HISTORICAL BACKGROUND OF HEAD INJURIES

Since ancient times brain injuries have provided a rich source of material for speculation about mental functions.

The findings of skull of the neolithic period with evidence of fractures and man made defects, bear mute testimony to the fact that one of the earliest forms of surgery to be practised by man was for head injuries. Signs of bony proliferation around such defects also indicate that the patients often survived considerable periods after the injury and surgery (Gurdjian and Webster, 1958). The Incas of Peru probably practised trephination as far back as 3000 B.C.

The Edwin Smith Papyrus recording the surgical practices in Ancient Egypt (1700 B.C.) recognised that scalp lacerations and fractures of the skull with meningeal irritation could be treated. The combination of pulsating brain in the wound, bleeding from both nostrils and stiffness of the neck was recognised to be of grave prognostic significance and the surgeon was cautioned that this was an ailment not to be treated. A case of left temporal depressed fracture was described with speech deficit and contralateral paralysis (Jaldwin, 1965).
Hippocrates (460-370 B.C.) pointed out that injuries to the head could cause severe sensory and motor disorders, and Galen included head injuries among the major causes of mental disorders. At the time of Hippocrates different types of fractures were recognised and trephination was advocated (Wilkins, 1965). It was practised mainly to enable pus to escape and the surgeon was warned not to cut the inner table fully but to leave a thin shell of bone thus ensuring the safety of the dura mater. Hippocrates felt that no head injury was so slight that it could be neglected or so severe that life should be despaired of.

Extradural haemorrhage without fracture as well as intradural haemorrhage were known in ancient Greece and Rome (Toole, 1964).

For the next few centuries advances in the concepts regarding head injuries and their management were few. To trephine or not to trephine was the question, even as recently as hundred and fifty years ago.

Perhaps the most famous historical case is the celebrated American crowbar case reported by Dr. JM Harlow in 1868. Since it is of both historical and descriptive significance, it merits a few details.
"The accident occurred in Cavendish, Vt., on the line of the Rutland and Burlington Railroad, at that time being built, on the 13th of September, 1848, and was occasioned by the premature explosion of a blast, when this iron, known to blasters as a tamping iron, and which I now show you, was shot through the face and head.

"The subject of it was Phineas P. Gage, a perfectly healthy, strong and active young man, twenty-five years of age.... Phineas P. Gage was foreman of a gang of men employed in excavating, for the road way ....

"The missile entered by its pointed end, the left side of the face, immediately anterior to the angle of the lower jaw, and passing obliquely upwards, and obliquely backwards, emerged in the median line, at the back part of the frontal bone, near the coronal suture.... The iron which thus traversed the head, is round and rendered comparatively smooth by use, and is three feet seven inches in length, one and one fourth inches in its largest diameter, and weight thirteen and one fourth pounds....

"The patient was thrown upon his back by the explosion, and gave a few convulsive motions of the extremities, but spoke in a few minutes. His men (with whom he was a great favorite) took him in their arms and carried him to the road, only a few rods distant, and put him into an ox cart, in which he rode, supported in a sitting posture, fully three quarters of a mile to his hotel. He got out of the cart himself, with a little assistance from his men, and an hour afterwards (with what I could aid him by taking hold of his left arm) walked up a long flight of stairs, and got upon the bed in the room where he was dressed. He seemed perfectly conscious, but was becoming exhausted from the hemorrhage, which by this time, was quite profuse, the blood pouring from the lecercated sinus in the top of his head, and also finding its way into the stomach, which ejected it as often as every fifteen or twenty minutes. He bore his sufferings with firmness, and directed my attention to the hole in his cheek, saying 'the iron entered there and passed through my head'.

Sometime later Dr. Harlow made the following report:

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Sometime later Dr. Harlow made the following report:
"His physical health is good, and I am inclined to say that he has recovered. Has no pain in head, but says it has a queer feeling which he is not able to describe. Applied for his situation as foreman, but is undecided whether to work or travel. His contractors, who regarded him as the most efficient and capable foreman in their employ previous to his injury considered the change in his mind so marked that they could not give him his place again. The equilibrium or balance, so to propensities, seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operations, which are no sooner arranged than they are abandoned in turn for others ....... his mind is radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage'.

