

Evidence of Cancer in Antiquity: The Amara West Man

Jonathan Scott

Summary of news article

Presently, cancer is one of the world's leading causes of death. On March 28, 2004, CBS published a news article titled "3,000-year-old skeleton found riddled with cancer" that helped shed more light on the evolution of cancer. Michaela Binder, a Ph. D student from Durham University discovered a skeleton that was riddled with lesions and holes in a tomb in Sudan, in northeastern Africa. She immediately suspected cancer but stated to Alphonso Van Marsh of CBS News that: "At first I wasn't sure if this is actually a disease because we have a lot of termites in the area, who tend to eat bones or tend to make a lot of small holes in the bones."

To find more conclusive proof, the 3,000 year-old skeleton was taken to the archeology lab at the British museum. Daniel Antoine, the museum's curator of physical anthropology used x-rays and high-powered microscopes to confirm the skeleton's cancer. Upon further examination, Binder and Antoine determined that the 3,000 year old man had died of metastatic cancer. The cancer had started in an organ and had spread to his bones (Figure 1-1). They estimated that he had been between 25 and 35 years old at the time of his death. Currently, the scientific community believes that only three other examples of malignant cancer deaths dating before the year 1000 BC have ever been found. As Antoine stated, "This represents the earliest and most complete skeleton of this type of cancer."

Today, cancer is often thought of as a consequence of modern day living. More specifically, it is linked to the diet, pollution, smoking and increased longevity. This 3,000 year-old skeleton provides new evidence that cancer has been killing humans since antiquity.

Researchers believe that Binder's discovery will indeed provide more information on cancer's evolution, but that more examples of ancient remains are needed to get a better

understanding as to how the disease has spread over time. Presently, they do not know what caused the cancer in this skeleton but they speculate that it may have been caused by smoke from wood fires, a bad gene, or an infectious disease.

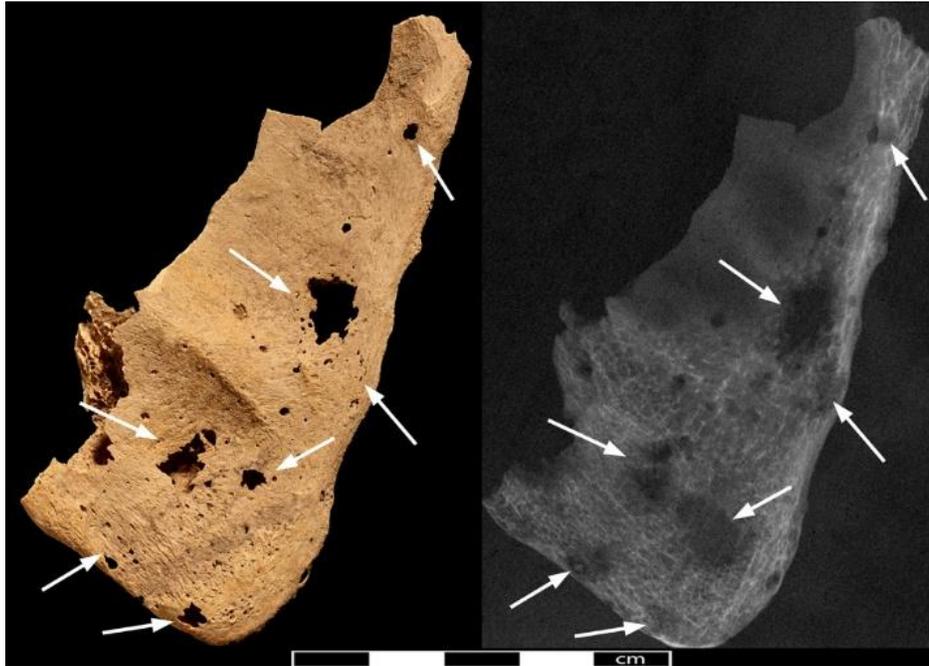


Figure 1-1. Lesions in the 3,000-year-old skeleton (Sk244-8) indicate the presence of cancer (Credit: Trustees of the British Museum).

Background context and significance

Cancer is second only to cardiovascular diseases as a cause of death in industrialized societies¹. In the US and the United Kingdom, more than 1,350,000 people on average are diagnosed with cancer each year². According to 2013 Canadian Cancer Statistics, an estimated 187,600 new cases of cancer (excluding about 81,000 non-melanoma skin cancers) will be diagnosed and 75,000 deaths will occur in 2013³. It is projected that 2 in 5 Canadians will

¹ David, A. Rosalie, and Michael R. Zimmerman. "Cancer: an old disease, a new disease or something in between?" *Nature Reviews Cancer* 10.10 (2010): 728.

