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The human adult skull with complete metopic suture – a case report

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Abstract

In the recent years, variations of cranial sutures are commonly studied because of their significance in various fields of medicine and surgery. The metopic suture is a dentate-type suture extending from the nasion to the bregma. The incidence of the metopism and difference in shapes varies by races. The fact is that metopism appears more frequently among women than men. The aim of this work is to analyze case to the human skull of an adult (female), originating from excavations in the vicinity of Kielce. The skull comes from the osteological collection of the Department of Anatomy, Faculty of Medicine and Health Sciences, Jan Kochanowski University. The knowledge of the anatomy of the metopic suture is important because its permanence can be mistaken for a cranial fracture in radiological images, or even for the sagittal suture. It is also important for anthropology and forensic medicine.

Keywords: skull, metopic suture, metopism, frontal bone

1. Introduction

The bone of the skull consists of a thin layer of connective tissue penetrating into adjacent bone firmly bonding them. In the brain of the skull sutures extend along a broken line. In the craniofacial bones are connected by a flat suture. The names are derived from the bone sutures that connect [1]. On the vault of the skull sutures, however, they have distinct names: the sagittal suture between the parietal bones, coronal suture between the frontal and the parietal bone and the lambdoid suture between the occipital and parietal bone. The metopic suture (also known as the median frontal suture) runs through the midline across the frontal bone from the nasion to the bregma, although it may often be incomplete. It usually fuses by around 9 months of age [2, 3]. Human brain grows to 45-50 years of age, and with it the need to enlarge the skull. After the cessation of growth of cranial sutures ossify gradually the fastest front suture (6-8 years old), sagittal suture (20-30 years old), then the coronal suture (30-40 years old) and the lambdoid suture (from 40-50 years of age) [1]. A suture which extends completely between the bregma and nasion is termed as the complete metopic suture or metopism. If it extends to a smaller distance either from the nasion or from the bregma, it is termed as incomplete type [4-6].

2. Case presentation

The skull comes from the osteological collection of the Department of Anatomy, Faculty of Medicine and Health Sciences, Jan Kochanowski University. Analysis of this case refers to the human skull of an adult (female), originating from excavations in the vicinity of Kielce. The two frontal bones were clearly seen due to the complete metopic suture. The suture extended from the bregma to the glabella as seen in Figure 1 and 2.

