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# Rediscovered identity of the scaphocephalic skull housed in the museum of the Department of Anatomy of the Medical College of the Jagiellonian University

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**Abstract:** A personal data referring to the scaphoid skull housed in the Department of Anatomy of the Jagiellonian University, Medical College was established thanks to reviewing 19th century literature performed by Dr. Soficaru. We received information that the skull had belonged to an adult man who was a carpenter, born at Cracow. The original anthropometrical study of this skull was performed by prof. Kopernicki 19th century.

**Key words:** scaphoid skull, scaphocephaly, cranial collection.

## Introduction

The cranial collection housed in the museum belonging to the Department of Anatomy of the Medical College of the Jagiellonian University consists of numerous skulls which origin is apparently unknown. Currently, there are on exhibition 83 skulls of adult individuals (males and females), and 17 isolated skulls of fetuses and infants. Few other skulls (11) remain together with the postcranial skeleton. Hence, 14 adult skulls are presented as the plaster replicas. The collection of the human skulls goes back probably

to the times of foundation of the *Theatrum Anatomicum* in Cracow (present Department of Anatomy) which took place in 19th century (1869–1872). However, the idea of the Anatomical Museum had been initiated much earlier by professor Andrzej Badurski who was the headmaster of the Department of Anatomy in the period of 1749–1789 and reformer of the medical faculty [1]. Unfortunately, only brief information about the skulls can be found in the inventory book of the Department of Anatomy, as well in the Polish and foreign anatomical and anthropological literature [2].

## Anthropological findings

At a recent time, Dr. Andrei Dorian Soficaru from Paleoanthropology Laboratory of "Francisc J. Rainer" Institute of Anthropology (Romania) found an article published in 1877 in the United Kingdom which contains description of the scaphoid skull of an adult male.

Because his researches concentrate on the historic skulls, and comparative studies he noticed resemblance between drawings of that scaphocephalic skull made in 19th century to photographs of the scaphoid skull which was described by Skrzat *et al.* in the article published in 2014 year in the Folia Morphologica — the official journal of the Polish Anatomical Society [3].

In 19th century, Dr. Isidor Kopernicki wrote a paper entitled "On the Scaphoid Skull of a Pole" in which included information that the Anatomical Museum of the University of Cracow possessed a very remarkable scaphoid skull. Professor Kozubowski, a polish anatomist, stated about scaphoid skull: "*the cranium belonged to an adult man, a carpenter, born at Cracow, and that the deformation of his head dated from infancy, during which he suffered for a long time from an extensive eruption upon the hairy scalp*" [4].

Anthropological description of this scaphoid skull together with drawings of the skull published in 19th century was compared to the results of morphometrical analysis performed apparently on the same skull in 21st century by Skrzat *et al.* At that time we could not find any information about the origin of this peculiar case of an adult scaphocephaly, and how this skull was introduced to the museum collection of the Department of Anatomy of the Medical College of the Jagiellonian University, where it still remains in a good condition. The current information might have been entered into the digital library after the team has already published their findings about the skull, which was treated as an anonymous case.

In comparison to the anthropological studies carried out previously by Kopernicki and the teams own personal studies of the skull, it has been deducted the said scaphoid skull is one and the same in both cases. However, we perceived few apparent discrepancies in presentation morphological features of the skull on the artistic drawings versus their visual observation on the skull and precisely documented by the digital photography (Fig. 1).

