Ophthalmology in Ancient Egypt

Abstract: The civilization of Ancient Egypt is the one that has the most references regarding the work of ophthalmologists, compared to the rest of the ancient civilizations. There are complete anatomical and treatment descriptions. Pepi Ankh Or Iri, who lived between 2270 and 2210 BC, is recognized as the first documented ophthalmologist in history. Ophthalmological cures were carried out with prayers, incantations, astrology for prognosis, amulets and pharmacotherapy with eye drops and ointments. Details of ophthalmologic surgery are unknown. The Edwin Smith (1600 BC), Ebers (1550 BC), Hearst (1550 BC) and London (1300 BC) medical papyri include ophthalmological pathologies. Ophthalmological medical assistance was in charge of lay doctors or swnw, priests and magicians, who worked together, since they believed that the origin of diseases was the result of external agents, as well as supernatural causes. The importance of this historical review article lies in pointing out some of the avant-garde aspects of the ancient Egyptian civilization with respect to ophthalmology and its practice, and the coexistence in their society of a rational medical practice together with a magical-religious approach.

Keywords: medical education, ancient egypt, ebers papyrus, edwin smith papyrus, medical specialization, ophthalmology

1. Introduction

The first settlements in Egypt arose 7,000 years ago. The civilization known as "Ancient Egypt" began around 3050 BC, with the first line of kings of the First Dynasty and culminated in the Persian invasion in 520 BC. From the year 1554 BC, the king began to be called "pharaoh", considered the incarnation of divinity.

The Egyptians were great farmers and sailors thanks to the Nile River valley. Its floods left silt[1] deposited on the ground. They were expert mathematicians and astronomers[2] and had a pictographic writing system called "hieroglyphics". They also skillfully executed metallurgy, goldsmith and carpentry.

Towards the end of its existence, Ancient Egypt was conquered by the Persians, who ruled until 332 BC, when Alexander the Great conquered the region and founded the city of Alexandria. Finally, in 30 BC, after Cleopatra's suicide, it became a province of the Roman Empire (Vázquez, 2000).

Egyptian society had a hierarchical and structured political organization, with numerous administrative, military and religious positions. The practice of medicine was regulated from the time of Imhotep and ethical rules were respected.

Imhotep, prime minister of Pharaoh Djoser of the Third Dynasty (2664 BC), was an Egyptian scholar who served as a chaty, the highest Ancient Egyptian official after the pharaoh. He stood out as an astronomer, doctor and, mainly, as the first known engineer and architect in history. He was made the god of medicine and wisdom in 525 BC. Furthermore, he practiced and wrote about medicine 2,200 years before Hippocrates and considered illness to be a natural consequence and not just a punishment sent by the gods (Rull Iglesias, 2022).

2. Discussion

2.1 Generalities of ophthalmology in ancient egypt

The Egyptian is the ancient civilization with the most references to the work of ophthalmologists, with complete anatomical descriptions and non-invasive treatments. It is considered that Egyptian ophthalmology had a good reputation in the ancient world

[1] It is a granular sediment composed of mud, clay and sand.

[2] The Egyptian calendar was the most accurate of the ancient calendars. It has 365 days and is very similar to the one currently used.

and there are texts by the Greek historian Herodotus of Halicarnassus (484 - 425 BC), which record the medical division into specialties: *"In Egypt, medicine, like the oracles, It is specialized. There is a doctor for every disease and there is no general medicine. Everywhere there are numerous doctors: some offer themselves as doctors for the eyes, others for the head, others for the teeth, others for the stomach, others for the internal organs."*

There were also other specialties. There are treatise registries in cardiology, gastroenterology, neurology, and trauma. Artificial eyes of metal and stones were produced to be placed in mummies and statues (Calvo Soriano, 2003).

Next to the pyramid of Giza is the tomb of Pepi Ankh Or Iri, known as the first documented ophthalmologist in history, who lived between 2270 and 2210 BC. He was also a specialist in astrology and iridology. Inscriptions on his tomb describe him as *"Chief of Royal Physicians, Royal Ophthalmologist, Chief of Intestinal Diseases, Magician, and Academician"* (Krause, 1933).

The religion of Ancient Egypt was polytheistic. In the Egyptian Olympus was Duau, god of ophthalmologists (Schirmer, 1962). There was also Hor (Hellenized as Horus), god of kingship in the sky, of war, and of the hunt, who, according to legend, had offered his healthy left eye to his father Osiris to restore his sight. He was the anthropomorphic[3] divinity of prosperity, agriculture, fertility and eternal life. The Egyptians referred to the sun (homologue of the god Ra) and the moon (homologue of the eye of Horus) as the eyes of the gods. The eye of Horus (see Figure 1) is the most often used Ancient Egyptian amulet (Vázquez, 2000).

