeth, of purulent tonsils, drainage for antral and bilateral sphenoidal empyemata and a cortical mastoid—including ligature of internal jugular vein—was followed by mental and physical recovery (discharge in October, 1937), his doctor and relatives being fully satisfied'; he has returned to scientific work.

CASE 5.—L. B. H—, a married male traveller, aged 31, was first admitted to mental hospital in July, 1937.

He had always been subject to nasal catarrh and periodic asthma, and for these he had had a resection of nasal septum performed in 1926. There was, however, no relevant family history.

He had had a motor cycle accident in 1934, resulting in slight concussion.

At Whitsuntide, 1937, he had become depressed and sleepless and lost appetite and weight. Became deluded that he was to lose his job and that he was suffering from incurable syphilis, contracted from his wife. On admission

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he was quite mute, depressed, apathetic, extremely resistive, refused food. He required every nursing care and attention, although his general state was fairly good. There was no evidence of organic disease, nor of syphilis, and the Wassermann test was negative in the blood.

There were three carious teeth. These were removed, and bowel sepsis was treated by hydrotherapy. The mental and physical states improved, delusions ceased, he exhibited a normally affectionate regard for his wife, worked outdoors and was discharged in October, 1937.

These three cases illustrate the group where mental disorder supervenes at various periods remote from the occurrence of surgical conditions of varied intensity following head injury.

4. Mental Symptoms Developing after Alleged Head Injury not producing Surgical Conditions.

The foregoing cases are a series providing a transition from those where the relation of the trauma to the mental disorder is apparently of considerable importance to those where the relation is much less obvious, although in all there is a history of surgical conditions. These are representative of a much larger number which could be collected, and in which it would be difficult to draw a line across the series and say that so far the trauma might be held responsible, and beyond it not responsible for the mental disorder.

Yet in all the cases described in the last two groups it has been possible to demonstrate septic disease, to treat it successfully and to obtain thereby recovery from the psychosis. It will not therefore be surprising if in the next group of cases a similar demonstration can be made. These are cases where there has been trauma received by the head, but not sufficient to produce surgical conditions, and in which mental disorder follows. In these cases relatives may attach considerable importance to the trauma, so much so as to obstruct the necessary treatment of sepsis or to raise the question of compensation.

These cases may be divided into two groups based on the time between the receipt of the injury and the appearance of mental symptoms.

A. *Mental Symptoms appearing closely Related to the Receipt of Trauma which has not produced Surgical Conditions.*

It may be useful to divide these cases into two groups:

(a) *Blows received on the nose, whilst fighting or boxing, and apparently soon followed by the appearance of a psychotic state.*—Two cases can be quoted to illustrate this group:

Case 6.—J. H— (Case 5, p. 15, *Board of Control Annual Report*, Part II, 1933). Here, in a youth of 17, a state of extreme mental confusion with auditory hallucinations had, amongst other causal factors, an immediately

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recent history of a blow on the nose at boxing. Investigation showed the presence of an empyematous right sphenoidal sinus, septic tonsils and adenoids, and badly impacted unerupted wisdom teeth. Only when all these conditions had been dealt with radically did complete recovery ensue—and it has been well sustained for ten years.

CASE 7.—E. B— (Case 21, p. 48, *Board of Control Annual Report*, Part II, 1936). Here a single vanman, aged 18, became wildly excited, aggressive and confused, but had been apparently normal to his relatives until three days before admission, on January 18, 1936, when he received a blow on the nose while fighting with a workmate.

This alleged fact influenced the relatives (who insisted there was no insanity in the family) considerably, and hampered the obtaining of the necessary consents for anæsthesia and operation for the treatment of foul oral sepsis and gross tonsillar and sinus disease. When this treatment was carried out it was followed by a remarkable and sustained recovery. He was discharged on August 13, 1936. There is reasonable ground to conclude that in this case, as in many others of a similar kind, the mental disorder was already in existence and the state of irritability led to a fight. Certainly the extensive and foul sepsis present had been in existence for a long period before admission.

(b) *Injuries received elsewhere on the head, and apparently soon followed by the appearance of a psychotic state.*

CASE 8.—D. G—, male, bricklayer's labourer, married, aged 28 on first admission to mental hospital on September 9, 1937, of good family history and abstemious habits.

