

# Tools of the Ancient Egyptian Embalmers

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## Abstract

**Although a considerable amount has been written about mummification techniques used in ancient Egypt, surprisingly little has been said about the tools the embalmers used. We survey the literature, discuss archaeological finds including embalmer's caches, and then present some findings based on an experimental mummification of a human cadaver.**

## Introduction

In 1994 the authors mummified a human cadaver to determine the details of ancient Egyptian embalming. We were primarily interested in three areas: 1) How natron, the desiccating agent, was used; (Brier and Wade, 1997) 2) The surgical procedures involved in the removal of the internal organs; (Brier and Wade, 1999) and 3) The tools used by the ancient embalmers. Today we would like to present our findings on the tools used by the ancient embalmers.

## Sources of information

It is well known that the ancient Egyptian embalmers never wrote the details of their profession. There are several papyri that deal with religious rituals during mummification, and there is even one that gives the surgical details of how to embalm the sacred Apis bull, but there is no papyrus that tells us how to mummify a human, and thus we have no account of the tools used. If we are to discover what tools were used, we must look to various sources.

### Tomb paintings

Egyptian tomb paintings have always provided views into the daily life of the ancient Egyptians, and this might seem a natural place to look for details of mummification and the

tools used. However, because of the secrecy associated with mummification, scenes of anything having to do with the actual mummification process are scarce. Fortunately, there are two tombs on the west bank of Luxor that provide a rare glimpse into the embalmer's workshop and it is here that we first see embalming tools.

The tomb of Thay was recorded by Norman de Garis Davies in 1925 and on one of the walls we see the final stages of mummification, the wrapping. Two embalmers hold small pots containing heated resin and brush it on the bandages (Fig. 1). Beneath the mummy is a two-handed pan from which the smaller pots are filled. The handles are necessary because the resin was heated and the handles would facilitate removal from the fire.



Fig. 1 - Embalmers brushing resin on a mummy. Tomb of Thay.

On the left, above the door, we see the pan above the brazier that Davies has labeled with a question mark. There is one more point of interest in the tomb of Thay. The mummy being wrapped is not resting on a table, but rather on two tall supports. This facilitates wrapping – the mummy does not have to be lifted each time a bandage is passed under the body. The information about the embalming equipment – the pans, pots, brushes, etc. – is welcome, but there is a second tomb, with a similar scene that reveals considerably more about tools.

The tomb of Amenemopet was recorded by the Franco-Tuscan expedition led by Champollion, the decipherer of the ancient Egyptian language, and Ippolito Rosellini, the founder of Italian Egyptology. The fourteen members of the expedition left for Egypt on July 21, 1828 and in the course of a year accomplished a great deal. They visited hundreds of tombs and when they left Egypt they took with them more than one thousand drawings recording the most important scenes on the walls of tombs and temples. These

drawings were eventually published in two monumental works, one in Italian and one in French, both with the same title: "Monuments of Egypt and Nubia." Plate 415 of the Italian edition shows one of the walls of the tomb of Amenemopte and gives considerable insight into embalming tools. (Fig. 2)

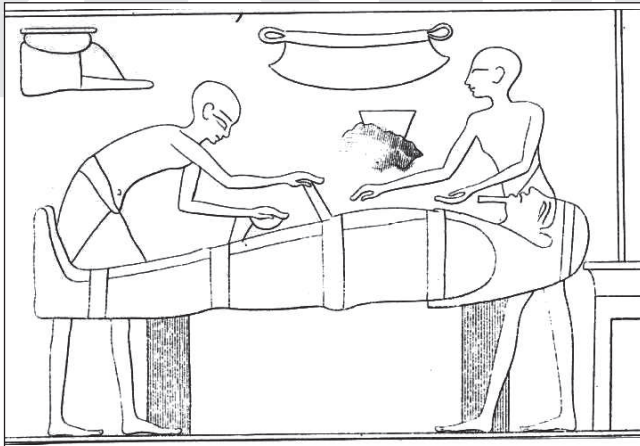


Fig. 2 - Double handled pan. Tomb of Amenemopte. (Rossellini Plate 415).

The scenes are quite similar to those in Thay's tomb; we see the double handled pan, the brushes, etc., but in the first vignette there is a strange object in the upper left corner. The object is difficult to interpret for two reasons: First, even in the days of Champollion and Rosellini the tomb walls were damaged. The second difficulty we have is the lack of perspective in Egyptian paintings. Still, I believe we may be able to identify a very specific tool used to introduce resin into the cranial cavity.

