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Case Report

Head Injuries, A Forensic Overview

M Emdadur Rahman[1], M Enamul Haque[2], Md Monsur Rahman[1]

Abstract

The incidence of head injuries is growing with greater mechanization in industry and an increase in high velocity transport. The injuries could be caused by a penetrating or blunt force either by direct violence or indirectly, such as a fall on the feet or buttocks. There is no direct relation to the severity of injury to skull bones and extent of cerebral disorder.We is reporting two cases of head injury from forensic point of view.

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Introduction

The incidence of head injuries is growing with greater mechanization in industry and an increase in high velocity transport. The injuries could be caused by a penetrating or blunt force either by direct violence or indirectly, such as a fall on the feet or buttocks. There is no direct relation to the severity of injury to skull bones and extent of cerebral disorder. Head injury includes the injury to scalp, skull and brain. The brain injury is divided into contusion, laceration, concussion, compression and intracranial haemorrhage. On the other hand, intracranial haemorrhage includes subdural, subarachnoid & intracerebral haemorrhage.

Injury to scalp

Injuries of the scalp are accidental, mostly vehicular or homicidal. Most scalp injuries are homicidal, and are generally produced by blunt weapons, for example, a lathi, a stone or wooden pestle (musal) and occasionally by a cutting instrument, such as a gandasa, a khurpi, an axe or a sword. The injuries are consequently mostly contusions and lacerated wounds, as well as incised and punctured wounds.

Injury to skull

The cranium varies in thickness and varies place to place. The more vulnerable thin areas lie on either side of the skull. Fractures of the skull are sometimes caused without any contusion or wound on the scalp, though there may be extravasations of blood on its under surface as the force of the violent impact may be cushioned bya turban or an abundant growth of hair on the head.

Fracture of vault occurs at the place of contact by direct violence or on its opposite side by centre-coup (counter side), when the head is not supported. It may be depressed, crushed or fissured. An extensive fracture running parallel to the two points of contact (bursting fracture) will occur, if mechanical force is applied on one side of the head, when it is pressed on the other side against a hard substance, such as a wall, while the individual is standing, or against the hard

[1] Assistant Professor, Department of Forensic Medicine, Rajshahi Medical College, Rajshahi-6000, Bangladesh.
[2] Assistant Professor, Department of Forensic Medicine, Islami Bank Medical College, Rajshahi-6000, Bangladesh.

ground or floor when he is in a lying posture. In such case, the fracture may extend transversely to the base of the skull. According to G. F. Rowbotham, injury to the brain may be either due to movements of the brain in relation to the skull or to distortions of the skull. The falx cerebri and tentorium cerebelli divide the cranial cavity into the communicating compartments and have a partly restraining effect on brain movements.

Injuries to brain

(i) Contusion and Lacerations of the Brain - These injuries, often seen in vehicular accidents and falls from heights are caused by the application of violence to the head and may occur with or without external injury to the scalp and fracture of the skull. They may be seen superficially anywhere on the surface of the brain though the commonest site is the outer surface of the parietal and temporal lobes or deep within the brain substance, and are associated with punctate haemorrhages limited in small areas or multiple haemorrhages diffused largely within the brain tissues. They are also associated with disturbances of cerebrospinal fluid circulation.

(ii) Concussion of the brain- Concussion of the Brain is a rotational injury caused by sudden acceleration. It occurs only when the head is free to move with sufficient velocity, but not when it is fixed. It is popularly known as "stunning', and may be produced by direct violence on vertex, by indirect as a result of a violent fall upon the feet or notes from a height, or by an unexpected fall on the ground, when pushed forcibly in any traffic accident or an injury received in industry.

(iii) Compression of the Brain- Compression of the brain is a clinical condition caused by increased intracranial pressure, which disturbs the functions of the brain. It may result from a depressed fracture of a skull bone or a foreign body, intra-cranial haemorrhage, acute spreading oaedema, inflammatory exudation and the presence of any space-occupying lesion like tumours, gummata or abscesses.

