Original Article

A STUDY ON METOPIC SUTURE IN ADULT SOUTH INDIAN SKULLS

Shanta Chandrasekaran*, Deepti Shastri**

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 completes3,4. 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 images7,8. 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 skulls5. 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%.12,136 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

**Figure 4:** Showing the ‘U’ 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%).

<table>
<thead>
<tr>
<th>Extent of suture</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Incomplete</td>
<td>64</td>
<td>40</td>
</tr>
<tr>
<td>Linear</td>
<td>28</td>
<td>17.5</td>
</tr>
<tr>
<td>‘U’ Shaped</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>‘V’ Shaped</td>
<td>12</td>
<td>07.5</td>
</tr>
</tbody>
</table>

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, but the incidence of metopism is lesser than European, Scottish, Mangoloids and higher than the incidence reported in other races. (Table 2)

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

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

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

**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.

**REFERENCES**:


**Authors**:

1. Shanta Chandrasekaran, Associate Professor, Department of Anatomy. Vinayaka Missions Kirupananda Vairiyar Medical College, Vinayaka Mission University, Salem. Tamilnadu, India.
2. Deepti Shastri, Professor & Head, Department of Anatomy. Vinayaka Missions Kirupananda Vairiyar Medical College, Vinayaka Mission University, Salem. Tamilnadu, India. E-mail: drshantasekaran@yahoo.co.in
In fetal skull the sutures are wide and allow slight movement during birth, but later they become rigid and fixed just like in the adults. Key facts. Anterior aspect of skull. Frontonasal suture - between the frontal bone and nasal bones
Frontozygomatic suture - between the frontal bone and zygomatic bone
Zygomaticomaxillary suture - between zygoma and the maxilla
Intermaxillary suture - between two maxilla
Metopic suture - found in children; on the midline of the frontal bone. The width of this joint is significantly increased during a maxillary expansion treatment. The metopic suture is a persistent childhood suture that runs down the midline of the frontal bone. Want a speedy way to learn skull anatomy? Check out our skull bones quizzes and diagrams.

Posterior view.


Methods: This study was conducted with 80 human adult dry skulls. Observations and results: Out of 80 skulls studied, a complete metopic suture was found only in one case (1.25 %), whereas an incomplete suture was observed in 18 cases (22.5 %). Among the incomplete ones, 13 were linear, 4 were V shaped and 1 skull had U shaped metopic suture. The remaining 76.25% of the skulls did not show a metopic suture. Suture in the Indian adult population. Obtaining more conclusive results demands study of more number of the skulls, as well as carrying out comparative studies between the different regions. Figure 1a.