

Content available at: <https://www.ipinnovative.com/open-access-journals>

IP Indian Journal of Anatomy and Surgery of Head, Neck and Brain

Journal homepage: <https://www.ijashnb.org/>

## Case Report

# Anomalous bipartite parietal bone variant mimicking fracture in a human skull- A case report

Mouna Subbramaniam<sup>1\*</sup>, Jagannatha SR<sup>2</sup>, Ayush Gowda<sup>3</sup><sup>1</sup>Dept. of Anatomy, Kempegowda Institute of Medical Sciences, Bangalore, Karnataka, India<sup>2</sup>Dept. of Forensic Medicine, Kempegowda Institute of Medical Sciences, Bangalore, Karnataka, India<sup>3</sup>Shri Atal Bihari Vajpayee Medical College and Research Institution, Bangalore, Karnataka, India

## ARTICLE INFO

### Article history:

Received 11-08-2024

Accepted 24-09-2024

Available online 28-10-2024

### Keywords:

Bipartite

Parietal

Suture

Fracture

Intraparietal

## ABSTRACT

The proper growth of the skull depends on the cranial sutures. There have been references in the literature to the occurrence of bipartite, tripartite and quadripartite parietal bones. Regular ante mortem and postmortem investigations may reveal these fracture-mimicking anatomical variations, which might change the path of the diagnosis and medico legal certification. Therefore, having sufficient knowledge about the occurrence of these abnormal suture variations will improve both postmortem and ante mortem diagnosis. In this case study, the genesis and clinical relevance of a unilateral bipartite parietal bone discovered in a museum specimen are discussed.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](#), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: [reprint@ipinnovative.com](mailto:reprint@ipinnovative.com)

## 1. Introduction

The proper growth of the skull depends on the cranial sutures. The cranial vault's shape is changed by early or late closure of the cranial sutures, which can result in widespread or localized deformation of the skull. People have known about these anatomical variations in cranial sutures since ancient times. These variations either originated in the unusual shapes of the skull via their obvious absence, abnormal persistence into adulthood, or mechanical creation owing to stress.<sup>1</sup>

## 2. Case Report

Tarin first reported the presence of a bipartite parietal bone in 1735. In addition, tripartite parietal bones in monkeys have been reported by Fusari and Maggi.<sup>2</sup> A solitary instance of a quadripartite parietal bone in the same monkey has been reported.<sup>3</sup>

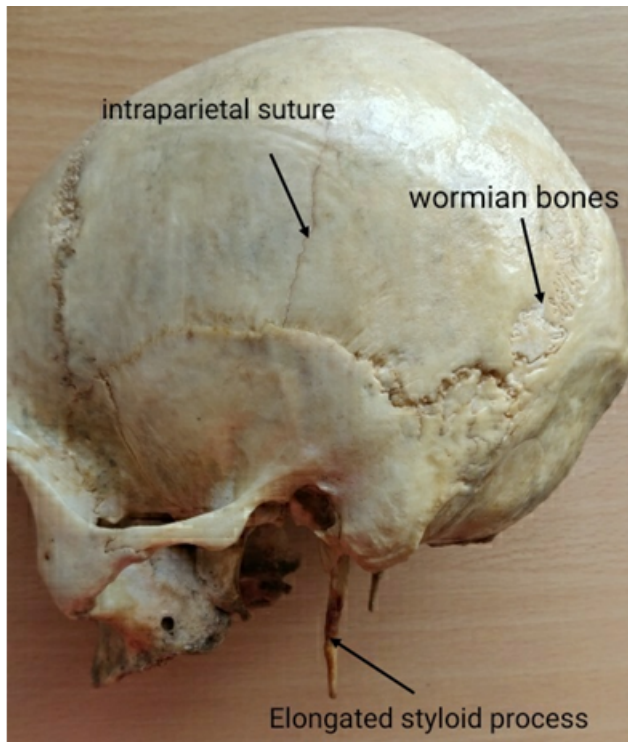
Radiographs of suspected skull fractures occasionally showed the diagnosis of a bipartite parietal bone. Regular autopsies may also reveal these fracture-mimicking anatomical variations, which might change how the cause of death is certified. Therefore, having sufficient knowledge about the occurrence of these abnormal suture variations will improve both postmortem and ante mortem diagnosis.<sup>4</sup>

