

**A STUDY OF METOPIC SUTURES IN SOUTH INDIAN SKULLS****Dr. Arun Kumar S. Bilodi, David Ebenezer, Dr. Rajasankar, M. Ram Kumar**Department of Anatomy, Velammal Medical College Hospital and Research Institute,  
Madurai, India.Article Received on  
30 July 2014,Revised on 24 August 2014,  
Accepted on 19 Sept 2014**\*Correspondence for  
Author****Dr. Arun Kumar.S.Bilodi**  
Department of Anatomy,  
Velammal Medical College  
Hospital and Research  
Institute, Madurai, India.**ABSTRACT**

**Aim of Study :** The objective of this study is to record types and variations of metopic suture. **Place of Study :** This study was done on unknown dry human skulls obtained from department of Anatomy, Velammal Medical College Hospital and Research Institute, Madurai, India. **Period of Study :** This study was done during the month of June - July 2014. **Materials and Methods :** 32 skulls from the department of Anatomy constituted the material for the present study. Each skull was examined for the presence or absence of metopic sutures. Their extent was measured from nasion to bregma. Their pattern was recorded compared and correlated with available literature.

**KEY WORDS :** Metopism, metopic suture, incomplete metopic suture, fracture skull, nasion, bregma

**INTRODUCTION**

Metopic suture is a midline suture present in frontal bone extending from bregma to nasion. The metopic suture may be complete or incomplete. If it is complete (extending from nasion to bregma) it is known as metopism. There are various types of metopic suture. They are linear, double shaped, and V shaped <sup>[1]</sup>. At 9th week of intrauterine life small ossification centers appear in the middle of each supraorbital part of frontal bone. By 11 weeks there appear eyebrow-like thickenings in the frontal bone. There is a progressive radial bone expansion in the second trimester and delineation of metopic suture occurs. In third trimester there is closure of metopic suture commencing from glabella and ascending upwards towards anterior fontanelle <sup>[2]</sup>. Collins has stated that metopic suture appears in the fetus and closes in the childhood of 6-8 years <sup>[3]</sup>. Physiological closure of metopic suture varies from birth to 8

years of age, and accepted time of closure of metopic suture is around 2 years <sup>[6]</sup>. This is supported by 3D CT scan <sup>[4]</sup>. Premature closure of metopic suture occurs in 10% of patients with craniosynostosis <sup>[5]</sup>. Metopic sutures do not have any clinical significance and occasionally they are mistaken for cranial fractures <sup>[6]</sup>.

### Incidences

Rau et al studied metopic sutures on the Dravidian skulls in Madras populations in 1934 and the incidence was 4% <sup>[7]</sup>. Inderjit and Shah studied metopic sutures in Punjabi skulls in 1948 and the incidence was 5% <sup>[8]</sup>. The study by Woo in 1949 showed the highest incidence of 10% in Mongoloids <sup>[9]</sup>. Breathnac showed 4-7% of incidence in European populations and 1% in African populations in 1958 <sup>[10]</sup>. Bilodi et al studied metopic sutures in 2004 and the incidence was 11.46% <sup>[11]</sup>.

S.No	Author	Population studied	Year	Percentage
1	Rau et al 6	Dravidian	1934	4%
2	Inderjit , Shah	Punjabi	1948	5%
3	Woo	Mongoloids	1949	10%
4	Breathnac	Europeans	1958	4-7%
5	Breathnac	Africans	1958	1%

### MATERIALS AND METHODS

A study was done on unknown dry human skulls for the presence of metopic sutures in the department of anatomy in Velammal medical college and research institute. Each above 28 skulls constituted the materials for the present study. Each skull was taken and examined in detail for the presence of complete and incomplete metopic suture. There were 4 skulls showing complete metopic suture. This complete metopic suture is known as metopism. In 5 cases of incomplete metopic suture where it was not extending above the root of the nose. It was localized in the region of nasion. There were associated presence of long styloid process on the base of skull and in some skulls external occipital protuberance was prominent. The present study was well compared and correlated with available literature.

### Observation

3 skulls showed complete metopism where the suture was extending from nasion to bregma. 9 skulls showed incomplete metopic sutures almost localized in the region of nasion and just above nasion. There were 3 skulls showing frontal bosselations and prominent unilateral mastoid process. On observation corrugation of metopic suture was more on the posterior part than the anterior part in complete metopic suture. In incomplete metopic suture corrugation

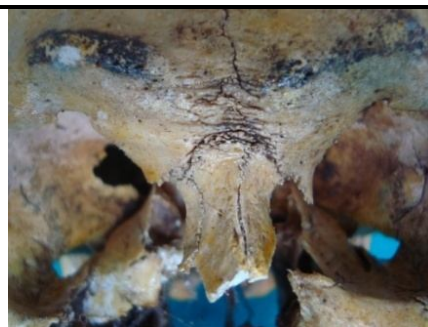
was more localized near the nasion and 1 cm above the nasion. In one skull there serrations was seen across the skull 2 cm above the nasion. This may be due to abnormal ossification.

