

HISTORICAL VIGNETTES IN VASCULAR SURGERY

Norman M. Rich, MD, Section Editor

Vascular medicine and surgery in ancient Egypt

Justin Barr, MPhil, *New Haven, Conn*

Lauded alike by ancient civilizations and modern society, pharaonic Egyptian medicine remains an object of fascination today. This article discusses its surprisingly sophisticated understanding of a cardiovascular system. The term “cardiovascular system,” however, carries assumptions and meanings to a modern audience, especially readers of this journal, which simply do not apply when considering ancient conceptions of the heart and vessels. For lack of better language, this article will use “cardiovascular” and similar terms while recognizing the anachronistic inaccuracy. After briefly summarizing ancient Egyptian medicine generally, it will review the anatomy, pathology, and treatment of the vasculature. The practice of mummification in ancient Egypt provides a unique opportunity for paleopathology, and the conclusion will explore evidence of arterial disease from a modern scientific perspective. (*J Vasc Surg* 2014;60:260-3.)

Knowledge of Ancient Egyptian medical practices primarily derives from about a dozen important medical papyri dating from ca 1550 BCE (Edwin Smith Papyrus) to 300 BCE (Brooklyn Snake Papyrus), each with its own history and area of focus (Fig 1).^{1,2} Scribes, with a distinct and elevated position in society, wrote these documents in hieratic, a cursive form of hieroglyphics. The Ebers Papyrus (ca 1500 BCE) provides the greatest insight into Egyptian anatomy and physiology generally as well as on the cardiovascular system specifically.³

In addition to written texts, Egyptian artwork also enlightens some medical conditions, although few illustrations of human organs exist, and the only definitive surgical image remaining depicts a circumcision (Fig 2). With the exception of some flint blades used to sever umbilical cords, no surgical instruments from ancient Egypt survive, thus leaving medical texts as historians’ primary source.⁴

Specific conditions permitted the development of relatively advanced ideas in health and treatment. The fertility provided by the Nile River created a surplus of grain, allowing members of society to focus on tasks other than just food production. Isolation in North Africa generally freed them from the risk of external invasion, with generations of peace permitting cultural development, facilitated by a highly organized bureaucratic and administrative system. The early creation of writing allowed the preservation and spread of knowledge throughout the civilization.²

Ancient Egyptian society supported at least three types of practitioners⁵:

Priests would pray to the gods for salubrity, although Egypt was unusual in antiquity for lacking a specific healing deity; Horus and Isis frequently functioned as such but did not serve primarily in this capacity. Later in their civilization, Imhotep assumed the role.^{5*}

Magicians offered spells and incantations to ward off evil spirits and restore health to those afflicted.

Finally, *smmw* served as natural healers, relying on medications and operations to treat the sick. Although their payment in kind does not denote a particularly wealthy society, they nonetheless held a relatively high social position, just below priests. *Smnm* specialized by organ system and disease process, although some debate remains about whether the “shepherd of the anus” truly focused on proctology or was just the royal enema giver.^{2,5,6}

The anus (understood as the lower intestines more generally) nonetheless played an important role in Egyptian pathology because it was the source of *wekhedu*, a poisonous substance that caused disease.^{7†} Pus represented the manifestation of *wekhedu* arising to the body surface. Most medical treatments sought to eliminate, control, or localize this *wekhedu*.² Although the ancient Egyptian medical system remained remarkably stable over 20 centuries, therapies gradually shifted from scientific and logical to a heavier reliance on magic and prayer.^{2,5,6}

From the Section of the History of Medicine, Yale School of Medicine, Yale University.

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Reprint requests: Justin Barr, Mphil, Yale University, Sterling Hall of Medicine, 333 Cedar St, L132, New Haven, CT 06520-8015 (e-mail: justbarr@gmail.com or justin.barr@yale.edu).

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CARDIOVASCULAR SYSTEM

The heart featured prominently in ancient Egyptian culture generally and in medicine specifically.⁸ They considered it the center of the body, spirit, and soul, and

*Thot did serve as a god for eye diseases, and Ta-urt Taouris presided over childbirth, but until the deification of Imhotep in the 7th century BCE, no Apollo or Asclepias-like figure existed in Egyptian religion.