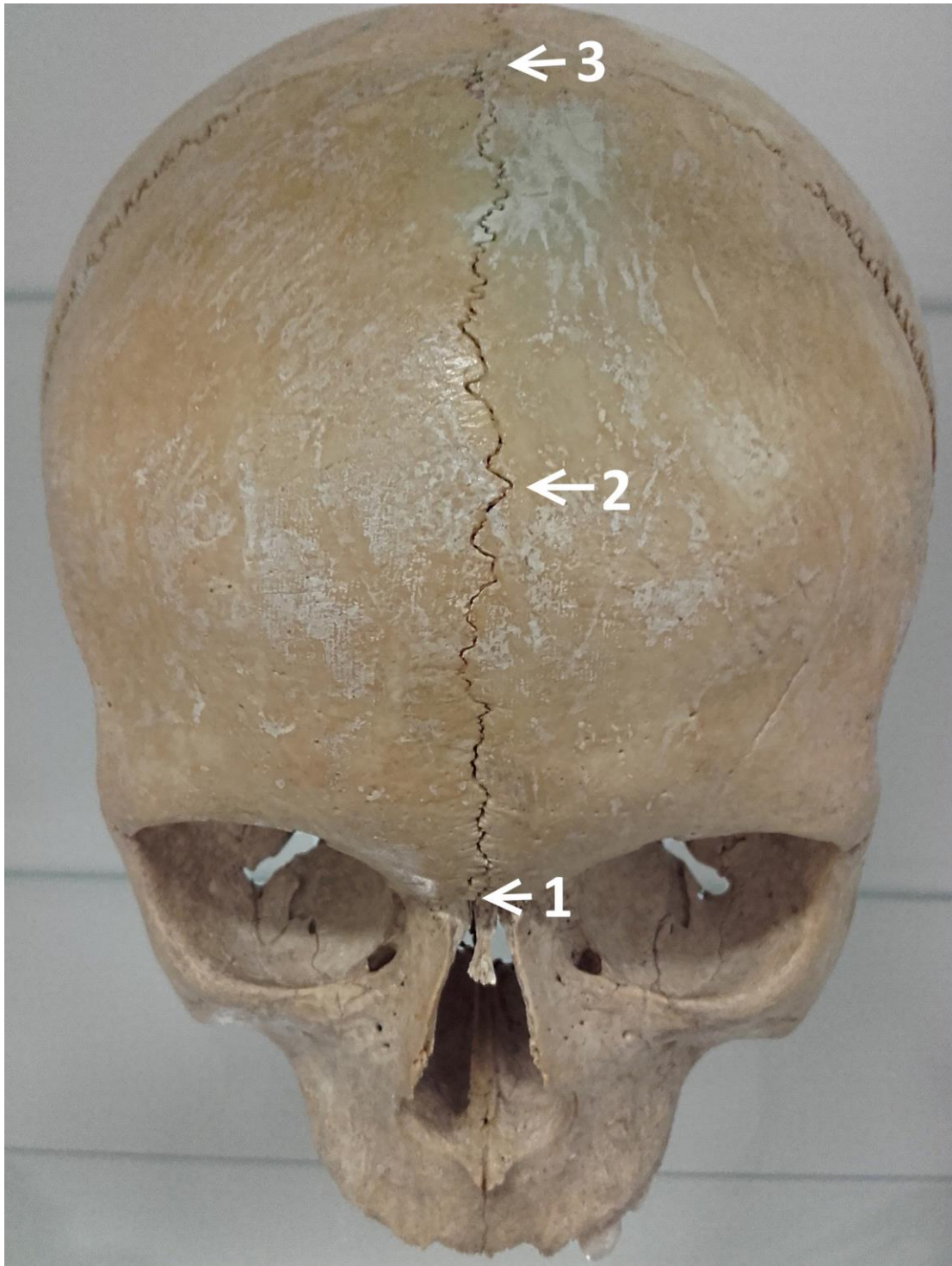


Figure 1. The white arrow indicates 1 – Glabella, 2 – Metopic Suture and 3 – Bregma.
(Photographed by Grzegorz Wróbel)



Figure 2. The white arrow indicates metopic suture not meeting end-to-end with the median sagittal suture at bregma (Photographed by Grzegorz Wróbel)

3. Discussion

The sutures of the skull ensure its proper shape during development. Premature suture ossification is the cause of the abnormal growth of the skull, the shape of e.g. “tower skull” (midface hypoplasia and ocular proptosis), caphocephaly (also known as dolichocephaly) is the most common form of craniosynostosis [7]. The metopic suture (also known as the median frontal suture) is a type of calvarial suture. It is often associated with frontal sinus agenesis or hypoplasia [8]. Fusion of suture between the two frontal bones occurs at the age of (1-3) years. But, earlier studies have shown that the age of fusion varies from as early as 1

year to 7 years, the upper limit might extend up to 8 years. Failure to fuse leads to persistent metopic suture above the age of 8 years [9]. Caffey [10] claimed that metopic suture may persist up to the sixth year and even throughout life in about 10% of cases in dry skull studies. Metopic suture varies in different races as concluded by Breathnach [11], the incidence is 4-5% in yellow races, 7-10% in Europeans, 1% in Africans. Bryce [12] demonstrated 5.1% in Mongolians, 8.7% in Europeans, 9.5% in Scottish, 1.2% in Negroes, 1% in Australian skulls. Metopism is found in approximately 5% of Asians and 9% of European Caucasians and 1% of Blacks [13]. Agarwal [14] reported the finding of 38.17% in Indian skulls, and Linc [15] observed it in 11% in Czech skulls, and finally Woo [16] reported the finding in 10% in Mongoloid skulls. Metopism has various degrees of incidence: from 7%-8% among Europeans to 1% in Africans and 4-5% in Mongolians. Overall, the range of incidence can go from 1% to 12%, and it is slightly more prevalent among males [17].

The knowledge of the anatomy of the metopic suture is important because its permanence can be mistaken for a cranial fracture in radiological images, or even for the sagittal suture. It is also important for anthropology and forensic medicine [18, 19]. According to the classical anatomic literature, there are different incidences when ethnic groups are compared. The fact is that metopism appears more frequently among women [18], but according to Skrzat [20] it is slightly more prevalent among males. It also occurred more often in a population whose average life expectancy was low [18]. Various theories have been proposed for the persistence of metopic suture. Consideration is given to the level of molecular biology [21]

4. Conclusions

Anatomical variability determines a number of interesting cases of different types of research. The presence of anomalies in the construction of the human skull may also be of clinical relevance. In imaging diagnostics this variation should not be confused with a line of fractures in the frontal bone, especially if observed close to the median line. Understanding the causes of structural changes in the structure of the human body is one of the main aspects in morphological studies.

