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TRACES OF A SMALLPOX EPIDEMIC IN THE FAMILY OF RAMESSES V OF THE EGYPTIAN 20th DYNASTY

ABSTRACT: *The evidence for smallpox in the mummy of Ramesses V proved by electron microscopy and immunology together with the quick, careless and poor mummification have been correlated to the historical testimony of Turin Papyrus No. 1923. This reveals the delay of the king's burial caused by cutting a new tomb for him and others for members of his family who also died unexpectedly proving an epidemic which spread to the palace from the commoners. These and several other precautions used suggest the beginning of quarantine as the result of anticipation of the infectious character of the epidemic.*

KEY WORDS: *Smallpox – Mummy of Ramesses V – Embalming methods – Anthropology – Palaeopathology – Electron microscopy – Immunology – Turin Papyrus No. 1923 – Epidemic – Quarantine*

This year, in celebration of the 200th anniversary of Jenner's discovery that marked the turning point in the gradual limitation of the epidemic occurrence of one of mankind's most threatening diseases – smallpox, we would like to present a chapter that has not yet been published in the literature on the history of medicine or anthropology – a chapter reaching back into the very distant past of the disease and its mass occurrence. Although the disease does not leave any traces in skeletal remains, which are the main source of information for the newly defined branch of interdisciplinary studies, palaeopathology, in Ancient Egypt, thanks to the old custom of mummification, three examples with evidence of smallpox occurrence have been found. The first case was described and histologically examined by Ruffer and Ferguson (1911), in a mummy of a man who lived in the time of the New Kingdom (1550-1069 B.C.). The next one was discovered by Elliot Smith (1912), in the mummy of King Ramesses V (20th Dynasty). His diagnosis was confirmed by Ruffer (1914), who, in a note of the work quoted above, had announced the

discovery of a mummy with a similar diagnosis, unfortunately without any subsequent publication of this.

We shall now concentrate on the personality of King Ramesses V, who died young and unexpectedly after a short reign that lasted only a little more than 4 years, in the year 1147 B.C. (Kitchen 1984) or 1144 B.C. (Forman, Quirke 1996). According to historical sources, at the time of his death he was only 20-29 years old (Wente 1980), according to radiological examination of the mummy the age has been determined to be 25-35 (Krogman, Baer 1980). According to 10 different criteria observed on his skeleton and teeth, we have calculated an arithmetical mean of 27.8, which corresponds well to the range suggested by the historical sources. It is more probable that this king was the son of his predecessor Ramesses IV rather than Ramesses III (Kitchen 1984). This can be proved by the resemblance between the metric characteristics of the skulls, with the exception of the lower jaw, and the mutual relationship between the incisors (Harris, Kowalski, Walker 1980).



FIGURE 1. Head of the mummy of Ramesses V from left side showing an incision in the cheek and a hole in the skull. (Photographed by Eugen Strouhal.)

The king's mummy, found in the second cache of mummies in the tomb of Amenhotep II in the Valley of the Kings in 1898 by V. Loret, was examined in the Cairo Museum on 25th June, 1905 by G. Elliot Smith (1912). He found that the upper part of the body was covered with many torn bandages without any trace of wrapping. The lower part of the chest, the abdomen and the legs were wrapped with ordinary linen bandages. Below this a stripe of linen was found – running from the nape of the neck down to the knees. This was found together with many other random pieces of cloth. The king's body was found bare: "without any wrappings". Other mummies from the same period have the bandages stuck on with resin. The king's hands were crossed over his chest, as was the custom during the 20th Dynasty.

Elliot Smith assumed that original wrappings had once existed but had later been torn from the mummy by tomb robbers searching for jewellery and amulets usually deposited in the folds of the bandages. This theory is perhaps supported by alleged traces of violence that were reported on the mummy – for instance the fingers on the left hand were cut away, and there was torn away skin above the left zygomatic bridge and above the ankles. However,

it seems more likely that the body was thus poorly wrapped by the embalmers shortly after his death, because the work of the priests of the 21st Dynasty when restoring the damaged mummies of the kings of the New Kingdom was usually much more professional.

