

Wormian Bones in the Coronal Suture

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The sutural bones, also known as Wormian bones, are inconstant, but of frequent occurrence. They are variable according to their shape and size. Wormian bones are defined as accidental or intercalated ossicles located in or between the cranial sutures and fontanelles and have no relation to their normal ossification centers. The aim of this study is to compare the frequency, localization, sexual and intergroup differences in the Wormian bones within the coronal suture among three different cranial series. Our results show that the presence of Wormian bones in the coronal suture is a comparatively rare anatomical variation, but yet the most common pattern of distribution is a single Wormian bone localized in the C2 section. Besides, there are no significant bilateral, sexual or intergroup differences in the Wormian bones distribution in the coronal suture.

Key words: Wormian bones; coronal suture; anatomical variation.

Introduction

The sutural bones, also known as Wormian bones (Wbs), are named after the Danish anatomist Olaus Wormius, who described them in 1644. In spite of their frequent occurrence, they are inconstant and variable according to their shape and size. Wbs are defined as accidental or intercalated ossicles located in or between the cranial sutures and fontanelles and have no relation to their normal ossification centers [9, 13]. It is established that Wbs most commonly appear in the lambdoid suture as they can be unilateral, bilateral or median [4, 9, 10, 13, 14, 15, 16, 17]. According to some researchers the Wbs also display a sexual dimorphism with respect to overall incidence, number, and location [2, 7, 14]. Therefore, the aim of our study is to compare the frequency, localization, sexual and intergroup differences in the Wbs within the coronal suture (CS) among three different cranial series.

Materials and Methods

The study was performed by macroscopic observation of 512 adult skulls from both sexes. The skulls were grouped into three different series: a contemporary male series

(CMS), a medieval male series (MMS) and a medieval female series (MFS). The CMS was consisted of 200 almost entirely preserved skulls from the ossuary of Bulgarian National Museum of Military History. The MMS (156 skulls) and MFS (156 skulls) 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.

The presence and localization of Wbs within the sections of the CS (C1, C2 and C3) were designated as follow: **0.** Absence of Wbs within the CS; **1.** Wbs within the section C1 of the CS; **2.** Wbs within the section C2 of the CS; **3.** Wbs within the section C3 of the CS; **4.** Wbs simultaneously localized in the C1 and C2 sections of the CS; **5.** Wbs simultaneously localized in the C1 and C3 sections of the CS; **6.** Wbs simultaneously localized in the C2 and C3 sections of the CS; **7.** Single Wbs in the C1, C2 and C3 sections of the CS; **8.** Wbs along the entire length of the CS.

Results

According to our results, Wbs in CS are uncommon. Notwithstanding, if there is Wbs in CS, they are presented mainly in the C2 section, except for the CMS, where single cases of Wbs in the C1 section are established. It should be noticed, that Wbs are always single. Cases of Wbs, simultaneously placed in different sections of CS, are not observed (**Table 1**). There are no established bilateral, sexual or intergroup differences in Wbs distribution as well.

Table 1. Wormian bones in the coronal suture

Codes for designation	Contemporary male series				Medieval male series				Medieval female series			
	D		S		D		S		D		S	
	n	%	n	%	n	%	n	%	n	%	n	%
0	197	98.50	197	98.50	155	99.36	153	98.08	151	96.79	151	98.05
1	1	0.50	1	0.50	0	0.00	0	0.00	0	0.00	0	0.00
2	2	1.00	2	1.00	1	0.64	3	1.92	5	3.21	3	1.95
3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
4	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
8	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	200	100.00	200	100.00	156	100.00	156	100.00	156	100.00	154	100.00

Discussion

According to a previous investigation of Kadanov and Mutafov [9], Wbs are common, but most frequently presented in the lambdoid and coronal sutures. The Wbs greatly differ in their number, shape, localization and laterality. In other words, there is no specific pattern in Wbs distribution [9]. Our investigation shows that the presence of Wbs in CS is a comparatively rare variation, and Wbs are most commonly localized in the C2 section of the CS.

There is no agreement according to the Wbs aetiology. The mechanism of their formation is not entirely known as well. Some authors supposed that the Wbs are developed in consequence of external influence [1, 8, 16], while others assumed that they derived from normal development processes and are genetically determined [6, 11, 12, 18]. The association of Wbs with some pathological conditions is also widely discussed [3, 5, 19]. In addition, the knowledge of Wbs morphology, and the knowing of their frequency and localization within the cranial sutures and fontanels, as well as their pattern of distribution are of great importance for many scientific disciplines and that could be useful in the clinical practice.

Conclusion

The presence of Wbs in CS is a relatively rare anatomical variation, but yet the most common pattern of distribution is a single Wb localized in the C2 section. Besides, there are no significant bilateral, sexual or intergroup differences in the Wbs distribution in the CS.

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