The clue to the object's identity is found on Plate 138 of the French edition of "Monuments of Egypt and Nubia." (Fig. 3) The plate illustrates various objects found by the Franco-Tuscan expedition. The brief caption describes one

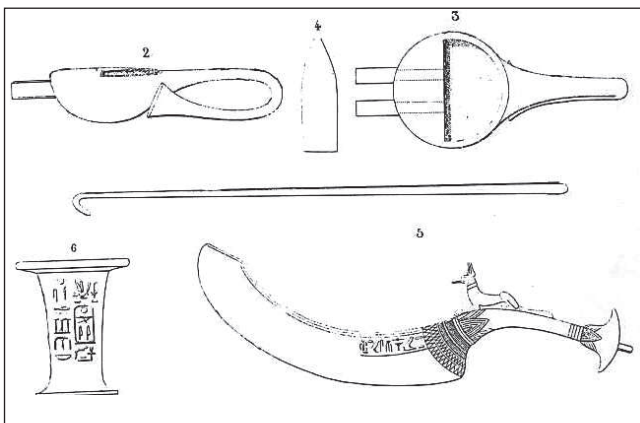


Fig. 3 - Cup for pouring resin into cranium (Champollion Plate 138).

of the objects as "Used to inject bitumen via the nostrils." One can readily see how the object was utilized by the ancient embalmer. The hot bitumen or resin was placed in the bowl and the two tubes inserted in the nostrils of the cadaver, introducing the molten liquid into the cranial cavity. This is almost certainly the object shown on the walls of Amememopte's tomb.

There is another piece of embalming equipment shown in the 5<sup>th</sup> vignette of the tomb, this time on Plate 126 of the French edition. (Fig. 4) In the upper right corner is a rectangle with lines across it. This we believe is an embalmer's table. In 1921, the Egyptologist Herbert Winlock, excavating at Thebes for

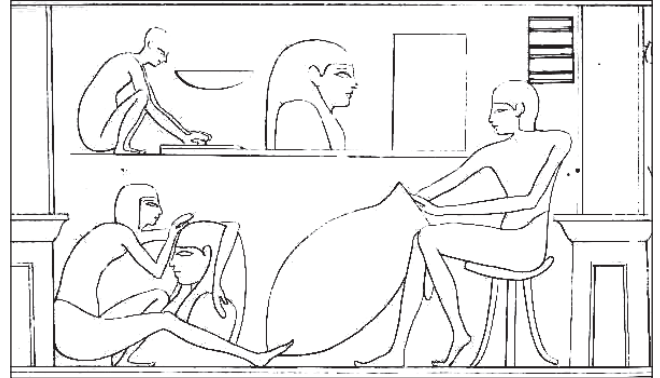


Fig. 4 - Embalming table (Champollion Plate 126).

the Metropolitan Museum discovered an embalmer's table along with other embalming material used to mummify an important official named Ipy. (Fig. 5) The table was 7 feet by 5 feet and Winlock was surprised by its width as well as the large boards going across it. We will comment on that later, but I think it is reasonable to conclude that the rectangle depicted on the wall of Amenemope's tomb is, indeed, an embalmer's board.



Fig. 5 - Emblmer's cache discovered by Winlock – embalming board, jars, tools, etc. Courtesy Egyptian Department, Metropolitan Museum of Art.

The tomb also depicts a large jar, remarkably like those found with Ipy's embalming table. Again a testament to the accuracy of the scenes depicted on the tomb's walls. Unfortunately, the tombs of Thay and Amenemopte are the only two that give us insight into the tools used by the ancient Egyptian embalmer. For more information we must look to a different source.

#### Embalmer's caches

As mentioned above, Winlock found an embalmer's table and jars associated with the mummification of Ipy. It

appears that after mummification of wealthy people, the unused materials frequently were gathered and buried in a pit near the tomb of the deceased. Perhaps by being so closely associated with a mummification, these materials were considered sacred, deserving of their own burial. When Winlock found the embalmer's cache of Ipy, he suggested that it was buried to avoid an enemy of Ipy's having even a hair of the deceased and thus bewitching him. (Winlock, 1922)

Thus when Winlock found the embalming board he also found 67 large jars that had been filled with soiled rags, natron, straw, etc. One of the jars contained a bronze tool 12.4 cm. long hooked at one end and rounded at the other. Winlock's field notes point out that the hook would certainly be useful in removing nose plugs, etc.

