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Did the ancient Egyptians know Cancer Cells and Radiotherapy?

Abstract

The theme of this report seeks to investigate and discuss what was the knowledge of the ancient Egyptians about radiotherapy and cancer cells, or in other words, the extent of knowledge of cancer cells and radiotherapy in ancient Egyptian civilization? In this regard, it can be said that the ancient Egyptians were known for their ingenuity and skill in various branches of medicine, and in particular, their unparalleled prowess in mummification techniques, which preserved many Egyptian mummies for thousands of years. There are some evidences and studies conducted that reveal new matters and knowledge of the secrets and implications of ancient Egyptian medicine, which did not stop only at the ingenuity of the ancient Egyptians in diagnosing diseases and how to treat them, as well as installing prosthetic limbs and also dental fillings, but this extended to what was described as there were indications that the ancient Egyptians tried to identify disorders and cancerous cells. Is this true? In this research paper, we will attempt to address this content to know the underlying truth of ancient Egyptian civilization from an observational and analytical perspective.

Keywords: ancient Egyptians, radiotherapy, medicine, egyptian mummies, cancer cells and physical disorders

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Introduction

The ancient Egyptians' beliefs about the essence and significance of the body are best represented in their religious burial rituals. The Egyptians acquired the custom of preserving the body as early as the Fourth Dynasty. The practice of removing organs susceptible to rapid decomposition dates back to the Old Kingdom, the earliest example of which is found in the burial chamber of the Queen "Hetepheres".[1] The mummification process gradually evolved, reaching its peak during the Twenty-first Dynasty. No one, then or even today, has been able to match the techniques developed by the ancient Egyptians. It is important to distinguish between two terms: body preservation and mummification. The first term probably refers to the earliest efforts of the ancient Egyptians, and the ancient Egyptians subsequently arrived at the meaning of the second term, mummification.[2]

Ayman Waziry points out that the four jars known as the Canopic Jars, which were found containing the entrails of Queen "Hetepheres", the mother of King "Khufu",[3] and which are currently preserved in the Egyptian Museum, represent the first known attempts at mummification in ancient Egypt. They may also indicate the meaning of the ways and means of preserving the body in order to achieve the desired immortality in the afterlife.[4] Embalmers removed the organs susceptible to rapid decomposition—the liver, lungs, stomach, and intestines—and mummified them separately in four earthenware vessels with human heads called "viscera vessels." As a rule, the heart was considered the seat of intelligence, reason, and reason, and was therefore left in the body. In later examples, the kidneys were also left inside. It is worth noting that the ancient Egyptians used the material and form of the human body to create a vibrant image of renewed life that would endure and endure for a long time and could be revived in the afterlife and be given a new spirit at any time. This could be accomplished through the "opening of the mouth" ritual, which was performed on both statues and mummies to prepare the mouth for food and speech, as well as to awaken all other senses. Thus, the deceased could enjoy offerings in the afterlife, paving the way for eternal immortality.[5]

Discussion and context

Early knowledge of medicine and mummification process in ancient Egypt

Many details about the mummification process are known from the medical papyri that have been discovered, and from the analysis of the remains of embalming materials and parts of mummies, and from what was found on the walls of tombs and temples, and from what was written by ancient Greek historians. Not many texts have been found about the mummification process, and perhaps the most important sources from which information has been taken are the writings of historians. Herodotus (5th century BC) remains the best source about this process, and the closest to the truth. He may seem a trustworthy witness in this field, although his testimony came relatively late. However, his statements agree with the information that has emerged

[1]Dodson A, Hilton D. The complete royal families of ancient Egypt. London: Thames & Hudson; 2004:57. See also: Manuelian P. A race against time in the shadow of the pyramids, the museum of fine arts, Boston and the Giza necropolis, 1902-1990. KMT. 1990-1991;1(4):10-21.

[2]Waziry A. Materials and tools used in the mummification process: an analytical study. In: Proceedings of the 1st International Conference on Ancient Egyptian Science; 2010; Cairo, Egypt:12–58..

[3]Dodson A. Monarchs of the Nile. Cairo: American University in Cairo Press; 2000;29–34. See also: Schneider T. Lexikon der Pharaonen. Düsseldorf: Albatros; 2002;100–104.

