

“Capta est ne malitia mutaret intellectum eius...”: Study on a natural mummy from an underground cemetery (18-19th century)

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Abstract. Here we present the paleopathological analysis that were recently conducted on one of the mummies present in the hypogeal cemetery of Santa Maria Maggiore in Vercelli, belonging, according to the writings above the tomb, to a young girl. Among the analysis carried out, the anthropological ones were able to confirm the young age of the subject, while the CT ones confirm the natural mummification and showed the presence of Harris lines, leading to the hypothesis that this girl was subjected to alternating periods of stress. Although it is not possible to reach an unequivocal conclusion on the stress suffered by the young woman, the data collected will allow us, first of all, to be able to continue archival research to identify her and her family, and then they will be useful for a larger study that will cover all the skeletal remains present in the cemetery. As our research advances, we anticipate unveiling deeper layers of understanding that contribute to the overarching narrative of this intriguing historical context.

Key words: Hypogeal cemetery, Paleoradiology, Paleopathology, Natural mummies

Introduction

The Jesuits erected the church of Santa Maria Maggiore in Vercelli (Piedmont, Italy) in the 18th century. They wanted to replace the old church called Santissima Trinità which was further north. In 1780, they named it after the old basilica that was just a few meters away (1). In 1777, the cemetery of the church opened to ordinary funerary use, also welcoming the remains transferred from the cemetery complex located near the ancient basilica. It remained active until the first decades of the 19th century (2).

From an architectural-structural perspective, it is an underground cemetery organized with vaulted structures, also exploiting some pre-existing architectural elements. It has the same dimensions as the building above and is therefore contemporary with today's church structure.

Starting in September 2020, the anthropology division of the University of Insubria has begun the process of recovering the bioarchaeological evidence of the hypogeum cemetery.

To facilitate understanding and cataloguing the finds, the cemetery was divided into sectors I to V, as well as the tomb structures, called Funeral Units (FU), which were numbered from 1 to 19 (Figure 1).

The underground space seems to develop around a central nucleus (Sector III), from which depart several areas employed for funerary use, including masonry structures, burial chambers, private chapels and two large underground ossuaries.

Inside, located along the perimeter of different rooms in sectors I, II and III, there are many mummified bodies contained in wooden coffins, currently open, delimited in the profiles by the plastered masonry of the tombs.