He had had " colds as a result of his work ", his wife said, but otherwise she had never known anything wrong until in April, 1937, he had a head injury caused by an 18-in. spanner falling on his head whilst at work, which she said left a scar about an inch long. He lost appetite and 2 st. in weight, " went into a decline and began to talk foolishly ", including suggesting a suicide pact. He complained of headache and fancied people were against him, also that he had turned into a woman. There was usually a nocturnal exacerbation of his mental symptoms. His speech altered. He was taken to hospital, where consideration was given to the diagnosis of post-encephalitis, as he appeared to have the characteristic speech, but that point was weakened by the fact that that change in speech was only of recent appearance. He was then regarded as a hebephrenic case. Radiography of the skull was negative for injury, but an area of calcification was found in the falx. It was observed that he was dull and lacking in interest, hid himself in out-of-the-way corners and avoided the company of other patients, was slow in thought and hesitant in replies. He said he was worried over the crimes he had committed and that everything he did was wrong. He was impulsive in behaviour. Medical examination found that he was in a state of great apathy and abstraction ; gloomy and fixed in expression, he showed no emotional changes whatever ; would not smile ; questions had frequently to be reiterated to elicit a reply, and frequently none was forthcoming. Said he accused himself of doing and saying wrong things ; said that as a boy he " sat on a monument to Edith Cavell " and believes " that crime " was the beginning of all his troubles.

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On admission to mental hospital there were some old scars on both legs, left elbow and left knee, but there was no scar visible on his scalp. The question of claim for compensation was, with legal assistance, raised, but no evidence could be brought forward that any surgical condition had followed the injury, and the absence of any scar did not support the seriousness of the blow. Nevertheless there was the wife's view that his present state had developed since the injury—for he had only been able to do a fortnight's work after the accident—and as his condition appeared so desperate and unlikely of recovery, superficially regarded, a diagnosis of traumatic insanity, enabling compensation for the wife and her three children to be obtained, was a not unreasonable proposition. Radiography showed that the calcification in the falx was a calcified pineal gland, and clinical investigation showed that an undeniably septic state was present. After removal of sixteen carious teeth, including two impacted but partially erupted lower wisdoms, whose residual sacs were purulent, of purulent tonsils, and drainage of an empyematous left antrum, together with accessory treatment, he displayed such a resurgence of physical and mental vitality, including a gain of 24 lb. in weight, that his wife stated he had not been in such good health for some time. Evidence of this improvement is shown in photographs. He lost all his mental symptoms and was cheerful and happy. Speech showed an occasional stammer, persistent from childhood, but he was now able to explain his case and to supply information which was previously unknown to anyone, viz., that he had had left headache and left tinnitus aurium for eighteen months before the accident, together with cacogeusia. He was discharged recovered and his wife was satisfied he was fit for work in April, 1938. It was now apparent that the accident was an incidental occurrence in the course of the development of a state of confusion arising from chronic infective processes in the head.

B. *Mental Symptoms Appearing More Remote from Alleged Head Injury which has not produced Surgical Conditions.*

A goodly number of cases could be found to illustrate this group, and two are selected in which the head injuries appear of diminishing importance, and thus bring the series of cases in which trauma might be regarded as a causal factor to a close. Nevertheless in these cases also sepsis can be demonstrated to be present, and its treatment is followed by rehabilitation of the disordered mental state.

CASE 9.—L. C—, a married painter and paperhanger, aged 46 on first admission to the mental hospital on June 28, 1937, in a state of severe depression with abject fear and delusions of persecution and unworthiness, but without hallucinations.

His father had died of drink. Normally the patient had been cheerful, sociable and industrious. Married twenty-four years, he had six children, the youngest aged 6. He had, in relation to his trade, suffered from lead-poisoning, and in 1930 had an operation for gastric ulcer. In the summer of 1936 he had a bicycle accident, and had to have several stitches in his chin. There had been no evidence of concussion. This was followed by debility, irritability and, probably legitimate, anxiety about his work and financial

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matters. Depression developed during the winter, and in the spring he attempted work, but could not continue. Depression and fear became dominant. On admission to the mental hospital septic tonsils and right antral empyema were found and treated by removal and drainage. This and accessory treatment resulted in very pronounced mental and physical improvement, including a gain of over 2 st. in weight. Discharge followed on April 7, 1938.

CASE 10.—A. R—, a single female french-polisher, aged 29 on first admission to mental hospital on February 22, 1935.

Very reserved, steady and a hard worker. Six years before admission she complained of having a " bump on the head ", and since then she experienced headaches and became depressed and more reserved. Pronounced mental symptoms were first noticed six months before admission, when she was in a state of confusion with excitement, fear and auditory hallucinations.

Examination showed gross oro-pharyngeal sepsis. This was treated radically and was followed by mental recovery, physical improvement, including a gain of 17 lb., and discharge on August 8, 1935. She was now able to state that she had been, during her mental illness, troubled with tinnitus passing on to hallucination, cacosmia and headaches, but these had all ceased after removal of diseased teeth and tonsils.

