ESTIMATION OF AGE FROM PELVIS – A RADIOLOGICAL STUDY

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Abstract

Estimation of age is an important task for forensic experts especially in developing countries where birth records are often not well maintained. Appearance and fusion of different ossification centres with their corresponding bones has been proved to be a very good and reliable tool for this purpose.

In the present study a careful observation was done, for the age related fusion of iIium, ischium and pubis in hip bone by calcification of triradiate cartilage and appearance of centers of Iliac crest and ischial tuberosity and their fusion with corresponding bones in 202 individuals of both the sexes by X-ray examination of pelvis.

Attempt is also made to analyze the stages of ossification and correlate them with the age of the individual.

Key words:

Ossification center; triradiate cartilage; iliac crest; ischial tuberosity and fusion.

INTRODUCTION

Forensic experts have to evaluate age in different medicolegal situations / especially when the identity is not known or when the liability and punishment are related to the maturity / age of the individuals as in cases of criminal responsibility, rape, kidnapping, nullity of marriage, child labour disposal of properties etc. The age estimation is more often required in developing countries where birth records are not well maintained.

Though the general development including height, weight, secondary sexual character and eruption and maturity of teeth are quite reliable data for estimation of age, changes in bones specially time related appearance and fusion of different ossification centres in growing periods are valuable indices for assessing the age. Here authors have tried to estimate age from Hipbones by studying X-rays of pelvis on the basis of calcification of triradiate cartilage and appearance and fusion of centre of iliac crest and ischial tuberosity.

MATERIAL AND METHODS

In this study x-ray pelvis of 104 boys and 98 girls between 10–22 years of age were taken and examined for the fusion for the calcification of triradiate cartilage, appearance of centres of iliac crest and ischial tuberosity and their fusion with corresponding bones. Only bonafide residents of Kanpur having sound health and definite birth records were included for this study. Attempt has been made to cover persons of different religious faith and social status with a view to co-relate their roles, if any in fusion. The age at which 50% cases showing appearance of centre or complete union was accepted as lower age limit, 100% as upper limit and 75% as average age for each event.

OBSERVATIONS & RESULT

In this study calcification of triradiate cartilage started in 11 years 3 months in a female and 11 years and 8 months in a male but complete calcification for the first time was not observed before 12 years 2 months in female and 12 years 10 months in males.

Complete fusion in males found in only 18.18% in 12-13 years, 52.3% in 13-14 years, 66.7% in 14-15 years and in all the cases above 15 years. In females it was observed in 22.2% cases in 12-13 years, 50% in 13-14 years, 75% in 14-15 years and in all cases about 15 years.

CALCIFICATION OF TRIRADIATE CARTILAGE

Sl. No.	Age (yrs)	Male			Female		
		No. of cases	Calcification	%	No. of cases	Calcification	%

1.	10-11	2	-	-	2	-	-
2.	11-12	4	-	-	6	-	-
3.	12-13	11	2	18.18	9	2	22.2
4.	13-14	21	11	52.3	14	7	50
5.	14-15	12	8	66.7	16	12	75
6.	15-16	11	11	100	7	7	100
7.	16-17	17	17	100	22	22	100
8.	17-18	14	14	100	3	3	100
9.	18-19	2	2	100	8	8	100
10.	19-20	2	2	100	4	4	100
11.	20-21	4	4	100	5	5	100
12.	21-22	4	4	100	2	2	100

Centre of iliac crest was observed for the first time in males at the age of 12 years 10 month it was found in 14.2% cases in 13-14 yrs 33.3% cases in 14-15 years, 54.5% in 15-16 years and in all the cases above 16 years and its fusion with the body of ilium bone was observed in 17.6% cases in 16 – 17 years, 42.8% in 17 – 18 years, 50% in 18 – 19 years and 100% above 20 years.

In females the centre has not observed below 13 yrs 5 month, it was observed only in 28.6% cases in 13-14 yrs, 75% in 14 – 15 yrs and in all the cases above 15 years. The fusion of centre with the ileum was observed in 22.7% cases in 16 – 17 years, 66.7% cases in 17 – 18 years, 75% in 18 – 19 years and in all the cases above 19 years.