(iv) Intracranial haemorrhage- The contents of the skull are the most fragile of the vital organs necessitating their enclosure in the strong- bony box of the cranium. Damage may occur either to the neural tissues or to the rich vasculature that surrounds and penetrates those tissues. Intracranial haemorrhage includes: **(a)** Extradural haemorrhage- also known as `epidural haemorrhage' bleeding between the inner surface of the skull and the dura matter is the least common of the three types of brain membrane haemorrage. **(b)** Subdural haemorrhage- Bleeding beneath the dura is much more common than the extradural haemorrhage. It is also proportionately less often associated with a fractured skull, but in absolute numbers far more fractured skull cover subdural than extradural haemorrhages. The Glasgow series of 635 fatal head injuries described by Adams included 18 percent of subdural haematomata. **(c)** Subarachnoid heamorrhage- The third type of brain memberane bleeding is even more common than subdural haemorrhage, but has a mixed aetiology. Whenever, there is damage to the cortex, there will be some degree of subarachnoid bleeding, so all penetrating injuries of the brain, as well as many blunt injuries that gives rise to extradural or subdural haemorrhage, will be associated with traumatic subarachnoid bleeding..

Method and Materials

Post mortem examination is carried in the morgue of RMC. After death of a person the police officers makes an inquest, sends the body of victien to the merge, with a requisition addressing the head of forensic medicine dept. escorted by police constable. Then the dead body is examined. Two (02) cases of head injury were studied and types and extent of head injury were noted. They are as follow:

Case-1 history

Ref. Rajpara P.S., U.D. case no-508, dated 23.11.08. Name of victim- MTR, age-about 30 years, PS-Pathia, Rajshahi. Inquest and requisition prepared by S. I MK, escorted by C/No-1780, MK MTR was a building worker. On 23.11.08, he was

working in a building at shibpur under PS-Puthia, was fell on ground by slipping his feet and got fatal injuries on his head. He was admitted in ward no-8, RMCH and died on 23.11.08 at 6.15 P.M. and Post mortem examination was done. **Result- (a) External exam-** Injuries found on the body were- (i) One heamatoma on the Lt. parietal scalp 2" in diameter (ii) one abrasion on the Lt. side of face etc**. (b) Internal exam** (Dissection)**-** Detailed dissection was done. (i) Scalp-injured with extravasation of blood on under surface Skull. Bones- fracture of Lt. parietal bone, Intracranial haemorrhage (extradural) detected on surface of brain with mild congestion, subarachnoid haemorrhage - present mildly, Intracranial haemorrhage- not found. Other bones- healthy Other organs – healthy Opinion: **Opinion** was given that death was due to shock and intracranial haemorrhage.

Case-2 history

Ref. Rajpara P.S., U.D. case no-554 dated 22.12.08, Name of victim- MZR, age- about 45 yrs, P.S-Dhamoirhut, District-Naogaon, Inquest and requisition were prepared by S.1.- Md. Kamurzzaman, escorted by C/No- 1780, Md. Khabiruddin. On 21.12.08 Md. Zillur Rahman while crossing the road near shorilah bazar at Dhamoirhut, he got accidental injuries by a heavy vehicle and was found fallen on ground at the east side of the road. He was admitted in ward no-8, RMCIi and died on 22.12.08 at IIA.M and Post mortem examination was done. **Result- (a) External exam-** Injuries found on the body were- (i) One lacerated wound on the vault of skull, size I"x0.5"x bone (ii) An abrasion on the dorsal aspect of left forearam, size 3"x2"x skin etc. **(b) Internal exam**. (Dissection)- Detailed dissection was done. Scalp- injured with extravasation of blood on under surface Skull-Fracture of Lt. parietal bone, Brain-Intracranial haemorrhage(extradural) was detected on surface of brain with mild congestion, Subarachnoid haemorrhage - present mildly, Intracerebral haemorrhage- not found. Other bones and organs were found healthy. **Opinion-** opinion was given that death was due to intracranial haemorrhage

