Maaref Med J. 2026;2(1):1-4
https://doi.org/10.5281/zenodo.21781637
Maaref Medical Journal
https://journal.imu.edu.ly/ojs/index.php/

Original article

Incidence of False Sutural Bones in a Venezuelan Population

Rafael Romero Reverón

Department of Human Anatomy, Faculty of Medicine, Universidad Central de Venezuela, Venezuela
Email. rafa1636@yahoo.es

Abstract
False sutural bones are bony islands resulting from normal ossification centers that did not fuse with the main skull bones (frontal, parietal, temporal, occipital, sphenoid), often described as unconnected ossification centers. Multicentric research was conducted in six private hospitals in Caracas, Venezuela, from January 2021 to December 2025. Three-dimensional reconstructed computed tomography images of the skull were used to investigate the presence, morphology, and variations of false sutural bones in a Venezuelan population. This research provides initial insights into the prevalence and morphology of false sutural bones in a Venezuelan population, based on an analysis of images of 1,000 subjects. Four false sutural bones were recorded, representing 0.4% of the individuals studied. These bones are rare anatomical variations, possibly related to abnormalities in endochondral ossification. But the knowledge of the potential presence of false sutural bones could be useful for making a differential diagnosis with cranial fractures.
Keywords. Computed Tomography, False Sutural Bones, Human Anatomy.

Introduction

The human skull is composed of 22 bones that fuse after birth -except for the mandibular bone- and various ossification centers. Sutural bones are sporadically found along the cranial sutures and fontanels or isolated. They are also called *Wormian* bones, intrasutural bones, or accessory cranial ossicles, and constitute supernumerary skeletal elements arising from ectopic centers of ossification within the fibrous joints of the cranium. These irregular, isolated bony islands most commonly appear along the lambdoid suture, though they may occur at other sites such as the coronal, sagittal, or masto-occipital sutures. [1,2]

The earliest attributions trace back to ancient observers. Hippocrates (circa 460–370 BCE) alluded to such structures in descriptions of skull morphology. Later, diagrams appear in Avicenna's (980–1037 AC) *Canon of Medicine*, marking some of the first visual representations of cranial sutural variants. Paracelsus (1493–1541 CE) explicitly denoted a posterior fontanelle ossicle as the *ossicle antiepilepticum*, linking it presumptively to neurological pathology. In the 16th century, anatomists like Johannes Gonthier d'Andemach and Andreas Vesalius advanced their systematic study; Vesalius correlated these bones with cerebral disorders in his textbook De *Humani Corporis Fabrica* (1543). These bones were described in the 17th century by Danish anatomist Olaus Worm (1588–1654), given a Latin description in a 1643 letter to Thomas Bartholin, prompting the latter to name them *ossa Wormiana*. [3] This formalized their identity as intersutural entities, though Worm acknowledged prior mentions. Paleontological evidence extends their antiquity: sutural bones appear in Australopithecine cranial fragments from Makapansgat, South Africa (circa 2.5–3 million years ago), and across mammalian taxa, underscoring phylogenetic upkeep rather than human exclusivity. [4] Modern terminological standardization occurred via the International Anatomical Nomenclature, designating them *ossa suturalia* (A02.1.00.043). [5,6]

Developmental understanding emerged concurrently: sutures form early, with ossicles arising from persistent mesenchymal matrices between proximal bone borders. Sutural bones are classified as true or false primarily based on their embryological origin and ossification centers. True sutural bones form from independent and additional ossification centers, appearing within the cranial sutures and fontanelles. False sutural bones are bony islands resulting from normal ossification centers that did not fuse with the main bones (frontal, parietal, temporal, occipital), often described as unconnected ossification centers, and are also distinguished by a possible cartilaginous origin. [7,8] The sutural bones' size ranges from a few millimeters to several centimeters, making them subjects of interest in fields such as anatomy, anthropology, and medicine. Despite their historical recognition, reports on these bones are partial and incomplete, particularly in specific population contexts [9,10,11,12,13,14]

In Venezuela, no studies have been conducted regarding this subject, underscoring the relevance of research such as this to better understand these variations and their potential application in clinical diagnostics and anthropological analysis. The aim of this research is to

Received: *13-01-2026 -* ***Accepted:*** *11-03-2026 -* ***Published:*** *30-06-2026*

evaluate the prevalence of false sutural bones in a Venezuelan population, through the analysis of three-dimensional reconstructed cranial computed tomography images.

