

## Morphometric Study of Metopism in Human Adult Dry Skulls

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### **Abstract:**

**Introduction:** Frontal bone is one of the unpaired bones of the skull. This bone develops in two halves and presents a metopic suture between the two in foetal life. However the suture disappears completely before or shortly after birth. It is essential to know about metopic suture, failing which; it can be easily misunderstood as fracture of frontal bone. It is also important for paleodemography and forensic medicine.

**Methods and Materials:** This study was conducted at Institute of Anatomy, Madras Medical College, Chennai among the 100 human adult dry skulls.

**Results:** The present study showed that metopic suture present in 27% skulls. Complete metopic suture present in 4% of skulls. Among incomplete metopic suture linear type was common. The present study showed that presence of linear, 'V' shaped and 'U' shaped metopic suture were 12%, 6% & 5% respectively.

**Conclusion:** The incidence of metopism is similar when compared with the previous studies. In the previous studies, it is observed that the incidence of metopism(complete metopic suture) was 4-5%.

**Key words:** Metopic suture, Nasion, Bregma & Metopism.

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### **I. Background**

The suture between frontal and parietal bone is coronal suture. Sagittal suture is between two parietal bones. Bregma is the meeting point of the sagittal and coronal sutures. It is represented by the anterior fontanelle in the foetal life. This usually disappears at the age of eighteen months.

Frontal bone ossifies in fibrous mesenchyme from two primary ossification centres which appear in the eighth week of intrauterine period. The metopic suture is present at birth. It is usually obliterated approximately at the age of second year. But it may extend up to the age of 6 to 8 years. The metopic suture extends from the point of junction between forehead and the root of nose known as nasion to the anterior the angle of bregma. Metopic suture is a kind of dentate suture.

The morphology of metopic suture varies. When the metopic suture extends from bregma to nasion, it is called as complete metopic suture and if not it is called as incomplete metopic suture. The complete metopic suture from nasion to bregma is known as Metopism.

Metopic suture can be due to various causes such as abnormal growth of cranial bones, growth interruption, heredity, sexual, hormonal influence, atavism, cranial malformation and hydrocephalus.

Incidence of metopic suture varies in different races. Indian studies reports that the metopic sutures are varying in different regions of the country ranging from 2.66% to 5%.

To study whether the metopic suture is persistent or not and whether it is complete or incomplete and also study the morphology of the metopic suture. This knowledge is useful to Radiologists and Neurosurgeons in studying skull x-rays and also avoid the misdiagnosis of metopic suture as frontal bone fracture.

### **Methods**

The present study was conducted in the Institute of Anatomy, Madras Medical College, Chennai.

### **Materials:**

Hundred human adult dry skulls of unknown sex without any gross pathology or abnormality were used for the study. All the skulls included in the study were adults as evidenced by the eruption of third molar teeth.

### **Inclusion criteria:**

- 1) Adult human dry skull irrespective of sex.
- 2) Calvarias intact.
- 3) Third molar tooth erupted.
- 4) Sutures well defined.

**Exclusion criteria:**

- 1) Damaged skulls.
- 2) Newborn, infants and children skulls.
- 3) Very old skulls with obliterated sutures.

The following parameters were recorded in relation with metopic suture in all the skulls.

- 1) Presence or absence of metopic suture.
- 2) Complete or incomplete metopic suture.
- 3) Shape of incomplete metopic suture. They were grouped as ‘U’ shaped, ‘V’ shaped, linear, ‘H’ shaped and inverted ‘U’ shaped.

**II. Results & Discussion**

Out of hundred human dry skulls studied, twenty seven skulls had metopic suture (27%) either complete or incomplete extent. Remaining seventy three skulls (73%) had neither complete nor incomplete metopic Suture (Fig 1,2,3,4,table 1).(chart 1)

**Table 1**

SNO	Metopic suture	No of skulls ( N-100)	Percentage
1)	Present	27	27%
2)	Absent	73	73%

Out of the twenty seven skulls which had metopic suture, only four skulls (4%) had complete metopic suture and exhibit metopism. Remaining twenty three skulls (23%) had incomplete metopic suture. (table 2)

**Table 2**

SNO	Extent of metopic suture.	No of skulls (N-100).	Percentage.
1)	Complete.	4	4
2)	Incomplete.	23	23

Among the twenty three skulls which had incomplete metopic suture, twelve skulls (52.2%) showed linear type, six (26.1%) showed ‘V’ shape and five skulls (21.7%) showed ‘U’ shape. (Fig 5,6,7,tab 3).(Chart 2)

**Table 3**

SNO.	Shape of incomplete metopic suture.	No of skulls (N-100).	Percentage.
1)	Linear.	12	12
2)	‘V’ shaped.	06	06
3)	‘U’ shaped.	05	05
4)	‘H’ shaped	0	0
5)	Inverted ‘U’ shaped.	0	0

There were no skulls which had either ‘H’ shaped or inverted ‘U’ shaped metopic suture.