S.No.	Research workers	Year	Skulls studied	Metopic suture (%)	Metopism (%)
1	Rau	1934	Dravidian	-	4
2	Inderjit and Shah	1948	Punjabi	32.5	5
3	Woo	1949	Mongoloids	-	10
4	Breathnach	1958	Europeans Africans	-	7-10 1
5	Fakuruddin and Bhalerao	1967	Indian	-	2
6	Dixit and Shukla	1968	Uttar Pradesh (India)	-	2.53
7	Linc and Fleischman	1969	Czech	-	11
8	Das et al	1973	Indian	24.67	3.31
9	Agarwal et al	1979	Indian	38.17	2.66
10	Ajmani et al	1983	Nigerian	34.97	3.4
11	Bilodi et al (previous study)	2004	-	11.46	3.92
12	Anjoo et al	2007	Indian	18.04	3.5
13	Bilodi et al (Present Study)	2014	South Indian	37.5	9.37

The above table shows higher percentage of metopic sutures studied in 32 South Indian skulls. The incidence of metopic suture in the present study is 37.5% which is higher than Ajmani et al studies in Nigerian skulls (34.97%). The percentage of metopism in the present study is 9.37%. In my previous study at Nepal<sup>[11]</sup> metopic suture incidence was 11.46% and metopism incidence was 3.92%. This difference may be due to racial difference or population difference or geographical difference.



Incomplete metopic suture with bilateral supraorbital notches



Incomplete metopic suture with bilateral supraorbital notches



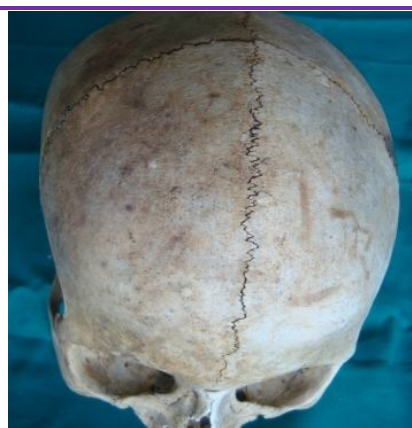
Interrupted incomplete metopic suture with widely placed supraorbital notches



Incomplete metopic suture with bilateral supraorbital foramen



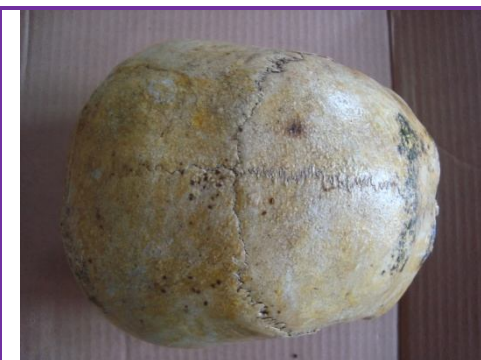
Incomplete metopic suture with bilateral supraorbital foramen



Complete metopic suture extending from nasion to bregma – (Metopism)



Complete metopic suture extending from nasion to bregma – (Metopism)



Complete metopic suture extending from nasion to bregma – (Metopism) – along with a horizontal suture in the region of frontal bone

## DISCUSSION

Incidence of complete metopic suture and incomplete suture was higher in rural population than in the urban population in the ratio of 4:1 and 4:2 respectively as per Baaten et al in Lebanese population <sup>[12]</sup>. A study by Ajmani et al on 206 Nigerian skulls showed metopic sutures in 34.97% of skulls and metopism in 3.4% of skulls <sup>[13]</sup>. A study conducted in Brazilian skulls by del Sol M et al showed metopism only in 2.5% of skulls and incomplete metopic suture is seen in 28.75% of skulls. The present study also shows more of incomplete metopic suture (17.86%) than complete metopic suture (10.71%) which goes in favour of del Sol M et al studies <sup>[14]</sup>. The persistence of metopic suture does not affect the shape of cranium as per the findings of Jit and Banga. He found the incidence of dolichocephalic heads which was same as that was seen in the population of non-metopic skulls <sup>[15]</sup>. Janusz Skrzat et al studied 24 skulls which showed various recognizable morphological patterns of metopic sutures. The suture was wavy and highly convoluted. The mean length of metopic suture was 123.1 mm and mean fractal dimension was 1.17 <sup>[16]</sup>.