[3] It refers to a divinity with physical forms or human qualities.

Figure 1. Horus Eye, circa 1390 – 1353 BC. C. Donated to Wikimedia Commons as part of the Metropolitan Museum of Art Project.

Ophthalmological cures were carried out in sanctuaries and temples, through prayers, incantations, astrology for prognosis, amulets and pharmacotherapy with eye drops and ointments. The details of ophthalmological surgery are unknown, having found indirect clues about the surgeries (Krause, 1933).

The first documented waterfall in the history of mankind possibly took place between the years 2467-2457 BC. It is found in Sakkara, in a statue carved in sycamore wood, representing the priest Ka-aper with leukocoria in his left eye, compatible with a mature cataract (see Figure 2).

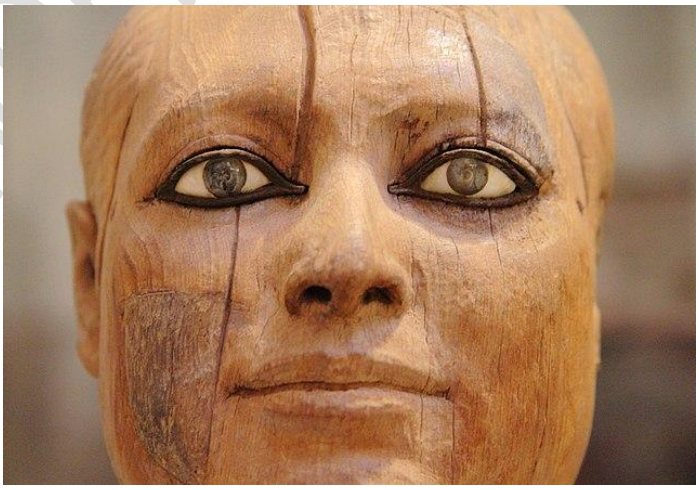

Figure 2. Egyptian Museum: wooden statue of high rank official. Circa 2500 BC. C., with a white reflection in his left eye.

It is not known if the cataract was operated on in Ancient Egypt. A painting from 1200 BC, in Thebes, portrays a scene consistent with cataract surgery. In addition, instruments related to this type of surgery were found in the tomb of the Egyptian doctor Skar and date from 4000 BC, as well as others from 2700 BC. in the city of Abydos (Ascaso et al., 2013; Torres, 2017).

The eyelid makeup used by Egyptian men and women was prescribed by medical priests and contained mainly Kohol[4] (see Figure 3), for aesthetic and medical purposes to repel flies that transmitted trachoma[5]. Trachoma was one of the most frequent causes of blindness in Ancient Egypt, called there "Egyptian ophthalmia" (Vázquez, 2000).

Figure 3. Kohol case, 1070 BC. C. Musée d'Art et d'Histoire de Genève. Wikimedia Commons.

2.2 Medical-ophthalmological papyri

[4] Cosmetic based on lead sulfide or galena.

[5] It is an infectious disease caused by the bacterium Chlamydia trachomatis, which can cause blindness. It is transmitted through contact with eye secretions from infected people and through flies that contribute to its spread.

The German Egyptologist Georg Ebers bought a unique relic in Thebes which he unveiled in 1874 and is kept at the University of Leipzig. It was the Ebers papyrus (see

