Mummification: all heart, no brain?

Why did ancient Egyptians preserve the heart and yet discard the brain in the mummification of humans? Sofia Aziz investigates.

To the ancient Egyptians, the word *ib* for the heart was a metaphysical entity embodying thought, intelligence, memory and wisdom, as well as bravery, sadness and love, as discussed in a recent *Per Mesut* article (AE.85). It was *ib* as a metaphysical entity that was weighed in the judgment scene depicted in the Ani papyrus and elsewhere. But there was a separate word used for the anatomical heart: *haty*. Preservation of the *haty* was vital in human embalming but the fate of the brain is still a puzzle. We know it was mainly removed and the process by which this was done. The purpose of mummification was to preserve the body intact for the afterlife, and other internal organs were surgically removed, preserved and put in canopic jars, so why was the brain discarded?

Symbolically the heart was conceptualised as the centre of a man’s life force; despite shifting ideological representations it always remained the seat of the mind. As yet no symbolic significance has been found for the brain; even the word for brain, *Ais*, is very rare and has only been found written in the Edwin Smith Papyrus. This may be because most of the brain’s functions were assigned to the heart instead.

Egyptian physicians believed that from the heart, *metu* linked all parts of the body together. *Metu* can best be defined as a series of ducts connecting the heart to each of the body’s organs. From some of those organs a second set of *metu* carried those organs respective products (such as air, saliva, mucus, sperm and excrements) to the surface. No *metu* travelled to or from the brain.
The ancient Egyptians may have considered the brain to be mainly a source of mucus; it was extracted via the nasal cavity and the hieroglyph for brain includes the determinative ‘discharge’ and consequently could be something worth ignoring or even actively removing to improve the afterlife.

**Mummification**
The ancient Egyptians left no written description of mummification procedures. The only available papyri describe what happens to the mummy after the embalming process. The main ancient sources we have are Herodotus of Halicarnassus who visited Egypt around 450 BC and Diodorus Siculus of Sicily writing c. 60 BC. Herodotus states:

"The most perfect procedure is as follows. As much of the brain as it is possible is extracted through the nostrils with an iron hook, and what the hook cannot reach is dissolved with drugs."

His account does have some truth in it. Modern autopsies of mummies confirm the removal of the brain in many bodies, and natron was used for drying and preserving the body. Herodotus, however, does not mention the heart. Diodorus Siculus, is the only ancient source to mention mummification procedures regarding the heart. He writes:

"When they have gathered to treat the body after it has been slit open, one of them thrusts his hand through the opening in the corpse into the trunk and extracts everything but the kidneys and heart, and another one cleanses each of the viscera, washing them in palm wine and spices."

Modern autopsies confirm that the kidneys were usually left intact. However, recent research reveals that the heart was not always retained in the body as Diodorus Siculus suggests.

**Evidence from Medical Papyri**
Did the ancient Egyptians understand the function of the brain or was it indeed just regarded a source of mucus or even a packing for the skull? Were the functions of the brain thought to be carried out by the heart? The main sources which provide an insight into ancient Egyptian medicine are the Edwin Smith Papyrus and the Ebers Papyrus.

The Edwin Smith Surgical papyrus probably dates from the seventeenth century BC. It is a partial copy and the original could have been composed during the Old Kingdom period. Although incomplete, the papyrus provides substantial insight into Egyptian medicine. It demonstrates a structured approach to clinical problems, especially trauma. Most interestingly, Case 6 refers to a number of important characteristics of the brain.

The word ‘brain’ occurs eight times in this papyrus; the text includes a description of the symptoms, diagnosis, and prognosis for each of two patients wounded in the head with compound fractures of the skull. It describes 27 cases of head trauma, four of which are deep scalp wounds whereby the skull is exposed, and eleven of which are skull fractures. Great detail is given of the symptoms and signs of head injury. Three traumatic head injuries mentioned are so severe that the brain is actually exposed. The text shows that the ancient medics had knowledge of brain convulsions, described as ripples which form on molten copper (see Per Mesut, AEL85), and of the meningeal membranes surrounding the brain: there is a separate word for meninges, nbt, with an animal skin determinative. From the papyrus it is also evident that the role of the spinal cord in the transmission of information from the brain to the lower part of the body is also understood: Case 31 gives a clear description of quadriplegia, a medical condition caused by injury or illness which results in motor and sensory paralysis of all four limbs.