5. References

1. Partrica Collins (1995). *Gray's Anatomy, Churchill Livingstone*, London. 38th edition, Reprint 2000, 354.
2. Weinzweig J., Kirschner R.E., Farley A., Reiss P., Hunter J., Whitaker L.A., et al. (2003). Metopic synostosis: Defining the temporal sequence of normal suture fusion and differentiating it from synostosis on the basis of computed tomography images. *Plast Reconstr Surg.* 112, 1211-8. DOI: 10.1097/01.PRS.0000080729.28749.A3
3. Vu H.L., Panchal J., Parker E.E. et al. (2001). The timing of physiologic closure of the metopic suture: a review of 159 patients using reconstructed 3D CT scans of the

- craniofacial region. *J Craniofac Surg.* 12 (6), 527-32.
4. Bilodi A. K., Agrawal B. K., Mane S., Kumar A. (2003). A study of metopic sutures in human skulls. *Kathmandu Univ Med J* 2, 96-99.
 5. Ajmani M. L., Mittal R. K., Jain S. P. (1983). Incidence of the metopic suture in adult Nigerian skulls. *J Anat.* 137,177-183.
 6. Castilho S. M. A., Oda Y. J., Santana G. D. M. (2006). Metopism in adult skulls from Southern Brazil. *Int J Morphol* 24, 61-66. DOI: 10.4067/S0717-95022006000100012
 7. Premalatha, Kannan V. P., Madhu (2010). Apert syndrome. *J Indian Soc Pedod Prev Dent.* 28, 322-5. DOI: 10.4103/0970-4388.76169
 8. Çakur B., Sumbullu M. A., Durna N. B. (2011) Aplasia and agenesis of the frontal sinus in Turkish individuals: a retrospective study using dental volumetric tomography. *Int J Med Sci.* 8(3), 278-82. doi:10.7150/ijms.8.278
 9. Mathijissen I. M., Vaadrager J. M., Can der Meulen J. C., Pieterman H., Zonneveld F. W., Dreborg S., et al. (1996). The role of bone centers in the pathogenesis of craniosynostosis: An embryologic approach using CT measurements in an isolated craniosynostosis and Apert and Crouzon syndromes. *Plast Reconstr Surg.* 98, 17-26.
 10. Caffey J. (1978). Pediatric X-ray diagnosis. 7th ed, Vol. 1. London: *Medical Publication Inc.* 10-25.
 11. Breathnach A. S. (1965). Frazer's Anatomy of the Human Skeleton, 6th ed. London, Churchill. 178.
 12. Bryce T. H. (1917) Observations on Metopism. *Journal of Anatomy.* 51(2), 153-166.
 13. Bergman R. A., Afifi A. K., Miyauchi (1988). "Compendium of human anatomical variation: text, atlas and world literature". Baltimore, Urban and Schwarzenberg. 41, 282-288.
 14. Agarwal S. K., Malhotra V. K., Tewari S. P. (1979). Incidence of the metopic suture in adult Indian crania. *Acta Anat (Basel).* 1979; 105: 469-474.
 15. Linc R., Fleischman J. (1969). Incidence of Metropism in the Czech Population and its causes C.R. Ass. Anat. Comptesrendus Del' Association des Anatomistes'. 142, 1192-1202.
 16. Woo J. K. (1949). Ossification and growth of the human maxilla, premaxilla and palate bone. *Anat Rec.* 105, 737-761.
 17. Eroğlu S. (2008). The frequency of metopism in anatolian populations dated from the neolithic to the first quarter of the 20th century. *Clinical Anatomy.* 21(6), 471-478. doi: 10.1002/ca.20663. DOI: 10.1002/ca.20663
 18. Skrzat J., Walocha J., Zawiliński J. (2004). A note on the morphology of the metopic suture in the human skull. *Folia Morphologica.* 63(4), 481-484.
 19. Tavassoli, M. M. (2011). Metopism: As an indicator of cranial pathology; A good example from Iranian Plateau. *Acta Medica Iranica* 49(6), 331-335.

20. Vikram S., Padubidri J. R., Dutt A. R. (2014). A rare case of persistent metopic suture in an elderly individual: Incidental autopsy finding with clinical implications. *Arch Med Health Sci.* 2, 61-3. DOI: 10.4103/2321-4848.133817
21. Longaker, M. T. (2001). Role of TGF-beta signaling in the regulation of programmed cranial suture fusion. *J Craniofac Surg.* 12, 389-90. DOI: 10.1097/00001665-200107000-00016