Methods

Multicentric research was conducted in six private hospitals (in Caracas, Venezuela) from January 2021 to December 2025. Three-dimensional reconstructed computed tomography images of the skull were used to investigate the presence, morphology, and variations of false sutural bones in a Venezuelan population.

This research project was exploratory, descriptive, and retrospective in nature, involving the analysis of computed tomography images with three-dimensional reconstruction of the skull with 64-slice systems. The cranial computed tomography images with three-dimensional reconstruction from 1,000 Venezuelan subjects (with a range between one year to 96-year-old) were reviewed and analyzed by the author and a medical doctor specializing in radiology and imaging at each of the hospitals participating in this study. The Cohen Kappa method was used with a radiologist on staff at each hospital.

In order to minimize bias in the observation and interpretation of the images. The JM Vargas Medical School, Universidad Central de Venezuela Bioethics Committee, after evaluating this research, approved its implementation since it follows the bioethical norms for research in human beings.

Results

One thousand outpatient cranial computed tomographic studies with three-dimensional reconstruction of the skull were collected from six hospitals. The studies had been obtained to ascertain head injuries, strokes, and others. None specifically pursued the findings of false sutural bones. Four cases of false sutural bones were recorded, representing 0.4% of the 1,000 individuals studied. These cases were: an 6-year-old girl with a rectangular-shaped bone (5mm x 6 mm) in the left parietal region; a 8-year-old boy with two bones in the right temporal region, one rectangular (6 mm x 4 mm) and one ovoid (8 mm x 5 mm); a 34-year-old woman with a square-shaped bone in the left occipital region (7 mm x 7 mm); and a 56-year old man with an ovoid-shaped bone in the left parietal region (9 mm x 5 mm) and a true sutural bone at the Bregmatic area (figure 1).

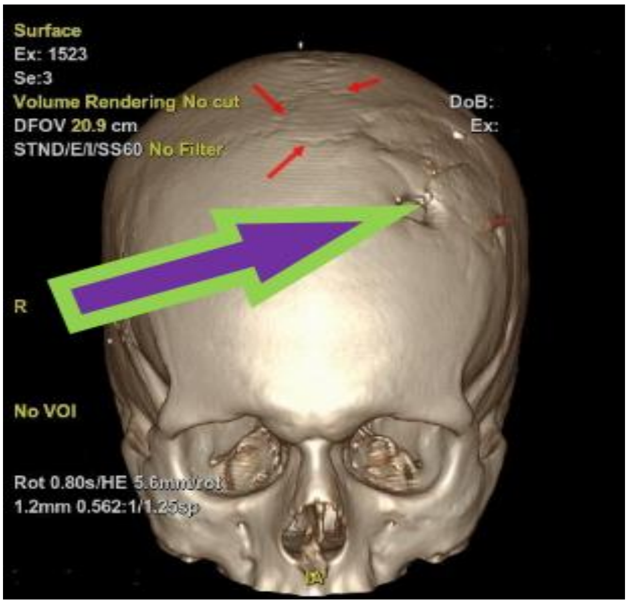

Figure 1: 56-year-old man with a false sutural bone in the left parietal region (thick purple arrow), which also has a true sutural bone in the Bregma area (thin red arrows).