**III. Conclusion**

The present study shows that the incidence of metopic suture is 27%.Of the total incidence of metopic suture; it is observed that the incidence of metopism i.e complete metopic suture which extends from nasion to bregma without interruption is 4%.Among the incomplete metopic sutures,linear type is the most commonone followed by ‘V’ shaped and ‘U’ shaped incomplete metopic suture. Among the African skulls, it was noted that the incidence of metopism was as low as 1%.The study among the Cezhianskulls; the incidence of metopismwas as high as 11%.This geographical differences may be due to genetic and environmental factors. This knowledge of metopic sutures is necessary to avoid any mistakes in correlating the various types of metopic sutures as fractures in frontal bone during radiologicaevaluation of skulls.

**IV. Review Of Literature**

**Inderjith et al (1948)<sup>9</sup>** found that the presence and absence of metopic suture were18.75% and 81.25% respectively amongst Punjabi adult human dry skulls respectively.

**Ajmani M.C et al (1983)<sup>1</sup>**in their study of 137 Nigerian human adult dry skulls showed that presence and absence of metopic suture were 34.97% and 65.03%respectively.

**Bilodi A.K et al (2004)<sup>3</sup>** found that the presence and absence of metopic suture were11.4% and 88.6% respectively amongst 51 Nepal adult human dry skulls.

**Marco Antonio Sant'Ano Castilho et al (2006)<sup>12</sup>** in their study of 71 Brazilian human adult dry skulls showed that presence and absence of metopic suture were 39.4% and 60.6% respectively.

**Hussain Saheb.S et al (2010)<sup>9</sup>** found that the presence and absence of metopic suture were 29.6% and 70.4% respectively amongst 125 South Indian adult human dry skulls.

**Anjoo yadav et ai (2010)<sup>2</sup>** in their study of 1020 North Indian human adult dry skulls showed that presence and absence of metopic suture were 18.04% and 81.96% respectively.

**Shantha Chandrasekaran et al (2011)<sup>17</sup>** found that the presence and absence of metopic suture were 45% and 55% respectively amongst 160 South Indian adult human dry skulls.

**Kalyana chakaravarthi.K et al (2012)<sup>10</sup>** in their study of 80 South Indian human adult dry skulls showed that presence and absence of metopic suture were 45% and 55% respectively.

**Neelima Pilli et al (2013)<sup>14</sup>** found that the presence and absence of metopic suture were 42.5% and 57.2% respectively amongst 180 South Indian adult human dry skulls.

**Rani Nallathamby et ai (2013)<sup>15</sup>** in their study of 120 South Indian human adult dry skulls showed that presence and absence of metopic suture were 85% and 15% respectively.

**Inderjith et al (1948)<sup>9</sup>** found that the incidence of complete and incomplete metopic suture were 5% and 13.75% respectively.

**Romanes C.J et al (1964)<sup>16</sup>** in their study of European human adult dry skulls found that the incidence of metopism was 8%.

**Frazer Anatomy of human skeleton (1965)<sup>6</sup>** stated that the incidence of metopism amongst European, African and Mongolian human dry skulls were 7-10%, 1% and 4-5% respectively.

**Dixit C.S et al (1968)<sup>5</sup>** in their study of Uttar Pradesh state human adult dry skulls found that the incidence of metopism 2.53%.

**Linc.R et al (1969)<sup>11</sup>** found that the incidence of metopism amongst the Czech human adult dry skulls was 11%.

**Das.A.C et al (1973)<sup>4</sup>** in their study of Uttar Pradesh state human adult dry skulls found that the incidence of metopism 3.31%.

**Ajmani M.C et al (1983)<sup>1</sup>** in their study of 137 Nigerian human adult dry skulls showed that the incidence of metopism and incomplete metopic suture were 3.4% and 30.10% respectively.

**Bilodi A.K et al (2004)<sup>3</sup>** found that the incidence of metopism and incomplete metopic suture amongst the 51 Nepal human dry skulls were 3.92% and 7.48% respectively.

**Marco Antonio Sant'Ano Castilho et al (2006)<sup>12</sup>** in their study of 71 Brazilian human adult dry skulls showed that the incidence of metopism and incomplete metopic suture were 7% and 32.4% respectively.

**Hussain Saheb.S et al (2010)<sup>7</sup>** found that the incidence of metopism and incomplete metopic suture amongst South Indians skulls were 4% and 33% respectively.

**Anjoo yadav et ai (2010)<sup>2</sup>** in their study of 1020 North Indian human adult dry skulls showed that the incidence of metopism and incomplete metopic suture amongst the North Indians skulls were 3.5% and 14.6% respectively.

**Shantha Chandrasekaran et al (2011)<sup>17</sup>** found that the incidence of metopism and incomplete metopic suture amongst 160 South Indian skulls were 5% and 40% respectively.

**Kalyana Chakaravarthi. K et al (2012)<sup>10</sup>** in their study of 80 South Indian human adult dry skulls showed that the incidence of metopism and incomplete metopic suture were 8.25% and 38.75% respectively.

**Neelima Pilli et al (2013)<sup>14</sup>** found that the incidence of metopism and incomplete metopic suture amongst 180 South Indian skulls were 5% and 42.5% respectively.

