Section: Anatomy

Original Research Article

A STUDY ON THE INCIDENCE OF METOPISM IN THE SOUTHERN DISTRICTS OF TAMILNADU

Yokeshwaran Gnanasekaran[1], Latha Karuppiah[2], Nagaarjun Arulraj[2]

[1]Assistant Professor, Government Medical College, Dindigul, Tamil Nadu, India.
[2]Assistant Professor, Government Medical College, Sivagangai, Tamil Nadu, India.

Received : 05/07/2025
Received in revised form : 24/08/2025
Accepted : 09/09/2025

Keywords:
Metopism, Metopic suture, frontal bone, craniosynostosis.

Corresponding Author:
Dr. Yokeshwaran Gnanasekaran,
Email: yokee24@mail.com

DOI: 10.47009/jamp.2025.7.5.97

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (5); 492-494

ABSTRACT

Background: Frontal bone of human skull develops in two halves, united by a frontal or metopic suture. The metopic suture is a dense fibrous joint extending from the nasion to bregma. Normally metopic suture disappears between 1- 10 years of age by ossification. Persistence of metopic suture throughout life is called as Metopism. The aim is to find the incidence of Metopism in the Southern districts of Tamilnadu. **Materials and Methods:** The present study was conducted on 130 dried adult human skulls from the Institute of Anatomy, Madurai Medical College, Madurai. **Result:** 4 skulls showed the presence of metopic suture, resulting in an incidence of 3.1%. All the metopic sutures were of the complete type. **Conclusion:** Knowledge of Metopic suture is important for forensic experts, neurosurgeons and radiologists since it may mimic a vertical fissure fracture of the frontal bone.

INTRODUCTION

Bones of the cranial vault are formed by mesenchymal ossification. The frontal bone develops from two ossification centers at around the 8th week of intrauterine life, one on either side of the midline separated by a median suture, the metopic suture. The metopic suture is a dentate type of suture. The term Metopic is from Greek, meaning "in the middle of the face" or "a space between the eyebrows". Metopic suture is also called as suture frontalis persistens or median frontal suture. The metopic suture usually closes between 1-10 years of age by ossification, from the endocranial side to the ectocranium. The anterior and posterior ends of the metopic suture don't always meet exactly at the internasal suture and the sagittal suture respectively.[1-10]

Metopism may be of many types. If the metopic suture persists extending from the bregma to nasion, then it is a Complete type of Metopism. Any interruption in its extent from bregma to nasion, then it is an Incomplete type. The incomplete type may be of superior, middle or lower types depending upon the region remaining unfused. The incomplete type can also be further classified into nasion incomplete and bregma incomplete. Depending on the shape of the metopic suture present, the incomplete sutures can be classified into Linear type, U – type and the V – type.[11-15]

MATERIALS AND METHODS

The present study was conducted on 130 dried adult human skulls from the Institute of Anatomy, Madurai Medical College, Madurai. All the 130 skulls were examined for the presence of metopic suture in them.

RESULTS

Of the 130 adult skulls examined, 4 skulls showed the presence of metopic suture, with an incidence of 3.1%. All the 4 metopic sutures were of the complete type, i.e., extending from the bregma to nasion. The anterior end of the metopic suture in all 4 skulls met at the internasal suture. The posterior end of the metopic suture met exactly at the sagittal suture in 1 skull. In the remaining three skulls, the posterior end was found to be deviating to the right (0.5cm) in one case and to the left (1 cm and 0.1cm) in the other two [Figure 1-4]. No Wormian bones and incomplete metopic sutures were observed in this study.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Figure 1: Complete Metopism, posterior end meeting the sagittal suture.

Figure 2: Complete Metopism, posterior end not meeting the sagittal suture.

DISCUSSION

The metopic suture along with the other sutures and intervening fontanelles helps in the malleability and moulding of the fetal skull for its easy passage through the birth canal during labour. At about the 2nd year of age, the metopic suture begins to disappear, by the appearance of secondary ossification center at its site, thereby replacing it with bone. The presence of metopic suture in adults is not always pathological. Though the causes for metopism are several, genetic influence is the most accepted factor. Closure of metopic suture is influenced by factors such as transforming growth factor-beta 2 and beta 3 (TGF-B2, TGF-B3), bone morphogenetic protein 4 (BMP4) and fibroblast growth factor 2 (FGF2).[14] Impaired closure of metopic suture is observed in Apert's syndrome.[15]

The incidence of metopism is varied in literature based on ethnicity. The present study had an incidence of 3.1%, which is similar to Keith L. Moore's,[13] Textbook of Clinically Oriented Anatomy 3-8%, Das et al,[7] (1973) in their study reported 3.31% of metopism in Uttar Pradesh population, Ajmani et al,[2] (1983) observed 3-4% of metopism in Nigerian population, Hussain Saheb et al,[10] (2010) 3.2%, Chandrasekaran et al,[17] (2011) reported 3% in South Indian population, Radha et al,[16] (2015) had an incidence of 3%. The incidence of metopism is compared with various other studies in [Table 1].

