

History and Development of Neurosurgery in Anatolia (Part One)

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Abstract : The history and development of neurosurgery in Anatolia is about 60 centuries old. Several trephined skulls have been found in numerous excavations in different sites. One of these skulls (800 years BC.) presents a free flap craniotomy performed with an excellent surgical technique. Among many physicians and

surgeons practicing in Anatolia, Şerafeddin Sabuncuoğlu emerged as an admirable physician of the fifteenth century.

Key Words: Anatolia, Craniotomy, History, Paleopathology, Skull, Trephining

Anatolia is probably one of the oldest parts of the world inhabited by men. Its nown history goes back to before the paleolithic age, much earlier than the invention of any kind of writing. Most of the knowledge about this dark age of history is based on discoveries from numerous archaeological excavations. Assembly and reconstruction of findings from different sites build our present knowledge about the level of civilization (art, architecture, social life etc.) of their period. Our information about the practice of medicine is extremely limited and mostly depends on relics, wall carvings and sketches, paintings on objects and some skeletal findings.

Historically, Anatolia is known as one of the oldest lands which mankind either selected as a home or crossed on the way to the west or the east. Because of its geographical location, Anatolia was the main theater of countless immigrations, invasions and occupations from the prehistoric ages to even our day.

As a natural result of this continuous demographic movement, an exchange and mixture of civilizations took place in.

To be able to understand what was going on in Anatolia for more than 60 centuries, a brief account of the main historical events should be recalled.

The level of culture and civilization and certainly the practice of medicine was extremely advanced in Mesopotamia and ancient Egypt. In Mesopotamia, the famous code of Laws of Hammurabi of Babylon includes medical ethics as the rules of medical practice and fees to be paid to the physicians. Compensation to be paid to patients who were not treated properly was also listed. On the other hand, in Egypt, some papyruses dealing with medicine were found in the pyramids (17). Neurosurgically the Edwin-Smith papyrus is the most important. There are 48 systematically arranged case histories, 27 of these concern head injuries and 6 deal with spinal injuries.

Before we go any further, a few words also should be said about the well known mixture and exchange of these advanced cultures and civilizations which took place in Anatolia.

It is generally accepted that starting from as early as 4000 BC the direction of demographic movement was mainly from east to west. Thus the highly developed Mesopotamian culture was brought to even the remotest parts of the Anatolia for several centuries. The same movement also occurred in Cyprus, on board traders' boats from Jaffa (the oldest port in the eastern Mediterranean). The flow of Egyptian culture and civilization from Alexandria to Crete

took place at almost the same time and a new civilization emerged in Crete in about 1500 - BC. The peace loving, talented people of the Minoan Kingdom of Crete refined, perfected and developed Egyptian culture adding their own talents. Thus the early beams of Aegean Culture and civilization were observed in this most southern island of the Aegean Sea. But this centre of culture was invaded, looted and destroyed by the hostile warriors of the Mycenaean Kingdom about 3 centuries later.

We see Hittites as the main rulers of Anatolia at the time of the Minoan Kingdom of Crete. The Hittite empire became the most powerful state of its time and its border reached to the Egyptian Kingdom in the south. They were militarily very powerful and very active in trading. Their transactions were recorded on clay tablets. The decline of the Hittite Empire coincides with the invasion of Crete and destruction of the Minoan Kingdom by the Mycenaean. Two kingdoms appeared in Anatolia when the Hittites disappeared from history: The Urartians in the east and the Phrygians in central Anatolia. There were also several city-states in western Anatolia.

The invasion of their kingdom caused a mass migration of Minoans towards western Anatolia. When this reverse flow of culture intermingled with the already existing civilization of western Anatolia, the highest civilization on earth the "Aegean Civilization" emerged in Western Anatolia and the islands near the coast starting from 1200 BC. This is the civilization which gave birth to the highly developed medical practice of Aesculapion, Hippocrates of the Island of Cos, Galen of Pergamum and many others (8). The inevitable spread of culture and civilization moved towards the Western and Northern Aegean islands and mainland Greece in the following centuries. It took several centuries (VII th Century AD) for Paulus Aeginata to compile a medical history book and medical encyclopedia in seven volumes, a main reference book for many physicians of later centuries.

Without going into detail, I will mention only the highlights of neurosurgical practice in Anatolia during the historical evolution. Unfortunately written documents about medicine found in the excavations are few. For that reason, most of our knowledge about neurosurgical practice depends on skeletal findings, specifically the trephined skulls as in the other parts of the world (4,5,10,12).