Discussion

In both the cases, it was found that the fracture of skull bone was associated with extradural haemorrhage and mild subarachnoid haemorrhage without any intracerebral haemorrhage. Extradural haemorrhage is mostly traumatic and occurs between the skull and duramatter. Subdural haemorrage occurs beneath the duramatter and usually found at the base of the brain, diffused, mixes with CSF and spreads upwards over the surface of brain. The types of skull fracture that may result from violence depends on the shape of the skull, mobility of the skull, presence of scalp hair, coverings on the head like a cap, hat, turban etc, weight and velocity of the weapon, the amount of force, the type of appliance used like a blunt or cutting weapon, a pointed or edged object or implement, a blade or the use of crushing or grinding force, the area, large or small, to which the force is applied and the varying thickness of the bone, on which its strength depends. The elasticity of the skull bone is limited. The outer and inner table of the skull many Suffer damage differently, the shape of the striking object may be marked on the outer table and the secondary fissures may be sec extending from this area, while the inner table could show more extensive damage and splintering.

Fracture of the base of the skull, which may involve the nasopharynx, nasal air sinuses, middle ear and mastoid is generally caused by a blow or fall upon the vertex as the head is pressed on the other side of the spinal column. An anterior, middle and posterior fossa exists in the base of the skull on each side, the floor of all these fossa is formed by an easily breakable thin plate of bone. A direct penetrating blow from the point of an umbrella or stick thrust through the roof of the orbit or up the nose through the cribriform plate, a violent blow on the chin or a gunshot wound through the roof of the mouth may cause a fracture of the base of the skull. It may also result from extension of a fracture of the vault, or may be caused indirectly by a heavy fall upon the feet or nates. A direct impact from falling forwards may

also cause a depressed fracture of the anterior fossa, while a backward fall, when the back of the head strikes the ground, may result in the fracture of posterior fossa which may even extend into the foramen magnum. Any kind of impact behind the ear or crush injuries of the head may involve the middle fossa on both sides. Occasionally the basal fracture of the skull may cause an arterio-venous communication between the carotid artery and the cavernous sinus, through which it passes.

Coup lesions are commonly found under the site of application of the blow, but are also sometimes found on the surface of the brain diagonally opposite the site of impact, and are called contre-coup injuries. They are most commonly found on the undersurfaces of the frontal lobes and near the tips of the temporal and frontal poles, rarely on the occipital poles. They are usually severe injuries. Hence, severe and extensive injuries occur in this region when a blow is struck on the occiput. On the other hand, contre-coup injuries which are caused by rotation will not occur, if the head is so well fixed that it cannot rotate at all when it receives a blow. In case of concussion, Trotter is of the view that it is a condition of widespread paralysis of the functions of the brain, which has a strong tendency to spontaneous recovery and is not necessarily associated with gross organic changes in the brain substance. However, according to symonds, it is a result of direct injury to the nerve cells, which in milder cases is reversible but may be permanent. Others also believe it is due to submicroscopic diffuse neuronal injury.

In extradural haemorrhage, leakage of the high-pressure arterial blood strips back the underlyin dura with progressive accumulation of a haematoma, which can reach a volume of several hundred millilitres and cover an appreciable part of the hemicranium. Hume Adams Suggests that in extradural haemorrhage a minimum volume of 35 ml is needed before clinical signs are apparent, though other writers suggest 100mI is usually the minimum associated with fatalities. Subdural haemorrhage can occur at any age, but is common at both extremes of life. It is one of the major causes of fatal child abuse and the rediscovery of that syndrome by Caffey consisted of an association of subdural haemorrhage with long bone fractures. In old people they commonly exist in a chronic form and can be mistaken either for strokes or for senile dementia. The condition is always due to trauma and there is probably no such entity as spontaneous subdural haematoma. Chronic subdural haematoma is most often found in old people, frequently as an incidental finding at autopsy where death was caused by some unrelated conditions. Subarachnoid haemorrhage is not common, though not unknown, for traumatic subarachnoid bleeding to occur as a pure lesion where there is no cortical contusion, no neck injury, no deep brain lesion and no other membrane haemorrhage. Slight subarachnoid bleeding probably occurs very frequently after a moderate impact upon the head as with slight subdural bleeding, but as the vast majority of such victims survive, no autopsy evidence is forthcoming.

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All correspondence to:
M Emdadur Rahman
Assistant Professor
Department of forensic medicine
Rajshahi Medical College
Rajshahi-6000, Bangladesh