Table 1: Incidence of Metopism in different Ethnic groups

Author (Year)	Ethnic group	Incidence (%)
Byrce,[5] (1917)	European	8.7
	Mongolian	5.1
	Black African	1.2
	Australian	1
	Scotish	9.5
Jit and Shah,[12] (1948)	Indian (Punjab)	5
Woo,[23] (1949)	Mongloid	10
	Negroid	2
Frazer and Breathnach,[4] (1965)	European	7-10
	East Asian	4-5
	African	1
Das et al,[7] (1973)	Indian (Uttar Pradesh)	3.31
Berry (1975)	Various ethnic groups	7.4
Agarwal et al,[1] (1979)	Indian	2.6
Herker et al,[9] (1981)	Indian (Maharashtra)	1
Ajmani et al,[2] (1983)	Nigerian	3-4
Bilodi A K et al,[3] (2003)	Nepal	11.46
Castilho et al,[6] (2006)	Brazil	7.04
William F Masih et al,[22] (2013)	Indian (Rajasthan)	6.5
Silva et al,[11] (2013)	Brazil	9.7
Ravikumar,[21] (2016)	Indian (Karnataka)	5
Vidulatha K et al,[20] (2019)	South Indian	3.3
Sucharitha T M et al,[18] (2021)	Indian (Andhra Pradesh)	2.4
Present study	Indian (Southern Tamilnadu)	3.1

CONCLUSION

Knowledge of Metopic suture is important for forensic experts, neurosurgeons, radiologists etc. since a persistent metopic suture may be misinterpreted as a vertical fissure fracture of skull. Early closure of metopic suture may lead to narrow elongated skull called trigonocephaly. Metopism may also be associated with frontal sinus irregularities like frontal sinus agenesis, aplasia and hyperplasia.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

REFERENCES

1. Agarwal SK, Malhotra VK, Tewari SP. Incidence of the metopic suture in adult Indian crania. Acta Anat. 1979;105:469-74.
2. Ajmani ML, Mittal RK, Jain SP. Incidence of metopic suture in adult nigerian skulls. J Anatomy. 1983;137:177-83.
3. Bilodi AK, Agrawal BK, Mane S, et al. A study of metopic sutures in human skulls. Kathmandu University Medical Journal 2003; 2: p. 96-99.
4. Breathnach AS. Frazer's Anatomy of Human Skeleton. Churchill Livingstone, London.
5. Bryce et al., Observations on metopism. J. Anat., 51: p. 153-66, 1917.
6. Castilho SMA, Oda YJ, Santana GDM. Metopism in adult skulls from Southern Brazil. Int J Morphol 2006;24:61-6.
7. Das AC, Saxena RC, Beg MAQ. Incidence of metopic suture in U.P. subjects. J Anat Soci India. 1973;22:140.
8. Datta AK. Essentials of human osteology. Current books international, Kolkata, India. 2005;p:89.
9. Herker NG, Jahagirdhar PL, Bhode DD. The study of metopism in Maharastrian. J Anat Soc India. 1981;1:29-31.
10. Hussain Saheb S et al, J Biomed Sci and Res., Vol 2 (4), 2010, p. 223-226.
11. Ivan do Nascimento da Silva et al, Occurrence of Metopism in Dry Crania of Adult Brazilians. ISRN Anatomy, 2013.
12. Jit I. & Shah M. A. Incidence of frontal or metopic suture amongst Punjabi adults. Indian Medical Gazette 1948; 83: p. 507.
13. Keith L. Moore, Arthur F. Dalley. Clinically oriented anatomy, 4th edition, Lippincott Williams & Wilkins publication, p. 834.
14. Opperman LA, Adab K, Gakunga PT. Transforming growth factor-beta2 and TGF-beta3 regulate fetal rat cranial suture morphogenesis by regulating rates of cell proliferation and apoptosis. Dev Dynam 2000; 219: p. 237-47.
15. Premalatha, Kannan VP, Madhu. Apert syndrome. J Indian Soc Pedod Prev Dent. 2010;28:322-5.
16. Radha Pujari, Naveen N. S, Ravi Shankar G, Roopa C. R. "A Study of Metopic Suture in Adult Human Skull". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 32, April 20; Page: 5452-5454, DOI: 10.14260/jemds/2015/799
17. Shanta Chandrasekaran, Deepti Shastri. A study on metopic suture in adult South Indian Skulls. International J Basic Med Sci. 2011;1.
18. Sucharitha TM, Phanindra SV. A study of the incidence of Metopism in adult skulls of Nellore district of South coastal Andhra Pradesh. Indian J Clin Anat Physiol 2021;8(1):46-48.
19. Susan S. Gray's Anatomy the Anatomical basis of Clinical Practice. Churchill Livingstone. 2016; pp:622-3.
20. Vidulatha K, Parthiban K. Metopic Suture- A Study in South Indian Population. J Med Sci Clin Res. 2019;7(9):287-92.
21. V. Ravi kumar, Siri. A. M. Study of metopic sutures in adult skull in Karnataka region. Int J Anat Res 2016;4(3):2674-2676. DOI: 10.16965/ijar.2016.299
22. William F Masih, Sumit Gupta, PK Saraswat, et al. Autopsy study of metopic suture incidence in human skulls in western rajasthan. National J Med Res. 2013;3:63-5.
23. Woo, JU-Kong. Racial and sexual differences in the frontal curvature and its relation to metopism. American Journal of Physical Anthropology 1949; 7: p. 215-226.

ISSN (O): 2687-5365; ISSN (P): 2753-6556