Hereby reporting a case of unilateral bipartite parietal bone found in a museum specimen of Kempegowda institute of medical sciences. The calvarium of the skull was brachycephalic with a cranial index of 82.6. The intraparietal suture was noted on the left side of the skull which was incomplete extending from the squamous suture to midway of sagittal suture measuring 3.8cm. (Figure 1) the sagittal suture was positioned slightly to the right of the midline with a visible flattening on the posterior part of the skull near the lambda. (Figure 2) There was a notable association of wormian bones along the posterior part of the parietal bone three on the right and three on the left sides. (Figure 2) Incidentally the skull was also associated with an elongated

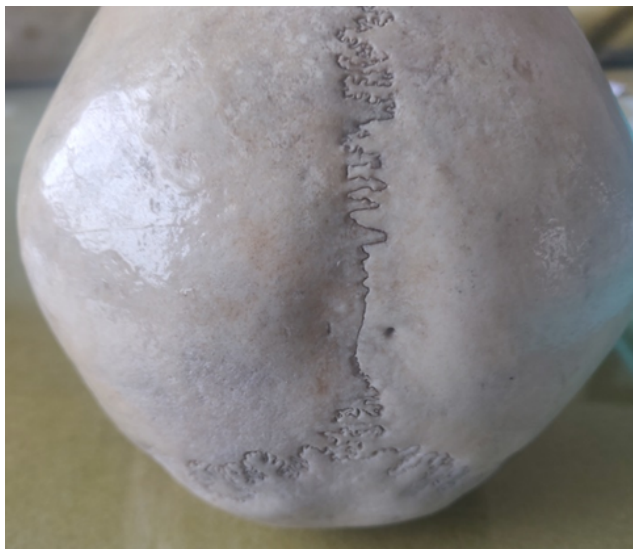
\* Corresponding author.

E-mail address: [msjkims@gmail.com](mailto:msjkims@gmail.com) (M. Subbramaniam).

styloid process which was more on the left side measuring about 5.2cm while it was 4cm on the right side.(Figure 3)



**Figure 1:** Skull showing bipartite parietal bone, wormian bones and elongated styloid process



**Figure 2:** Skull showing shifting of sagittal suture to right and depressed portion



**Figure 3:** Skull showing elongated styloid process

### 3. Discussion

Although bipartite parietal bones were documented by a few previous writers, their occurrence is rare. As a result, Hrdlicka's 1903 publication has the most thorough examination of the topic. According to him, the division of the parietal bone in lower (sub primate) mammals is uncommon overall, although it is widespread in several ape and monkey taxa. In humans, this oddity is quite uncommon. Only three times in his estimated 25,000 skull roentgenograms did he come across full parietal division in his clinical practice. He also mentioned that men are more susceptible than women and unilateral parietal division is more common than bilateral.

The enhanced development in the divided parietal bone is often perpendicular to the anomalous suture, making it bigger than the undivided counterpart. Skull asymmetry is frequently caused by the split parietal bone growing unevenly. The sutures might be oblique, vertical, or horizontal. Along the abnormal parietal suture's length, one or more wormian bones are frequently seen. This might be connected, or just a coincidental occurrence.<sup>5</sup> Even in our case we found many wormian bones in the skull favoring the possibility of an association.

Bone development proceeds radially in a centrifugal manner from the major site of ossification during normal parietal bone ossification from membrane. It is not unusual for linear membrane strips to remain unossified at birth while ossification progresses; typically, these linear membranous strips ossify later in infancy. They can appear along any margin of one or both parietal bones and they can be solitary or many. Since they are frequently mistaken for straightforward parietal bone fractures, it is crucial to be aware of their existence.

In fact, it can be challenging or impossible to distinguish between a straightforward linear fracture and a typical parietal membranous strip in the absence of concomitant local soft tissue edema. The strip is typically too short to be mistaken for an abnormal parietal suture, though. When there is sutural serration, sclerosis, or asymmetric expansion of the homolateral hemi cranium in adults, parietal sutures shouldn't provide a significant challenge to the differential

diagnosis. However, in infants without soft tissue edema, it could be challenging to differentiate between a linear fracture and a unilateral horizontal aberrant intraparietal suture.<sup>6</sup>

Regarding the natural growth of the human parietal bone, opinions vary greatly. According to some, such as Arey, every parietal grows from a single core.<sup>7</sup> The parietal bone is ossified in membrane from two foci that arise at the parietal eminence, one above the other, about during the seventh week of intrauterine life, according to Gray's Anatomy. These centers come together early and ossification progressively spreads outward toward the bone's edges.<sup>8</sup> Most people believe that the creation and failure of fusion of two distinct sites of ossification accounts for the full bipartite separation of the parietal bone. Regarding the vey oblique and angle divisions, there are differing views. Although the majority of writers think that a distinct center of ossification is also responsible for these little divisions, Coraini views the extra segment as a wormian bone.