Such changes in personality following frontal lobe damage have been noted by laymen as well as doctors. In his book Arctic Adventure, Freuchen (1935) describes an old Eskimo, Agpaleq, whose gun exploded in his hand while he was shooting caribou and resulted in extensive destruction of the brain. The left frontal lobe was badly shattered in the accident and about a cupful of brain matter was lost.

"They cleaned out more with a spoon, after which Alequasag sewed the skin together ... Agpaleq's recovery was slow, but almost complete. The accident resulted in peculiarity of habits rather than invalidism. During the remainder of his life he could sleep for a week or more at a time, and remain awake an equal length of time. When asleep, it was almost impossible for him to be awakened, and it became quite the custom for his neighbours to walk into his house and help themselves to whatever they might desire, including his wife. Agpaleq slept soundly through it all and never knew what practical jokes were played on him."
"He also became almost unbearably dirty, soiled himself and never cared. Prior to the accident he had been neat and clean, but afterward he was always smeared with grease or blood or both. His hands were filthy, his toes rotted away and filled the house with the most noisome stench. He could still hunt in his kayak, for he retained his heels and half of his feet, and was useful until the time of his death."

One of the earliest cases of subdural haemorrhage on record was that of Henry the Second of France who sustained a frontal wound and died. Hoessly (1965) published a translation of Wepfer's case notes written in 1657 on subdural haematoma. These were probably the first fully described cases of this condition. However, it was only sixty years ago that Trotter finally established that the lesion described as pachymeningitis haemorrhagica interna by Virchow and others was in reality a chronic subdural haematoma due to trauma.

Although Hippocrates had referred to cerebral commotion as the cause of traumatic unconsciousness, it was not until the time of Ambrose Pare in the seventeenth century that concussion was recognised as a distinct classical entity.

Sharp in 1754 distinguished between concussion and intracranial extravasation and emphasised the danger of insisting on a history of lucid interval before diagnosing the latter (Pandya 1969). Hutchinson in 1867 drew attention to the significance of the unilateral dilated pupil in head injury (Kellett 1964). Cushing (1908) advocated subtemporal decompressive operations for the intracranial complications associated with bursting fractures of the skull.
The importance of the prevention of head injury had been recognised for a long time since the knights of middle ages wore steel helmets as part of their armour. The tin hat was evolved during the First World War and the helmet of the second World War was its natural extension. To Cairns (1941) goes the credit for popularising the crash helmet for civilian use.

The two World Wars taught many lessons in the management of penetrating injuries of the head. Extensive debridement of all parts of open wounds, recognition of the effectiveness of dura matter or dural substitutes as a barrier to infection and the use of powerful antibiotics reduced morbidity and mortality from head injuries effectively.

In the early 1900's the mortality rate of head injury with coma was around 70%. Currently, most studies show that mortality rate in adults has been reduced to about 50% with the improvement in medical care and innovation of new modes of treatment. The mortality rate in children is substantially less, ranging between 30 and 40% in most studies. In general, if the patient survives the initial head trauma, prognosis is usually better than one would assume — post-traumatic amnesia, severe dysphasia, and symptoms suggesting brain stem lesions imply a poorer prognosis.
The whole history of epilepsy is linked with the story of magical belief and their refutation by scientific physicians. Until modern times this battle was not conclusively won. The 'Sacred Disease', an ancient name for epilepsy, is probably the oldest human disorder of the brain. As early as 2080 B.C. it was mentioned in the Hammurabi Laws and then as now had medico-social importance. It was known to both the ancient Egyptians and the Hebrews. In the Talmud it was stated that peculiar behaviour of parents during cohabitation could lead to epilepsy in the child.

The battle between the scientific and non-scientific attitude to the disease was first recorded in the book 'On the Sacred disease' written by the physician Hippocrates in 400 B.C. It was an attack against popular superstition, magicians and charlatans who called the disease 'sacred'. He considered that epilepsy was the result of brain disease and berated his colleagues who regarded it as some manifestation of divine intervention, maintaining that they said it merely to cloak their ignorance. He blamed the imbalance of the four humours - blood, phlegm, yellow bile and black bile - as the cause of fits. By his accurate study of epileptic patients Hippocrates was able to put forward original views on the functions of the brain.
THE COMITIAL DISEASE

The 'sacred disease' of the Greeks became to the Romans the 'Morbus comitialis'. The epileptic was considered to be unclean, so the sufferer was paradoxically labelled as having the 'sacred disease' and yet never considered holy.