When Ramesses V was mummified, all the usual procedures were carried out, but nevertheless, some of Elliot Smith's finds show that this mummification was atypical, and that it was done too quickly and rather carelessly. In addition, the hole through which the viscera were removed was of unusual dimensions, an ellipse (with the longest diameter 169 mm), with wide open edges without any trace of an attempt to sew it up or to draw it together. Nor was there any wax plate covering the incision. The abdominal cavity was filled with sawdust in which the viscera were chaotically dispersed without having been wrapped in the four so-called visceral packets – according to strict anatomical rules. This procedure, replacing the original deposition of the viscera into four canopic jars, was introduced as late as with the 21st Dynasty – that is, approximately 75 years later. Elliot Smith supposed this evidence to mark the very beginning of the new custom. In accordance with the listed facts, however, we may



FIGURE 2. Detail of the right half of the face of Ramesses V with a pustulous eruption. (Photographed by Eugen Strouhal.)

explain the viscera left scattered around as evidence of careless mummification. The brain cavity, from which the brain had been removed through the aperture of the ethmoid bone, was not filled with resin but with a narrow and long strip of linen (length 9 m, width 31 mm). The nostrils were closed with small wax discs. Under the eyelids, the artificial eyes were not made of bone, glass or stone but rather of stuccoed and painted linen. Since we are dealing here with the interment of a king, we would normally expect a more elaborate technique and more precious materials.

From the anthropological findings we would like to point out that the king's height was rather above average – 172 cm – and that his facial features (sloping forehead, protruding nose and large angular mandible) are reminiscent of Seti I and Ramesses II, two distant royal ancestors of his from the beginning of the 19th Dynasty.

The king's mummy enabled Elliot Smith to describe four palaeopathological findings. An enlarged scrotum (19 × 87 mm) suggests an indirect inguinal hernia or hydrocele. In the right inguinal region Elliot Smith reports a large and deep ulcer of irregular triangular shape with thickened edges (18 × 22 mm). It was covered with a layer of resin so that it was not possible to examine it thoroughly,

but the author considers that it could possibly be an open plague bulb (bubo) because of its location and character. This hypothesis, however, can only be confirmed by a thorough examination using modern methods.

A surprising find is that of a perforation of the left parietal bone by a large elliptical hole (19 × 34 mm). This is accompanied 2 cm from its rear edge by an elevated rolled flap of the scalp. This can only occur during the lifetime or shortly after death when it is still flexible. Around the hole there is a wider circle of discoloration and a deposit of a blackened substance which Elliot Smith considered to be the remains of bleeding before death (chemical or biological tests were unsuccessful allegedly because the mummy was too old). This find also needs to be re-examined to see whether a stroke could have been the cause of death.

The last find brings us back to our original topic. There is a clear pustular exanthema in the pubic area, in the lower abdominal region and in the face. This distribution, according to the pathologist A. R. Ferguson, could be evidence of smallpox. Detailed examination and the photographic documentation that Dr. Nasry Iskandar allowed us to carry out in the Cairo Museum in 1994 support this diagnosis.

In late 1960's the king's mummy was examined by X-ray (Harris, Weeks 1973, Harris, Wente 1980). This, among other things, confirmed the described perforation of the skull. However, the above mentioned scientists were not permitted to carry out a laboratory examination, which is destructive because it requires the removal of a small piece of tissue. At the beginning of the 1980's, this was conducted by a Canadian medical doctor, P. K. Lewin, with the permission of President Sadat. In the piece of skin that was flaking off the neck of the king's mummy, E. Palmer and J. Nakano of the American Center for Disease Control and Prevention in Atlanta (Georgia) found a corpuscule of a virus – under magnification 12,000 times, using an electron microscope. The diagnosis of smallpox was also positively confirmed by an immuno-precipitation test (Lewin 1984, 1991, 1995).