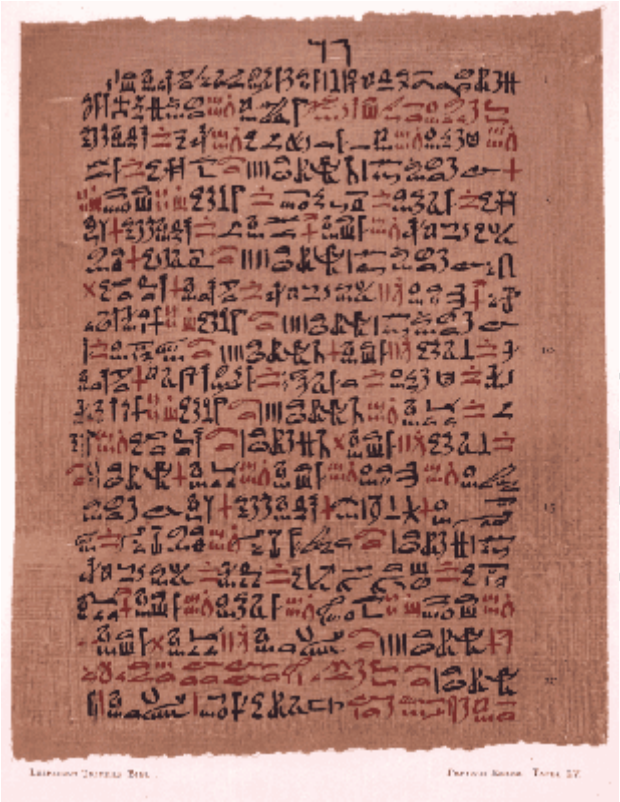

Figure 4), written around 1550 BC.

Figure 4. Ebers Papyrus. Circa 1550 BC C. National Library of Medicine. Found in Egypt. Public domain.

It is 20 meters long by 30 centimeters high and is considered the second-oldest medical treatise known, since the oldest dates from the Neo-Sumerian period (2112 BC - 2004 BC) (Yuste, 2010). It is the best preserved medical papyrus, and it includes the algorithm to carry out the diagnostic sequence of various diseases.

It details multiple treatments of vegetable, mineral and animal origin. For example, he develops the preparation of a tortoise brain ointment to treat strabismus and the preparation of an animal and vegetable remedy, together with a religious prayer, to treat cataracts.

There are also descriptions of the preparation of solid eye drops and various eye pathologies, such as trachoma, blepharitis, iritis, ectropion, cataracts, chalazion, nyctalopia (through the intake of liver, rich in vitamin A) (Torres, 2017) and the pterygium. Of its 110 columns, 8 of them are dedicated to eye problems. It is very likely

that the Ebers Papyrus was written by priests (Rull Iglesias, 2022; Torres, 2017; Wheeler, 1946; Smith, 1930).

Another important papyrus that helped to clarify the medical knowledge of Ancient Egypt is the one acquired by Edwin Smith in 1862 (see Figure 5). It dates from 1600 BC, is more accurate than the Ebers papyrus in its descriptions and is housed at the New York Academy of Medicine.

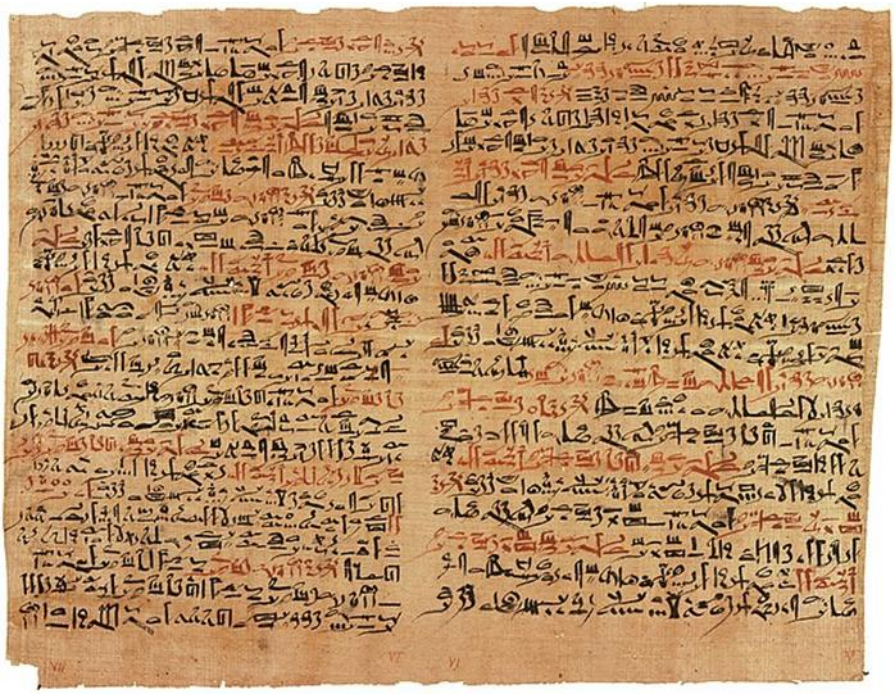

Figure 5. Edwin Smith Papyrus. Columns 6 and 7. Public domain.

It deals with surgical traumas and exposes problems that follow an order from head to toe, of which only those of the head and torso are preserved, including facial and orbital injuries. It is believed to be the result of learning during military battles (Rull Iglesias, 2022; Krause, 1933).