### Present Study

This study was done on 32 dry unknown human skulls, which showed complete metopic sutures in 3 skulls and incomplete metopic sutures in 9 skulls. Incomplete suture was seen just above the nasion, whereas complete metopic suture is extending from nasion to bregma. The serrations or corrugations of complete metopic suture are more on the posterior half near bregma, but less on anterior half. The circumference of all the skulls is from 36 to 56 cm. 12 out of 32 skulls were heavy with prominent muscular markings on mastoid process which is a feature of male skulls. The orbit was round and supraorbital margins are prominent. The remaining skulls (20 out of 32) are light muscular markings are not well marked probably belonging to females. There were no mastoid canals or grooves.

## CONCLUSION

Study on metopic suture is purely of morphological importance and the pattern, type and degree of wavyness varies from species to species and race to race. This may be due to population difference or genetic difference.

## REFERENCES

1. Aksu F, Cirpan S, Mas NG, Karabekir S, Magden AO. Anatomic features of metopic suture in adult dry skulls. *J Craniofac Surg.* 2014 May;25(3):1044-6. doi: 10.1097/SCS.0000000000000564. PubMed PMID: 24699103.

2. Faro C, Benoit B, Wegrzyn P, Chaoui R, Nicolaidis KH. Three-dimensional sonographic description of the fetal frontal bones and metopic suture. *Ultrasound Obstet Gynecol.* 2005 Nov;26(6):618-21. PubMed PMID: 16193520.
3. Collins P. Neonatal anatomy and Growth. In: Williams PL, editor. in *Gray's Anatomy; The Anatomical Basis of Medicine and Surgery.* 38 th ed. London: Churchill Livingstone; 1995:343-73.
4. Bademci G, Kendi T, Agalar F. Persistent metopic suture can mimic the skull fractures in the emergency setting? *Neurocirugia (Astur).* 2007 Jun;18(3):238-40. PubMed PMID: 17622463.
5. Eppley BL, Sadove AM. Surgical correction of metopic suture synostosis. *Clin Plast Surg.* 1994 Oct;21(4):555-62. Review. PubMed PMID: 7813155.
6. Bademci G, Kendi T, Agalar F. Persistent metopic suture can mimic the skull fractures in the emergency setting? *Neurocirugia (Astur).* 2007 Jun;18(3):238-40. PubMed PMID: 17622463.
7. Rau R.K:Skull showing absence of coronal suture *J.Anat.London* :1934:69:109-112.
8. Inderjit and Shah M.A. Incidence of frontal or metopic suture amongst Punjabi adults. *I.M. Gazette* 1948; 83: 507-50.
9. WOO JK. Ossification and growth of the human maxilla, premaxilla and palate bone. *Anat Rec.* 1949 Dec;105(4):737-61. PubMed PMID: 15409816.
10. A.S. Breathnach. *Frazer's Anatomy of the Human Skeleton.* Fifth Edition. 1958. London. Page 177-185.
11. Bilodi AK, Agrawal BK, Mane S, Kumar A. A study of metopic sutures in human skulls. *Kathmandu Univ Med J (KUMJ).* 2004 Apr-Jun;2(2):96-9. PubMed PMID:15821373.
12. Baaten PJ, Haddad M, Abi-Nader K, Abi-Ghosn A, Al-Kutoubi A, Jurjus AR. Incidence of metopism in the Lebanese population. *Clin Anat.* 2003 Mar;16(2):148-51. PubMed PMID: 12589670.
13. Ajmani ML, Mittal RK, Jain SP. Incidence of the metopic suture in adult Nigerian skulls. *J Anat.* 1983 Aug;137 (Pt 1):177-83. PubMed PMID: 6630031; PubMed Central PMCID: PMC1171801.
14. Del Sol M, Binignat O, Bolini PD, Prates JC. [Metopism in Brazilians]. *Rev Paul Med.* 1989 Mar-Apr;107(2):105-7. Portuguese. PubMed PMID: 2629053.
15. Jit I, Banga N (1988) Metopism in north-west population of India. *J Anatomical Society of India,* 37: 45–60.

16. Skrzat J, Walocha J, Zawiliński J. A note on the morphology of the metopic suture in the human skull. *Folia Morphol (Warsz)*. 2004 Nov;63(4):481-4. PubMed PMID: 15712147.