†The pre-Hippocratic Greek medical conception of *perittoma* may have derived from *wekhedu*.



Fig 1. Column from the Edwin Smith Papyrus displaying the hieratic script. Case 33, toward the bottom, presents a sternoclavicular dislocation and describes two vessels in the upper chest carrying blood to the respiratory tract. Source: https://www.nlm.nih.gov/news/turn_page_egyptian.html.

it accordingly received substantial treatment in their medical literature. The Ebers Papyrus considered “knowing the movements of the heart” as “the beginning of the secrets of the physician.”^{3,9sec854a} It goes on to detail a variety of heart diseases. The “heart is deflected,” for example, when heat from the anus caused it to enlarge and shift toward the stomach (literally: mouth of the heart). The “heart is spread out” when its vessels carry feces. The “heart is flexed” or shrunken when *wekhedu* falls upon it, causing the heart to go into mourning and misshape itself.⁹ Other examples abound. Unfortunately, the Ebers Papyrus does not detail how to diagnose most of these conditions, but if the manuscript was designed for use by the naturalistic *swmw*, then we might assume it was based on clinical presentation and possibly some collection of specific symptoms and patient history.

Extending from the heart were *mtw*, translated roughly as “vessels” (Fig 3).^{3,6} Depending on their location, *mtw* carried not just blood but all other bodily fluids as well,

with *mtw* near the bladder transporting urine, those in the testicles ferrying semen, ones near the anus transmitting feces, etc. Papyri identified 22 vessels distributed to all parts of the body and broadly described their location (“in his occiput” or “for his eye” or “for his upper arm”). The absence of postmortem dissection in ancient Egypt precluded more detailed localization, and contrary to popular belief, physicians’ anatomical knowledge did not benefit from the embalming and mummification process. Papyri went on to recognize that local pathologies resulted from the disruption or sickening of *mtw* leading to that particular body part.

Although medical thought certainly did not elucidate a circulatory system as such, it did clearly define a unidirectional distributive system. *Mtw* originated at the heart and terminated at the anus. Egyptians recognized some connection between the lungs and the heart, teaching “as for the air that enters at the nose, it enters to the heart and lungs, and they convey [it] to the whole body.”^{9sec855a,10} Similarly, food entered *mtw* through the intestines and spread to nourish the corpus.

Importantly, Egyptians recognized that the peripheral pulse resulted from the heart and that assessing the beat of the heart and vessels provided insight into the patient’s condition.¹⁰ Some scholars go so far as to assert the ancient Egyptians actually measured the pulse, but the lack of any time-keeping device probably precluded this practice.¹¹ Nonetheless, it was a remarkably advanced understanding that predated similar Greek knowledge by over a 1000 years.

Textual evidence points to the first description of varicose veins in the Ebers Papyrus: “if thou findest in on the leather layers (skin?) of any limb as many serpentine windings which are inflated with its air, it is an enemy of the vessel,” although the description admittedly leaves some room for doubt.⁵ More definitively, the Ebers Papyrus does provide the oldest description of an arterial aneurysm:

*When thou considereth a swelling of the vessels on any part of the man’s body and thou findest it globular [and] firm under thine fingers when going [pulsating?]. . . then thou shalt say: ‘this is a vessel swelling, a disorder I will treat. It is the vessels that cause it. It originates from an injury upon the vessel.’ Then thou shalt apply to it treatment with the knife; this [the knife] is heated in fire; the bleeding will not be considerable.*¹²

Here, the Egyptians seem to understand the pathology because they assert that stopping flow to the aneurysm halts its pulsation, and the proposed etiology leads one to diagnose a pseudoaneurysm. Although the cautery they describe no longer obtains, it nonetheless offered a simple and reasonably effective intervention. Interestingly, scientists have not found any evidence of aneurysms in mummies.