Case 10 of the Edwin Smith papyrus deals with the healing of a wound above the eyebrow penetrating to the bone. Indicates its examination with palpation and subsequent suture. In case 19, the examination and approach to the wounds on the temple are exposed, with their respective mention of ocular involvement (The Edwin smith surgical papyrus, 2022).

In addition, ophthalmological diseases and treatments are referenced in the Hearst papyrus (1550 BC) and in the London medical papyrus (1300 BC) (Metwaly et al., 2021). Medicine during the late period of Ancient Egypt shows a rational empirical regression, demonstrated by the greater use of healing charms in these two later papyri (Ritner, 2000).

2.3 Medical assistance and education in ancient Egypt

Medical assistance in Ancient Egypt was in charge of three groups of citizens (Sullivan, 1996):

- Lay doctors or swnw, who practiced outside the temple, but according to its precepts. They began their practices as itinerant doctors and were specialists. Only the doctor with great experience became a generalist and ceased to be itinerant. They practiced empirical and rational medicine.
- Priests of Sekhmet (see Figure 6), lioness goddess of war, revenge and healing. They practiced only in the temple, using magic, and were the pharaoh's doctors.
- Magicians or exorcists, who healed with charms and amulets.

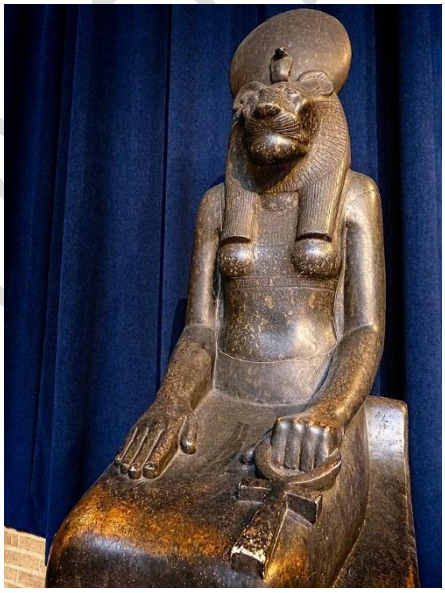

Figure 6. Black granite statue of the goddess Sekhmet. Thebes. 1405 – 1367 BC C. Wikimedia Commons.

There were also three classes of patients (Krause, 1933):

- Royal officials and religious caste, attended in sanctuaries by the priests.

- Free men, who received attention from magicians, priests and private healers. Payments were made in merchandise since there was no use of money.
- Slaves from Nubia, Libya and Ethiopia, with almost no access to medical care.

In Ancient Egypt, medical teaching was given in temples or sanctuaries, so we can deduce that the teachers were doctor-priests. The Egyptian school system began at age 5, with a stage of elementary education in the temples or in the streets, which was sometimes continued in a higher school with scribes.

Anatomical knowledge was poor, except for the abdomen and skull. Still, they mastered embalming. They used rudimentary techniques of inspection, palpation, percussion and auscultation.

Possibly, both the practice of medicine and medical education were also carried out in institutions called Per Ankh or "houses of life", considered medical schools (Rull Iglesias, 2022; Mendel et al., 2019).

Some of his public health laws were remarkable, although they did not have an infrastructure. Among such laws we will mention medical salaries, which were paid by the State. Doctors made certificates, many homes had rudimentary toilets, nets were used to ward off mosquito-borne malaria during the hot months, and hair was shaved to prevent flea bites.

While the Greeks believed that disease was caused by an imbalance between the four liquid humors, the Egyptians thought that some pathologies were the result of contamination by an external agent. The other causes were attributed to supernatural origins.

Therefore, doctors and magicians worked together. They held that the body wrap was a necessary element to achieve eternal life and that its destruction would prevent eternity, as happens in cases of death by drowning or cremation. Hence, the practice of embalming (Rull Iglesias, 2022; Ford, 2014).

3. Conclusion

Medicine and medical education in the ancient world, both in Egypt and Mesopotamia, was largely in the hands of priests, who practiced it with superstition and magic.

Even so, they dominated anatomical and possibly surgical-ophthalmological knowledge that, perhaps, preceded by thousands of years the cataract surgery of the great surgeon Sushruta, in the year 800 BC. He was the first recognized to describe the technique of couching, using a metal lancet to subluxate or dislocate the lens towards the vitreous cavity (Enfield, 2018).

Later, the Greek civilization absorbed much Egyptian medical and ophthalmological knowledge that reached the Western civilization. Thus, Ancient Egypt was a pioneer, with medical specialties, public health laws, and medical knowledge documented on stone, clay, and papyrus.

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