



First Skull Surgery in Iran: The Burned City and a 4800-Year-Old Skull

****Abdorrezza NASER MOGHADASI***

MS Research Center, Neuroscience Institute, Sina Hospital, Tehran University of Medical Science, Tehran, Iran

***Corresponding Author:** Email: abdorrezamoghadas@gmail.com

(Received 12 Dec 2013; accepted 26 Dec 2013)

Dear Editor in Chief

In 1977, an Italian archeological group made a great discovery while excavating the Burned City (Shahr-e sukhteh). They found a skull dating back to 2800 BC with a triangular surgery scar showing the removal of a piece (1) (Fig. 1-A & B). The other remarkable feature of the skull was the dimensions that were significantly big compared to the age of the person it belonged to (1). Based on the investigations, the skull belonged to a girl who was approximately 13 yr old (1). A neurologist could immediately and without any diagnostic measures diagnose congenital hydrocephalus in her (1). The abnormal enlargement of the skull, particularly the parietal regions on both sides (1) is the common view in congenital hydrocephalus. Since surgery can be a method of treatment in case the patient is symptomatic, it is assumed that this ancient surgery was conducted for treating the girl. In the present manuscript, I am intending to study the allegation to find relevant supporting documentation.

It should be born in mind that performing similar surgical interventions on skull has a long history and was mostly conducted as a magical intervention (1).

However, performing such a surgical intervention indicating an underlying disease in the patient is a very noticeable case. In order to partially presume the event, some information on congenital hydrocephalus, its causes and the reason for performing

the skull surgery at a certain age (13 years in this case) would be helpful.

Hydrocephalus is the abnormal accumulation of cerebrospinal fluid in ventricles that may have several causes, the most prevalent of which include infections, strokes, bleeding and tumors. Congenital hydrocephalus is a type that takes place prior to/immediately after birth. The disease may cause impatience, drowsiness and vomiting in children. Almost 45%-53% of the patients die, if remain untreated (2); yet, others may survive with the slow growth or the spontaneous discontinuation of the disease (3). However, the patients do not always have stable conditions and hydrocephalus may suddenly become unstable due to a minor stroke (4). At this point, this girl's case is reviewed. First, we are aware that the girl was among those who could survive until 13 years of age; i.e. her hydrocephalus had discontinued. The point that her enlarged head had made her look unusual can be true but the data show that skull enlargement was not extraordinary in the Burned City because two other skulls representing hydrocephalus were also found there (5). Second, if the intervention was performed as magic, why was it delayed until the time she was 13? I believe that something special should have happened at a certain time and this could have made the physicians perform the magical rituals. Considering the above-mentioned explanations, the patient's hyd-

rocephalus had exited from stable to progressive stages. In other words, at the time, hydrocephalus was activated for some reason, the patient became symptomatic and this made the physicians perform the magical intervention. The next question would be if the magical intervention had affected

her health conditions. Possible treatments of hydrocephalus should be considered before answering this question. Shunting is the major procedure; it functions as a bridge between intraventricular and the exterior spaces and reduces the pressure by discharging cerebrospinal fluid (6).