Galen, another physician who lived some 500 years after Hippocrates synthesised the Greek ideas of the four 'elements' earth, air, fire and water with the notion of the four 'humours' devised by Hippocrates, blood, phlegm, yellow bile, and black bile. Galen affirmed that epileptic attacks started in the brain and he is often credited with the introduction into medical terminology of the word 'aura'. These warning signs of a fit were also described by Aretaeus of Cappadocia, who lived from 150 AD to 200 AD.

In the Dark and early Middle Ages the popular desire to connect epilepsy with supernatural powers found a Christian counterpart association with certain saints, especially St. John of France and St. Valentine of Germany. The popular view then was that epilepsy was contagious and this belief was held by both physicians and laymen alike.

While these discussions about the supernatural powers were continuing, Thomas Willis was involved in studies of the anatomy and physiology of the brain. He has been called the founder of 'Neurology'. He described fits in which the disturbance of consciousness was not so profound, as 'Universal Convulsions'. Those which were associated with periodic disorders of sensation would be now called temporal lobe epilepsy. He regarded mild epileptic disturbances as
hysterical in nature. This view persisted for 200 years down to the time of Charcot, when the hybrid concept 'Hystero-epilepsy' was invented.

DEMONIACAL POSSESSION:

Most 16th and 17th Century physicians were interested in demoniacal possession. Few doubted the existence of Satan. Many physicians admitted that possession could occur and their task was to distinguish it from epilepsy. The church was well aware of the close relation between epilepsy and possession - in order to distinguish, the physicians were called in. They applied irrational treatments like enemas, purges, cuppings, fomentations, plasters and sweatings. If these treatments failed to give results, then it was presumed that a malign influence was at work.

THE AGE OF ENLIGHTENMENT:

Before this age other irrational views appeared and disappeared, for example, that of the moon. Upto the end of the 17th century the influence of the moon upon epilepsy was taken as an established fact. Richard Mead, an enlightened physician was also of this view and he even influenced John Hunter and Erasmus Darwin into thinking similarly.

In France, it was pointed out that the amount of heat the moon radiated was negligible, so that a mortal blow was dealt to the astrophysical theory of epilepsy. Tissot's "Treatise on Epilepsy" (1770) was the first book on the subject to show all the characteristics of enlightenment in medicine. It was learned, scientific and readable.
He rejected the influence of the moon but he also refused to accept the imagination of the pregnant mother as a cause of epilepsy. The opinion prevailed that sexual excesses were harmful to epileptic people and yet complete continence might cause the disease. Later, the emphasis was on masturbation. At the annual meeting of the British Medical Association in 1880, Dr. Bacon reported that he had castrated 2 male epileptics and found improvement on one. However, writing in 1881, Dr. Gowers indicated that castration had proved unsuccessful as a treatment of epilepsy. In 1861, Sir Samuel Wilks published the first report on the treatment of epilepsy by bromides. This was the first effective treatment for epilepsy, though it was observed that, when the treatment was discontinued, fits would recur, often with greater frequency.

**THE LATER HISTORY OF EPILEPSY**

The history of epilepsy in the era of scientific medicine began with Dr. Richard Bright who noted that an epileptic attack beginning in a small area of the outer surface of the brain or cortex was preceded by an aura. Dr. Bright was also notable as one of the first physicians to record the condition 'status epilepticus'. Only recently (1960) Dr. Richard Hunter wrote the history of status epilepticus though the reason for this is still not clear. Apart from clinical observation of the patient, other methods have also advanced the knowledge of epilepsy. Pathologists who examined the brain after the death of a patient have also contributed. Walter Spielmeyer, his
first thought was of a career in the church, however, he turned to medicine and worked with great energy. He took small sections of the brain and studied them carefully under the microscope. He demonstrated that a shortage of blood in the brain could produce changes in the small and deeply placed part of the temporal lobe called "Ammon's horn". Later, others were to confirm that this area was responsible for the psychomotor seizures which occur in temporal lobe epilepsy. Aleksei Yakovlevich Kozhevnikov was distinguished Russian neurologist, who described an unusual type of seizure, starting in a small zone of the brain and remaining localized to that area for some minutes or even hours and resulting in prolonged attacks of twitching of a limb or face. Charles Edward Brown-Sequard, began to study guinea pigs who developed epileptic seizures following electrical stimulation. He was one of the first people to prescribe bromide in the convulsion disorders—the only really effective medicine at that time. 

