

A STUDY ON METOPIC SUTURE IN ADULT SOUTH INDIAN SKULLS

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ABSTRACT

Failure of the closure of two halves of the frontal bone even after the childhood is known as metopic suture. The time of the closure of metopic suture varies from one to eight years and it can persist until adult age. This study was carried out on 160 adult south Indian skulls from the bone collection of the department of Anatomy of the Vinayaka Missions Kirupananda Variyar Medical College, Annapoorna Medical College and Vinayaka Missions College of Physiotherapy of Vinayaka Missions University – Salem, Tamil Nadu. Metopism was found in 5% of the studied skulls. The incomplete metopic suture was found in 40%. Morphology of sutures varied from linear (17.5%), 'U' shaped (15%) and 'V' shaped (7.5%), of which linear was found to be most common. 88 skulls (55%) were found to have no metopic suture.

Key words: Metopic suture, Metopism, Frontal bone, Adult skull

INTRODUCTION

The metopic suture is a suture seen between the two halves of the frontal bone which ossifies in membrane from two primary centres, which appear by the end of the second month of fetal life and fuse first at the inner surface of the skull, by chondroid tissue as reported by Manzanares et al.,¹. The suture between the two halves of frontal bone will generally disappear in childhood. Metopic suture results when the suture between the two halves of the frontal bone fails to close. The morphology of the metopic suture varies. When the Metopic suture extends from bregma to nasion it is called complete metopic suture and if not it is called as incomplete metopic suture. Complete metopic suture from nasion to bregma is known as Metopism, Which is more common in higher races and not related to brachycephaly.²

The variation of the metopic suture is studied by many researchers. According to the researchers

the disappearance of metopic suture varies from one year to eight years. Study by Piersol et.al., concludes that the metopic suture disappears by the end of the fourth year, leaving a faint trace at the lower end but Keith et.al conclusion differs from Piersol and reveals that the metopic suture disappears when the first year of life completes^{3,4}. According to Romanes the metopic suture closes by the fifth or sixth year, leaving traces of it on the above and below⁵. Warwick & Williams states that metopic suture is usually obliterated by the eighth year.⁶

It is essential to know about metopic suture failing which it can be easily misunderstood as fracture of frontal bone or even for the sagittal suture in radiological images.^{7, 8} It is also important for paleodemography and forensic medicine.⁹

Incidence of metopic suture varies in different races. Metopic suture can be due to various causes such as abnormal growth of cranial bones, growth interruption, heredity, sexual, hormonal influence, atavism, cranial malformations, and hydrocephalus.⁷ According to Breathnach the incidence of metopic suture varies from 4-5 % in Yellow races, 7-10% in Europeans, and 1 % in African skulls¹⁰. Bryce reports metopism is present in 5.1 % of Mongolian subjects, 8.7 % of European crania, 9.5 % of Scottish skulls, 1.2 % of Negroes and 1% of Australian skulls². The incidence of metopism is about 10% in Whites and Mongoloids and only 2% in Negroids¹¹. Indian studies reports that the metopic sutures are varying in different regions of the country ranging from 2.66 to 5%.^{12, 13, 14}. This study attempts to identify the incidence of metopic suture and its variation in size, shape in adult south Indian skulls.

MATERIAL AND METHODS

This analytical study was conducted in the department of Anatomy of V.M.K.V. Medical College, Vinayaka Mission University, Salem. We included adult south Indian skulls from the bone collection of

the department of Anatomy of the Vinayaka Missions Kirupananda Variyar Medical College, Annapoorna Medical College and Vinayaka Missions College of physiotherapy of Vinayaka Missions University, Salem, Tamil Nadu. The skulls with signs of diseases, visible abnormalities and damaged skulls were excluded from the study.

The analysis was initiated with macroscopic observation of the skulls and these skulls were divided into three groups as normal skulls without any metopic suture (Fig.1), complete metopic suture (Fig.2) and with incomplete metopic suture. When the metopic suture is extended from the nasion to the bregma uninterruptedly they were considered as complete (Fig.2). Whereas those extending from the nasion to varied points of the frontal bone anterior to the bregma were considered as incomplete metopic suture. The incomplete metopic sutures were further grouped according to their shape namely linear, 'U' shaped and 'V' shaped (Fig -3, 4 and 5 respectively). Those with single and shallower suture were considered as linear, double linear sutures originating from fronto nasal suture and resembling like 'U' were considered as 'U' shaped and those with bifurcation are considered as 'V' shaped. The data obtained were tabulated and analyzed through descriptive statistics. The incidence of each type of metopic suture were noted in percentages and compared with other studies.