² Ibid.

³ Canadian Cancer Statistics. "Canadian Cancer Statistics 2013 Special topic: Liver cancer " (accessed May 31, 2014),

develop cancer in their lifetimes and that 1 in 4 will die from it⁴. Lung, breast, colorectal and prostate cancers will account for more than half of all new cases. It is because of statistics such as the above that the evolution of cancer needs to be known. The history of cancer has the potential to improve our understanding of disease prevention, the aetiology, the pathogenesis and the treatment.

Although considered rare, cancer did exist in ancient times. The history of systematically diagnosing and documenting diseases only dates back to 500 years. Therefore, it helps explain why there are very few archaeological records on pathologies, and of those that do exist, their accuracy is often in doubt. To date, only 200 skeletons and mummified persons have been reported with primary and secondary malignancies⁵. The majority of the evidence comes from Europe and Egypt. Some evidence of malignant neoplasms had also been uncovered in Australia and North and South America⁶. The earliest and most accepted example of malignant neoplasm was found in an Austrian Neolithic Skeleton dated at 4000 BC⁷. The Czech Republic and Russia also reported such early finds⁸.

Egypt has a high number of reports of cancer in ancient human beings because of its plentiful supply of well-preserved mummies and skeletal remains and historical paleopathological research. The earliest detection of malignancies in Egypt came from an Old Kingdom skull dated around 3000 BC. and to 14 individuals who had primary and secondary malignancies dated around 3000-1000 BC⁹. Some promising examples of cancer came from

<http://www.cancer.ca/~media/cancer.ca/CW/cancer%20information/cancer%20101/Canadian%20cancer%20statistics/canadian-cancer-statistics-2013-EN.pdf>

⁴ Ibid.

⁵ Binder, Michaela, et al. "On the Antiquity of Cancer: Evidence for Metastatic Carcinoma in a Young Man from Ancient Nubia (C. 1200BC)." *Plos One* 9.3 (2014): e90924. *MEDLINE*. Web. 3 Apr. 2014: 2.

⁶ Ibid.

⁷ Ibid.

⁸ Ibid.

⁹ Ibid.

skeletons in the tombs of Thebes (modern Luxor) and very convincing evidence of prostate cancer came from a Ptolemaic mummy dated 285-230 BC¹⁰.

Ancient Egypt and Ancient Greece were both known for their extensive and well-documented history with the treatment of cancer. Ancient Egyptians developed their acclaimed medical papyri. The Egyptian medical papyri contained around 2,000 remedies for disease. Within these documents, there were multiple treatments for cancer. The Egyptian's treatment for cancer included "excision with a knife, burning with red-hot irons, fumigations, topical applications of pastes, spells and advice to leave the swelling untreated¹¹."

The Greeks were considered more successful at treating cancer than the Egyptians. The Greeks could successfully remove superficial cancers with surgery, however, deep-seated cancer removal surgery continued to be unsuccessful¹². The Greeks also employed various other treatments such as: attention to the patient's diet, attention to postoperative care, physiotherapy and topical applications (plant and/or heavy metal based)¹³. The ancient Roman society also had some success in the treatment of cancer. "Like the Greeks, the Romans found that some tumors could be removed and cauterised¹⁴." These well-documented cases of cancer and their specific descriptions of treatments provide further evidence that cancer existed in antiquity.

The first pre-human fossil records have shown that neoplasms existed in aquatic vertebrates as early as the Paleozoic Era (540-250 mya)¹⁵. The first consistent studies of cancer on non-humans were done on dinosaurs. This suggests that if cancer existed in pre-human animals, it would likely evolve to exist in man. In addition to this, there is a biological connection with pathologies. Some aquatic vertebrates grew benign tumors to help them adapt to difficult

¹⁰ Ibid.

¹¹ Rosalie, Zimmerman. "Cancer: an old disease, a new disease or something in between?" 731.

¹² Ibid.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Capasso, Luigi L. "Antiquity of cancer." *International journal of cancer* 113.1 (2005): 4.

environments. For example, heavy tumors allowed certain fish to sink to bottom and become a bottom-feeder (Figure 2-1)¹⁶. These pathologies have been passed on through evolution.



Figure 2-1. One normal fish vertebra (right) compared to two fish vertebra with osteoma (Glades Country, Florida, USA, Pleistocene (sample 439-1,2,3 of the University Museum, Chieti, Italy).