APPEARANCE AND UNION OF THE CENTRE OF ILIAC CREST

S. No.	Age (yrs)	Male					Female				
		No. of cases	Appearance		Union		No. of cases	Appearance		Union	
			No.	%	No.	%		No.	%	No.	%
1	10-11	2	-	-	-	-	2	-	-	-	-
2	11-12	4	-	-	-	-	6	-	-	-	-
3.	12-13	11	1	9.1	-	-	9	-	-	-	-
4	13-14	21	3	14.2	-	-	14	4	28.6	-	-
5.	14-15	12	4	33.3	-	-	16	12	75	-	-
6.	15-16	11	6	54.5	-	-	7	7	100	-	-
7.	16-17	17	17	100	3	17.6	22	22	100	5	22.7
8.	17-18	14	14	100	6	42.8	3	3	100	2	66.7
9.	18-19	2	2	100	1	50	8	8	100	6	75
10.	19-20	2	2	100	2	100	4	4	100	4	100
11.	20-21	4	4	100	4	100	5	5	100	5	100
12.	21-22	4	4	100	4	100	2	2	100	2	100

Centres for ischial tuberosity appeared for the first time at the age of 13 years 7 months in a male and 13 years 5 months in a female in males it was found in 41.66% cases in 14-15 years, 54.5% in 15-16 yrs, 82.3% in 16-17 yrs and in all cases above 17 years. Its fusion with Ischium bone was observed in 42.8% cases in 17-18 yrs, 75% in 20-21 yrs and in all cases above 21 yrs. In females it was appeared in 68.7% cases in 14-15 yrs and in all cases about 15 years, while fusion in 33.3% cases occur in 17-18 years, 50% in 18-19 years, 80% in 20-21 years and in all the cases above 21 years.

APPEARANCE AND UNION OF THE CENTRE OF ISCHIAL TUBEROSITY

S. No.	Age (yrs)	Male					Female				
		No. of cases	Appearance		Union		No. of cases	Appearance		Union	
			No.	%	No.	%		No.	%	No.	%
1	10-11	2	-	-	-	-	2	-	-	-	-
2	11-12	4	-	-	-	-	6	-	-	-	-
3.	12-13	11	-	-	-	-	9	-	-	-	-
4	13-14	21	6	28.6	-	-	14	2	14.3	-	-
5.	14-15	12	5	41.66	-	-	16	11	68.7	-	-
6.	15-16	11	6	54.5	-	-	7	7	100	-	-
7.	16-17	17	14	82.3	1	5.9	22	22	100	2	9.1
8.	17-18	14	14	100	6	42.8	3	3	100	1	33.3
9.	18-19	2	2	100	1	50	8	8	100	4	50
10.	19-20	2	2	100	1	50	4	4	100	3	75
11.	20-21	4	4	100	3	75	5	5	100	4	80
12.	21-22	4	4	100	4	100	2	2	100	2	100

Discussion

The calcification of triradiate cartilage was studied by **Galstaun** (1937) in Bengali's and he found its calcification at the age of 15-16 yrs in male and around 14 yrs in females. In another study in Australians **Flecker** (1947) found calcification of triradiate cartilage at the age of 15 years in males and 13 years in female. These observations are nearly at par with our result, which is 15 and 14.5 years in males and females respectively.

In our study the average age of fusion of iliac crust in males was found 19.5 years that is quite compatible with the other observations in Indian subjects such as **Galstaun** (1937), 19 – 20 years. It is much higher in English Subjects i.e. 23 years as observed by **Davies and Parsons** (1927) probably because of geographical variation.

In females our results (18.5 years) are quite at par with the findings of **Galstaun** (1937) i.e. 17 – 19 yrs and **Krogman** (1962) 18-19 yrs. It was quite higher 22 yrs in English population as observed by **Smith & Fiddes** (1955).

The average age of union of ischial tuberosity with the bone in the present study was found 20.5 years in males and 19.5 yrs in females which is quite close with the findings of **Galstaun** (1937) 20 yrs and **Flecker** (1942) 20 yrs.

Conclusion

The pelvis of Two hundred and two boys and girls are radio logically and the results are concluded as:

1. Triradiate cartilage is calcified in such a way that three bones ileum, ischium and Pubis become unite to form a signal Hip bone in 15 years.

2. Iliac crest usually appears in 16 years in males and 15 years in females and fuses with the iliac bone in 19 years.

3. Ischial tuberosity appears in 17 and 15 years in males and females respectively while fuses in 20 years.

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