Original Research Article

An Autopsy Based Comparative Study Between Males and Females Age of Sagittal Suture fusion at Tertiary Health Care Center at Jaipur (Rajasthan)

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Abstract

Background: A reasonably correct estimation of age in elderly people is essential in legal, medical, social and administrative matters. Skulls are usually well preserved in decomposed, mutilated state or in fragmentary bodies. Sagittal suture has a very wide range of fusion. The aim of this study is to collect data of sagittal suture fusion of male and female and comparing with each other, so the more appropriate estimation of age can occur by including sexual dimorphism of sagittal sutural fusion.

Material and Methods: This study was conducted in 100 autopsy cases of Department of Forensic Medicine, S.M.S. Medical College & Attached Hospital, Jaipur of aged between 20 to 70 yrs, With making group of male and female for each year of age. The obliteration of the sutures was ascertained endocranially as well as ectocranially. The Sagittal suture was studied in four parts and Scale for closure is studied by Acsadi-Nemeskeri complex method

Results: Ectocranially the start of fusion of sagittal suture was observed at the age of 51-60 yrs age group in females and in 46-50 yrs in males and endocranially at 31-40 yrs in males and 41-50 yrs in females.

Conclusion: When comparison between males and female subjects for ectocranially closure were made, closure was earlier in males. Completion is perfected at the age of 61-70 years. The study showed that fusion of endocranium began first on S4 & last on S1 in both sexes.

Though consensus of opinion in our country is that the obliteration of the skull sutures in females is somewhat earlier than that of males, in the present study no such pattern in difference was noticed in endocrinal sutural fusion.

Key Words: Age, Female, Fusion, Male, Sagittal suture

Introduction

The need of determination of age continues from intrauterine life to old age for different purposes. A reasonably correct estimation of age in elderly people is essential in legal, medical, social and administrative matters i.e. to fix of age for regularization of employment, superannuation, pension settlements, senior citizen benefits, old age

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and good behavior of the prisoner. There are various ossification studies used to determine the age of the person with certain degree of accuracy from birth to 25 years[1,] but scientific estimation of age is not an easy task especially in adult age group. In older age groups skull sutures are useful which are fibrous joints in the craniofacial skeleton and are simple at birth[2]. Sutural obliteration is a multifactorial phenomenon depending on age, genetic factors, tensile stresses, brain growth, tissue interactions, and biochemical signaling[3,4,5,6]. Therefore, age estimation using only suture obliteration is unreliable.[7] However, suture obliteration can be used with other identification indicators to conclusively determine the age.[8,9,10]

In 1905, F. G. Parsons and C. R. Box examined that Dwight was justified in his assessment that cranial sutures closed later in females[11]. Powers 1962[12] studied that obliteration of cranial sutures commences earlier in the males than in females. Chandra B.[13], January 2007 to March 2008 observed that Females showed earlier union than males in the age group 20- 29, in the other age groups suture closure occurred earlier in males.

By using skull sutures, age estimation can be done in the bodies which are found in decomposed, mutilated state or only fragmentary. Since the bone resists putrefaction and destruction by animals, they can lead to the reliable determination of age, sex, race and stature of the individual. The sagittal suture has wide range of fusion.

Since the cranial sutural fusion is influenced by heredity, climate, race, diet, hormone level, disease process etc. So this study on the sagittal suture was conducted to develop the statistical data in relation of sagittal suture fusion with respect to the age of individuals and studying the comparing with difference among male and female of Jaipur region.

This study was conducted to observe and compare the age of fusion of Sagittal suture in males and females during autopsy.

Material and Methods

This study was conducted in autopsy cases conducted in Department of Forensic Medicine, S.M.S. Medical College & Attached Hospital, Jaipur after taking permission from review research board and institutional ethical committee and completing all due formalities during 1st August 2020 to 31st April 2021.

Autopsy cases of age between 21 to 70 yrs with documented age were included and subjects with skull fracture, associated documented calcium/ metabolic/ endocrinal disorders, history of flame burn/electrical injuries and cases where proper consent could not be obtained were excluded from the study.

The obliteration of the sutures were ascertained endocranially as well as ectocranially. The Sagittal suture was studied in four parts:- **S1**- [Pars bregmatica (i. e. anterior1/3 part) of Sagittal suture]; **S2**- [Pars verticis (i.e. middle1/3 part) of Sagittal suture]; **S3**- [Pars obelica (i.e. posterior1/3 part) of Sagittal suture]; **S4**- [Pars lambdicia (i.e. fourth part) of Sagittal suture]

Scale for closure: Acsadi-Nemeskeri complex method[1]

0 = open. There is still little space left between edges of adjoining bones.

1 = incipient closure. Clearly visible as a continuous often zigzagging line.

2 = closure in process. Line thinner, less zigzags, interrupted by complete closures

3 = advanced closure. Only pits indicate where the suture is located (almost complete closure)

4 = closed. Even location cannot be recognized.

Results

100 cases were selected in 5 groups, each of ten year age intervals i.e. 21-30 yrs, 31-40 yrs, 41-50 yrs, 51-60 yrs, 61-70 yrs. Males and females were equally distributed that is 10 males and 10 females in each group (sex ratio 1:1). (table no.1)

The fusion of sagittal suture was observed ectocranially at the age of 52-69 yrs in females and in 46-62 yrs in males; and endocranially at 31-61 yrs in males and 40-68 yrs in females (table no. 2).