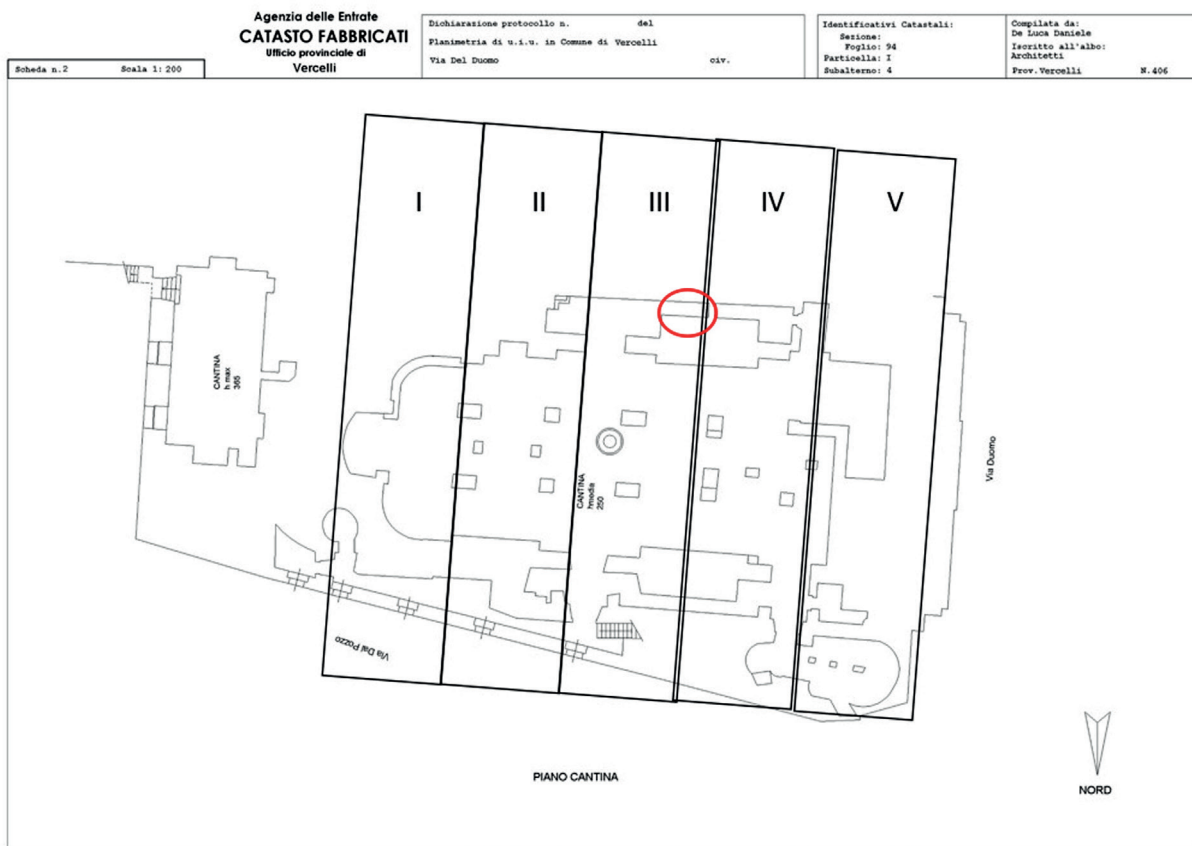


Figure 1. In the red circle the location of FU 13

In 2021, the study of one of the first mummies was carried out. Funeral Unit 13, Sector III, is located in a narrow cul-de-sac in the extreme southern portion of the cemetery.

The mummy was placed in a trapezoidal tomb made of bricks and covered entirely with a thick layer of mortar, which does not make the arrangement of the bricks visible. Inside the masonry case, there is a wooden coffin, completely exposed due to the lack of coverage.

Inside the coffin, a perfectly female mummified body was preserved. On the wall facing north of the narrow corridor, there is a funerary inscription that reads “*capta est ne malitia mutaret intelletum eius obiti aetate annorum sedecim*” which can be translated as “It was taken before malice changed its intellect at the age of sixteen” (Figure 2).

Here we present the results of the complete paleoradiological investigation of the mummy FU 13.



Figure 2. 3d reconstruction of FU 13

Materials and methods

When approaching a mummified subject, the first question is whether the degree of preservation is good enough to allow a meaningful study, and this decision

is usually based on the extent of soft tissue preservation (3). Is very important the possibility of non-invasive techniques such as conventional radiology, computerized tomography, or even magnetic resonance studies (4, 5).

The mummy was transferred to the Diagnostic Imaging and Interventional Unit of the IRCCS Galeazzi Hospital in Milan to undergo a digital radiological examination and computed tomography (CT).

Images were obtained using a Revolution Ascend CT scanner (GE Medical, Milwaukee, MI, USA), with the following protocol study: slice thickness = 0.625-1.25mm, FOV = 500mm, Kv = 120kV, effective mA = 80-125mA.

Age at death, according to the writing on the wall, should be 16 years. To confirm this data, an age diagnosis was made. In particular, the degrees of welding between the diaphysis and epiphysis of the main skeletal districts were observed (6, 7).

Results

The body lay outstretched, arms resting gently at its sides. The legs were extended, with the left foot slightly turned outward. A subtle tilt of the head and neck to the right added a delicate angle. Remarkably, the mummy remained well-preserved and in a complete state of conservation. While the skullcap displayed a skeletonized appearance, the rest of the skeleton was covered by desiccated soft tissues.

Contrary to the clothing that adorns other mummies of the same context, that of the girl of FU 13 has not resisted the passage of time, except for some remains of fabric around the shins, perhaps remains of stockings.

The results of the CT scan revealed no evidence of disembowelment or external manipulation of the body. The skeleton, boasting an intact and well-connected structure, exhibited no prominent signs of decay caused by environmental factors.

Noteworthy is the observation that certain bone metaphyseal plates remained not completely fused or unfused. Specifically, the sternal end of the clavicle, the humeral head (Figure 3), the greater trochanter, the



Figure 3. The fusion line of the femoral head is observed, which in females completely fuses between the ages of 18 and 22 (7).



Figure 4. The fusion line of the greater trochanter, the head, and the distal end of the femur are observed, which in females completely fuses between the ages of 15 and 19 (7).

head, and the distal end of the femur exhibited absence of fusion (Figure 4), as did the proximal and distal ends of the tibia. The youthfulness of the individual was corroborated by the presence of third molar cusps in the maxilla and zygomatic bone, accompanied by incomplete root maturation.



