



STUDY OF PATTERN OF FUSION OF SAGITTAL SUTURE USING SKULL RADIOGRAPHY AND ITS ASSOCIATION WITH DOCUMENTED AGE IN FEMALES

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ABSTRACT Cranial sutures are often sought to comment on age in an individual. They as a method of age estimation are often debatable. However when used with other criteria, they are held a reliable age assessment criteria. Sutures fuse much later in age as compared to the other skeletal parameters. In this study we have used the sagittal suture in female on roentgenograms to study the stage of fusion of the suture when the age of an individual is known. We have used Key Score to stage the fusion. We have divided our samples in the age group of 20-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55, 56-60, 61-65, 66-70, 71-75, 76-80 years. We have used the documented age to study the stage of fusion the suture is in.

KEYWORDS : Sagittal suture; age; fusion; stage; female

Introduction

Identification is the establishment of the individuality of a person. It maybe: Complete- absolute ascertainment of identity or Partial / Incomplete- in which certain facts of identity are ascertained and others are unknown. 1,2,3Age, Sex, Stature and Race are considered the Primary parameters in forensic identification2,3.

Sutures are like epiphysis diaphysis plane. The edges are the loci of growth and they have a time of closure 4. For the study of sutures, in skull roentgenogram, the skull sutures can be divided into upper half and lower half5,6.

Baker 7used three scores:

- 1. O (Open)
- 2. P (Partial union)
- 3. C (Complete union).

Serrations on radiographs have been reported as: None- flight-Medium- Complex 7.

An antero-posterior view and postero-anterior view of the radiograph of the skull shows the Sagittal, Coronal and Lambdoid sutures 1, 2,3. Plain film radiography is a cost effective method in evaluating skull fractures, sutures and vascular grooves 8.



Figure 1: 21 years/Female Antero-Posterior view of the skull

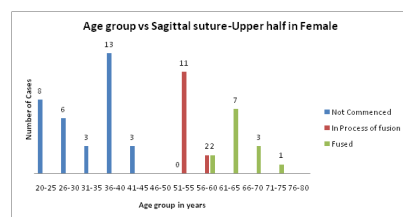


Figure 2: 55 years, female Antero-posterior view of the skull showing sagittal suture.

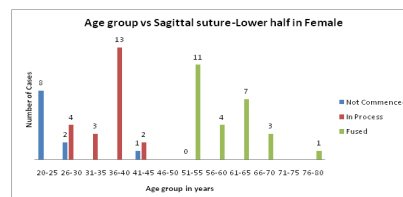
Sagittal Suture Fusion: Female

Table 1: Fusion of Sagittal suture in Female

AGE (in years)	NUMBER OF CASES		UPPER HALF						LOWER HALF					
	NUMBER	PERCENTAGE	NOT COMMENCED		IN PROCESS		FUSED		NOT COMMENCED		IN PROCESS		FUSED	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
20-25	8	14	8	100	0	-	0	-	8	100	-	-	0	-
26-30	6	10	6	100	0	-	0	-	2	20	4	80	0	-
31-35	3	5	3	100	0	-	0	-	0	-	3	100	0	-
36-40	13	22	13	100	-	-	0	-	0	-	13	100	0	-
41-45	3	5	3	100	-	-	0	-	1	33	2	67	0	-
46-50	0	-	0	-	0	-	0	-	0	-	0	-	0	-
51-55	11	19	0	100	11	100	-	-	0	-	0	-	11	100
56-60	4	7	0	-	2	50	2	50	0	-	0	-	4	100
61-65	7	12	0	-	0	-	7	100	0	-	0	-	7	100
66-70	3	5	0	-	0	-	3	100	0	-	0	-	3	100
71-75	-	-	0	-	0	-	-	-	0	-	0	-	-	-
76-80	1	1	0	-	0	-	1	100	0	-	0	-	1	100
TOTAL	59	100	-	-	-	-	-	-	-	-	-	-	-	-



Graph 1: Fusion of Sagittal suture in its upper half in female



Graph 2: Fusion of Sagittal suture in its lower half in female

In Table 1, in the age group 20-25 years, total number of sample was 8(14%). In upper half of the suture, in 8 cases(100%) fusion had not commenced. In lower half of the suture, in 8 cases (100 %) fusion had not commenced. In the age group 26-30 years, total number of sample was 6(10%) . In upper half of the suture, in 6 cases (100 %) fusion had not commenced. In lower half of the suture, in 6 cases (100 %) fusion had not commenced. In the age group of 31-35 years, total number of sample was 3(5%). In upper half of the suture, 3 cases (100 %) fusion

had not commenced. In lower half of the suture, in 3 cases (100 %) fusion was in process. In the age group of 36-40 years, total number of sample was 13(22%). In upper half of the suture, 13 cases (100 %) fusion had not commenced. In lower half of the suture, in 13 cases (100 %) fusion was in process.