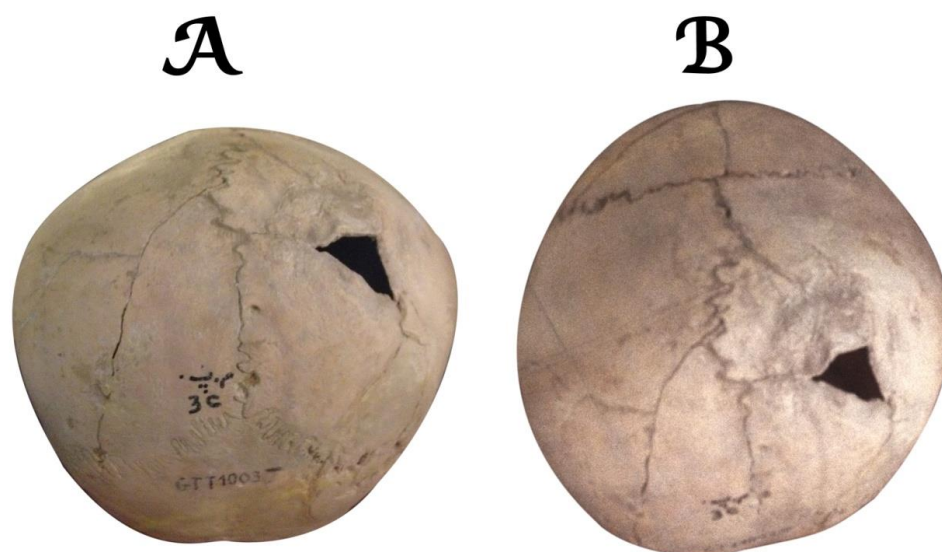


Fig. 1: A & B: Two views of the Burned City skull

The other method is decompressive craniotomy. In this method, a piece of skull is removed to reduce intracranial pressure (7). Despite its several complications, the approach is still applied for reducing intracerebral pressure. Now, it can be determined that the surgery carried out on the Burned City girl was scientifically a type of decompressive craniotomy, though it was magic-based. In this case, a part of the skull in the right posterior region was removed and this should have probably reduced the intracerebral pressure. Following the examination of the scar and the regrowth of bone adjacent to it, it can be presumed that she had lived for about 6 months after the intervention (1). If this is the case and the patient had experienced a progressive trend prior at the time of the intervention, she should have passed away without being treated. Nevertheless, she had

lived for at least six months post-surgically. This means the intervention had functioned as a kind of decompressive craniotomy and managed to, at least temporarily, treat her.

The present report is an example of the mutual interaction between neuroscience and archeology. Different branches of neuroscience can help archeological findings be more productively.

Acknowledgment

My special thanks go to Dr. Seyed Mansour Seyed Sajjadi, a distinguished archeologist who supervised the Burned City excavations and was kind enough to provide me with plenty of useful information on the Burned City. I would also like to thank the manager and dear specialists of the Iranian National Museum of Medical Sciences His-

tory for their cooperation. The author declares that there is no conflict of interests.

References

1. Seyed Sajjadi SM (2008). First evidences on pre-historic surgery in Iran; *J Skull: Burned City (Shahr-e sukhteh)*. *Tourism Journal*, 7:11-22.
2. Hirsch JF (1992). Surgery of hydrocephalus: past, present and future. *Acta Neurochir (Wien)*, 116(2-4):155-60.
3. Laurence KM, Coates S (1962). The Natural History of Hydrocephalus Detailed Analysis of 182 Unoperated Cases. *Arch Dis Child*, 37(194): 345-362.
4. Dickerman RD, McConathy WJ, Lustrin E, Schneider SJ (2003). Rapid neurological deterioration associated with minor head trauma in chronic hydrocephalus. *Childs Nerv Syst*, 19(4): 249-51.
5. Seyed Sajjadi SM (2009). The Burned City: Medicine and Local Technologies in Ancient Iran. In: The Burned City articles. Ed, Seyed Sajjadi SM. Cultural Heritage, Tourism, and Handicrafts Organization of Sistan & Balouchestan. Volume 1, pp. 111-121.
6. Grand W, Chamczuk AJ, Leonardo J, Snyder KV (2011). Endoscopic third ventriculostomy for hydrocephalus after perimesencephalic subarachnoid hemorrhage: initial experience in three patients. *Acta Neurochir (Wien)*, 153(10):2049-55.
7. Kunze E, Meixensberger J, Janka M, Sorensen N, Roosen K (1998). Decompressive craniectomy in patients with uncontrollable intracranial hypertension. *Acta Neurochirurgica, (Supplement)* 71: 16-18.