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Estimation of Age by Roentgenologic study of Epiphyseal union at the upper end of Radius in Karnataka.

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Abstract: *The present work was undertaken to find out the age of union of epiphysis at the upper end of Radius in males and females. A radiological study was conducted on 100 males and females, in the age group of 13-22 years, residing in Davanagere, Karnataka, India. Radiographs of upper end of Radius (elbow) of both sides were taken and progress of fusion was studied and recorded. There was no difference in the findings of epiphyseal union at the upper ends of Radius of the two sides. In general, the fusion of epiphysis occurs 1-2 or 2-3 years earlier in females as compared to males. From these radiographs age of union of epiphysis at upper end of Radius is determined and compared with the other authors from other states of India and also with other countries and found to vary appreciably.*

Keywords: *Epiphysis; Radius; Elbow Joint; Age Estimation.*

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I. Introduction

Each long bone has its distinct developmental history. Epiphyses of bones unite during an age period, which is remarkably constant for a given epiphysis. It is of great value in medico-legal aspects and in a variety of medical and surgical specialties.

The study must necessarily be carried out on the living with x-rays. The study of upper end of Radius could be undertaken, as it is convenient to take x-rays at this level, without causing any embarrassment to persons exposed. In addition, epiphyseal separation, displacement and fractures of this part are exceedingly frequent in young persons. A correct knowledge of normal is therefore important, particularly as the size and relation of the epiphysis vary with age.

With so many implications, the study of skeletal maturity could be preferably undertaken during the growing period of individuals.

II. Materials and Methods

This study was intended to find out the age of fusion of ossification centers at the upper end of Radius in age group 13-22 years. A Proforma of age estimation was prepared containing all the details necessary for age estimation; name, age, sex, food habits, socioeconomic status and religion. The investigations were conducted in the Radiology Department of Bapuji Hospital, Davangere, India.

A total of 100 healthy males and females from 13-22 years of age were selected by random sampling procedure. The age was confirmed from authentic birth records. A complete general physical examination was carried out. Radiographs of the right and left elbow, both antero-posterior view and lateral view, were taken of each subject. Abnormalities are excluded in the present study e.g., abnormalities of bones, poor films.

The material for the present study is the radiographs of the upper end of radius presenting the fusion of upper end of radius with shaft. The subjects were divided into 10 age groups.

Criteria for fusion:

In recording the observations of radiological union at the lower end of humerus Das Gupta, Vinod Prasad & Shamer Singh (1971)[1] and Banerjee & Agarwal (1998)[2] method of classification of fusion has been followed.

1. Those showing incomplete union
2. Those showing complete union

The union was regarded as complete when the diaphysio-epiphyseal space was fully obliterated and bone in architecture and density, indistinguishable from the epiphysis and diaphysis in the neighbourhood, and there was an uninterrupted continuity of the periosteum between the epiphysis and diaphysis without any notching at the periphery of the epiphyseal line. Cases of recent union, where a white transverse line was still seen in place of the epiphyseal cartilage, was also taken as complete union, and the so called epiphyseal scar

was disregarded. It was taken as incomplete union even when some amount of obliteration of diaphyseoepiphyseal space was still left.

The union of the ossification centers that is studied at the upper end of the radius is:

1) Upper end of radius fuses with shaft.

III. Results

A total of 100 healthy males and females from 13-22 years of age were included for the study. Of them 44 were males and 56 were females. Table 1 shows the number of subjects in the present study.

Table 1 : The number of subjects in the present study

Age group in years	Sex with number of cases		Total
	Male	Female	
13-14	0	7	7
14-15	0	14	14
15-16	9	7	16
16-17	4	3	7
17-18	7	10	17
18-19	5	2	7
19-20	2	3	5
22-21	9	8	17
21-22	8	2	10
Total	**44**	**56**	**100**

Table 2: shows age of union of the upper end of radius with shaft.

Age Group [Years]	% of cases showing complete union.	
	Boys	Girls
13-14	-	71.42
14-15	-	100
15-16	44.44	100
16-17	50	100
17-18	100	100
18-19	100	100
19-20	100	100
22-21	100	100
21-22	100	100

IV. Discussion

Taking into consideration, the research work done by different workers on epiphyseal union at upper end of radius, a table was drawn. Comparisons were made between the results of their study and the present study.

Table 3 shows the comparative study of epiphyseal union at the upper end of radius[3,4,5,6,7,8,9.]

The present findings support the conclusion of majority of workers that fusion occurs somewhat earlier in females than in males; usually by 1-2 or 2-3 years. Although vegetarians and non-vegetarians were both taken in the present study, this dietetic variation seemingly had no effect on the progress of epiphyseal union, since majority of the subjects were vegetarians.

It may be important also to stress that different workers used somewhat different criteria for epiphyseal union and generalization. It is indeed possible that such varying criteria could be responsible for some of the variations reported by them.

Further studies involving a larger number of cases and following uniform roentgenological criteria of epiphyseal union and generalization of the results, are strongly indicated.

Fig 1. X-ray : AP-Lt. Elbow-Male
Aged 11 yrs 13 days

Fig 2. X-ray : AP-Rt. Elbow-Male
Aged 19 yrs 5 mon 5 days

TABLE 3: COMPARATIVE STUDY OF EPIPHYSEAL UNION AT THE UPPER END OF RADIUS[3,4,5,6,7,8,9.]

Workers	**Subjects**	**Upper end of Radius fuses to shaft (in yrs)**	
	Indian	**F**	**M**
Lal and Nat (1934)	Uttar Pradesh (Males)	-	15-17
Pillai (1936)	Madrasis	14-17	14-17
Basu and Basu (1938)	Bengalis (Females)	13-14	-
Galstaun (1939)	Bengalis	14	16
Lal and Townsend (1939)	Uttar Pradesh (Females)	14-15	-
	Other countries		
Sidhom and Derry (1931)	Egypt	16-18	17-18
Present study (2006)	Karnataka	14-15	17-18

V. Conclusion

The following conclusions are derived from the study of 100 cases in the present series.
I. The upper end of radius fuses with the shaft at the age of 14-15 years in females and 17-18 years in males.
II. In general, the fusion of epiphysis occurs 1-2 or 2-3 years earlier in females as compared to males.

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