[4]Waziry A. Materials and tools used in the mummification process: an analytical study. In: Proceedings of the 1st International Conference on Ancient Egyptian Science; 2010; Cairo, Egypt:13.

[5]Hornung E. Fisch und Vogel: zur altägyptischen Sicht des Menschen. In: *Eranos Conference Book*. 1983;52:455.ff.

See also: Hornung E. Vom Sinn der Mumifizierung.*Die Welt des Orients*. 1983;14:167-175.

Piankoff A. Le Coeur dans le Texte Égyptiens. Paris. 1930;10-17.

from scientific studies conducted on mummies. Information about this process was obtained thanks to the numerous studies in which a large number of Egyptian and foreign scholars contributed, who relied on what was mentioned about mummification in ancient Egyptian sources, in addition to the statements of some ancient historians such as Herodotus (5th century BC) and Diodorus Siculus (1st century BC), in addition to some recipes and steps. Mummification records found on the panels and walls of Egyptian tombs from the Old Kingdom, as well as some recorded scenes, have provided researchers with some mummification rituals without mentioning any physical treatment of the body. Examination of mummies and analysis of the materials used in the mummification process, which were found in the bodies of these mummies, in addition to what was found buried next to the tombs of the remains of the mummification process, have perhaps all helped to learn more about the details of the mummification process (Figures 1&2).[6]

Figure 1 Materials used in the mummification process.[2]

Figure 2 Tools used in the mummification process (mummification tools).[2]

The study of mummification was addressed by historians such as Herodotus (fifth century BC) and Diodorus Siculus (first century BC), archaeologists such as Oran Dawson, physicians such as Elliot Smith, and scientists such as Forbes and Lucas. In the nineteenth century, many chemists and physicists analyzed mummified remains to learn more about this process. In addition, numerous archaeological and scientific studies were conducted to identify ancient mummies' diseases. Perhaps the development of x-ray imaging of mummies without damaging them or removing their wrappings has helped us understand the steps, materials, and tools used in the mummification process.[7] Perhaps the most important sources on the mummification process are the following:

Ancient Historians and Travelers: The ancient Greek historians provided many details about the mummification process. The main sources-Greek and Latin- on the mummification process are, in chronological order, as follows:

i. Herodotus (fifth century BC).

ii. Diodorus Siculus (1st century BC).

iii. Strabo (1st century BC and 1st century AD).

iv. Pliny (1st century AD).

Ancient Egyptian texts, papyri, and scenes: There is an inscription on a stone tablet by the Eighteenth Dynasty named "Thoth" indicates and proves that the mummification and washing process lasted seventy days. The text reads: "The burial of Tayeb and Iqbal in peace, and your seventy days have been completed in the embalming center (House of Mummification)." There is a Demotic text by a man named "Ankhi," another by a man named "Nanferkaptag," and a priest named "Herry-ib" from the Ptolemaic period. These texts confirm that the mummification process lasted only seventy days.[8] It is worth noting that a text has been found that talks about anointing the mummified body with oils and wrapping it in its clothes. Perhaps the paragraphs in it refer very precisely to the mummification rituals. The Rituals of Embalming are two papyri that may have been copied from a well-known public source. They have been dated to the Roman period (31 BC - 395 BC). They are the papyrus called (Bulaq-3) in the Egyptian Museum, and the other papyrus in the Louvre Museum under number (No. 5158). In addition to the text of the Cairo Papyrus, which contains ten pages, we do not know how many pages are missing. The first papyrus was found in a mass grave in Thebes from the Late Period. It is 2 meters long and 28 cm wide. The second is in the Louvre Museum and its source is unknown. It may have been from Luxor. The information in it is less than the first, and in its margin there is a summary of each paragraph that is performed. The Embalmers. These two papyri are incomplete, but they deal with the mummification rituals, primarily focusing on the formulas chanted by the priests performing the service and the process of wrapping the body. These two papyri contain three elements:

i. Funeral rites for mummification.

ii. Hymns chanted during the mummification process.

iii. Methods of using perfumes and wrappings in some parts.[9]

The extent of ancient Egyptian knowledge of cancer cells and radiotherapy

It is believed that the ancient Egyptians may have attempted to treat cancer, where there are researchers conducted their study on two skulls, one dating back more than 4,000 years. In this regard, the ancient Egyptians were known for their ingenuity and skill in

[6]Waziry A. *Materials and tools used in the mummification process*. Proceedings of the 1st International Conference on Ancient Egyptian Science; 2010;15.

