

## JOHANN GOTTLIEB WALTER (1734-1818) AND THE TECHNICAL PREPARATION OF BONES IN AN ANATOMICAL CABINET IN THE LATE EIGHTEENTH AND NINETEENTH CENTURY

### JOHANN GOTTLIEB WALTER (1734. – 1818.) I TEHNIČKO PREPARIRANJE KOSTIJU U KABINETU ANATOMIJE U KASNOM XVIII. I XIX. STOLJEĆU

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#### SUMMARY

*This study aims to analyze Johann Gottlieb Walter's biography (1734-1818), a German physician that specialized in human anatomy, who received an award of the Göttingen Royal Academy of Sciences. Here, we describe his technique of preparing bones for educational purposes through the comparison of other widely used techniques. The article also focuses on the great historical, scientific and didactic values of the anatomical preparations. In Europe during the eighteenth century the activity of some anatomists and physiologists, who were dedicated to the realization of anatomical preparations, testified the progress of medicine in the study of the human body, fundamental knowledge for physician training.*

**Keywords:** J. Gottlieb Walter; history of medicine; history of anatomy; bones.

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## INTRODUCTION

This article celebrates the life and work of Johann Gottlieb Walter, a German physician who specialized in human anatomy and the recipient of a prestigious award from the Göttingen Royal Academy of Science. It is also an introduction to his techniques of bone preparation.

In 1768 the *Giornale di Medicina* published a note about a doctor, named *Wasler*, and his technique of bone whitening (Nuovo metodo di imbiacare le ossa degli scheletri, che fa l'oggetto del dottor Wasler [sic] coronate dall'Accademia Reale delle Scienze di Gottinga. *Giornale di Medicina* 27 febbraio 1768; XXVII: 210-211). His name was unknown among the physicians who lived during that period. It is likely that the surname was misspelled, and that the article was actually about one of the most famous anatomists of that time: Johann Gottlieb Walter.

Johann Gottlieb was born on July 1<sup>st</sup>, 1734 in Königsberg, East Prussia [1]. He studied at the University of his hometown and then graduated in Frankfurt (Oder) in 1757. In Berlin, he was one of the Johann Friedrich Meckel's students. Under his guidance, he worked at the Anatomical Theater. Thanks to this experience, he published a text of Osteology, which was considered a milestone: *Abhandlung von trocknen Knochen des menschlichen Körpers: zum Gebrauch seiner Zuhörer, und derjenigen, die sich in der Zergliederungs-Kunst üben, auf dem anatomischen Theater in Berlin* [2] (Figure 1). After Meckel's death, he became a professor of anatomy in Berlin in 1774.



Figure 1.

Johann Gottlieb also worked in the field of museology. He started a large collection of anatomical samples that were later bought by the Prussian State, which then became the foundation of the collection owned by the University Anatomy Institute of Berlin. Walter is remembered for the clarity and precision of his teachings and for his wide literary production. He died on January 4<sup>th</sup>, 1818 [3].

## DISCUSSION

During the eighteenth century in Europe, the first museum collections with medical and scientific aims began to develop [4]. The goals of these collections were to support the teaching of anatomy, to spread anthropotomy, and to show how to perform and preserve the anatomical preparations [5].

The *Giornale di Medicina* described Walter's technical preparation of bones, which involved several essential steps. The first phase was the maceration. After removing the flesh from the bones, the skeletal remains were immersed in river water. The skeletal districts were placed in an oak barrel, similar to the ones used for the conservation of herrings. During the second phase, the barrel was covered with a plank and kept in a warm and airy place. Adding blood to the flesh and the brain increased the degree of decomposition. Spring and summer are the most suitable seasons to plan this operation, because of the alternation of heat and cold that is a necessary condition for acquiring good results. Walter explained that the maceration should not last too long in order to avoid the blood corroding the bones.

The process was completed when the bones were covered completely in a crust that was produced by the salt crystals in the blood and insect remains. Once removed, it was used to obtain the desired white color. After maceration, the fleshy parts and the tendons were easily removed with a cloth. Then the different skeletal districts were re-immersed in fresh, cold water for several days and finally exposed to the open air. It was necessary to avoid sun exposure, which could cause certain parts to break.

Walter's technique was just one of many whitening practices and methods of conservation of skeletons used in European anatomical laboratories of that time.

It is interesting to compare his technique with those used in the Italian anatomical laboratories [6]. In 1837 Angelo Dubini published an *Anthropotomy Treatise*, which focused on the study of *schelotropoea* techniques [7]. The procedures described by the Italian physician had several similarities to Walter's method, but there were also some substantial differences. In fact, in the early nineteenth century, the practices in use had a clear evolution thanks to the introduction of new chemical elements.

These new techniques were similar to the sequence structured by Walter. As Walter did, Dubini also chose the skeleton of an adult whose age was

between 25 and 50 years old. The individual was tall and thin. He believed that before starting the process, it was necessary to roughly clean the soft and gelatinous tissue from the bone and to split the limbs at the level of major joints. This task required special care not to scratch the surface of the bones with a chisel or scalpel. Dubini recommended leaving a thin layer of soft parts in order to accelerate the process of putrefaction.

The next step consisted of removing the thoracic and pelvic viscera followed by putting aside the breastbone and its cartilage. Those parts needed to be treated with special care. The pieces were then left in running water for fifteen days in order to remove all the blood. Then it was necessary to dry them on a convex wooden table joining cartilage with pins, so that they would not lose their natural curvature. Once dried, the cartilage could be applied to the finished skeleton.