In Table 1 in age group of 41-45 years, total number of sample was 3(3%). In upper half of the suture, 3 cases (100%) fusion was in process. In lower half of the suture, in 1 cases(33 %) fusion had not commenced and in 2 cases(67%) fusion was in the process. In the age group of 46-50 years, we had no sample. In the age group of 51-55 years total number of sample was 11(19%). In upper half of the suture, in 11 cases (100 %) fusion was in process. In lower half of the suture, in 11 cases(100 %) fusion had occurred. In the age group of 56-60 years, total number of sample was 4(7%). In upper half of the suture, in 2 cases(50%) fusion had not commenced and in 2 cases(50%) fusion was in process. In lower half of the suture, in 4 cases(100%) fusion had occurred. In the age group 61-65 years, total number of sample was 7(12%). In upper half of the suture, in 7 cases(100 %) fusion had occurred. In lower half of the suture, in 7 cases(100%) fusion had occurred. In the age group 66-70 years, total number of sample was 3(5%) . In upper half of the suture, in 3 cases (100 %) fusion had occurred. In lower half of the suture, in 3 case(100 %) fusion had occurred. In the age group of 71-75 years, we did not have sample. In the age group 75-80 years, total number of sample was 1(1%). In upper half of the suture, in 1 cases (100 %) fusion had occurred. In lower half of the suture, in 1 cases(100%) fusion had occurred P value for age versus upper half of Sagittal suture in female is < 0.001 as the age increases the trend is not commenced to fused.

P value for age versus lower half of Sagittal suture in female is < 0.001 as the age increases the trend is not commenced to fused. Test used is Fisher's Exact test

Discussion

In our study we found that the earliest age of fusion in sagittal suture in its upper half is 31 years and lower half is 26 years. The fusion completed earliest in the upper half in 51 years and lower half in 39 years.

Age estimation cannot be done using a single factor as it depends on many factors with time 9.

It has been opined that epiphyseal union can be seen on roentgenogram examination. Roentgenograms can be correlated with the gross inspection of anatomic position and is a non-destructive process 10.

Key et al 11 used 3 point system to score: open, partial, complete union. Sutures which are not fused have a characteristic serrated appearance in outer table .with progression of fusion of sutures, the radiolucent appearance of fusion and margin decreases 12.

Age of fusion in sagittal suture given in various Indian textbooks say that upper half of sagittal suture closes by 40-50 years and lower half by 30- 40 years. In our study the earliest age of commencement of suture fusion was 31 years in upper half and 26 years in lower half. The earliest age of completion of fusion was 51 years in upper half and 39 years in lower half.

Table Number 2: Comparative account of suture closure

Author	Method	Age of closure of Sagittal suture
Reddy 2	Roentgen ray	40-50 years
Nandy13	Roentgen ray	40-50 years
Pradeep et al.15	Roentgen ray	45-50 years
Parmaret al.14	Roentgen ray	50-50 years
Vij 1	Roentgen ray	40-50 years

Conclusion

We studied the radiological stages of fusion of Sagittal suture of the skull in association with the documented age and found a significant correlation between the two using a Scoring method. Sagittal suture was found to start fusion by 26 years and earliest completion was at 39 years. Ectocranial suture closure can be used for age estimation with

other associated factors. In our study the trend of correlation is increasing with age which strengthen the view that there is a significant relationship between suture closure and age. It is important to refine the methods of scoring or quantifying these structures to make it an unbiased observation.

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CRediT roles	Author 1	Author 2	Author 3
Conceptualization			×
Data curation	×		
Formal analysis	×	×	×
Funding acquisition	---	--	--
Investigation	×		
Methodology	×	×	×

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