[7]Waziry A. *Materials and Tools Used in the Mummification Process*. 2010:15. See also: Harris J, Weeks KR. X-Raying the Pharaohs. New York: Charles Scribner's Sons; 1973;73. Redford D. *The Oxford Encyclopedia of Ancient Egypt*. Vol 2. Cairo; 2001;442: Smithsonian Institution. Egyptian Mummies. Bakry HSK. *A Brief study of mummies and mummification*. Cairo; 1965:2f. Lucas A. Cedar – Tree products employed in mummification. *JEA*. 1931;15:13f. Strouhal E, Vynanek L. Egyptian mummies in czechoslovak collections. Prague; 1980;f.

[8]Waziry A. *Materials and tools used in the mummification process*. 2010:16.

[9]Waziry A. *Materials and tools used in the mummification process*. 2010:16. See also: Taylor J. *Unwrapping a mummy: the life, death and embalming of Horekenesi*. London: British Museum Press; 1995;5. Cockburn A, Cockburn E, Reyman TA. Mummies, disease & ancient culture. 2nd ed. Cambridge: Cambridge University Press; 1998;19. Smith E, Dawson W. *Egyptian mummies*. New York; 1991;56. Stetter C. The secret medicine of the pharaohs: ancient Egyptian healing. Chicago; 1993;151.

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medicine, particularly mummification techniques, which preserved many Egyptian mummies for thousands of years. There are some studies conducted and researches concerned the secrets of ancient Egyptian medicine, its fields and techniques, which indicate that ancient Egyptian medicine did not stop at the skill and ingenuity in diagnosing diseases and how to treat them, as well as how to install prosthetic limbs and dental fillings. It is believed that it extended to what is described as there being in ancient Egypt, where Researchers have indications that the ancient Egyptians attempted to identify physical disorders and cancer cells. Allowing us to trace the frontiers of medical knowledge and treatment in the past. There is a study published in the journal Frontiers in Medicine entitled: Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls,[10] as there are also statements in context published in Nature Middle East.[11]

According to the aforementioned study, and in light of the study of two human skulls found in the Duckworth Laboratory at Cambridge University, it is believed that a milestone in the history of medicine in general and ancient Egyptian medicine in particular occurred through the discovery of the first attempt at tumor surgery in history. The significance of this lies in the fact that we see that more than 4,000 years ago, the ancient Egyptians were dealing in some way with what we today call cancer. In light of the current study, the two skulls will be treated from a historical and chronological perspective. The first skull and lower jaw, designated "236," dates back to between 2687 and 2345 BC, and scientists say it belongs to a man between 30 and 35 years Old. The second skull, designated "E270," dates back to between 663 and 343 BC and belongs to a woman may be over 50 years Old (Figures 3&4).[12]

The research reports two cases of ancient Egyptian skulls from what are believed to be different lineages or the so-called diverse dynasties. The human remains were preserved at the Duckworth Laboratory (University of Cambridge, UK). From a historical perspective, the first skull, "236," dating back to the Old Kingdom, 2687-2345 BC, reveals a primary and secondary tumor, and is in fact one of the earliest known cases of malignancy from ancient Egypt, having previously been analyzed by Calvin Wells.[13] The second skull, "E270," dating to the Late Period, 664-343 BC, shows a primary tumor and several healed skull fractures. These latter lesions demonstrate the ability of ancient Egyptian medicine to manage severe cranial trauma. Analysis revealed peri-mortem cut marks associated with multiple metastatic lesions.[14]