Figure 1: Normal Skull



Figure 2: Showing metopism. The metopic suture is extending from nasion to bregma



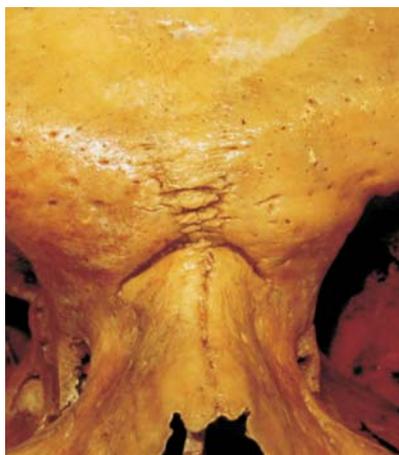
Figure 3: Showing the linear shaped metopic suture in the lower part of the frontal bone



Figure4: Showing the 'U' shaped metopic suture in the lower part of the frontal bone



Figure 5: Showing the 'V' shaped metopic suture in the lower part of the frontal bone



RESULTS

Totally 162 skulls were included, two skulls with visible abnormalities were excluded and finally 160 skulls were studied. Eighty eight (55%) of the skulls had neither complete nor incomplete metopic suture. Seventy two skulls (45%) had metopic suture either in the form of complete or incomplete. Complete metopic suture was found in eight skulls (5%) (Fig.2), and incomplete suture was observed in 64 skulls (40%). Three different types of incomplete sutures namely linear (Fig.3), 'U' shaped (Fig.4), 'V' shaped (Fig.5), were identified. Among the incomplete metopic sutures, the incidence of linear incomplete metopic suture was 28/160 (17.5%), 'U' shaped incomplete metopic suture was 24/160 (15%) and 'V' shaped incomplete suture was 12/160 (7.5%).

Extent of suture	Number	Percentage
Complete	8	5
Incomplete	64	40
Linear	28	17.5
'U' Shaped	24	15
'V' Shaped	12	07.5

Table 1. Incidence of the metopic suture (n = 160)

DISCUSSION

In the present study, metopism was found in eight skulls (5 %) which is similar to Punjabi(Indians), yellow race and Mongolian,^{2,10,12} but the incidence of metopism is lesser than European, Scottish, Mangoloids^{2, 11} and higher than the incidence reported in other races.^{2,4,8,10,11,13,14&15}(Table 2)

Worker	Race	Percentage
Jit & Shah. et al., (1948)	Indian (Punjabi)	5.00%
Das. et al., (1973)	Indian (U.P)	3.31%
Agarwal. et al., (1979)	Indian (Kanpur)	2.66%
Bryce. et al., (1915)	European	8.70%
	Mongolian	5.10%
	Negro	1.20%
	Australian	1.00%
	Scottish	9.50%
Keith. et al., (1948)	Subject to race	3-8%
Woo. et al., (1949)	Mongoloids	10.0%
	Negroids	2.0%
Breathnach.et al.,(1958)	European	7-10%
	Yellow races	4-5%
	Africans	1.00%
Romanes. et al., (1972)	Europeans	Up to 8.00%
Berry. et al., (1975)	Various ethnic groups	07.4%
M. L. Ajmani. et al.,	Nigerians	3.40%
Present Study	India(South India)	5%

Table 2. Incidence of metopism in different races as reported by various workers

The incidence of incomplete metopic suture was higher in our study compared with other studies (Table 3). Variations were seen in the incomplete type of metopic suture. Unlike other studies the present study had found 'U' shaped incomplete metopic suture in 15% of the skulls. Whereas the other incomplete metopic suture variations like 'H' shape, inverted 'U' shape and 'Y' Shapes were not seen in our study. The incidence of 'V' shape was found high in our study. All these variations can be due to various causes such as abnormal growth of cranial bones, growth interruption, heredity, sexual, hormonal influence, atavism, cranial malformations, and hydrocephalus⁷.

Extent and shape of suture	Agarwal et al. (1979) %	Das et al. (1973) %	Jit & Shah et al. (1948)%	M. L. Ajmani et al. (1983) %	Present study(2010) %
Incomplete	35.51	17.57	-----	31.57	40
Linear	23.12	-----	-----	24.27	17
'H'-shaped	1.57	-----	1.25	3.88	-----
'U' shaped	-----	-----	-----	-----	15
Inverted 'U' shaped	2.43	1.93	11.25	0.97	-----
'V' Shaped	3.25	1.01	-----	0.49	7.5
'Y' Shaped	1.96	0.28	1.25	-----	-----

Table 3. Comparison of the incidence of incomplete metopic suture with other workers

CONCLUSION

This study has shown the incidence of metopic suture in south Indian adult skulls as 45% of which 5% of the skulls had metopism. The most common incomplete metopic suture was linear which was 17.5% and least common was 'V' shaped which was 7.5%. This study has identified 'U' shaped incomplete metopic suture in south Indian skulls.

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skulls with metopic suture, classify the metopic sutures into complete and incomplete type. Further to classify the incomplete variety based on shape. Then to correlate the data with previous studies and discuss the morphology and importance of metopic suture. Materials and Method 282 dry adult cadaveric skulls of unknown sex. were observed for the presence of metopic suture. These skulls have been taken from Department of Anatomy and Department of Forensic Medicine, KIMS, Koppal, Karnataka. 19. Shanta Chandrasekaran, Deepti Shastri. A study on metopic suture in adult South Indian Skulls. International Journal of Basic Medical Science - October 2011, Vol : 1, Issue :7. 20. Del Sol M, Binvignat O, Bolini PD, Prates JC: Metopism in Brazilians.