According to Ranke's theory, there is a chance that other regular cranial sutures may close too soon, putting undue burden on the two (normal, in his opinion) parietal ossification centers.<sup>9</sup>

Kolliker, like Coraini, provided a distinct account of the parietal bone's evolution. He reported seeing several tiny, isolated ossific foci around the parietal bone, which eventually multiply and merge together.

It develops in two ways: partially by the expansion of the preexisting osseous framework and partially through isolated centers. concurrently, osseous material fills the interspaces. This clarifies the potential rise in the quantity of wormian bones linked to.<sup>10</sup> Hauser and De Stefano assume that the manifestation of this feature has a hereditary basis. If this is the case, then related variations such as the extended styloid process that occurred in our instance and was not previously documented might also be possibilities.

The low prevalence of this feature in the population under investigation raises the possibility that it has identification weight and may be significant for comparison identification in forensic contexts if ante mortem photos are provided. This discovery may also be helpful in clinical forensic medicine and expert opinion reports when there is a possibility that it will be misinterpreted for a fractured skull in a suspected head trauma case.<sup>11</sup>

#### 4. Conclusion

The results of the previously described observation show that bipartite parietal bones occur in the Indian setting. This condition may be accidental; the result of different lifestyle patterns, or has a genetic foundation. Thus, detailed research

on population levels is recommended. This has significance in evaluating its identification value in anthropology, medico legal examination, bio anthropological population research and the investigation of potentially familiar links in historical identifications or intracemetery linkages.

#### 5. Conflict of Interest

None.

#### 6. Source of Funding

None.

#### References

1. Subbaramaiah M, Vyshak BN. Craniosynostosis with scaphocephaly-embryological basis and clinical relevance. *Indian J Clin Anat Physiol*. 2023;10(3):197–9.
2. Maggi L. Ossicini fontanellari coronali e lambdoidei nel cranio di mammiferi e dell'uomo. *Boll Sci*. 1899;p. 97–103. Available from: <https://eurekamag.com/research/092/346/092346445.php>.
3. double AL. Traité des Variations des Os du Crane de l'Homme, et de leur Signification au Point de Vue de l'Anthropologie Zoologique. *J Anat Physiol*. 1904;38(3):375–6.
4. Angonèse A, Sonnaert M, Rassart A, Gauquier N, Cavatorta E. Fracture ou os pariétal bipartite ? Skull fracture or bipartite parietal bone? *Arch Pediatr*. 2010;17(4):391–3.
5. Hrdlicka AK, Am Antho Asso. Divisions of parietal bone in man and other mammals. *Bull Am Mus Nat Hist*. 1903;5(3):23–4.
6. Shapiro R. Anomalous parietal sutures and the bipartite parietal bone. *Am J Roentgenol*. 1972;115(3):569–77.
7. Arey LB. Developmental Anatomy: A text-book and laboratory manual of embryology. 3rd ed. Philadelphia, London: W.B. Saunders Company; 1934. p. 695.
8. Henry G. Gray's Anatomy descriptive and applied. 31st ed. Johnston T, Whillis J, editors. London: Green & Company Ltd; 1954. p. 318.
9. Ranke J. Die Überzahligen Hautknochen Des Menschlichen Schädeldachs. vol. 899. Whitefish, Montana: Kessinger Publishing; 2010. p. 277–464.
10. Kolliker A. Entwicklungsgeschichte des Menschen und der höheren Thiere. German: Antigonos Verlag; 2024. p. 454.
11. Bašić Z, Jerković I, Bareša T, Jerković N, Mladenović S, Skejić I, et al. Bipartite parietal bone: a case from Croatian population. *J Bioanthropol*. 2022;2(2):14–21.

#### Author's biography

**Mouna Subbramaniam**, Professor

**Jagannatha SR**, Professor

**Ayush Gowda**, Undergraduate Student(MBBS)

**Cite this article:** Subbramaniam M, Jagannatha SR, Gowda A. Anomalous bipartite parietal bone variant mimicking fracture in a human skull- A case report. *IP Indian J Anat Surg Head, Neck Brain* 2024;10(3):76-78.