There is debate about whether these alterations were related to an attempt at surgical treatment before death or to postmortem medical exploration, raising fundamental questions about the early understanding and management of neoplastic disorders in the history of medicine. The aforementioned research seeks to approach the limits of ancient Egyptian medicine regarding oncological and trauma care through ancient pathological analysis applied to these two conditions. There were large lesions in skull numbered 236. Microscopic observation revealed large wounds consistent with excessive tissue destruction, a condition known as necrosis. There were also about 30 small, round wounds scattered across the skull. What astonished the researchers was the discovery of cut marks around these lesions, which were probably made with a sharp metal instrument. Skull E270 showed extensive lesions consistent with a cancerous tumor that had destroyed the bone. This may indicate that although today's lifestyle, aging, and environmental carcinogens may increase the risk of cancer, it appears that cancer was also a common disease in ancient times. Such studies on the history of ancient Egyptian medicine provide new opportunities and hypotheses to explore the nature of medical operations and their surgical aspects in ancient Egypt and the extent of their understanding in ancient Egyptian civilization. This also enhances and contributes to knowledge of the importance of the history of ancient Egyptian medicine and the extent of health and therapeutic care during those eras.[15]

Figure 3 The first skull (236): (A) Front view; (B) Rear view; (C) Left lateral view of the mandible; (D) Right lateral view of the mandible; (E) Top view; (F) Bottom view.[10]

[10]Tondini T, Isidro A, Camarós E. Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls. *Front Med.* 2024;11:1-9.

11 Nature Middle East. The ancient Egyptians may have tried to cure cancer. 2024.

[12]Tondini T, Isidro A, Camarós E. Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls. *Front Med*. 2024;11:2.

[13]Tondini T, Isidro A, Camarós E. Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls. *Front Med*. 2024;11:2.

[14]Tondini T, Isidro A, Camarós E. Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls. *Front Med*. 2024;11:2.

[15]Tondini T, Isidro A, Camarós E. Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls. *Front Med*. 2024;11:1-9.

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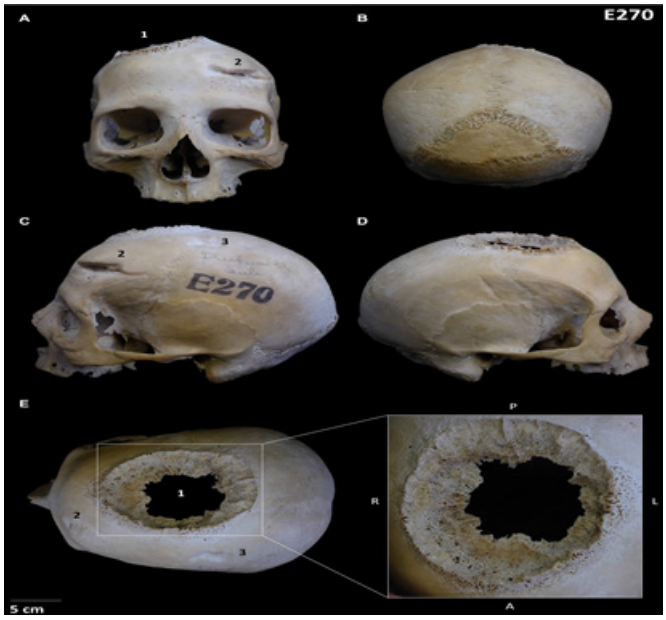

Figure 4 The second Skull (E270): (A) Anterior position showing the three lesions; (B) Rear view; (C) Left lateral view showing lesions 2-3; (D) Right side view; (E) Details of the identified neoplastic lesion (lesion 1). The Other lesions noted are numbered 1 to 3.[10]

In light of the two cases mentioned, "Two Human Skulls," although they are not historically or chronologically concurrent, as the first skull and lower jaw, designated "236," date to between 2687 and 2345 BC, and the second skull, designated "E270," date to between 663 and 343 BC. However, the two human skulls are of interest and importance in understanding the nature of diseases in ancient Egypt, as well as how the ancient Egyptians dealt with these diseases, whether cancerous tumors or physical injuries. Two wounds were found on the female skull, both believed to have healed. One of the wounds is believed to have been caused by a violent event, perhaps at close range using a sharp weapon. These semi-healed wounds suggest that the woman may have received some form of treatment, and perhaps healed as a result. However, it appears that the presence of such a wound on a woman's head is historically uncommon and is believed to be common. It is noted that most violence-related injuries are more common in males than females. In light of this, it is believed that this woman with the two-injured skull may have been engaged in strenuous tasks (Figures 5&6).[16]