The first representatives of our genus, *Homo habilis*, lived in East Africa about 2 million years ago¹⁷. They underwent a unique time in evolution which included biological changes and rapid technological development. This meant that primordial humans were different from modern day humans in their biology, cultural capabilities and social organization. Although it is reasonable to believe that there would be variations in their ability to contract, develop and

¹⁶ Ibid., 5.

¹⁷ Ibid., 2.

spread diseases including cancer, the discovery of Binder's Amara West man in Sudan on the left bank of the Nile (Figure 2-2) did indeed prove the existence of bone cancer in antiquity.



Figure 2-2. Southwestern view over Amara West, on the Nile River (Photo: Susie Green).

Also, the genetic factor, although not proven, cannot be ruled out as a cause of cancer in the ancient populations. It is also important to note that the ancient populations were exposed to environmental carcinogens in the same ways as modern man. Sun light, natural radiation and asbestos are naturally occurring carcinogens. Bitumen, which is known to cause cancer today in those who are exposed to its fumes, was used by the ancient Egyptians in waterproofing and embalming¹⁸. Pollution has even been documented by ancient populations. Both the people of Herculaneum in the 1st Century AD. and the primitive tribes in the New Guinea highlands

¹⁸ Binder, et al. "On the Antiquity of Cancer: Evidence for Metastatic Carcinoma in a Young Man from Ancient Nubia (C. 1200BC)." 9

referred to pollution from wood smoke, from the use of oil or animal-fed lamps and from organically-fed fires used for cooking food¹⁹. This increased the risk of heart disease and cancer in ancient times.

It is also interesting to note that in Amara West, where Binder's 3,000 year old man was found, the houses had both open hearths and bread ovens in rooms without windows. Currently, in Sudan, the use of fires in poorly vented rooms is still considered one of the major factors in causing lung cancer in their country²⁰.

Cancer can also be caused by specific types of infections. Schistosomiasis is recognized today as a cause of bladder cancer and this disease has affected the Egyptian and Nubian people since 1500 BC²¹. The disease is also related to breast cancer and in present day Egypt, there is a high ratio of male to female breast cancer²². Although the parasites that are responsible for this disease were not found at the actual grave site of the 3,000 year old man, the parasites are known to be prevalent in this area²³. It is suggested that Binder's man could have contracted the infection and developed male breast cancer which then metastasized to bone cancer.

Despite all the studies and reports on cancer, the direct evidence for cancer among ancient remains is rare. The scientific community holds the assumption that this is due to three factors, one being longevity. People in ancient times had a life expectancy of about 30 to 50 years²⁴. Their deaths were mostly due to infections which did not allow them to live long enough to develop the age-progressive disease of cancer. Bone cancer, which is known to be more

¹⁹ Capasso, "Antiquity of cancer." 10.

²⁰ Binder, et al. "On the Antiquity of Cancer: Evidence for Metastatic Carcinoma in a Young Man from Ancient Nubia (C. 1200BC)." 8-9

²¹ Ibid.

²² Ibid.

²³ Ibid.

²⁴ Ibid., 2.

prevalent in younger ages, was not significant in ancient times. Therefore, this suggests that cancer was a rarity in antiquity.

An explanation for the absence of cancer in antiquity is related to the fact that 80% of cancer-related deaths today are attributed to the modern lifestyle such as smoking, dietary habits and the lack of physical activity²⁵. Ancient people had overall healthier conditions. However, it must be noted that the ancient populations as previously mentioned, had been exposed to physical and chemical environmental carcinogens.

A third explanation for the rarity of cancer in antiquity is the pathological evidence of the malignancies. Diagnosis was not always clear because there was a need for more complex assessment techniques such as radiography or SEM (Scanning electron microscope use). Also, in the early days, diagnoses were often based on morphological appearance alone and the descriptions were often inadequate. Many of the mummies and skeletal remains were often not available for the re-examination. This raises the questions of validity and reliability of the research. Also, due to the excavation strategies, scientists were only able to examine isolated skulls and bones. Consequently, they were unable to examine a complete specimen to see its full range of pathological changes. Binder's discovery of the 3,000 year old man was significant because it was a complete specimen that clearly illustrated the effects of bone cancer.

When estimating the prevalence of cancer in antiquity, there are additional factors that have the potential for researchers to draw the wrong conclusions. Chemical factors such as soil acidity, physical forces such as mechanical erosion and micro-fractures and biological factors such as fungi, bacteria and viruses can mimic primary and metastatic bone lesions and could skew results.

It is believed that present-day humans contract cancer because they live longer and they have had to adapt biologically to rapid changes experienced in moving from a hunting and

²⁵ Ibid.

gathering society to an industrialized society. Presently, we are in our third transition which is characterized by an increase in infectious diseases due mainly to newly emerging and re-emerging infectious diseases in combination with resistance to antibiotics and cancer therapies.

