

## RESEARCH ARTICLE

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## Incidences of anterior fontanel bone in cranial series from Bulgaria

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### ABSTRACT

The anterior fontanel is the largest of the fetal fontanels and is usually closed by the end of the first or second year. Notwithstanding, it is not uncommon for the fontanel to contain a separate ossicle, which may be present at birth or develop later. This fontanel bone or so-called bregmatic bone appears to grow centrifugally until it fuses in variable sequence with the centripetally growing edges of the parietal and frontal bones during the fourth or fifth year of life. In some cases the anterior fontanel bone does not fuse with the adjacent bones and it is presented in adults as a separated supernumerary bone. Therefore, the aim of the study was to establish and compare the incidences of the anterior fontanel bone amongst three cranial series of adult individuals from Bulgaria – a contemporary male and medieval male and female series. Our results showed that this anatomical variation was presented with very low frequency only in the male series and completely absent in the female one.

**Key words:** anterior fontanel bone, anatomical variation, cranial series

### Introduction

The anterior fontanel is the largest of the fetal fontanels (Figure. 1a, 1b and 1c). It is diamond-shaped and is placed at the junction of the parietal and frontal bones. At birth, the frontal bone is composed of two symmetrical halves, which are separated from each other by the metopic suture. The anterosuperior angles meet the parietal bones exactly at the anterior fontanel. The usual mechanism for closure of the fontanel is centripetal marginal growth of contiguous bones until finally the anterior fontanel is obliterated. Usually, the anterior fontanel is closed by the end of the first or second year, but it is not uncommon for the fontanel and its contiguous sutures to contain a separate ossicle, which may be present at birth or develop later. This fontanel bone, also called bregmatic, appears to grow centrifugally until it fuses in variable sequence with the centripetally growing edges of the parietal and frontal bones during the fourth or fifth year of life (Girdany & Blank, 1965; Berry & Berry, 1967; Bergman et al., 1988; Scheuer & Black, 2000).

The anterior fontanel bone is usually single, but it could be paired or multiple as well (Wiedersheim, 1895; Barclay-

Smith, 1910; Willock, 1925). In some cases a small bone occupied part of the fontanel, as it may lie posteriorly, centrally or anteriorly and if a metopic suture is present, the bone may lie in it either posteriorly or anteriorly. This bone does not seem to interfere with normal growth and usually fuses with the surrounding bones before the fifth year of life. Fusion may first occur posteriorly or anteriorly (Girdany & Blank, 1965).

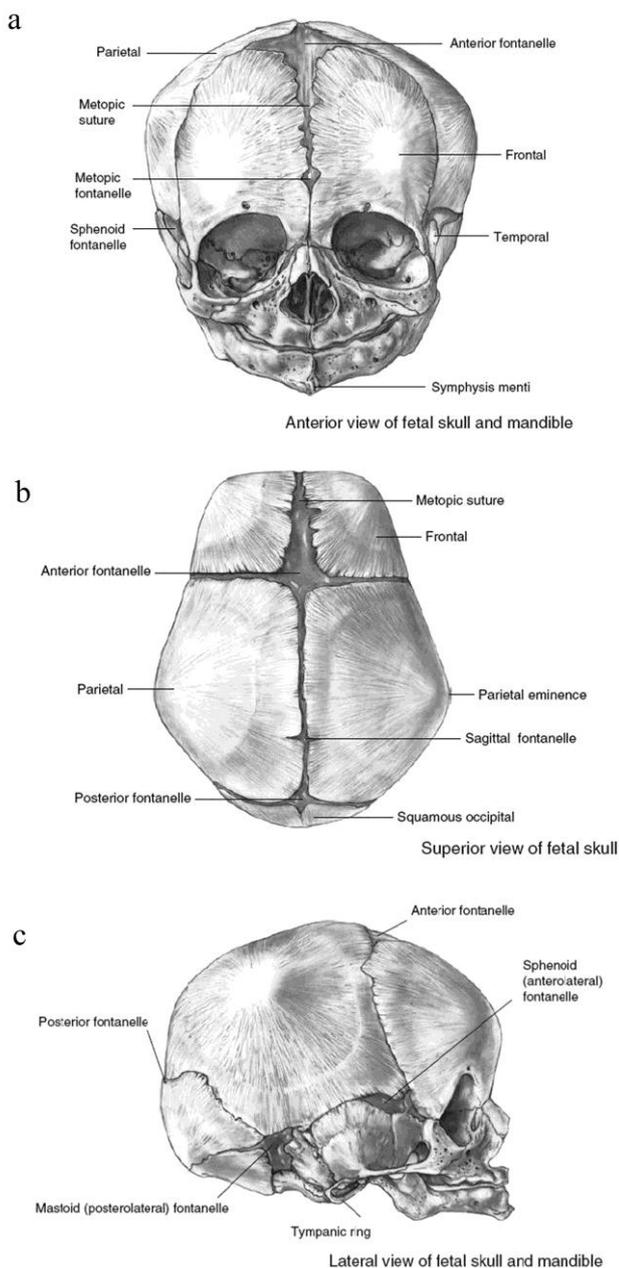
In rare cases, the anterior fontanel bone does not coalesce with the adjacent bones and it is present as a separated supernumerary bone in adults. Thus, the aim of this study was to establish and compare the incidence of the anterior fontanel bone between three cranial series: a contemporary male, medieval male and medieval female series.

