

## A Complete Metopic Suture in an Adult Human Cadaveric Skull

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### Introduction:

In some foetal skulls, the two halves of the frontal bone are separated by the midline or median frontal suture. This suture typically fuses by the age of 6 to 8 years. However, in some cases, it may persist beyond this age as a complete or incomplete metopic suture,

due to the failure of the two halves of the frontal bone to unite. The incidence of metopism varies among different racial groups. Therefore, the present study was undertaken.

**Aim of study:** To find out the incidence of metopism in adult human cadavers.

**Method:** Metopism's prevalence was investigated. Twenty male and five female adult human cadavers, acquired from the Department of Anatomy at Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra, were evaluated for the existence of metopic suture. The metopic sutures were divided into two categories: incomplete and complete (metopism).

### Observations and Results:

The incidence of metopic sutures in this study is approximately 2 (8%). This investigation only identified one form of metopic suture: incomplete metopic suture 0% and complete metopic suture 2 (8%), which were discovered in male cadavers.

**Conclusion:** The data of present study showed the incidence of metopic sutures (Metopism) useful in the field of Forensic medicine, Radiology, Anatomy, Neurosurgery.

**Keywords:** Metopic suture, Metopism, Median frontal suture.

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### Introduction:

The frontal bone makes up the bony structure of the forehead and connects below with the nasal and zygomatic bones. In a foetal skull, the frontal bone exists as two separate halves, divided by the frontal suture or metopic suture. These halves typically fuse together by around the age of six<sup>1</sup>.

According to Manzanares et al.<sup>2</sup>, by the end of the second month of foetal development, two primary ossification centres emerge from the membrane to form the metopic suture. The fusion process, which involves chondroid tissue, usually starts near the inner surface of the skull. Usually, this suture closes in early childhood or infancy. But in some people, it might not fuse at all or only partially.

When metopic suture runs continuously from the bregma to the nasion, it is known as metopism, persistent metopic suture, or sutura frontalis persistens. If the suture is segmented or appears in fragments, it is called an incomplete metopic suture. In such instances, the remaining suture rarely extends beyond the outer layer of the frontal bone, and sometimes it doesn't reach even that far<sup>3</sup>.

"The bones of the skull are connected by a dense connective tissue framework, primarily composed of collagen. These bones are united through immovable joints known as sutures or synarthroses" <sup>4</sup>.

"This suture is located between the superciliary arches and the frontal tubers of the frontal bone, and is therefore also referred to as the median frontal suture."<sup>5</sup>

The frontal bone is a single, unpaired bone that forms the forehead, also referred to as the "frons." The metopic suture or frontal suture, is a dentate-type calvarial suture that runs along the midline of the frontal bone<sup>3</sup>.

The closure of the suture starts around 2 yrs and completes within 7-8 yrs. However there varied opinion about the time of completion of closure of metopic suture. Persistence of metopic suture in adulthood is called as Metopism<sup>4</sup>.

According to Weinzweig J the term "complete metopic suture" refers to a dense connective tissue that extends from the bregma to the nasion<sup>6</sup>.

The persistence of the metopic suture has been reported in 1% to 12% of skulls. Keith notes that the metopic suture typically fuses by the end of the first year or early in the second year of life<sup>7</sup>.

while Piersol<sup>2</sup> suggests that it may remain open until the end of the fourth year, with a faint remnant occasionally visible at the lower end.

According to A.K. Datta, each half of the frontal bone ossifies from a separate center, and the metopic suture between them is usually obliterated by the age of six years<sup>8</sup>.

Warwick & Williams, Moore et.al, also reported that the metopic suture was usually obliterated by 8 years<sup>2</sup>.

## **Materials and Methods**

### **Study design**

The current research as observational study

### **Study setting**

A total of 25 adult human cadavers of both sexes (20 males and 5 females) were examined for the presence of a metopic suture in the Department of Anatomy, Krishna Vishwa Vidyapeeth (Deemed to be University), Karad, Maharashtra. The metopic sutures were categorized as either complete (metopism) or incomplete types.

The metopic suture classification followed by Ajmani et.al.<sup>9</sup> were applied.

Classification of Metopic Suture According to Ajmani et al.

1. Complete Metopic Suture (Metopism):

- A persistent suture extending from the bregma to the nasion.
- This condition is termed "metopism" and is considered a normal anatomical variant.

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2. Incomplete Metopic Suture:

- A suture that does not extend the full length from bregma to nasion.
- Further subclassified based on the location of persistence:
  - Nasion-Incomplete Type: Persistence at the nasion end.
  - Bregma-Incomplete Type: Persistence at the bregma end.





