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Original Research Paper

Age Estimation from Epiphyseal Fusion of Ischial Tuberosity

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Abstract

Radiological technique is most reliable and informative of all the available methods for assessing age i.e. physical development, secondary sex characters, height and weight measurement, eruption of teeth, especially in the young. Anatomical method and Haversian canal technique for determination of age of an individual are, however, obsolete now a days. External inspection of the dead permits only an approximate estimate of age and it is liable to error by upto 10 years in adults.

In the present study 100 individuals are studied between the age group of 16 to 25 years in male and female separately i.e. 50 males and 50 females, whose X- ray examination is done at Rajindra Hospital; Patiala, Punjab. The study is undertaken to know the time of fusion of epiphyses of ischial tuberosity. In this study, every individual's X-ray pelvis AP view is taken to know fusion of ischial tuberosity epiphysis.Epiphysis of ischial tuberosity fused in majority of cases by the age of 20-21 year in both male and female. Earliest union occurred at 18 years in males and 17 years in females.

Key Words: Epiphyseal fusion, X-ray, Age Estimation, Ischial tuberosity

Introduction:

To know the age of marriage in India for girls i.e. 18 years and for boys i.e. 21 years, the epiphyses selected for age determination are ischial tuberosity & iliac crest. Fixing up of the individuality of a person, no matter if it is new born baby in the hospital or in criminal cases and in civil cases like marriage, inheritance of property, passport, insurance claims, disputed sex and missing persons etc has got its own importance. There are many agencies for fixing the identity of a person from village Panchayat to police and usually it is the police which help most in this job. But when all other agencies fail then the medical jurist comes into picture and he is able to do this job by virtue of his knowledge and experience. So he is able to supply to the police and law enforcing agencies certain facts about an individual, dead body or fragmentary remains which will enable them to complete the identification. [1, 2, 6, 8]

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Material and Method:

In present study, 100 cases were studied including male and female differently. The cases studied are between age group of 16-25 years that are exposed to x-ray at Rajindra Hospital Patiala. Male and Female individuals are studied with age interval of two years and ten cases from each age interval were taken.

The cases are studied with the help of X-ray pelvis- antero-posterior view for ischial tuberosity for epiphysis fusion. Status of epiphyseal union was divided into following four stages. (Table A)

Table A: Stages of Epiphyseal Union (1)

Stage	Appearance and fusion	Grade
I	Centre not appeared	**A**
II	Centre appeared but no union	**+**
III	Union started but incomplete	**++**
IV	Complete union	**+++**

Age of each individual studied is confirmed from birth certificate, driving license, passport, ration card or voter's card etc.

Study has been carried out by Roentgenographic technique. The technique included standardization of -

1. Time of exposure
2. Positioning of the part
3. Distance of film from X- Ray tube and
4. Processing and time of developing the films.

Positioning of the Epiphyses during X- Ray: [2] Clark's radiographic technique has been followed in this investigation

AP View for Pelvis:

1. Patient lying supine with the median sagittal plane adjusted to coincide with the central

longitudinal axis of the couch. Anterior superior iliac spines should be equidistant from the couch top. This distance may be assessed by placing a thumb on each iliac spine and the fingers in contact with the couch necessary using non-opaque pads.

The knees should be flexed over foam pads for comfort. The heels should be separated and the limbs rotated medially so that the long axis of the feet is approximately 5-10 degrees to the vertical. The limbs are maintained in position using sandbags.

The film is centred at a level midway between anterior superior iliac spines and superior border of the symphysis pubis.

2. **Direction and Centering of the X- ray Beam:**

Centre in the midline midway between the level of the anterior superior iliac spines and the superior border of the symphysis pubis with the central ray perpendicular to the film.

Observations:

This Study showed that in five cases (50%) of age group of 16-17years in males centre not appeared and in 50% centre appeared but no union occurred.

In age group 18-19 years, in three cases (30%) centre appeared but no union, in 40% union started but incomplete and in 30% complete union occurred.