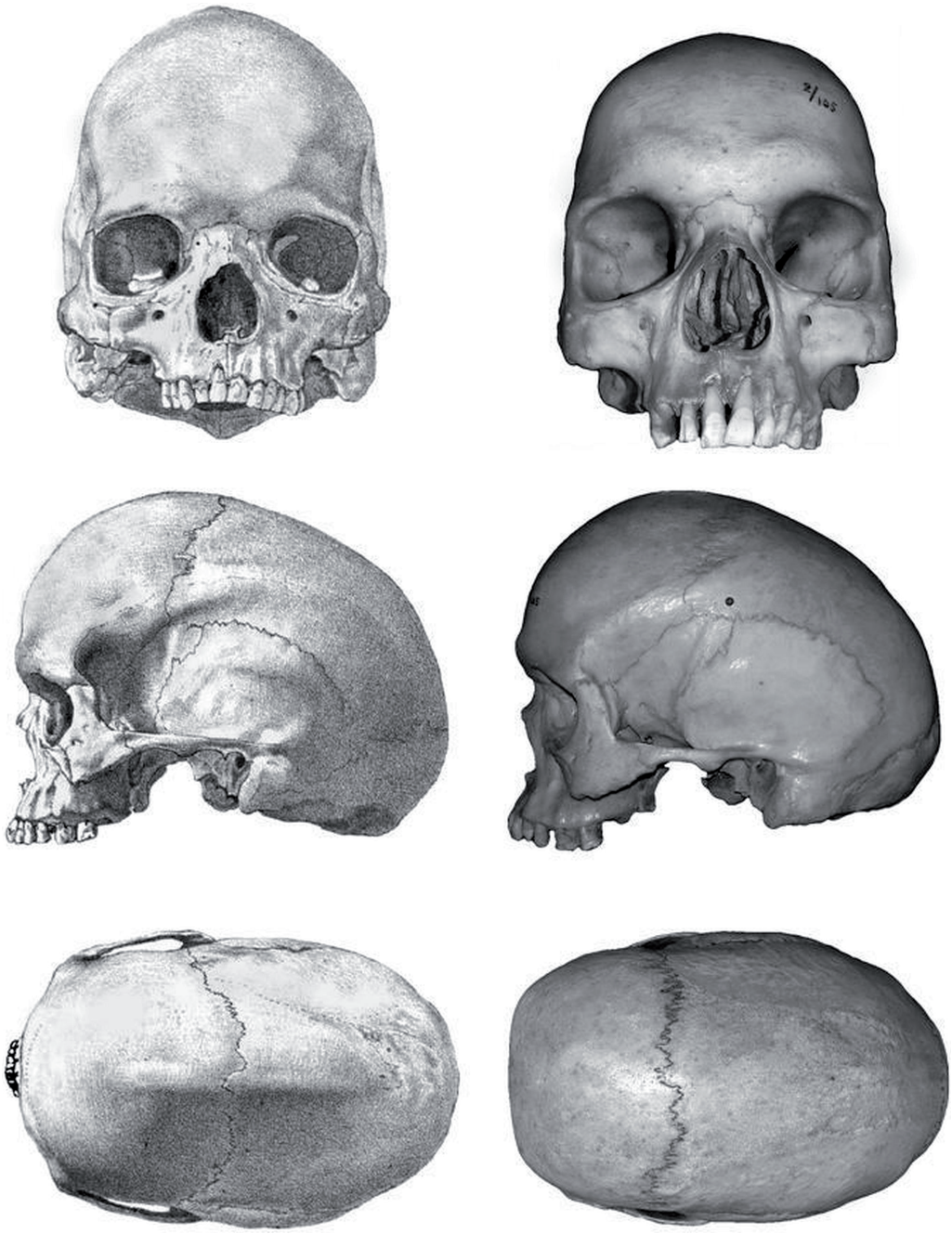

**Fig. 1.** The 19th century drawings of the scaphoid skull versus photographs of the same skull taken in 21st century. Note considerable realism of the drawings and huge similarity between morphological features of the skull captured by the unknown highly-skilled artist and the digital photography.

First, is a moderate similarity between the appearance of the skull in *norma frontalis* seen in the artistic drawings comparing to the photographs, though we tried to adjust orientation of the camera and the skull to obtain a photography which would match the craniofacial drawing. Also, positioning of the skull in the posterior projection for exposing the occipital and the parietal part of the skull presented in the drawings seems to diverge from the photographic presentation of this cranial region.

There is only one unclear finding regarding the mandible which was not described by Kopernicki who reported that the lower jaw had been wanting. Actually, this bone exists together with the scaphoid skull and its anatomy and teeth position fits to the maxilla.