The surgical intervention recommended in treating aneurysms represented an exception to the pharmacologic remedies that dominated *swmw*’s practices. Aside from stitching together simple wounds and setting fractures, few proposed surgical cures appear in any of the papyri,^{5,6} no evidence of major surgery exists on any of the 30,000

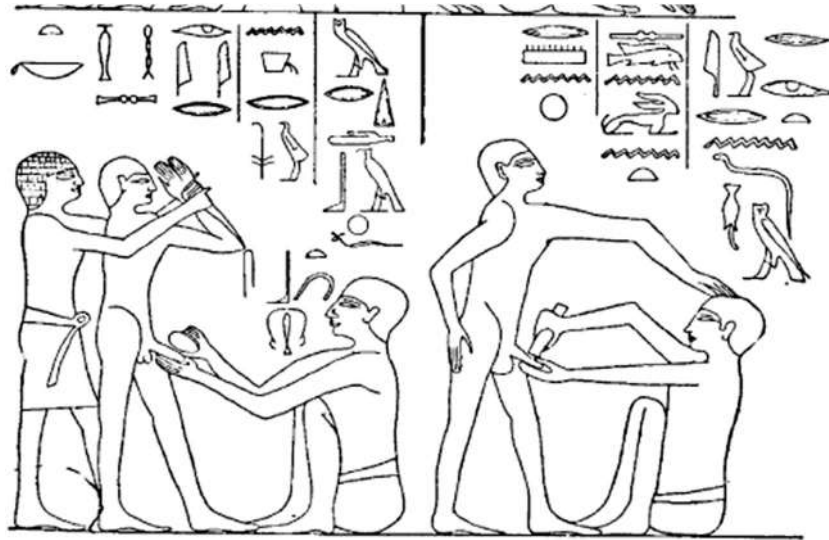


Fig 2. The only definitive image of Egyptian surgery remaining depicts a circumcision. Source: Wash JJ. First pictures of surgical operations extant. *JAMA* 1907;xlix: 1593-95.

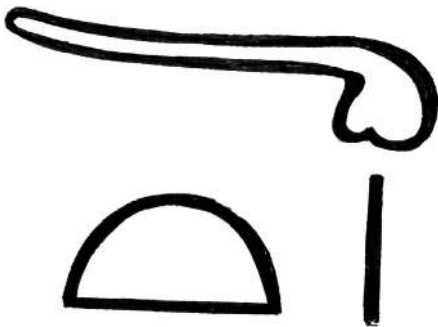


Fig 3. Hieroglyph for *mtw*, or vessel, rendered by Wa Liu. The erect phallus has phonetic, not symbolic significance.

mummies examined, nor have archeologists unearthed any collections of surgical instruments, except for the aforementioned flint blades.² Thus, procedures such as blood-letting and ligature, long associated with ancient medicine, presumably occurred infrequently, if at all, in ancient Egypt. Instead, practitioners relied on an expansive array of drugs and nostrums to treat their patients, a pharmacopeia highly regarded throughout antiquity.^{2,5,6}

The above representation is admittedly sketchy, but in fact, the cardiovascular system remains the best elucidated organ system in ancient Egyptian medicine, due largely to the primacy of the heart in their culture, resulting in an entire vessel book within the Ebers Papyrus.⁵ In contrast, no known references to the kidney survive, and given that kidneys were the only major organ left in mummies, it is possible the ancient Egyptians did not even know of their existence. Still, an incomplete understanding of the heart and vessels remains. Evidence from mummies, however, can help fill in some of those gaps.

PALEOPATHOLOGY

Paleopathology, the study of disease in ancient populations through archaeological records, affords unique opportunities to explore disease burden. The high state of preservation of Egyptian mummies proffers unusually detailed and complete information. Certainly, this method of investigation has limitations, notably confusion resulting from poor documentation during excavation, discriminating between disease and postmortem degeneration and damage, and of course, retrospectively applying 21st century CE disease labels to 21st century BCE patients.¹³ However, it provides otherwise unobtainable insight in the vascular health of their society.