In our study 20-21 years category showed that in 40% union started but incomplete & in 60% complete union occurred. In age group 22-23 years, all ten cases (100%) showed complete union. In age group 24-25 years in only one case (10%) union started but incomplete & in 90% complete union occurred. (Table 1) Present study showed that in females in age group 16-17 years, in four cases (40%) centre appeared but no union occurred, in 50% union started but incomplete & in 10% complete union occurred.

In age group 18-19 years, in 50% union started but incomplete & in 50% complete union occurred.In age group 20-21 years, 10% showed starting of union but incomplete &90% showed complete union.In age group 22-23 years, in 10% centre appeared but no union occurred, in 10% union started but incomplete & in 80% complete union occurred.

We observed that 100%cases showed complete union in age group of 24-25 years in this study. (Table 2)

Discussion:

In this study, males show epiphyseal union at 20-21 years age group and earliest union occurred at 18 years. Females also show epiphyseal union at 20-21 years age group and earliest union occurred at17 years and one month. The present study findings are close to other authors. [3-5, 9] (Table 3)

In our study for males in 18-19 years age group three cases (30%) showed complete union, in 20-21 years age group six cases (60%) showed complete union and in 22-23 years age group all ten cases (100%) had complete union and in 24-25 years age group nine cases (90%) showed complete union. (Table 4)

For females in 16-17 years age group one case (10%) showed complete union, in 18-19 five cases (50%) had complete union, in 20-21 nine cases (90%) showed complete union, in 22-23 eight cases (80%) had complete union and in 24-25 years age group ten cases (100%) showed complete union. (Table 4)

Conclusion:

From the present study it can be concluded that Epiphysis of ischial tuberosity fused in majority of cases by the age of 20-21 year in both male and female. Earliest union occurred at 18 years in males and 17 years in females.

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Table 4: Age Incidence of Complete Union of Ischial Tuberosity Epiphysis

Age grps(Yrs)	Cases Examined	Complete Union (%)	
		Males	Females
16-17	20	0(0)	1(10)
18-19	20	3(30)	5(50)
20-21	20	6(60)	9(90)
22-23	20	10(100)	8(80)
24-25	20	9(90)	10(100)

Table 1
Incidence and Extent of Fusion of the Ischial tuberosity in Different Age Groups for Male

Extent of fusion	Age Group (Yrs.)				
	16-17	18-19	20-21	22-23	24-25
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
Centre not appeared	5(50)	0(0)	0(0)	0(0)	0(0)
Centre appeared but no union	5(50)	3(30)	0(0)	0(0)	0(0)
Union started but incomplete	0(0)	4(40)	4(40)	0(0)	1(10
Complete union	0(0)	3(30)	6(60)	10(100)	9(90)

Table 2
Incidence and Extent of Fusion of the Ischial tuberosity in Different Age Groups for Female

Extent of fusion	Age Group (Yrs.)				
	16-17	18-19	20-21	22-23	24-25
	Cases (%)	Cases (%)	Cases (%)	Cases (%)	Cases (%)
Centre not appeared	0(0)	0(0)	0(0)	0(0)	0(0)
Centre appeared but no union	4(40)	0(0)	0(0)	1(10)	0(0)
Union started but incomplete	5(50)	5(50)	1(10)	1(10)	0(0)
Complete union	1(10)	5(50)	9(90)	8(80)	10(100)

Table 3
Comparison of Time of Fusion of Ischial Tuberosity (in Years) with that Shown by Other Authors

Author	Year	Race	Sex			Earliest Union (years)
			Male	Female	Mixed	Male/Female
Galstaun (3)	1937	Bengalis (Indians)	20	20	-	-
Krogman (7)	1962	U.S.A.	-	-	19-20	-
Parikh (8)	1990	Indian	-	21-22	-	-
Jain (5)	1999	Indian	20-21	19-20		18 yr 3 M/ 18 yr 2 M
Krishan Vij (9)	2001	Indian	-	-	19-21	-
D. Govindiah (4)	2003	Indian			20-21	
Present	2001	Punjab (Indian)	20-21	20-21	-	M = 18, F = 17