Discussion

Emerging technological innovations have led to the development of virtual dissection. Virtual (or digital) dissection refers to the “anatomization” of a computer-generated three-dimensional anatomical visualization to study the human body, its structures, internal systems, and cross-sections, and enhance the understanding of regional relationships [15,16]

Digital (Virtual) dissection requires the acquisition of computed tomography images, which provide cross-sectional slices of the skull. These images are then processed by specialized software to generate three-dimensional reconstructions, allowing an interactive exploration of the bony structures. The advent of computed tomography with three-dimensional reconstructions of the skull has transformed the capacity to visualize, characterize, and quantify sutural bones, thereby enhancing our comprehension of their anatomy and clinical significance. [17,18]

Digital dissection can yield significant insights into false sutural bones research, given valuable insights into the intricate process of cranial ossification and its potential variations. The very low incidence of false sutural bones in this research (0.4%) suggests that these are rare anatomical variations, possibly related to alterations in endochondral ossification, with no direct association with serious pathologies. However, their identification in children and adults highlights the importance of cranial computed tomography images with three-dimensional reconstruction in early detection, which could improve diagnoses in subspecialties such as neurosurgery or radiology. [19]

***Received:** 13-01-2026 - **Accepted:** 11-03-2026 - **Published:** 30-06-2026*

Study limitations include retrospective bias and the lack of detailed clinical data, which precludes broad generalizations. This research study included a small subset of Caracas, and it is not statistically representative of the overall population of Venezuela. Future studies should incorporate genetic analyses and comparisons with non-Venezuelan populations to enrich the theoretical framework. As far as the authors' investigation and knowledge, there are no references about exclusive false sutural bone research. Therefore, a quantitative or qualitative comparison with previously published prevalence data, nor any discussion of population variability. This research is a descriptive report of the prevalence of false sutural bones. It does not have the objective to offer any novel interpretative framework or to advance current knowledge about the relationship between false sutural bones and pathologies.

This study provides initial insights into the incidence and morphology of false sutural bones in a Venezuelan population based on the findings of cranial computed tomography images with three-dimensional reconstruction taken from 1,000 subjects. Although false sutural bones are not directly associated with pathologies, knowledge of their presence, morphology, and variability could facilitate accurate differential diagnoses when considering skull fractures. The need for further research in diverse populations to explore their etiology and variability is emphasized. On the other hand, false sutural bones could have a different origin as well as a different clinical meaning than true suture bones. Nevertheless, since “false” indicates something that is not authentic or valid, these bones should be named by their own anatomical attribute, that is, their location inside another cranial bone and not related to cranial sutures. Therefore, the author had proposed that false sutural bones should be denominated as intercranial bones (*Ossa Intercranial*). [20]

Conclusions

In summary, this research advocates for the integration of imaging technologies into the study of bone structures (in this case of the skull). The results highlight the very low incidence of false sutural bones (0.4%) but underscore their potential relevance in differential diagnoses, as visualized in the cranial computed tomography images with three-dimensional reconstructions that were studied. Knowing about the possible presence of false sutural bones could be useful for making a differential diagnosis with skull fractures.

Notes on Contributors

RRR was involved in the study by conceptualizing the idea, reviewing the literature, data acquisition, formal analysis, designing and writing the original draft, and obtaining the images (photos).

Funding

There are no funding sources to declare.

Declarations of Interest

The author declares that has no competing interests.

Declarations of interest conflict.

The author declares that has no conflicts of interest.

Data Availability Statement

Data supporting this research are available in the original publications that were cited in the reference section. The author declares not any specify AI applications have been used to help or collaborate in searching for and writing this paper.