Paleopathologists have been examining Egyptian mummies' vasculature for well over a century, identifying examples of atherosclerotic disease.¹⁴ As early as 1852, histologic examination noted aortic calcifications in mummies.¹⁵ More recent investigations found evidence of arterial disease in 44 of 52 mummies (85%) examined radiographically, with probable or definite atherosclerosis in 20. Arterial lesions spanned the coronary, carotid, iliac, femoral, and tibial vessels.¹⁶ Another study found the incidence of atherosclerosis in Egyptian mummies (38%) comparable with that of other ancient civilizations.¹⁷ With an average lifespan of 36 years (20% longer than the predynastic era),² a diet free from modern viands, and a lifestyle that involved extensive physical labor, perhaps one might expect less arterial disease. However, it is important to recall that most mummies hailed from the upper classes of society, presumably more idle and with a richer, more carnivorous diet.

CONCLUSIONS

The age of the Pharaohs and its practice of medicine has fascinated western society from Herodotus's visit in ca 450 BCE to the 21st century *Mummy* movies. As this

article has elucidated, the ancient Egyptians developed a relatively sophisticated understanding of the heart and vessels in structure, function, and pathology. The chronologic and geographic isolation of Egyptian physiology from that described in the Hippocratic texts precluded significant influence on western medical thought, but it nonetheless provides a translucent window into how an ancient society conceived of, thought about, and treated disease in their version of the cardiovascular system.

REFERENCES

1. Dawson WR. Egypt's place in medical history. In: Underwood EA, editor. *Science, medicine, and history: essays on the evolution of scientific thought and medical practice written in honour of Charles Singer Vol. I*. New York: Oxford University Press; 1953. p. 47-60.
2. Nunn JF. *Ancient Egyptian medicine*. Norman: University of Oklahoma Press; 1996.
3. Ritner RK. The cardiovascular system in ancient Egyptian thought. *J Near East Stud* 2006;65:99-109.
4. Allen JP. *The art of medicine in ancient Egypt*. New Haven, CT: Yale University Press; 2005.
5. Ghalioungui P. *Magic and medical science in ancient Egypt*. Great Britain: Hodder and Stoughton; 1963.
6. Estes JW. *The medical skills of ancient Egypt*. Revised edition. Canton: Science Hill Publications; 1993.
7. Steuer RO, Saunders JB. *Ancient Egyptian and Cnidian medicine: the relationship of their aetiological concepts of disease*. Berkeley: University of California Press; 1959. p. 3-7. 36-45.
8. Boisaubin EV. Cardiology in ancient Egypt. *Tex Heart Inst J* 1988;15: 80-5.
9. Ebers papyrus, sections 854-855, columns 99/1-102/16, quoted in Ritner RK. The cardiovascular system in ancient Egyptian thought. *J Near East Stud* 2006;65:99-109.
10. Sanchez GM, Meltzer ES. *Edwin Smith papyrus: updated translation of the trauma treatise and modern medical commentaries*. Atlanta, GA: Lockwood Press; 2012. p. 225.
11. Breasted JH. *The Edwin Smith surgical papyrus*. Chicago, IL: Chicago University Press; 1930. p. 104-14.
12. Ebers papyrus, section 872, column 108/3-9, quoted in De Moulin D. Aneurysms in antiquity. *Arch Chir Neerl* 1961;13:49-63.
13. Buikstra JE, Baker BJ, Cook DC. What diseases plagued the ancient Egyptians? A century of controversy considered. In: Davies WV, Walker R, editors. *Biological anthropology and the study of ancient Egypt*. London: British Museum Press; 1993. p. 24-53.
14. Ruffer MA. On arterial lesions found in Egyptian mummies. *J Pathol Bacteriol* 1911;XV:453-64.
15. Sandison AT. Degenerative vascular disease in the Egyptian mummy. *Med Hist* 1962;6:77-81.
16. Allam AH, Thompson RC, Wann LS, Miyamoto MI, Nur El-Din Ael-H, El-Maksoud GA, et al. Atherosclerosis in ancient Egyptian mummies: the Horus study. *JACC Cardiovasc Imaging* 2011;4:315-27.
17. Thompson RC, Allam AH, Lombardi GP, Wann LS, Sutherland ML, Sutherland JD, et al. Atherosclerosis across 4000 years of human history: the Horus study of four ancient populations. *Lancet* 2013;381: 1211-22.

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