Figure 5. Harris lines in the distal tibia

From paleopathological point of view, four prominent Harris lines were observed in the distal end of the tibias (Figure 5).

Various structures were identified both on the upper surface of the body and at the bottom of the sarcophagus. These structures were attributed to a phase in the life cycle of two species of necrophagous insects: some exuviae from the pupal stage of *Dermestidae* and several *Diptera* pupae.

Discussion

Anthropological analyses substantiate the youthfulness of the individual, indicating that the young woman's age falls within the range of 15 to 22 years. This aligns with the mural inscription, which attributes her age to 16 years.

The cemetery phases are dated between the late 18th and 19th century and the burial of the girl from FU 13 should be situated within this chronological span.

In terms of clothing, FU 13 retains only remnants of socks. Within the crypt, there are other mummies currently undergoing study. These mummies, in contrast, retain their clothing in a remarkably well-preserved state. Notably, the attire of male mummies, fashioned from more durable materials, has withstood the test of time, contributing to their superior preservation.

The absence of internal organs and the lack of any filling materials or incisions on the skin have provided us with conclusive evidence supporting the notion of a natural mummification process. This process seems to have been driven by swift dehydration, likely influenced by the arid climate conditions inside the hypogeal space.

The inscription adorning the wall alludes to a biblical passage concerning the untimely passing of the virtuous (Bibbia, s. 4–11). Its essence conveys that death intervened before malevolent influences could lead a person astray with their allure, preserving the person's untarnished perspective. This Latin phrase is commonly found on the tombs of those who die prematurely, a tribute to their inherent virtues, which, thanks to their early demise, remain intact. Under this inscription, a long cross has been drawn.

It is worth highlighting that no other tomb within this context bears Latin phrases or quotations. In general, inscriptions are infrequent, and if present, they are typically engraved into the mortar, bearing solely the subject's name and date of passing. A singular exception is the tomb of Vicar Bronzini, positioned in a prominent location beneath the high altar. This exceptional tomb, distinct from the rest, features painted inscriptions detailing the age of death and his role in the Church (8).

The inscription on the wall, along with the burial's placement in a secluded passageway, hints at a significant role held by the girl's family within the community. It is highly likely that this family held noble status and held a prominent position.

As for the discovered pupae, *Diptera*, the foremost group of insects, are the initial colonizers of the body, initiating extensive infestations shortly after death. However, their attraction wanes as the remains progress beyond a certain stage of decomposition or if the body has undergone mummification (9).

From a paleopathological perspective, radiology revealed the presence of Harris lines in the distal portion of the tibiae (Figure 5). These lines are nonspecific indicators of stress, as they appear in response to various forms of physiological stress, leaving a mark on the bones themselves. They manifest as transverse lines of ossification that develop along the proximal and distal metaphyses of long bones. These Harris lines result from systemic physiopathological stress and can form from birth up to the age of 16–18 during skeletal growth (10). Conditions such as malnutrition, trauma, fractures, vitamin deficiencies, weaning, infectious diseases like measles or influenza can lead to a metabolic insult that temporarily halts the growth of long bones (11, 12). After the stress period, a recovery phase characterized by intense bone remineralization occurs, leading to the formation of these lines (13). Consequently, they signify a renewed growth phase and indicate the overcoming of a period of illness or malnutrition by the individual.

Therefore, what we can hypothesize is that the young girl experienced metabolic stress, although the precise underlying cause of this stress eludes our identification. While we cannot definitively pinpoint the specific trigger, it remains evident that her skeletal development was subject to a period of physiological challenge or disruption, possibly stemming from a combination of factors such as nutritional inadequacies, infections, or other health-related stressors.

Although we cannot definitively ascertain the exact cause of her passing, her body experienced metabolic disturbances.

Conclusion

In conclusion, the anthropological examination, confirmed the age of 16 of the young lady. Ongoing archival research aims to definitively identify her and her family. The CT points to a natural mummification process facilitated by rapid dehydration, due to the climate of the crypt. Moreover, the exceptional preservation of clothing of males, highlights the interplay between cultural practices, material durability and environmental conditions. These conclusions represent

preliminary outcomes of a broader study endeavouring to examine all skeletal comprehensively remains within the crypt. As our research advances, we anticipate unveiling deeper layers of understanding that contribute to the overarching narrative of this intriguing historical context. Within the Santa Maria Maggiore cemetery project, the use of the bioarchaeological context is also envisaged in the future, following the guidelines and ethical principles that revolve around the display of human remains (14).

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