Ipy's cache is not the only one Winlock discovered. He mentions "This last year alone we ran across three such caches of the later finds, and two years ago we found the same sort of things left over from the embalming of the body of Mehenkwtetre." Winlock never published the details of these caches and a comprehensive examination of his field notes might prove fruitful.

Decades before Winlock's discoveries of the various embalmers' caches, one was discovered in the same area by Edouard Naville when he was clearing the middle terrace of the funerary temple of Queen Hatshepsut at Deir El Bahri. He discovered several large jars filled with small bags of natron, straw, and rags. Naville doesn't describe the find in detail but recognized the find for what it was and suggested that embalmers had set up a workshop in the area. He describes a remarkable coffin that seems to have been associated with the embalmers' workshop. "Among the jars was a very fine coffin, well painted with the face dark brown... When the coffin was opened it was found that there was no body inside, but several hundreds of little bags full of nitre." (Naville, 1895) Naville was notorious for being interested only in inscribed artifacts. He never published a photo of the coffin or jars nor did he describe them in any detail. Indeed, because most early excavators were not interested in mummification, much information has been lost.

When Douglas Derry examined the larger of the two fetuses discovered in Tutankhamen's tomb, the wire embalming tool used to insert linen into the cranium was still *in situ*. Derry threw it out, without even describing it. (Leek, 1972) This is an extreme case, but it shows how difficult it is to gain information about embalming tools from early excavators.

One embalmers' cache for which we have a complete report is Tutankhamen's and the only reason we have that report is because the excavator was throwing it out! Theodore Davis, a wealthy American, was excavating in the Valley of the Kings during the beginning of the 19<sup>th</sup> century when he found a small pit housing a dozen or so large jars (No exact count exists because several were thrown away.) that contained packets of natron, bandages, and chopped straw, clearly an embalmer's cache. Along with the embalming materials were numerous dishes, floral pectorals, and animal bones, mostly of fowl. Many of the

bandages and dishes were inscribed with Tutankhamen's name; Davis had found a combination of materials used to embalm the boy king as well as the remains of the ritual last meal consumed on the day of burial. Davis had no interest in these materials and gave them to Winlock for the relatively new Metropolitan Museum of Art, where they can be seen today. Winlock published this cache properly only because of its association with Tutankhamen.

(Winlock, 1941) There were numerous natron packets of various shapes and hundreds of bandages, some of special interest. Normally bandages were torn from old garments and sheets used in daily life. Some of Tutankhamen's bandages had finished edges on both sides – they were woven specially for the mummification. No embalmer's tools were found among the embalming paraphernalia. Perhaps they were just too precious for the royal embalmers to give up for a ritual burial.

Although the embalmers' caches haven't supplied as much information about embalming tools as one would hope, there are items from other excavations that are likely candidates. One of these tools, described by Herodotus around 450 BC, provides the earliest discussion of an embalming tool: "...They first draw out part of the brain through the nostrils with an iron hook..." (Herodotus) Iron was rarely used in ancient Egypt and no examples of iron hooks have been discovered, however quite a few of copper have been found. In the first article ever published on embalming tools Sudhoff surveyed various museums for hooked instruments and found more than a dozen that seemed appropriate to the task. (Sudhoff, 1911) They range in length from 28-33 cm. and fall in two distinct categories – hooked or rolled at the end. Later we will discuss the reason for the two kinds of tools.

Sudhoff goes on to discuss, at some length, another possible embalmer's tool that he calls the "necrotome" or death knife (Fig. 6). Sudhoff singles out this instrument

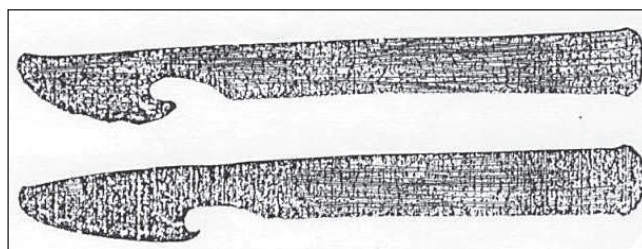


Fig. 6 - Sudhoff's necrotome.

primarily because of the notch in its side. He theorized that due to the small incision made during mummification, the embalmer could get only one hand inside the abdominal cavity making removal of the internal organs difficult. With the necrotome, organs could be hooked by the sharpened notch and with a strong tug separated from the adjoining vessels. This too we will discuss later.

#### Empirical tests

When we began our 1994 mummification project, we decided to use only replicas of ancient tools found in

Egypt. Three of these yielded new information that we would like to discuss.