It is worth noting that the Edwin Smith Papyrus[17] is an ancient Egyptian medical text, named after Edwin Smith, who purchased it in 1862, and is the oldest known surgical treatise on trauma. The Ebers Papyrus, or the so-called Papyrus Ebers,[18] was an Egyptian medical papyrus of herbal knowledge or botanical remedies, dating to c. 1550 BC, the late Second Intermediate Period or early New Kingdom. It is among the oldest and most important medical papyri of Ancient Egypt. The Ebers Papyrus represents the most extensive and best-preserved known record of ancient Egyptian medicine. The Ebers Papyrus mentions the use of plant remedies, including boswellic acid, to treat tumors, showing an early form of attempts to control cancerous conditions. This papyrus contains chapters dealing with contraception, pregnancy diagnosis, and other issues related to gynecology, intestinal diseases and parasites, eye and skin problems, dentistry, surgical treatment of abscesses and tumors, orthopedics, and burns. The Ebers Papyrus can be considered a precursor to ancient Greek humoral pathology and the later established theory of humoral pathology, providing a historical link between ancient Egypt, ancient Greece, and medieval medicine.[19,20]

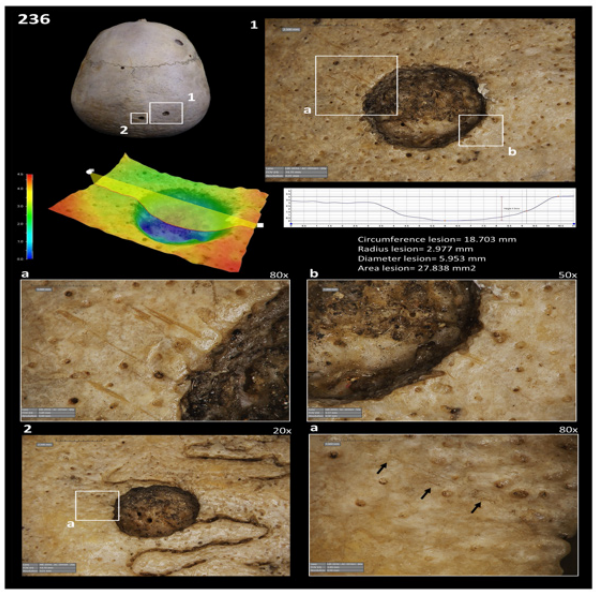

Figure 5 The first skull (236): Images of the cut marks near the two lesions taken using the HIROX microscope: (1) Images showing the location of the lesions with cut marks; Depth of lesion 1; Cut marks for lesion 1 (A and B). (2) Images showing the second lesion with evidence of cut marks.[10]

[16]Tondini T, Isidro A, Camarós E. Case report: Boundaries of oncological and traumatological medical care in ancient Egypt: new palaeopathological insights from two human skulls. *Front Med*. 2024;11:1-9.

[17]Wilkins RH. Neurosurgical Classic-XVII (Edwin Smith Surgical Papyrus). *J Neurosurg*. 1964;21(3):240–244.

See also: Nunn JF. Ancient Egyptian Medicine.*Trans Med Soc Lond.* 1996;113:57–68.

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See also: Joachim H. Papyros Ebers: Das älteste Buch über Heilkunde. Berlin: Reimer; 1890.Bryan C. The Papyrus Ebers. New York: Appleton; 1931;163–167.

Tetley CM. The reconstructed chronology of the Egyptian kings. Onerahi; 2014:8f.

[19]Hartsock J, Halverson C. Lost in translation: the history of the Ebers Papyrus and Dr. Carl H. von Klein. *J Med Libr Assoc.* 2023;111(4):844–851.

[20]Guerini V. *A History of Dentistry from the Most Ancient Times Until the End of the Eighteenth Century*. Philadelphia: Lea & Febiger; 1909:18–19.

See also: Hartmann A. Back to the roots—dermatology in ancient Egyptian medicine. *J Dtsch Dermatol Ges.* 2016;14(4):389–396. Popko L. Some notes on papyrus Ebers, ancient Egyptian treatments of migraine, and a crocodile on the patient's head. *Bull Hist Med.* 2018;92(2):352–366.