Nevertheless, this circumstance is not sufficient to negate that the scaphoid skull described by Kopernicki in 19$^{th}$ century and that one housed presently in the Department of Anatomy is a different skull. Numerous morphological similarities captured from the drawings of the scaphoid skull and values of cranial measurements vastly outweigh observed discrepancies. Therefore, we are convinced about its identity presented originally in 19$^{th}$ century by Kopernicki in the paper entitled "On the Scaphoid Skull of a Pole".

Hereby, we mention only the most prominent morphological features of this skull resulted from the premature obliteration of the sagittal suture, and selected measurements performed on the Cracovian scaphoid skull (Table 1).

The profile of this cranium is characteristic for the scaphocephalic skulls — extremely long and narrow brain case ended with a bulged occiput. In *norma verticalis* the cranial vault resembles elongated oval. The glabella (a craniometric landmark located on the frontal bone between the eyebrow ridges and above the nose) advances considerably above the face.

The forehead is straight and prominent. The frontal squama rises vertically and arches far backward, and seems to be relatively long, similarly to the parietal bones. In the posterior view the cranial vault is extremely narrow, showing an acute keel which forms a ridge extending backwards, along the entirely obliterated sagittal suture. The occiput is very prominent and bent downward due to the compensate growth caused by the lateral compression of the cranial vault. All external prominences of the occipital bone are well developed, which is characteristic for male skulls. The facial skeleton looks rather delicate and small in proportion to the abnormally enlarged *calvarium*. The face is slender and orthognathic having protruding maxillary teeth. The orbits are moderately wide and quadrangular in shape. The nasal bones are short and the roof of the nose is deeply depressed.

The cranial measurements indicate that extreme elongation of this skull resulted from extensive development of the parietal bones in length. The cranial index being the ratio between maximum cranial length and maximum cranial width is below average that of a normal Polish skull, and resembles other scaphoid skulls instead [4].

**Table 1.** Selected measurements characterizing Cracovian scaphoid skull.

| Measurements in millimeters | Kopernicki, 1877 | Skrzat, 2018 |
|---|---|---|
| g-op (max. cranial length) | 203 | 201 |
| ba-b (height of the skull) | 130 | 130 |
| eu-eu (max. cranial width) | 128 | 127 |
| ft-ft (min. frontal breadth) | 101 | 103 |
| zy-zy (bizygomatic width) | 131 | 130 |
| arch length n-b | 150 | 147 |
| arch length b-l | 155 | 160 |
| arch length l-o | 107 | 110 |
| eu-eu/g-op × 100 (cranial index) | 63.0 | 63.2 |
| zm-zm (zygomaxillary breadth) | 95 | 93 |
| n-pr (upper facial height) | 60 | 61 |
| ns-pr (height of alveolus) | 18 | 15 |
| ekm-ekm (maximal alveolar breadth) | 65 | 62 |
| ol-sta (palatal length) | 45 | 43 |
| end-end (palatal width) | 34 | 35 |
| ec-ec (biorbital width) | 101 | 102 |
| n-ns (nasal height) | 20 | 20 |
| nasal opening (length and width) | 32 × 27 | 30 × 26 |
| orbits (height and width) | 31 × 31 | 31 × 33 |

Measurements of the cranio-facial skeleton (orbits, nose, maxilla, and palate) performed by Kopernicki comparing to currently done measurements are very similar (differences ≤3 mm). Only the arch length b-l of the parietal bones revealed difference of 5 mm. This small discrepancies may result from caused by inaccuracy of measuring instruments used in XIX century or inexactness in identification craniometric points on the scaphoid skull studied by Kopernicki and Skrzat.

## Conclusions

Thanks to the insightful observation of Dr. Soficaru, we received both reliable and valuable information about one of the numerous skulls belonging to the cranial collection of the Department of Anatomy. Therefore, the most important educational finding was the ability to correctly identify the man whose head was afflicted

with premature sagittal suture obliteration, where he had lived and what was his occupation. Brief information about this individual reported by professor Kozubowski and published by professor Kopernicki may be added to the contemporary knowledge about consequence of untreated infant cranial deformations and its neurological results in adolescent life in case of premature sagittal synostosis.

## Conflict of interest

None declared.

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