The minimal age of fusion at endocranium was 61, 46, 40 and 31 in males and 68, 49, 50 and 40 years in females at S1, S2, S3 and S4 locations respectively. The ectocrainium fusion in respective segments are as 60,53, 62, 46 of S1, S2, S3 and S4 locations (table no 3).

When comparison between males and female subjects for ectocranially closure were made, closure was earlier in males.

In sagittal suture mean age of closure ectocranialy was lower in males and statistically significant difference was found in S1 and S2. In sagittal suture mean age of closure ectocranialy was lower in males and statistical significant difference was found in S1. In S2, S3, S4 mean age of closure was not significant.

The maximum age in male showing non-union of suture on endocranium was 67 years on S1, 69 years on each S2 and S3, 62 on S4. In female it was 69 years on S1, 67 years on S2, 68 years on S3, 51 on S4. In male, on ectocranium it was 67 years on S1, 70 years on S2, 66yr on S3, 60 on S3. Among the female maximum age of non-union of ectocranium was observed to be 68 years on S1, S2, S3 whereas S4 had 70 yr(table no 4).

In sagital suture mean age of closure endocranialy was lower in males and statistically significant difference was found in S1 and S2.

In sagital suture mean age of closure ectocranialy was lower in males and statistically significant difference was found in S1. In S2, S3, S4 mean age of closure was not significant (table no 5).

The development and consolidation of the bones of the skeleton, which ossify in cartilages occurs, as a rule, about two yrs earlier in females than in males. But obliteration of sutures of vault of skull sets in a little later and proceeds slowly in females than in males. In our study also the fusion of cranial sutures was observed earlier in males as compared to females and earlier endocranially than ectocranially.

The study showed that fusion of endocranium began first on S4 & last on S1 in both sexes. Though consensus of opinion in our country is that the obliteration of the skull sutures in females is somewhat earlier than that of males, in the present study no substantial difference was noticed. This finding is in conjunction with Meindl and Lovejoy[7].

Table 1: Age wise distribution

Age group (Yrs.)	Sex distribution of cases	No of cases	Percentage
21-30	10 males + 10 females	20	20.00
31-40	10 males + 10 females	20	20.00
41-50	10 males + 10 females	20	20.00
51-60	10 males + 10 females	20	20.00
61-70	10 males + 10 females	20	20.00
Total	50 males +50 females	100	100.00

Table 2: Age of complete fusion of sagittal sutures

	S1		S2		S3		S4	
	Male	Female	Male	Female	Male	Female	Male	Female
Ectocranially (age group in yrs)	60-69	65 – 69	53-59	61-69	62-69	69-70	46-50	51-60
Endocranially (age group in yrs)	61-69	68-70	46-49	49-55	40-49	50-59	31-40	41-50

Table 3: Minimum Age (in years) of complete Union of Sagittal Sutures

Sagittal Suture	Male		Female	
	Endo-cranium	Ecto-cranium	Endo-cranium	Ecto-cranium
S1	61	60	68	65
S2	46	53	49	61
S3	40	62	50	69
S4	31	46	40	52

Table 4: Maximum Age (in years) of non-union of Sagittal Suture

Sagittal Suture	Male		Female	
	Endo-cranium	Ecto-cranium	Endo-cranium	Ecto-cranium
S1	67	67	69	68
S2	69	70	67	68
S3	69	66	68	68
S4	62	60	51	51

Table 5: Mean age of complete fusion of sagittal suture

	Mean age of complete fusion Ectocranially					Mean age of complete fusion Endocranially				
SUTURES	Male		Female		P value	Male		Female		P value
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
S1	65.62	3.11	68.00	1.67	**0.0001***	63.75	2.82	70	0.01	**0.0001***
S2	61.75	4.84	65.71	2.82	**0.001***	57.11	7.72	59.07	6.28	**0.167**
S3	66.00	2.53	66.00	3.40	**1.000**	54.2	9.45	56	7.72	**0.229**
S4	59.76	7.14	61.00	5.41	**0.330**	50.10	12.92	53	13.78	**0.280**

Conclusion

Present study reveals that obliteration of the various segments of the sagittal sutures of the skull is so erratic that neither does it help in estimating the age of the deceased nor does it provide any supportive evidence in determining the age of skeletal remain. Our analyses strengthens the view that regardless of scoring method, there is only a very loose association between suture closure and age, and this poses a real problem in terms of practical use for age determination. It is important to refine the methods of quantifying these structures and the underlying biological factors for suture closure, in order to render the methods of quantification as unbiased as possible.

Suggestion

This study was confined to a particular area at Jaipur region, confined to a very small sample size in comparison to the population of Jaipur and persons of extreme ages for closure of suture were not taken which should be included to find more appropriate results. Smaller age groups can be studied to get better results. Age estimation from morphological changes in bone is affected by various factors such as climatic, dietetic, hereditary, nutritional, sociological, racial, environmental, geographical, genetic factors, tensile stresses, brain growth, tissue interactions, and biochemical signaling etc. which may affect cranial sutures as well. These factors may be subjects of further studies in this field./;po

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