The aim of these man-made holes in most of the skulls is not known exactly today. It is believed that cranial procedures performed in prehistoric times were not done only for therapeutic reasons but mostly to chase away evil spirits in psychiatric illnesses or epilepsy. According to another theory, a wise man's brain was removed after he died and used to treat a mentally retarded person. However in some pieces we have every reason to believe that the trephination was performed for treatment. Today when a trephined skull is found we would like to know:

- 1) If the individual who was subjected to this procedure was dead or alive at the time of the trephination? A hard question to answer.
- 2) If the individual survived this procedure and if he did, for how long? Today paleophysiology and paleopathology are able to answer this question.
- 3) What was the reason for this procedure? This question can only be answered if there are visible signs in the skull such as trauma.

Although there have been numerous excavations in almost every part of Anatolia within the last two centuries, skeletal findings were not cared very much. It is my impression that the variety of artifacts found was so tremendous no one paid any attention to evaluating skeletal findings. Unfortunately most of the early excavations were unauthorized and most of the objects recovered were not registered in the country but usually marketed commercially in other countries.

The earliest report of the finding of a trephined skull in Anatolia was published in 1958 by Şenyürek (11). Several skulls were found in a necropolis of an Assyrian bronze age trade colony during Kültepe excavations. A manmade hole was observed in the occipital bone in one of these skulls. The preserved edges of the bone along the hole seem rounded externally. This finding suggests that this individual survived the procedure for some time. No paleopathological study was reported. The oldest cranium with a manmade hole found in Anatolia is on display in the Ancient Civilisations Museum in Ankara. It was found in Kadipınarı in Southern Anatolia in 1962. A rather large craniectomy had been performed in the left posterior frontal region of this skull dating to the neolithic age (Figure 1a and b). It seems a sharp chisel-like object was used to produce the hole.

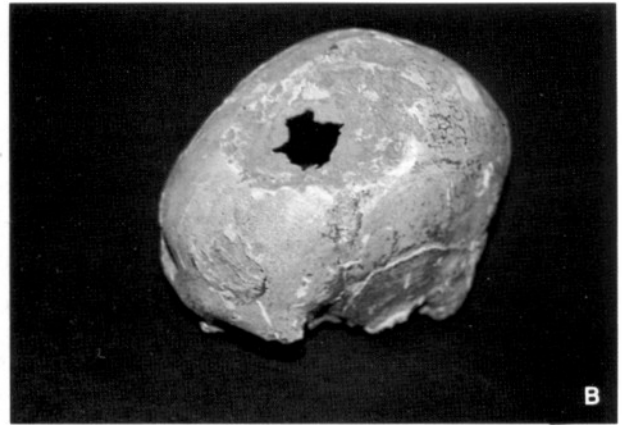


Fig. 1a and b : A large craniectomy had been performed in the left posterior frontal region of this skull dating to the neolithic age

Since there are signs of bone trauma in other locations we believe this procedure was performed for an open fracture. The sharp edges of the craniectomy suggest this individual did not survive the procedure very long. No paleopathological study was made.

Some other trephined skulls belonging to the early bronze age were found in İkiztepe-Samsun in northern Anatolia in 1986 (1, 2). The surgical technique of trephination seems much more developed, similar to that observed in Mesopotamia (Figure 2). There is no evidence suggestive of the reason for the trephination in these. No paleopathological study was reported.



Fig. 2 : The surgical technique of trephination seems much more developed, similar to that observed in Mesopotamia.

Another cranium belonging to Urartu period (800 BC) was found in Dilkaya -Van in the eastern Anatolia belonging to Urartu period (800 BC) by Erksin Güleç (6, 7). The surgical technique used seems highly developed, very similar to that used today. A free flap craniotomy was performed about 11 cm by 6 cm

in diameter. Several small holes were connected probably with a fine chisel. Apparently the bone flap was replaced after the procedure since both the cranium and bone flap were found together in the same grave during excavation (Figure 3A, 3B, 3C). Paleopathologically macroscopic and microscopic examination findings along the craniotomy edges suggest this patient survived the procedure for several weeks. Another interesting finding in this cranium is the presence of a long linear fracture-looking fissure travelling from the frontal to the occipital bone. The fracture line crosses more than one branch of the middle meningeal artery. Speculation can be made about the possibility of a surgically evacuated epidural haematoma through a craniotomy. Evidence of survival after this procedure strengthens the possibility of curative surgery. Unfortunately we have no available written information about this fine technique who was the surgeon and what happened to him, were there any proteges and the fate of his school. As a neurosurgeon today I certainly salute this colleague of ours with great respect. This cranium with a free bone flap craniotomy is unique and the only example of its kind.