#### The Necrotome

Our replica of the necrotome was bronze composed of 88% copper and 12% tin, the same composition as 18<sup>th</sup> Dynasty bronze instruments. At first we cast the instrument from a mold quickly discovered that when made that way it would not take a sharp edge. A second method of manufacture was tried, this time repeatedly hammering and folding the tool from a bronze blank. With this technique we attained a somewhat sharp edge. The fact that the first method was not serviceable explains why although quite a few of such tools have been discovered, no molds have been found. They were not produced from moulds. It is interesting to note that Janot et al. in an interesting study replicated the instrument from a mold, but they don't discuss in detail an attempt to use it. (Janot et al., 1994) They concluded that because their replica looked very much like one found, the Egyptians must have made theirs in a similar way. Our experience suggests that this may be wrong.

Even with our replica being beaten and folded, when we attempted to use it, we found it not very effective. Indeed, we believe this instrument never had any connection to mummification. Sudhoff was an anatomist, not an Egyptologist, and understandably was not fully conversant with the Egyptological literature. The knife was called *dg3* by the ancient Egyptians and has the sign for copper as a determinative.

Another form has a double determinative that includes a knife.

Such knives appear in a variety of contexts, but not in conjunction with mummification. One appears on the outer coffin of Dhty-nht associated with razors. (Boston Museum of Fine Arts 20.1822-7) There was even one found in Tutankhamen's tomb in an ivory box of shaving equipment. (Davies, 1977) The finding of these instruments in the context of toilet equipment rather than in mummification contexts strongly suggests that they were not embalming tools and this is somewhat confirmed by our attempt to use a replica during our mummification.

If it was not the tool used to remove the internal organs, what was? Replicas of several standard ancient knives were also fashioned for our use, both of copper and bronze.

When we performed preliminary trials with them, we found them to be rather dull and wondered if something better wasn't used by the ancient embalmers. The answer came from Herodotus. When he described the "iron hook" for brain removal, he also added, "...the flank is slit open with a sharp Ethiopian stone and the entire contents of the abdomen is removed." (Herodotus) The sharp Ethiopian stone is obsidian, volcanic glass. Earlier, we thought that "At the time of Herodotus, the Egyptians had razor-sharp bronze knives, so there was no practical need to use a stone knife. That was demanded only because of tradition." (Brier, 1994) As you will see, we were wrong on two accounts.

From our preliminary work with the knife replicas, we realized that they were far from "razor-sharp." We then

concluded that obsidian was used, not because of ritual considerations, but because it was the most efficient tool. To test this hypothesis, a series of obsidian blades of various shapes was flaked (Fig. 7). Some, shaped like

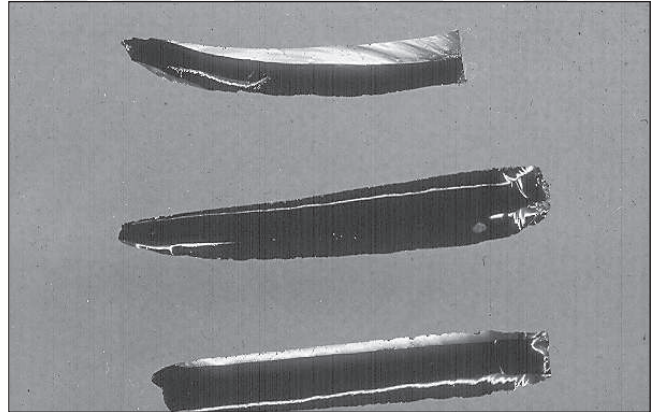


Fig. 7 - Obsidian flakes used to make incisions.

traditional knives were quite good, but by far the best for clean incisions were simple flakes with single, sharp edges. Indeed, when we performed the surgical procedures, this was the tool we used, holding it with a piece of leather to avoid being cut. It performed wonderfully and was sharper than any surgical steel scalpel. Based on Herodotus' account and our empirical experience, we are convinced that this was the tool used by the ancient Egyptian embalmer to remove the internal organs.

#### The Emblamers' Board

It will be remembered that Winlock discovered a large embalmers' board in the refuse form Ipy's tomb. His notes state that the board was "...somewhat stained with oil and completely smeared and encrusted with natron." Thus there is little doubt about its use. Like all Egyptian wood constructions, no nails were used and the board was pegged together. There are two features of the board that were somewhat puzzling: 1) It was wider (150 cm.) than seemed necessary, and 2) Running across the top were four thick blocks 15 cm wide and 13 cm high, the purpose of which was uncertain.