References

1. Dziedzic M, Ostrowski P, Ghosh S, Balawender K, Koziej M, Bonczar M. Exploring the evolution of anatomy: From historical foundations to modern insights. Transl Res Anat. 2024;35:100286.
2. Habbal O. The science of anatomy: a historical timeline. Sultan Qaboos Univ Med J. 2017;17:18-22.
3. Kardel T, Shampo MA, Kyle RA. Ole Worm—versatile, dedicated Danish physician. Mayo Clin Proc. 1990;65(3):373. doi:10.1016/S0025-6196(12)62537-3.
4. Dart R. The Makapansgat proto-human Australopithecus Prometheus. Am J Phys Anthropol. 1948;6(3):259-83.
5. Federal Committee on Anatomical Terminology, International Federation of Associations of Anatomists. International Anatomical Terminology. Madrid: Editorial Médica Panamericana; 1998. ISBN:84-7903-614-1.
6. Chmielewski PP. New Terminologia Anatomica: cranium and extracranial bones of the head. Folia Morphol. 2021;80(3):477-86. doi:10.5603/FM.a2019.0129.
7. Romero-Reverón R. Anatomical classification of sutural bones. MOJ Anat Physiol. 2017;3(4):130-1. doi:10.15406/mojap.2017.03.00101.
8. Bellary SS, Steinberg A, Mirzayan N, Shirak M, Tubbs RS, Cohen-Gadol AA, Loukas M. Wormian bones: a review. Clin Anat. 2013;26(8):922-7. doi:10.1002/ca.22262.
9. Bisiecka A, Romero-Reverón R. Prevalence of wormian bones worldwide: a critical review. Anthropol Rev. 2023;85(4):95-121. doi:10.18778/1898-6773.85.4.07.

Received*: 13-01-2026 -* ***Accepted****: 11-03-2026 -* ***Published****: 30-06-2026*

Maaref Med J. 2026;2(1):1-4
https://doi.org/10.5281/zenodo.21781637
Maaref Medical Journal
https://journal.imu.edu.ly/ojs/index.php/

10. Ogut E, Yildirim FB. Wormian bone types: investigating their appearance, correlation to sex, population affinity, and clinical syndromes. Egypt J Forensic Sci. 2023;13-9. doi:10.1186/s41935-023-00337-2.
11. Tôrres S, Pessoa E, et al. Frequency of wormian bones in identified Brazilian human skeletons. Braz J Dev. 2021;7(11):102435-52. doi:10.34117/bjdv7n11-050.
12. Goyal N, Garg A, Kumar Y. Incidence and medicolegal significance of wormian bones in human skulls in North India region. Int J Appl Basic Med Res. 2019;9(3):165-8. doi:10.4103/ijabmr.IJABMR_89_19.
13. Romero-Reverón R, Arráez-Aybar L. Sutural bones: a literature review. Anatomy. 2019;13(1):61-5.
14. Marti B, Sirinelli D, Maurin L, Carpentier E. Wormian bones in a general paediatric population. Diagn Interv Imaging. 2013;94(4):428-32. doi:10.1016/j.diii.2013.01.001.
15. Romero-Reverón R. Virtual dissection: an educational resource that improves medical students' learning?. Anatomy. 2026;4(1):41-5.
16. Pandey S, Bhadkaria V, Chourasia R, Kumar R. The role of technology in anatomy education: evaluating knowledge gains with virtual dissection tools. Eur J Cardiovasc Med. 2024;14(3):1355-60. doi:10.5083/ejcm.
17. Chytas D, Piagkou M, Salmas M, Johnson EO. Three-dimensional digital technologies in anatomy education: better than traditional methods, but are they better than cadaveric dissection? Clin Anat. 2021;34(8):1122-3. doi:10.1002/ca.23591.
18. Arakawa T, Campisi E, Tran J, Agur AMR. Dissection, digitization, and three-dimensional modelling: a high-fidelity anatomical visualization and imaging technology. Anat Sci Int. 2023;98(3):337-42. doi:10.1007/s12565-023-00725-7.
19. Singh R. Wormian bones: prevalence, topography, and implications. J Craniofac Surg. 2024;35(1):247-50. doi:10.1097/SCS.0000000000009746.
20. Romero-Reverón R. False sutural bones should have its own anatomical denomination in international anatomical terminology?. J Morphol Anat. 2020;4:134.

Received*: 13-01-2026 -* ***Accepted****: 11-03-2026 -* ***Published****: 30-06-2026*