



In Hungary up till now it was not possible to make facial reconstructions on well preserved mummies. The reason is, that the mummified soft tissues cover the skull, obstructing the casting process. The aim of our study is the utilisation of new, non-invasive devices and technologies in the field of physical anthropology, for reproducing skulls of mummies.

The mummified body of Antonia Tauber English Lady was excavated from the 18th century Dominican Crypt of Vác (Hungary). The CT examination of the nun's mummified head was made at Semmelweis University, Department of Diagnostic Radiology and Oncotherapy (Budapest) with a multislice spiral CT appliance. We prepared a 3D virtual reconstruction of the skull from the CT slice-data of 0,4mm thickness.

We achieved the 3D prototyping of the skull with the assistance of TONDO BT. During the segmentation process, first we virtually removed the mummified soft tissues from the software-reconstructed 3D head. In this way we produced the digital skull model for the 3D printing.

Our ZCORP DESIGNMATE CX COLOUR 3D PRINTER uses the method of creating the model (the 3D object) from powder and adhesives. The digital object of the skull created from CT data was cut into 0,089 mm slices by the 3D software of the 3D printer. During the printing process the model of the skull was built up from thin layers of powder.

The printer spreads the amount of powder that will make the thickness of one slice with the help of an arm. The head of the printer leaves adhesive on the powder where there's the contour of the object. This movement will be repeated as many times as many layers the object was cut. After the printer had finished building the layers we have fixed the model of the skull. The opened position of the mandible caused some difficulties during the facial reconstruction process. As an important new result, we could remove virtually the dislocated mandible from the digital model of the skull. After that we printed the mandible separately from the skull, so we could resettle that in its original anatomic position.

The end result, the 3D rapid prototyping way printed skull-cast is accurate and detailed enough for making plastic facial reconstruction.

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265 spontaneously mummified corpses survived from the coffin burials going back to a history of almost 110 years which were opened up in Vác (Hungary), in 1994-95. Antonia Tauber the English Lady died in 1786, at the age of 37, and was buried into the crypt of the White Monks of Vác.

Antonia Tauber's mummy is quite strange - it is different from the others. The back showed prominent humpback indicating the possibility of the Pott's disease or a serious development abnormality. Her face must have been distorted already in her life; a supposition which is supported by the fact that her face was covered by a shroud in addition to the mortuary cloth, although in other cases shrouds or their remains were only found in the civilian coffins.

In order to detect the reason of her massive humpback, radiological examinations were needed. Traditional X-ray pictures of the chest show massive vertebrae deformity, might have been caused by developmental abnormality. Microbiological tests of her tissue samples indicated the presence of the DNA residue of the Mycobacterium tuberculosis complex. The tuberculosis might have contributed to Antonia Tauber's early death, but it can not be considered as its exclusive cause.

The name of a Tauber family that gained barony in 1747 appears in a genealogy book about the Austrian noble families published in 1899. In an old, handwritten chronicle of the Institut der Englishen Fraulein Ordensarchiv in St. Pölten, we found a note:

*"Baroness Antonia Tauber was a small and plain person, but she was rich in virtues and honesty as well as diligent in educating the noble youth - a zealous and loveable soul. She was born in Brünn, Moravia, she took the veil in Buda, Hungary in 1775 and died in Pest in 1788."*

This note seems to support the findings of our research, that Antonia Tauber in all probability, was not an attractive person in her life. We were curious how she looked like in her life? Could we confirm our assumption that she was really ugly?

The tool for it making a facial reconstruction. First we make a copy of the skull. As the mummified soft tissues of the head cover the skull, it is impossible to carry out the traditional way of casting. For this reason we utilised a non invasive 3D rapid prototyping (RP) method for producing the copy of the skull from computer tomography (CT) 3D data.

The postmortem missing front teeth were replaced with wax.

The essence of the „anatomic-sculptural method“ is the reconstruction of mimic and masticatory muscles onto the plastic-cast of the skull.

The thickness of the muscles can be deduced from the grade of expressedness of muscle insertions (Röhler-Ertl & Helmer 1984). We modelled the facial features according to the morphological correlations of the hard to soft tissue of a face.

The skull is small and gracile. The neurocranium is very flared and the forehead is domed, frontal tubers are expressed. The main characteristic of the facial skeleton is the short upper face and the relatively strong and prominent lower face. The open bite pattern is indicated by the bimaxillary protrusion. The piriform aperture is of medium wide, and of anthropin form. The high and narrow nasal root goes on the humped nasal bones, while the anterior nasal spine downwards slightly. Therefore the nasal bridge is arched and the nasal apex is pointing down.

As a consequence of the serious vertebral deformity, the neck is oblique angle. Due to the strong alveolar prognathism, the lips are pouting and fold back, making her face homely.

The different research results thus cleared up Antonia Tauber's sketchy life story. We understand that due to her physical condition she might not even have had opportunity to have a successful layman's life and start a family, despite of her wealthy family background.

Probably it was her decision to join the order where her presumable disadvantageous physical conditions were not so conspicuous. Yet, her life did not bring her only misery and pain, since according to the manuscript of St. Pölten she was an outstanding teacher and a loveable, diligent and honest character. Her spiritual and mental capacities counterbalanced her physical disabilities.

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Facial Reconstruction of a Mummified Nun from the 18th Century Vác,  
by the 3D Printed Skull Derived from CT Data

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## REPRODUCING SKULLS WITH RP TECHNOLOGY

## FACIAL RECONSTRUCTION OF A MUMMIFIED NUN FROM THE 18TH CENTURY VÁC

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