Jean Martin Charcot is perhaps best known for his work on hysteria. Hysterical attacks at that time were very common and mimicked convulsions. Charcot's clinical demonstrations of patients with neurological disorders, and the use of hypnosis in treatment influenced. Freud who later wrote about the association of epilepsy and hysteria and the use of hypnosis in psychiatric treatment. Freud also published a study of Dostoievski, the famous Russian novelist who suffered from epilepsy.
Sir William Gowers, a British scientist, whose main interest was in the clinical aspects of epilepsy wrote a book which is still widely read "The Borderlands of Epilepsy". In this are described conditions other than epilepsy which occur spasmodically, for eg. migraine.

The most important contributor to the neurology of epilepsy was Dr. Hughlings Jackson. His name is attached to one type of fit now widely known as Jacksonian epilepsy. He noted that if the fit started in the toe, a tight band around it could prevent the epileptic movements spreading up the leg and later involving the whole body. However more important than the exact description of one type of rare attack was his formation of the concept of epilepsy, which has stood the test of time and in particular, has been confirmed by EEG studies fifty years later. He defined epilepsy as "an occasional, sudden, massive, rapid and local discharge of the grey matter". He further divided the brain into higher and lower levels with corresponding higher and lower functions.

**TREATMENT FOR EPILEPSY**

The history of the treatment of epilepsy, shows, as with other diseases, a great variety of irrational manoeuvres, some effective but most ineffective. Sir Edward Sieveking observed in 1858 that "there is not a substance in the 'Materia Medica' there is scarcely a substance in the world capable of passing through the gullet of man, that has not at one time or other enjoyed the reputation of being an anti-epileptic".
The medieval physicians regime of drugs, cauterisation and trephination followed ancient traditions. Of the surgical methods, cauterisation took first place. The hot iron was usually applied to several places on the head and sometimes to other regions e.g. the shoulder blades. Trephinning, or making a small opening in the skull was meant as a vent to allow the 'mischiefous matter' to escape.

The change in therapeutics during the 18th century manifested itself by the rejection of a great many remedies that had been recommended by generations of physicians for their occult power over epilepsy. The 18th century physicians did not ignore therapeutics. Tissot (an 18th cc physician) recognised that the pre-disposing causes of epilepsy were not known, but that the patient should be kept on a healthy regime and free from excitement. This was treatment of the epileptic patient rather than of epilepsy, which is still the key to practice of good medicine.

The next stage was the introduction by Dr. Alfred Hauptmann from Germany of the barbiturate drugs. In 1912 he published the first paper on the use of luminal, now called phenobarbitone; the beginning of a safe and really effective treatment for epilepsy. Not until 1938, when Drs. Merritt and Putnam in the U.S. introduced phenytoin
did the next really efficacious drug become available to be followed by troxidone in 1946, described by Drs. Richards and Perlstein. This again was a real advance, because it was the first effective drug in the treatment of 'petitmal' epilepsy.

In more recent times, the Drs. Gibbs, husband and wife team, have made great contributions in the field of electroencephalography, Dr. William Lennox not only devoted much of his life to the study of epilepsy, but wrote a two volume work embracing the current knowledge of this disease. This book, "Epilepsy and Related Disorders", has historical references and numerous case studies of his own patients. Dr. Wilder Penfield worked on the treatment of epilepsy by surgical operation at the Montreal Neurological Institute. By skilful observations during operations he has increased understanding of the basic mechanisms of the brain function. However, inspite of extensive research, a vast number of unsolved problems of causation and treatment remain, and the story of epilepsy is still far from complete.