In addition, people's diets have been changing and now include unhealthy amounts of sugar and fat content. There has been an increased use of alcohol and tobacco and exposure to environmental pollutants.

According to Luigi L. Capasso, a Professor of Physical Anthropology in Chieti, Italy, cancer "only increased significantly during the medieval and modern times²⁶." The more sedentary lifestyle of the people led them to develop the first large towns and cities. They adopted indoor habitats and had prolonged exposure to indoor pollution such as radon gas and uranium²⁷. As the cities and towns grew the external environment developed pollution similar to that of the indoor environments.

It must be remembered that the ancient populations had experienced indoor pollution from wood smoke, oil or animal-fed lamps and organically-fed fires used for cooking foods. They were also exposed to naturally occurring carcinogens. Therefore, it is possible to see the similarities between ancient and modern day populations who were exposed to some of the same types of carcinogens. This highlights the significance of studying cancer in ancient populations to help us gain an understanding of the diseases. It also illustrates how important the discovery of Binder's complete skeleton with definitive bone cancer is to our understanding.

Civilization has constantly been associated with cancer. In an article reviewed by Luigi L Capasso, Dietz and his colleagues, have "found a statistically significant correlation between cancer and the amount of time spent indoors²⁸." Although Strouhal observed that "the prevalence of malignancy in Europe is very small in comparison to the number of remains

²⁶ Capasso, "Antiquity of cancer." 6.

²⁷ Ibid., 10.

²⁸ Ibid.

examined and represent only less than 1%²⁹,” the distribution levels of cancer in ancient times did show some relationship to higher social aggregate levels. It seemed to be related to population levels, the richness of populations, the number of houses and the size of the towns etc. In pre-Christian time, the social aggregate level was high in north-east Africa³⁰. Today, it is known that the higher the social aggregate level, the more malignancies are reported. Therefore, this would suggest that the changing habits and lifestyles of some of the Ancient people who lived in large communities, experienced changes similar to what we have experienced in modern-day life. By studying these changes in both the ancient populations and in our present-day populations, we may gain a better understanding of cancer.

In examining the background of cancer, the following information has been generally accepted by members of the scientific community. They believe that neoplastic diseases have affected humans since their first appearance on Earth, but that primary and secondary neoplasms were rare in ancient times³¹. No real differences were found in the prevalence of neoplasms in ancient populations throughout the world. The types of cancers that were prevalent in ancient times vary from those of today. They were cranial cancers, nasopharyngeal cancers, and multiple myelomas³². Scientists also believe that higher prevalence of malignancies are related to highly civilized populations with high social aggregates.

Conclusion

In conclusion, Michaela Binder’s discovery of the 3,000 year old skeleton (Sk244-8) in Amara West, Sudan was significant. It was the most complete example of cancer in ancient times. Although “there are older examples of cancer from ancient Egypt and Austria ... none

²⁹ Ibid., 9.

³⁰ Ibid., 8.

³¹ Ibid.

³² Ibid.

have shown the extensive progressions of cancer” that was seen in her specimen³³. The site of Amara West, in which the remains were found was remarkably well-preserved. The abundance of material culture gave a clear picture of life in ancient Nubia. Providing Binder’s skeleton can be given a cultural and historical framework. We have knowledge of the changing environmental conditions, the specific diet and the subsistence living strategies the 3,000 year old man would have experienced living in Amara West around 1300 BC. This discovery will allow researchers the opportunity to better understand what factors led to cancer before the onset of modern-day life.

Although the authors Binder, Roberts, Spencer, Antoine and Cartwright caution “against claims for the absence, or presence, of any disease based on skeletal evidence alone³⁴,” there is hope that new useful information will be found on the subject of cancer. Today, scholars working in the field of paleopathology are viewing their work in a new light. They are becoming aware of the value of using their data to contribute to the knowledge of diseases. More ancient remains are being made available and modern analytical techniques are being done within a “well-documented archeological and historical context³⁵.” Therefore, scientists are optimistic that new insights will be made in the field of cancer research and this will aid humanity in fighting this devastating disease.

³³ CBS NEWS. “3,000-year-old skeleton found riddled with cancer” (accessed May 30, 2014), <http://www.cbsnews.com/news/3000-year-old-skeleton-found-riddled-with-cancer/>

³⁴ Binder, et al. "On the Antiquity of Cancer: Evidence for Metastatic Carcinoma in a Young Man from Ancient Nubia (C. 1200BC)." 9

³⁵ Ibid.,1.

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