بسم الله الرحمن الرحيم

HE SIGNIFICANCE OF INITIAL CT FINDINGS IN CLOSED HEAD INJURY

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The various types of severe head injuries have long been known and have been described by many anatomics and surgeons. They are mentioned in a script over 2.500 years old discovered by Edwin Smith near Luxor. In which his records of the case histories of many Egyptian cranial wounds and the recommended treatment was mentioned. It is of interest that injuries involving the brain were considered fatal and not to be treated, whereas other minor wounds of the scalp were closed by opposition of the margins with tape **(Vigocroux and Givillerman, 1981)**. If trephination was known at that time it was not in the favor of the surgeon who wrote the Edwin Smith papyrus. But by the time of Hippocrates the procedure apparently was well known and he recognized five types of wounds and recommended trephining for all except extensively comminuted and depressed fractures. Also in his book on injuries of the head Hippocrates gave directions for the use of the trepan, noting that it should be carefully applied away from the sutures and the temporal region where it may rupture a vessel and leads to convulsion. The trephine was to be kept cool and the trephining should stop short of the inner table, leaving a thin shell of bone which would slough out as suppuration, which was considered as a usual stage of healing **(Walker, 1985)**.

Many of the concepts of Hippocrate were criticized later. Theodoric in the 13 th century denied the thesis that laudable pus was essential for the healing of a wound and held that it retarded the "conglutination and consolidation of the wound". He advised approximation of the cut edge by sutures and the application of compresses soacked in wine. Saliceto who printed the Cyrugia (1476) specified contralateral paralysis as a sequel of head injuries and advised a thick compress to prevent the injurious admission of air **(Garrison, 1929)**.

In France, the interest of the academy of Medicine in head injuries brought the technique of cerebral surgery up to effective standards of laboratory experimentation, which became the key to topical diagnosis, and through the work of Pourpoir du Petit (1664-1741), Antoine - Lorry (1725-83) and Nicolas Sourcerotee (1741-1801) they concluded that the medulla is the seat of vital function and also established the theory of contralateral innervation **(Garrison, 1929)**.

Benergerius (1728) trephined over the sutures in the temporal region. Glandrap (1729) advised trephining for intracranial Haemorrhage. Galen (1854) was the first to report that he had often seen healing of brain wounds **(Walker, 1985)**.

In 1941 Denny - Brown and Russel described the phenomenon of Linear acceleration - deceleration, and in 1943 Holburn demonstrated rotational acceleration, **(Vigocroux, et al., 1981)**. Recent experimental studies beleive that the skull distortion and head rotation hypothesis offers opportunities for developing a better theory for brain injury by direct as well as indirect impact. **(Gurdjan, et al., 1966)** and **(Ommaya, et al., 1971)**.

From a diagnostic point of view, the detection of lesions has benefited from the use of cerebral angiography, which was first pointed at by a group of workers from Lille **(Laine et al., 1959)**. Since then there have been many reports devoted to this subject. Most authors seem to agree on the difficulties encountered in identifying the different components of such Lesions. More precise diagnosis now appears possible due to the recent introduction of computerized tomography (CT) in cranial traumatology, which was started by the description of Kardon (1917) on the construction of a three - dimensional representation of an object using an infinite number of projections **(Van Dongen, et al., 1981)**.

Hounsfield was able, after solving many theoritical and practical problems, in 1967, to embark upon the development of the CT. The first prototype was ready in 1969, while the first machine was installed in 1971 **(Van Dongen, et al., 1981)**. This was followed by the publication, in 1973, of the results and potential application of this investigative technique **(Ambrose, 1973)**. Further development occured in the era of refinement of the apparatus and its operation (fine matrics, tiltable gantries, faster machines, thinner section and so on). Considerable progress was also made in the era of CT interpretation **(Roberts, et al., 1977)** and **(Solomon, et al., 1977)**. The first unique successful outcome recorded for removal of a post traumatic intracranial hematoma was that of Glandrop (1728) **(Walker, 1985)**, while J. Hill (1772) removed a subdural hematoma and extradural hematoma successively **(Van Dongen, et al., 1981)**.

The management of severe head injury has undergone major changes during the past 20 years based on the increased understanding of intracranial dynamics which followed the publication of Lunberg's paper 1960 **(Lundberg, 1960)**.

Intracranial pressure (ICP) measurement has become a routine procedure in many centres. Whilst the introduction of the CT scan has given insight into space occupation and brain shift following head injury **(Moss, et al., 1982)**.

Controlled ventilation has been advocated by some since 1967, whilst other methods for the control of elevated ICP include steroids, diuretics, osmotic agents and, more recently, thiopentone and other hypnotics. Various combinations of these measures are used in different centres and no consensus has emerged about which regime is most effective in the reduction of mortality and morbidity **(Moss, et al., 1982)**.

REVIEW OF LITERATURES

MECHANISM OF CLOSED HEAD INJURY

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In order to improve the prevention and treatment of head injuries, a complete understanding of their mechanisms of causation and pathophysiology is essential **(Gennarelli, et al., 1986)**.

To understand how an individual mechanical input to the head results in a particular type of head injury, one must consider multiple factors. First, the nature, the severity, and the site and direction of mechanical input to the head. The manner in which the head responds to that input will determine what structures are injured and to what extent they are injured. Finally, the total injury produced by mechanical trauma depends not only on the primary mechanical damage but also on the complex interaction of pathophysiological events that follow **(Gennarelli, et al., 1986)**.

Classification of head injuries

In general terms, primary head injuries include three distinct varieties, each having a unique set of mechanical etiology (Table 1). Skull fracture can occur with or without damage to the brain. Injuries to the vascular or neural elements of the brain and its coverings cause neurological dysfunction and can be reading divided into two categories, each of which has for the most part, different mechanistic causes. Focal injuries result from localized damage and account for approximately 50 percent of all hospital admissions for head injury **(Gennarelli, et al., 1982).**

The cortical contusions, subdural hematomas, epidural hematomas, and intracerebral hematomas that constitute focal injuries are responsible for two-thirds of head injury associated deaths. Diffuse brain injuries are associated with wide spread brain damage. This damage may be principally functional, as in the case of concussive injuries, or may be structural, as seen in prolonged traumatic coma unassociated with mass lesions, a condition recently termed diffuse axonal injury. Diffuse brain injuries account for approximately 40 percent of hospitalized head injured patients and for one - third of the deaths, and are the most serious cause of persisting neurological disability in survivors **(Gennarelli, 1982).**

Mechanisms of injury:

The types of mechanical loading of the head are numerous and complex.

Static loading occurs slowly and forces are applied to the head gradually. Sufficient force results in multiple, comminuted, or "egg-shell" fractures of the vault or skull base.

However, coma and severe neurological signs are characteristically not seen until the skull deformation is so severe that the brain itself becomes compressed and distorted, at which time serious or fatal compresive brain damage occurs **(Gennarelli, et al., 1985).**

Dynamic loading is the most common mechanical input to the head. It can be of two types-impulsive or impact. Impulsive loading occurs when the head is set into motion or when the moving head is arrested without its being struck or impacted. Impact loading is the more frequent type of dynamic loading and usually results in a combination of contact forces and inertial forces **(Gennarelli, et al., 1985).**

Table (1). Classification of primary head injuries

Skull fractures	Focal injuries	Diffuse injuries
Linear Depressed Basilar	Contusions coup contre-coup intermediate Hematomas extradural subdural intracerebral	Concussion mild classic Diffuse axonal injury mild moderate severe

(Gennarelli, 1990)