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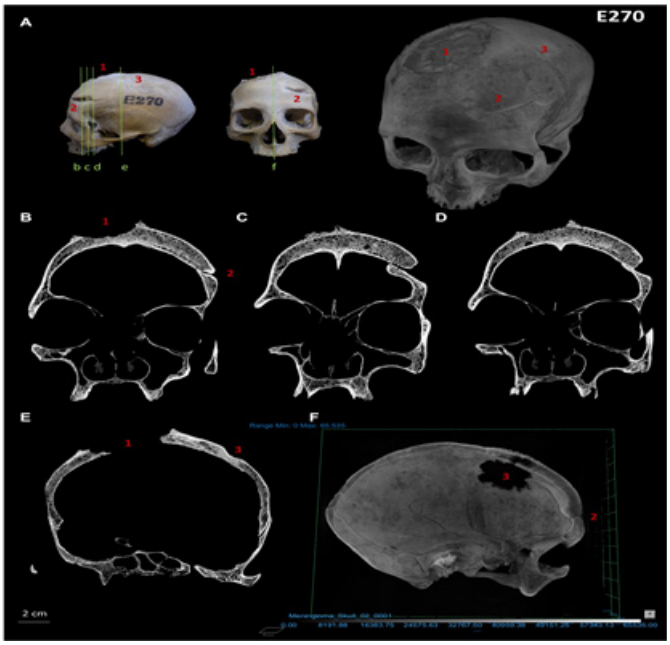

Figure 6 The second Skull (E270): Micro-CT images (coronal plane) and virtual reconstruction of skull E270: (A) Images showing the different angles from which the skull was analyzed, as well as a virtual reconstruction showing the three identified lesions. (B-E) Lesion 1 shows Codman's triangle, marked osteocytes (bone cells) destruction (including internal lesions), and a severe, disfiguring periosteal reaction (solar eruption). Healed traumatic lesions 2 (blunt force fracture) and 3 (blunt force trauma) show a periosteal reaction; (F) Cross-section of a virtual skull reconstruction showing lesions 1 and 2.[10]

Conclusion

As a specialist in ancient Egyptian archaeology and head of the Department of Egyptology at the Faculty of Archaeology, Fayoum University, I encourage such studies and research conducted on the history of ancient Egyptian medicine. I hope that encouraging rules will be established for such research on ancient oncology. In light of this, the opportunity must be provided for such research studies to reveal how ancient societies in general, and ancient Egyptian society in particular, dealt with cancerous diseases in light of the interest in radiotherapy.

In light of this regard and context, it can be said that although the ancient Egyptians were aware of tumors and their associated conditions, they did not have the recent understanding of cancer cells or the concept of radiotherapy as we know it today. However, the ancient Egyptians demonstrated some early attempts at treating tumors, including possible surgical interventions on the skull.

In light of early knowledge of tumors, the Edwin Smith Papyrus, dating back to around 3000 BC, provides the earliest written description of a tumor-like swelling, indicating early recognition of cancerous conditions.

In light of the limited treatment options, the ancient Egyptians documented various diseases and had a range of treatments, and the Edwin Smith Papyrus indicates that there were no effective treatments for the breast cancer cases described.

From the perspective of possible surgical intervention, the recent research suggests that the ancient Egyptians may have attempted to perform surgical interventions on skulls, perhaps to remove or examine tumors. It should be noted that there is a study focused on a 4,000-year-old skull with cut marks around the lesions, which may indicate an attempt at surgical treatment.

I think there is no radiation therapy, or the so-called "Radiotherapy". Radiotherapy, as a form of cancer treatment using radiation, was not part of ancient Egyptian medicine, as I believe their knowledge of cancer was limited to what could be observed and treated with the materials and methods available at the time.

In regard of Botanical remedies, or the so-called "Herbal Remedies", the Ebers Papyrus mentioned the use of plant-based remedies, including boswellic acid, for treating tumors, showcasing an early form of trying to manage cancerous conditions.

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None

Conflicts of Interest

The authors declare no conflict of interest.

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