**Figure 1: Skulls showing metopism extending from nasion to bregma  
(A: Dry Skull, B: Human cadaver skull)**

Approximately 25 adult skull bones from both sexes were examined in the Department of Anatomy at Krishna Institute of Medical Sciences, Karad (Maharashtra), over a period of one year. The presence of a metopic suture was observed in 2 of the cadaveric skulls. In both cases, the sutures were complete, extending from the bregma to the nasion. The incidence was found to be approximately 8%.

### Observations and Results

The skull bones of two adult human cadavers showed complete metopic sutures extending from the bregma to the nasion. No incomplete type of metopism was observed. In some skulls, the posterior end of the metopic suture did not align precisely with the sagittal suture, while in others, it did. Similarly, the anterior end did not align exactly with the internasal suture in some skulls, but aligned properly in others.

**Table 1: Incidence of complete and incomplete metopic sutures**

Type of suture	Number (25)		Percentage %
	Male	Female	
Complete	2	0	8
Incomplete	0	0	0



Fig.2: Normal skull bone



Fig.3: Showing complete type of metopic suture



**Discussion:**

**Table 2: Incidence of metopism in different regions as reported by various author's**

Name of Author (Year)	Regions of India	Incidence (%)
Rani Nallathamby.et al <sup>3</sup> (2013)	South India	3.33
Ravikumar <sup>1</sup> (2016)	Karnataka	5
Agarwal. et al.,(1979)	Indian (Kanpur)	2.66
Pankaj et al <sup>11</sup> , (2009-2014)	Indian (Akola)	1.25
Anjoo Yadav <sup>14</sup> et al., (2010)	Indian (North India)	18.04
Pilli N (2013)	South India	4.25
Hussain Saheb S et al (2010)	Davangiri (Karnataka)	3.2
Banani Kundu et al (2017)	Kolkata (west Bengal)	0.82
<b>Present study</b>	<b>Indian (Maharashtra)</b>	<b>8</b>

According to the study, the adult population in East India has a metopism incidence of 3.68%, which is similar to that in other regions of India. Actually, research on the Indian population has shown that the prevalence of metopism varies from 2.66 to 5% in different parts of the nation <sup>2</sup>.

In the present study, metopism was found in 8% in adult human cadavers. which is correlated with studies of Indian authors and the incidence of the metopism is higher in males than in females.

In a study of 120 skulls, Rani Nallathamby,et al<sup>3</sup> discovered that 81.66 percent (98 out of 120 ) of the skulls had metopic suture, with 4 skulls (3.33%) having complete metopic suture.

Ravikumar<sup>1</sup> found that out of 115 skulls 5 (7.04%) had complete metopic suture.

Ajmani et al<sup>9</sup>. investigated the prevalence of metopic suture in 206 adult Nigerian skulls. They found that whereas metopism was present in 3.4% of instances, 34.97% of the skulls had an incomplete metopic suture.

According to Hussain Saheb S et al., Out of 125 skulls studied complete metopic suture was found in only four cases (3.2%), whereas incomplete suture was observed in 33 cases (26.4%)<sup>10</sup>.

The frequency of metopic suture in 133 adult dry skulls was examined by Banani Kundu<sup>2</sup> et al. They discovered that 36.09 % of the skulls had an incomplete metopic suture, while 0.82 % of cases showed metopism.

The metopic suture was present in 52(64.1%) cases out of 80 skull bone and incidence was 1.25% in the study conducted by Pankaj et al<sup>11</sup>

Sharada B Menasinkai <sup>12</sup> observed the presences of Metopic suture in 38%. Complete suture was seen in 3% and incomplete in 35%.

Basha and Sugavasi<sup>13</sup> studied South Indian skulls, revealing that persistent Metopic sutures were completely observed in one out of 100 dried human skulls.

Metopic suture can result from a number of factors, including atavism, cranial deformities, developmental disruption, genetics, sexual impact, hormones, and hydrocephalus.<sup>7</sup>

Forensic specialists and medicolegal advisors find the knowledge regarding metopic sutures to be instructive. From a radiological and surgical perspective, the doctor should pay attention to their morphological details. Among other craniofacial abnormalities, metopic suture has been connected to cleft lip, cleft palate, and frontal sinus abnormalities.<sup>15</sup>

### **Conclusion:**

The occurrence of the metopic suture was investigated in this study using the skulls of 25 adult human cadavers. In 8% of instances, metopism of the skull was found. Because vertical fractures of the frontal bone might be misinterpreted for persistent metopic sutures, neurosurgeons and radiologists in routine clinical practice need to have a solid awareness of the metopic suture. When treating trauma patients and performing surgeries like frontal craniotomies, this anatomical knowledge is especially helpful. The purpose of the current

study is to present significant anatomical information on the metopic suture in the adult population of Maharashtra. More research with a greater number of skulls and comparative analysis across various locations are advised in order to draw more conclusive findings.

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