James Henry Breasted who translated the Edwin Smith papyrus was convinced that the ancient Egyptians understood the brain to be the source of control of movements...
of the body because the papyrus discusses a severe head injury which may have affected the limbs, one of the symptoms being a limp. However, the papyrus only acknowledges that a severe trauma to the head could affect the limbs. Also it states that the limb on the side of the trauma is affected; since the left side of the body is controlled by the right side of the brain, it is the opposite limb that should be affected (although this could be due to scribal error when the papyrus was written or copied).

If the ancient Egyptians had understood the importance of the brain, surely they would not have mutilated and discarded it during the mummification process. Egyptian medicine was highly specialized with experts in eye ailments etc., but there seem to have been no brain specialists, which would be surprising if Egyptians understood that the brain was the most important organ.

The Ebers papyrus demonstrates that some functions of the brain were conceptualised as that of the heart. This papyrus is a 110-page scroll written in hieratic around 1500 BC, probably a copy of earlier texts, and is one of the oldest ancient Egyptian medical documents. It contains seven hundred magical formulas and remedies with incantations to expel demons that cause disease, and it states that the heart is at the back of the skull where the spine enters the head, while 27 were found with brains still in situ. Dr Wade’s team also discovered that only 21 out of 80 mummies investigated were found to have the heart intact. It appears that as mummification techniques evolved, the heart was left in the body, but from the later part of the Middle Kingdom onwards, the incidence of heart retention reduced significantly. Social status may have been a factor, with heart removal only for the elite to give them a more favourable afterlife.

Brain extraction was initially reserved just for the king, occurring as early as the Fourth Dynasty, and later allowed for members of his family and the highest officials. By the Middle Kingdom, brain removal was also accessible to the middle class, but was not practiced during the New Kingdom; X-ray scans of Seqenenra, Queen Ahmose Henetmesu, Amenhotep II and Thutmose IV show these mummies retain their brain tissue. Furthermore, the surviving brains were found to be impregnated with natron which was very effective in shrinking and preserving the brain. In the latter part of the Eighteenth Dynasty, resin had been poured into the cranial cavity, as seen in the mummies of Yuya (opposite right), Amenhotep III and Tutankhamun. Interestingly Tutankhamun’s mummy was also found to have had the heart removed. During the late to the Roman period emphasis shifted to external aesthetics of mummification rather than internal mummification.

**Brain Extraction**

Exactly how the brain was removed has been investigated by the study of mummified remains and by modern mummification experiments, the first in 1994 by Dr Bob Brier and his team. To remove the brain, the team laid the body on its back, head downwards, allowing any remaining fluid to drain away by gravity; this suggests that the brain had to be broken down into a liquefied form and could not have been removed piecemeal with a hooked instrument.

In 2012, a Croatian team led by Dr Mislav Cavka of the University Hospital Dubrava in Zagreb actually discovered a brain-removing probe, which the embalmers had accidentally left behind wedged inside the skull of a 2400 year-old mummy (see below and opposite, left). The instrument, made not from metal but a cheaper plant material similar to palm or bamboo, would have been inserted through a hole punched into the ethmoid bone near the nose. Dr Cavka believes that parts of the brain were wrapped around this stick and pulled out, while the rest was liquefied by movements of the stick inside the skull.

However brain extraction did not always take place. A 2010 study of 125 mummies from various periods by Dr Andrew Wade and Dr Andrew Nelson of the University of Western Ontario found that 92 showed evidence for brain removal via the nasal passage and 6 with brains removed via the foramen magnum (the large cavity at the back of the skull where the spine enters the head), while 27 were found with brains still in situ. Dr Wade’s team also discovered that only 21 out of 80 mummies investigated were found to have the heart intact. It appears that as mummification techniques evolved, the heart was left in the body, but from the later part of the Middle Kingdom onwards, the incidence of heart retention reduced significantly. Social status may have been a factor, with heart retention only for the elite to give them a more favourable afterlife.

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Conclusions

Recent research thus shows a high degree of variability of mummification procedures regarding the brain and the heart, which calls into question many of the assumptions previously made. If the ancient Egyptians believed it vital to retain the heart as the seat of intelligence needed in the last judgement, why were some people mummified without a heart or a replacement heart amulet? The assumption that the brain was simply discarded is called into question by the fact that mummies have been discovered with intact brains. Also, although no separate brain has been discovered so far, we do not actually know what was done with the brain once it was removed or what happened to the heart in cases where that was removed from the body. Only larger-scale studies can begin to answer these questions and allow us to understand better the vari-

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Further Reading