The diagnosis of smallpox as the cause of the death of Ramesses V can be correlated to the historical evidence found on the verso of Papyrus No. 1923, part C, in the Egyptian Museum in Turin (Ventura 1988). After the king died unexpectedly early, he was not buried in Tomb 9 in the Valley of the Kings after the usual 70 days of mummification. He had ordered this tomb to be cut during his reign of four years. Approximately half of the intended area of the tomb had been cut and over the course of 70 days the work could have been at least roughly completed. This had happened many times in the past when a ruler had died unexpectedly. But the work in Tomb 9 was stopped and the royal craftsmen were ordered immediately to start cutting a new tomb that has not yet been identified by the archaeologists. It is probably hidden in one of the valleys that branch off the Valley of the Kings. The work took a full year.

Next, another six tombs had to be prepared very quickly in the Valley of the Queens for members of the king's family who had also died unexpectedly. The craftsmen took four months to do this. In the Papyrus there is no information about whether the deaths of these six people had any connection with the king's death, but considering their number and the fact that they died at the same time it is very likely that they died of smallpox too. Their mummies, together with the king's, were probably waiting to be buried in a secret and well-protected place.

Sixteen months after the king's death – a length of time that was contrary to the Egyptian concept of *maat* (cosmic order) the mummies were placed into the new tombs. There is no evidence about the burials but we may assume that they were probably carried out with a minimum of the usual ceremonies. What we do know is that the royal craftsmen were given a one month vacation after the burials "at the expense of Pharaoh". This could have been done either as a reward for an unusual amount of work, or for fear of spreading a resistant, fatal disease. The latter interpretation – the first attested quarantine in history – may be supported by the fact that the Valley of the Kings (and perhaps the Valley of the Queens too?) was closed to all visitors for six months.

Only after the return of the craftsmen did King Ramesses VI have Tomb 9 which originally belonged to Ramesses V,

enlarged to twice the area of the original. He also had it decorated with his own reliefs (Baedeker 1928). Moreover, he took over the mortuary temple built for his two immediate predecessors (Kitchen 1984).

In accordance to the historical events described above, we may conclude that the highest royal officials were forced to carry out extraordinary precautions after the king's death that were absolutely contrary to the practices followed in Egypt for thousands of years. They were probably very scared of an unknown, fatal epidemic that possibly spread to the royal palace from the common people. There is no doubt that it also deeply influenced magico-religious ideas, because ordinary protection such as amulets and prayers to the gods did not help against it. The possibility cannot be ruled out that helpless relatives or the palace doctors, or maybe unknown enemies of the king, had the ruler killed during the critical phase of his disease. The embalmers were probably also at risk from the king's illness and the illness of members of his family. This may be why they carried out their work so quickly and carelessly, using only the most ordinary procedures. The time usually taken to wrap the mummy, accompanied by the reciting of ritual texts, was probably cut extremely short. The mummies of the king and his relatives had to wait a long time for the burial that should have been carried out after 70 days for religious and ritual reasons, an unbelievable 16 months.

In some parts of the information from the Papyrus quoted above we can trace the beginnings of some sort of anti-epidemic precautions, which could have taken place because the people responsible were aware of the infectious character of the disease. They include the careless work of the embalmers, the decision to hide the mummies of the deceased for a period of time, the decision not to use Tomb 9 in the middle of the Valley of the Kings, the decision to close the Valley after the burial of the mummies in hastily prepared tombs, and the one month vacation given to the craftsmen.

The existence of epidemics in Ancient Egypt can be well supposed because of a low standard of hygiene (Strouhal 1992). Together with the epidemic of smallpox we should also mention the epidemic of so-called "Asian Disease" (the origin of which is in the Near East). Its symptoms are described in the Hearst (11,12 nn.) and London (11,4 nn.) Papyri (Goedicke 1984). In these instances it was probably bubonic plague. There were at least two epidemics of this – one at the beginning of the New Kingdom (around 1550 B.C.) and another in the time of Akhenaton (around 1350 B.C.). Another epidemic called the "annual pestilence" (*j3dt-rnpt*), also noted in the Edwin Smith papyrus, need not have been fatal (Goedicke 1984).