**Rani Nallathamby et ai (2013)<sup>15</sup>** in their study of 120 South Indian human adult dry skulls showed that the incidence of metopism and incomplete metopic suture were 3.33% and 81.66% respectively.

**Inderjith et al (1948)<sup>9</sup>** described 11.25% ‘V’ shaped incomplete metopic suture, 1.25% ‘Y’ shaped incomplete metopic suture and 1.25% ‘H’ shaped incomplete metopic suture in their study.

**Ajmani M.C et al (1983)<sup>1</sup>** in their study of 137 Nigerian human adult dry skulls showed that the incidence of linear shaped metopic suture was 24.27% and inverted ‘V’ shaped incomplete metopic suture was 0.49%.

**Bilodi A.K et al (2004)<sup>3</sup>** described 3.92% ‘V’ shaped incomplete metopic suture, 1.96% ‘Y’ shaped incomplete metopic suture and 1.25% ‘H’ shaped incomplete metopic suture in their study of the 51 Nepal human dry skulls.

**Marco Antonio Sant’Ano Castilho et al (2006)<sup>12</sup>** in their study of 71 Brazilian human dry skulls found that the incidence of linear incomplete metopic suture was 22.5%, ‘V’ shaped incomplete metopic suture was 5.6% and double metopic suture was 42%.

**Shantha Chandrasekaran et al (2011)<sup>17</sup>** described 17.5% linear incomplete metopic suture, 15% ‘U’ shaped incomplete metopic suture and 7.25% ‘V’ shaped incomplete metopic suture in their study of 160 South Indian human dry skulls.

**Kalyana chakaravarthi.K et al (2012)<sup>10</sup>** in their study of 80 South Indian human adult dry skulls showed that the incidence of linear incomplete metopic suture was 18.75%, ‘V’ shaped incomplete metopic suture was 10% and ‘U’ shaped incomplete metopic suture was 10%.

**Neelima Pilli et al (2013)<sup>14</sup>** described 8.8% linear incomplete metopic suture, 6.1% inverted ‘U’ shaped incomplete metopic suture, 10% ‘V’ shaped incomplete metopic suture, 7.7% ‘H’ shaped incomplete metopic suture and 3.8% ‘Y’ shaped incomplete metopic suture in their study of 180 South Indian human dry skulls.

**Rani Nallathamby et ai (2013)<sup>15</sup>** in their study of 120 South Indian human adult dry skulls showed that the incidence of linear incomplete metopic suture was 26.53%, ‘V’ shaped incomplete metopic suture was 13.26%, ‘U’ shaped incomplete metopic suture was 12.24%, double linear incomplete metopic suture was 13.26%, ‘H’ shaped incomplete metopic suture was 7.14%, ‘Y’ shaped incomplete metopic suture was 5.1% and inverted ‘U’ shaped incomplete metopic suture was 2.04%.

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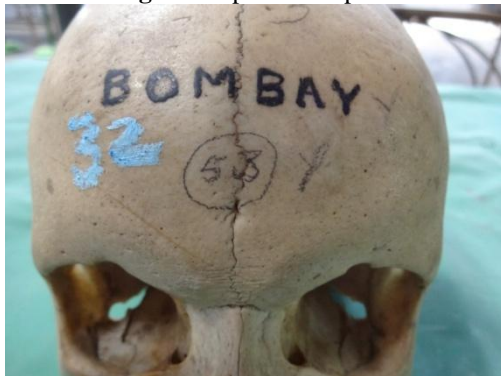
**Fig 1** Incomplete metopic suture.



**Fig-2** Incomplete metopic suture



**Fig-3** Complete metopic suture.



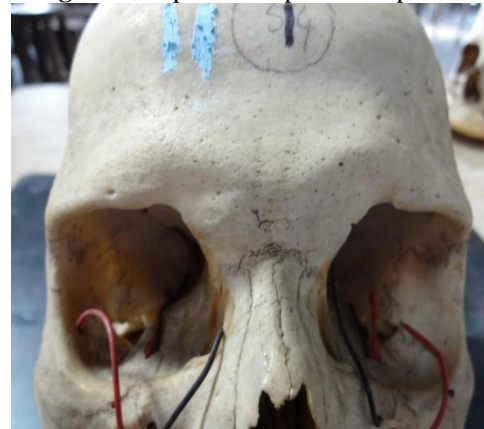
**Fig-4** Complete metopic suture



**Fig-5** Linear shaped incomplete metopic suture.



**Fig-6** 'V' shaped incomplete metopic suture



**Fig-7** 'U' shaped incomplete metopic suture



Chart 1

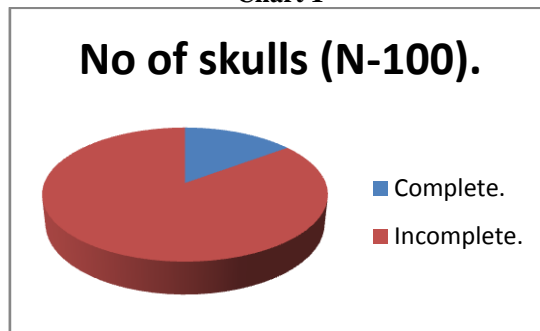


Chart 2