Using only hand tools and ancient Egyptian methods we built a replica of the embalmers' board (Fig. 8). When it came time to place the eviscerated cadaver on the board,

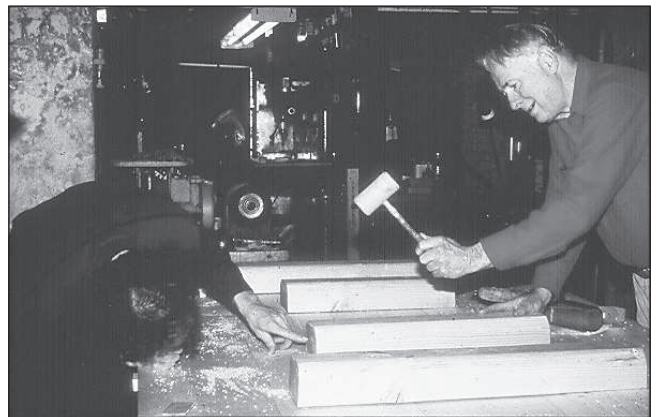


Fig. 8 - Replica of mummification board.

the purpose of the blocks became obvious. When a person dies and his heart stops pumping, the only thing effecting the location of the blood is gravity. Thus if a body is supine, the blood accumulates on the underside, near the gluteus maxima, quadriceps, etc. Thus to dehydrate effectively, one wants as much natron as possible beneath the body and this was the function of the blocks – to keep a large amount of natron in place beneath the body. Consequently, we filled all the spaces between the blocks with natron and then placed the body on top of the natron.

The second question, about the great width of the board was answered when we covered the body with natron. The natron naturally mounds and to completely cover a cadaver resting on the blocks, the entire width of the board was necessary for the mound's broad base. Once again, it took an empirical test to understand why the ancient Egyptian embalmers were using the tools they created.

#### The Hook

The last instrument we would like to comment on is the hook that was discussed by Herodotus in 450 BC and next by Sudhoff in 1911. Sudhoff pointed out that copper not iron was used and then noted that there seemed to be two kinds, those with a hook at the end and those with rounded ends. The purpose of the two varieties became clear when we attempted to remove the brain from our cadaver. The hook could not be used to simply pull the brain out a bit at a time. Rather, as we reported in our earlier, we had to liquefy the brain by rotating the hook when it was inside the cranium. (Brier and Wade, 1999) Then, we inverted the cadaver and the brain ran out. The rolled instrument would provide more surface area and thus break down the brain more easily. Therefore, there were probably two tools used for evacuation of the brain. The hooked one was used to first break through the cribiform plate and rip the dura matter and other solid elements. Then the rolled instrument could be inserted to complete the breakdown of the brain.

#### Conclusions

We should mention that we also made replicas of the jars found by Winlock in Ipy's embalmers' cache and these proved to be well suited to the task. The large jars held 10.9 kg of natron, just about the limit one man could easily handle when pouring natron on the body.

It is not surprising that a profession practiced for 3000 years would develop a set of tools specifically designed for the task at hand. Our experience working with replicas of these tools only increased our admiration for the skill of the ancient Egyptian embalmer.

#### Literature Cited

- Brier B. 1994. *Egyptian Mummies*. New York: William Morrow, p. 67.
- Brier B. and Wade RS. 1997. The Use of Natron in Human Mummification. *Zeitschrift fur Agyptische Sprache* 124: 89-100.
- Brier B, and Wade RS. 1999. Surgical Proceedings During Ancient Egyptian Mummification. *Seitschrift fur Agyptische Sprache* 126: 89-97.
- Davies, WV. 1977. Tut'Ankhamun's Razor-Box: A Problem in Lexicography. *J.E.A.* 63: 107-111.
- Herodotus. *Histories*. Book II: 86-7.
- Janot, Francis et al. 1994. Pour Mieux Comprendre L'Embaumement. *Archeologie*, pp. 943-952.
- Leek F, Filce. 1972. *The Human Remains From the Tomb of Tut'Ankhamen*. Oxford: Griffith Institute, p. 23.
- Naville, E. 1895. *The Temple of Deir El Bahri, Part II*. London: Egypt Exploration Fund, p. 6.
- Sudhoff, K. 1911. *Agyptische Mummienmacher-Instrumente*. *Archiv fur Geschichte der Medizin*. 5: 161-172.
- Winlock, H. 1922. *Bulletin of the Metropolitan Museum of Art*, p. 34.
- Winlock, HE. 1941. *Materials Used at the Embalming of King Tut-'Ankh-Amun*. New York: Metropolitan Museum of Art.

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