The prevalence of smallpox and other infectious diseases in certain periods of the history of Ancient Egypt could in future most reliably be explained by a systematic examination of the relevant mummies using the methods of molecular biology.

REFERENCES

- BAEDECKER K., 1928: *Ägypten und der Sudan. Handbuch für Reisende*. K. Baedeker, Leipzig.
- ELLIOT SMITH G., 1912: The Royal Mummies. *Catalogue général des antiquités égyptiennes du Musée du Caire*, Nos. 61051-61100. Imprimerie de l'Institut français d'archéologie orientale, Le Caire.
- FORMAN W., QUIRKE S., 1996: *Hieroglyphs and the Afterlife in Ancient Egypt*. British Museum Press and Opus Publishing, London.
- GOEDICKE H., 1984: Seuche. In: W. Helck and W. Westendorf (Eds.): *Lexikon der Ägyptologie*. Vol. V. P. 918. Harrassowitz, Wiesbaden.
- HARRIS J. E., KOWALSKI C., WALKER G. F., 1980: Craniofacial variation in the royal mummies. In: J.E. Harris and E.F. Wente (Eds.): *An X-ray Atlas of the Royal Mummies*. Pp. 346-357.
- HARRIS J. E., WEEKS K. R., 1973: *X-Raying the Pharaohs*. Ch. Scribner's Sons, New York.
- HARRIS J. E., WENTE E. F. (Eds.), 1980: *An X-ray Atlas of the Royal Mummies*. The University of Chicago Press, Chicago, London.
- KITCHEN K. A., 1984: Ramses V. – XI. In: W. Helck and W. Westendorf (Eds.): *Lexikon der Ägyptologie*. Vol. V. P. 124. Harrassowitz, Wiesbaden.
- KROGMAN W. M., BAER M. J., 1980: Age at death of Pharaohs of the New Kingdom, determined from X-ray films. In: J.E. Harris and E.F. Wente (Eds.): *An X-ray Atlas of the Royal Mummies*. Pp. 188-233, esp. 202 and 206.
- LEWIN P. K., 1984: "Mummy" riddles unravelled. *Bull. of the Microscopic Society of Canada* 12: 4-8.
- LEWIN P. K., 1991: Technological innovations and discoveries in the investigation of ancient preserved men. In: D.J. Ortner and A.C. Aufderheide (Eds.): *Human Paleopathology. Current Syntheses and Future Options*. Pp. 90-91. Smithsonian Institution Press.
- LEWIN P. K., 1995: Ventures in paleopathology. "Mummy" riddles unravelled. *Germs and Ideas* 1: 10-14.
- RUFFER M. A., 1914: Pathological notes on the Royal Mummies of the Cairo Museum. *Mitteilungen zur Geschichte d. Medizin u. d. Naturwissenschaften* 13, No. 2. Reprinted in: M.A. Ruffer: *Studies in the Palaeopathology of Egypt*. Pp. 166-178.
- RUFFER M. A., 1921: *Studies in the Palaeopathology of Egypt*. R. L. Moodie (Ed.). The Chicago University Press, Chicago, Ill.
- RUFFER M. A., FERGUSSON A. R., 1911: An eruption resembling that of variola in the skin of a mummy of the XXth dynasty. *J. of Pathology and Bacteriology* 15. Reprinted in: M. A. Ruffer: *Studies in the Palaeopathology of Egypt*. Pp. 32-34.
- STROUHAL E., 1992: *Life in Ancient Egypt*. Cambridge University Press and Opus Publishing, London. Pp. 72-75.
- VENTURA R., 1988: The largest project for a royal tomb in the Valley of the Kings. *J. of Egyptian Archaeology* 74: 137-156, esp. 154-156.
- WENTE E. F., 1980: Age at death of Pharaohs of the New Kingdom, determined from historical sources. In: J.E. Harris and E.F. Wente (Eds.): *An X-ray Atlas of the Royal Mummies*. Pp. 234-285.

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