In the first of these cases, although the acute mental symptoms necessitating admission to mental hospital reached certification intensity a year after the accident, there was a state of general ill-health, easily explicable by the gathering force of the toxæmia from sepsis, linking the accident with the acute psychotic state. Nevertheless, recovery from the psychosis followed in less than a year as a result of the treatment of chronic infective processes, which were doubtless in existence before the accident.

In the second case it was noticed after the " bump on the head ", six years before admission to the mental hospital, that she complained of headaches and became more reserved and depressed. Headaches were a serious feature of her psychotic state, but with the removal of diseased teeth and tonsils they, and the auditory hallucinations with their causal tinnitus, ceased and the psychosis disappeared.

So far consideration has been given to " injury before mental symptoms ", and in the cases submitted, as far as relatives and friends are able to state, that has been the order observed.

We now may briefly complete this review of head injuries and mental disorder by considering " mental symptoms before injury ", and here, again, take into account the part played by chronic infective processes.

B. MENTAL SYMPTOMS PRESENT BEFORE SURGICAL CONDITIONS, E.G., FRACTURE OF BASE OF SKULL ACQUIRED IN A SUICIDAL ATTEMPT.

To illustrate this sequence of events I refer to Case 29, described on p. 636 in the July number of the *Journal of Mental Science*, 1932. Here a married housewife, æt. 34, was first admitted to a mental hospital on October 23, 1919.

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Her family were not psychotic. She had five children, the last born on Christmas Day, 1917. Since that year she had suffered from violent headaches, and during 1918 developed insomnia. Later she "began worrying, thinking people were talking about her". In May, 1919, her husband recognized that she was not normal and sought advice. On a diagnosis of neurasthenia she was sent to a nursing home early in July, where, on the 30th, she made a serious attempt at suicide by precipitation, fracturing the base of the skull and both wrists. She survived from her injuries, but after judicial procedure she was found to be insane at the time of the suicidal attempt and sent to a mental hospital. She lived in a state of chronic delusional psychosis for nearly seven years, dying on January 10, 1926, of a generalized leptomeningitis, which had extended from nasal sinus disease in the vicinity. At autopsy the right frontal, right ethmoidal and the sphenoidal sinuses contained pus, most marked in the last-named.

The only fracture involving the brain cavity was represented by a line of fibrous union in the cribriform plates and adjoining frontal bone. Over this the dura was continuous, but covering the line of fracture the brain was adherent to the dura in an area irregular in outline and of the size of a half-penny, involving the central part of the right gyrus rectus and the adjoining portions of the right internal orbital gyrus and the left gyrus rectus. This adhesion of brain and dura was not of recent development. The basal sub-arachnoid spaces were full of greenish pus. The substance of the brain showed no macroscopic lesion. The cerebral vessels were healthy, except in so far as they were surrounded by pus leading along the various sulci.

The meninges appeared to be infected from the nasal sinus infection of the right ethmoid by the rupture of parts of the old adhesion in and over the cribriform plate.

Here the presence of the original violent headaches suggests the existence of a septic condition involving part or the whole of the upper air and mouth tracts, and in view of the chronic sinus disease found at autopsy it is reasonable to suppose that sinus disease was present before the injury occurred.

This sinus disease was probably a residuum from the influenza pandemic of that period, which killed one of her children at the age of 5½ years.

Comment.

The last case, therefore, supplies one answer as to what may be the fate of cases with these combined septic and traumatic conditions, if left untreated.

The presence of sepsis in the nose would not improve the chances of healthy union of the fractured parts, and it is not improbable that the adhesions of the brain to the dura had resulted therefrom. Under healthy circumstances the tendency to secure the insulation of the nervous system

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would be to reduce such adhesions to negligibility. Under these septic conditions that process was counteracted, and this *locus minoris resistentiæ* became the channel whereby infection seeped through from nose to meninges.

This case therefore indicates the need to investigate and treat sepsis in cases of head injury.

The previous cases in this present series show that treatment of sepsis results in mental amelioration, as well as survival of the patient, even in cases where the insanity is grossly evident and the head injury of various degrees of severity.

It is well recognized that there is no special liability for traumatic neuroses to be precipitated by accidents which have caused well-marked concussion.*

These cases point to the conclusion that in both "traumatic neuroses" and "traumatic insanity" the trauma is of much less importance than the chronic infective processes which may be associated with such cases.

* Trotter, Wilfred, and Taylor, Julian, "The Scalp, Skull and Brain", in Choyce's *System of Surgery*, third edition, iii, p. 332.

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