There are several other trephined craniums belonging to the later periods. Among these three skulls found in a collective grave in a Roman theater at İznik in western Anatolia belonging to late Byzantine period should be mentioned. Findings on one have been reported by Özbek (9). Others are subject to paleopathological studies at the time being.

A few words should be said about the medical practice of the Hittites. Among the several thousands of clay tablets found, the number of medical writings

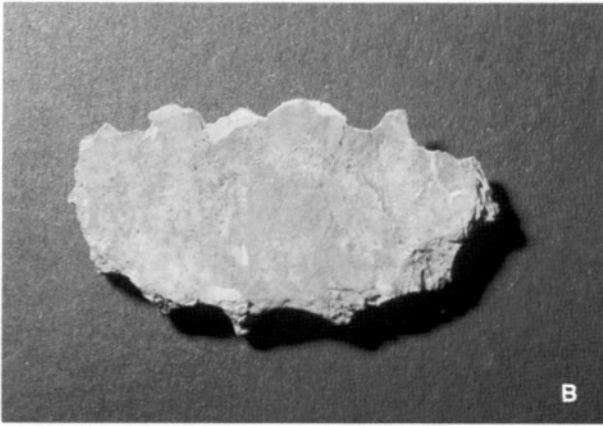


Fig. 3a, b, c : Apparently the bone flap was replaced after the procedure since both the cranium and bone flap were found together in the same grave during excavation.

are very few and in view of this, we assume that medicine in the Hittite period was sort of suppressed. It is generally believed that Hittite medicine was more primitive than Egyptian and Mesopotamian. According to the very few clay tablets related with medicine, the Hittites only performed magic rituals against diseases (16). One of the clay tablets, (Ritual of Ashella CTH 394) describes the ritual against contagious diseases (3).

Progress of the practice of medicine, especially in western Anatolia was parallel to the Western countries during the early AD centuries. Physicians and surgeons of Anatolia were influenced by the work of Avicenna and Abu Kasım Zahrevi (Albucasis) of Cordoba starting from the tenth century AD. Turan Melik Hatun of Divriği-Sivas was a female scientist-physician and surgeon of the 13th AD century in the

Selçuk period. She wrote a surgical book in Turkish with Arabic scripts. Abu Kasım Zahrevi's influence seems quite obvious in her work. Şerafeddin Sabuncuoğlu is a corner stone in Anatolian medicine and surgery of the 15th century (see Uzel's article about *Cerrahiyyetü'l-Haniyye* in this issue).

Although Şerafeddin's surgical book was also greatly influenced by Abul Kasım's work, he enriched the text with his own experiences. *Cerrahiyyetü'l-Haniyye* was written in Turkish with Arabic scripts. All surgical techniques were explained by colored miniatures. Some neurosurgical entities and procedures were described and demonstrated with miniatures in this book (13,14,15). Such as migraine headaches and their treatment (figure 4), epilepsy and treatment, haematomas and fluid collections (figure 5) in the head and their treatment. Reduction of



Fig. 4 : Migraine headaches and their treatment.



Fig. 5 : Haematomas and fluid collections in the head and their treatment.

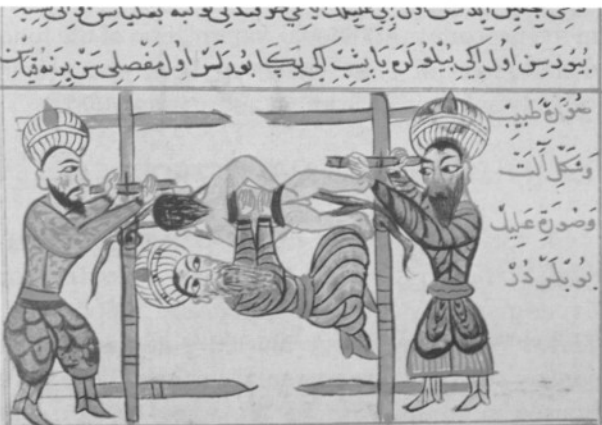


Fig. 6 : Reduction of fracture dislocation of the vertebral column.

fracture dislocation of the vertebral column (figure 6). Interestingly enough, Sabuncuoğlu cited Paulus Aeginata as "physician Pavlos said". This was not done by many others before him. Miniatures from Şerafeddin's book have been reprinted in medical history books and some of the legends make him an Arabian or Persian physician. By giving him a little

longer paragraph, I just wanted to put the record straight.

As the author of this article, I have no intention of giving a chronological account of development of medicine and neurosurgery in Anatolia. If I did, it might be more scientific but would be boring. Therefore, I have only touched on some points of interest. I will do the same in the second part of this article. (To be continued)

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