Dubini said that this technique was rarely used in the nineteenth century and that often the costal cartilages were replaced with white buffalo leather straps. The other parts of the body were divided at the level of the main joints. The head was disjoined from the first vertebra and the brain was removed with a curved iron and copious water injections. The limbs were detached from the trunk, while the ribs were left attached to the spine. The author advised to close each hand in a sac, be careful not to swap the bones and to mark with a silk thread the three phalanges of the index that could be confused with those of the ring. The skeleton was then ready for the steeping and brewing processes.

The author introduced another maceration method. The bones, especially those long and spongy ones, had to be perforated to allow water to penetrate the medullary substance. Then, the holes were covered with melted wax and ceruse. The femur, the tibia and the humerus were drilled at the center of the articular heads and laterally in the area with more presence of marrow; this helped obtain a better result, i.e. whiter bones.

The bones were then transferred to a clay jar and were covered with cold water for three to eight months, depending on the season. The water could not be changed in order to continue the decomposition process and the whitening of bones. The maceration process was complete when the intervertebral cartilage, ligaments and tendons could be removed from the bones without any effort. After, the jar was emptied and attention was paid to the small bones of the feet, hands, skull, and teeth. The bones were washed in clean water and were scraped to remove any remaining meat. Finally, they

were left to dry until bleaching. Other soaking methods were faster. Dubini mentioned the technique used by Ernest Alexander Lauth. In this case, the skeleton was placed in a vat with a tap, as the water had to be changed every day for the first two weeks and then only once a week [8]. Lauth suggested pouring boiling water over the bones to speed the maceration process. This operation was performed only once and helped to eliminate a large amount of fat from the bones. Another bone whitening method was proposed by Jules Cloquet (1790-1833). Bones, coarsely cleaned, were put into a tub and sealed with two or three liters of water. The bones were detached from the soft parts within three to six weeks during the summer season. The same result was obtained in winter by immersing the sealed tub into a manure pile [9].

An extremely rapid maceration process involves leaving the bones in fresh air and in a humid place during the summer. In few days, a blowfly will lay some larvae. In eight to ten days, the larvae will consume the soft parts of the bones. Then the bones can be bleached. There are numerous methods [10, 11]. Among the most common, there is the practice to expose bones to direct sunlight and morning dew for a period of a few months. Yet this process is very slow and it requires a lot of care. The bones need to be turned every fifteen days in order to become evenly white. Also the bones have to be collected in case of rain or excessive sun. Other methods suggest boiling bones in soap or a wet lime solution for a few hours. Often the bones are washed in a solution of water and hydrochloric acid, which increases the whiteness and prevents any development of insect larvae. The same results can be achieved by using chlorinated water and a carbon potash solution that was made from hygroscopic bones.

## CONCLUSIONS

In conclusion, this article's purpose was to focus on the new techniques of anatomical conservation and preparation that spread to Europe in the late eighteenth century which have been of great historical and scientific interest. The realization of anatomical preparations were not alien to the cultural and scientific context of that time and gave increasing importance to the study of anatomy as a fundamental aspect in the training of physicians. The preparation of anatomical materials, which have become a part of the museum collections and anatomical theaters, have marked a meeting point between academic scientific doctrine and practical observation, essential for teaching anatomy at the early modern universities.

## BIOGRAPHICAL NOTE ON AUTHORS CITED IN THE PAPER

**Jules Germain Cloquet** (18 December 1790 – 23 February 1883) was a French anatomist, physician and surgeon. In 1821, he became one of the earliest members elected to the Académie Nationale de Médecine in Paris. In 1836, he was elected an Honorary Fellow of the Royal College of Surgeons in Ireland. Cloquet was known for his expertise as a surgeon, especially for his work with hernias. He has also provided the surgeons with detailed anatomical descriptions that have been useful in developing innovative surgical techniques.

**Ernest Alexandre Lauth** (14 May 1803 – 24 March 1837) was a French anatomist. In 1836 appointed to a chair of anatomy and physiology at the University of Strasbourg. He is remembered for his pioneer investigations of the lymphatic system in birds and humans. In 1829 he published a *Nouveau Manuel de l'Anatomiste, comprenant la description succincte de toutes les parties du corps humain et la maniere de les préparer, suivie de préceptes sur la confection des pièces de cabinet et sur leur conservation*.

**Angelo Dubini** (8 December 1813 – 28 March 1902) was an Italian physician. He was to spend almost his entire working life in the Ospedale Maggiore in Milan. In 1837 he published a *Trattato di antropotomia o dell'arte di eseguire e conservare le preparazioni anatomiche*. Dubini is remembered for his discovery of the intestinal parasite that he named *Ancylostoma duodenale*. He was first to discover the parasite in 1838 during an autopsy of a woman who died of pneumonia. He published his discoveries in the *Universal Annals of Medicine* in 1843.

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## SAŽETAK

Cilj je ovoga rada analizirati životopis Johanna Gottlieba Waltera (1734. – 1818.), njemačkoga liječnika specijaliziranog za ljudsku anatomiju, koji je dobio priznanje Akademije znanosti iz Göttingena. U radu opisujemo njegovu tehniku prepariranja kostiju u obrazovne svrhe usporedbom s drugim široko rabljenim tehnikama. Članak se usredotočuje i na veliku povijesnu, znanstvenu i didaktičku vrijednost anatomskeg prepariranja. U Europi su tijekom XVIII. stoljeća neki anatomici i fiziolozi, koji su se posvetili realizaciji anatomskeg priprava, svojim djelovanjem svjedočili napretku medicine u proučavanju ljudskog tijela, što je osnovno znanje liječničke obuke.

**Ključne riječi:** J. Gottlieb Walter; povijest medicine; povijest anatomije; kosti.