### Materials and Methods

The incidences of the anterior fontanel bone were investigated in a total of 516 skulls through macroscopic observation. All of the skulls belonged to adult individuals. The skulls were grouped into three cranial series: contemporary male series, medieval male series and medieval female series. The contemporary male series included 200

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well preserved skulls from the ossuary of Bulgarian National Museum of Military History. The medieval male (160 skulls) and female (156 skulls) series were part of the bone collection of Institute of Experimental Morphology, Pathology and Anthropology with Museum, Bulgarian Academy of Sciences. The age and sex of the individuals from the medieval series were previously determined.



**Figure 1.** Fetal skull after Schaefer (Schaefer et al., 2009): a) anterior view; b) superior view; c) lateral view.

## Results

The anterior fontanel bone was observed only in the male series with very low frequency. In contemporary male series it was found in 2 (1.00%) cases (Figure 2). In medieval male series the anterior fontanel bone was also presented in 2 (1.25%) cases (Figure 3). Amongst the medieval female series this anatomical variation was not observed.

## Discussion

The presence of a supernumerary bone at the bregma (*ossiculum fonticuli anterioris*, *os fronto-parietale*, *os antiepilepticum* or *os bregmaticum*) occurs very rarely in modern humans (Parker, 1905; Berry & Berry, 1967; Hauser & De Stefano, 1989). This bone is more often found in the cebidae among monkeys, and less frequently in rodents (Wiedersheim, 1895). Kadanoff and Mutafov (1984) described the anterior fontanel bone as a rectangular, rhomboidal, triangular or oval in shape, as in most of the cases its outline is rounded. The bone is usually placed in midline, but the authors found a case with anterior fontanel bone placed on the right side. According to Kadanoff and Mutafov (1984), the anterior fontanel bone is observed with the lowest frequency compared to the other fontanel bones. The authors found this bone in 41 (1.16%) cases among the series of 3522 contemporary adult male skulls from Bulgaria. This result corresponds to our findings among both male series. Furthermore, Brasili et al. (1999), Patil and Sheelavant (2012) reported that bregmatic bone is more frequent in male skulls, which is confirmed by our results as well.

In the relevant literature, there are single reports for incidences of an anterior fontanel bone in individuals of advanced age. Barberini et al. (2008) reported a case of a single, independent bregmatic bone, in 66-year-old Caucasian woman, with almost regularly pentagonal shape, slightly rotated toward left. Saheb et al. (2010) described a skull with unusual tetragonal large sutural bone at bregma. Radović and Miladinović-Radmilović (2013) reported a similar case of a supernumerary bone at bregma co-occurring with a metopic suture in an ancient Roman skull in Serbia. Gupta et al. (2013) announced two cases of the bregmatic bone in north Indian skulls. The latter cases are disputable because of the exceptionally small sizes of the bones.

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**Figure 2.** Case of an anterior fontanel bone in the contemporary male series.



**Figure 3.** Case of an anterior fontanel bone in the medieval male series.

Obviously, the presence of the anterior fontanel bone in adults is a rare anatomical variation which is of importance for many scientific disciplines, such as anthropology, anatomy, medicine and clinical practice.

## Conclusion

We can conclude that the anterior fontanel bone in adults is a rare anatomical variation presented in the male series and completely absent in the female one, which is in accordance with the findings of other researchers.

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