Indian Internet Journal of Forensic Medicine & Toxicology IndianJournals.com
ISSN 0973-1970, Vol.7, No.4 (2009)

Determination of Age of Boys of Western Rajasthan by Epiphyseal Union of Bones at Ankle joint

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Abstract

Characteristic changes during epiphyseal union helps provide an estimation of age. Currently there are no data on epiphyseal union for the purpose of age estimation specific to Western Rajasthan population. This study was conducted to formulate a data for age of epiphyseal union of bones at ankle. A total of Seventy five boys of age of 14 -20 were included. In the study the X ray films of the subjects were divided into three groups on the basis of degree of fusion. Firstly, those which were showing Non-union (N), secondly those showing partial union (P), and thirdly those showing complete union (C). Observations made were compared and discussed with the previous studies.

Key words: Epiphyseal union, Ankle joint, distal end of tibia, distal end of fibula

Introduction

Evaluation of age of an individual using various methods is required for medico legal purposes in both civil and criminal matters. The principal means which are employed by a medical man to have a fair accurate estimate about age of a person can be categorised as microscopic and macroscopic methods.

The feature of appearance of secondary ossification centers which is commonly used for assessment of age is the timing of the union of epiphyses. Until the teenage years, the diaphyses of the long bones are separated from their epiphyses on both the ends. (Connor JEO, 2008) The present study is focused on radiological examinations of ankle joint of subjects between 14 and 20 years of known age of males of Western Rajasthan population.

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Aims and objectives

1) To make the data available on the time of fusion of ossification centers at the ankle for subjects of Western Rajasthan.

2) To see that how far these data correlate or contradict the findings of different authors in other parts of India and data of other countries.

Material and Methods

The present study was carried out in Department of Radiodiagnosis, Dr. Sampurnanand Medical College and Associated group of Hospitals, Jodhpur. A total of seventy five males participated in this study.

The subjects included students of schools, of Medical college and degree colleges of Jodhpur. The subjects were from 14-20 years of age. An informed consent was taken from all subjects prior to each investigation.

The subjects chosen for the study were evaluated and confirmed for the following criteria-

1) They are born to parents living in Western Rajasthan and have lived in Western Rajasthan since birth.
2) The subjects should not have any bony deformity or pathology and should not have any known chronic disease affecting the general health of person.

The X ray films were taken and films were developed with the help of experienced technicians. The part X rayed was ankle for distal end of tibia and fibula.

For the study the X ray films were divided into three groups for each epiphysis -

1) Those showing Non-union (N)
2) Those showing partial union (P)
3) Those showing complete union (C)

Observations

The observations thus made are shown in Table 1. None of the case was showing non union.

Distal end of Tibia: Distal end of Tibia was fused in all cases by 18 years. The Distal end of Tibia showed earliest complete fusion between 15-16 years in 20% instances. In this group majority of cases (80%) are showing partial fusion. The minimum age group in this study is of 14-15 years and all cases in this group show partial fusion. The Distal end of Tibia shows complete fusion in majority of cases (66.67%) between 16-17 years ago. Above 18 years of age 100% cases show complete fusion.

Table 1. Table showing observations for degree of fusions for distal ends of Tibia and Fibula.

S. No.	Age group (yrs)	No. of cases	Degree of fusion Distal end of Tibia				Degree of fusion Distal end of Fibula			
			Partial complete	%	Complete	%	Partial complete	%	Complete	%
1	14-15	15	15	100	-	-	14	93.3	1	6.6
2.	15–16	15	12	80	3	20	12	80	3	20
3.	16 –17	15	5	33.33	10	66.66	5	33.33	10	66.66
4.	17 – 18	15	6	40	9	60	3	20	12	80
5.	18 – 19	15	-	-	15	100	6.6	10	14	93.3
6.	19 – 20	15	-	-	15	100	-	-	15	100

Among the subject studied earliest fusion of epiphysis was seen at the age of 15 years 4 months and 2 days. The oldest age at which fusion of epiphysis was not present is 17 years and 13 days.

Distal end of Fibula: Distal end of Fibula was fused in all cases by 18 years. The Distal end of Fibula showed earliest complete fusion between 14- 15 years in 10% instances. In this group majority of cases (90%) are showing partial fusion. The Distal end of Fibula shows complete

Table 2: Comparison of age of Distal Epiphyseal Union of Tibia in various Regions and Races with present study

S. No.	Researcher	Race/Region	Age of Observations (Years)
1.	Davies and Parson (1927)	England	18
2.	Hepworth (1929)	Punjabi	17-18
3.	Flecker (1932)	Australians	17
4.	Pillai (1936)	Madrasis	14-17
5.	Galstaun (1937)	Bengalis	14-16
6.	Basu and Basu (1938)	Hindu	15
7.	Narain and Bajaj (1957)	Uttar Pradesh	17-19
8.	Singh Z (1998)	Punjab	18
9.	Present Study	Western Rajasthan	17-18

Table 3. Comparison of age of Distal Epiphyseal Union of Fibula in various Regions and Races with present study

S. No.	Researcher	Race/Region	Age of Observations (Years)
1.	Davies and Parson (1927)	England	18
2.	Hepworth (1929)	Punjabi	17-18
3.	Flecker (1932)	Australians	17
4.	Pillai (1936)	Madrasis	14-17
5.	Galstaun (1937)	Bengalis	14-16
6.	Basu and Basu (1938)	Hindu	15
7.	Narain and Bajaj (1957)	Uttar Pradesh	17-19
8.	Singh Z (1998)	Punjab	18
9.	Present Study	Western Rajasthan	17-18

fusion in majority of cases (70%) between 16-17 years of age. Above 18 years of age 100% cases show complete fusion.

Among the subject studied earliest fusion of epiphysis was seen at the age of 14 years 9 months and 22 days. The oldest age at which fusion of epiphysis was not present is 17 years 13 days.

Discussion

The data evaluated from the present study was compared with the data of previously published studies from different parts of country and world. These findings are depicted in Table II and III.

Despite an apparent wealth of knowledge, it is extremely difficult to find consensus on ages of epiphyseal union at the ankle.

Conclusion

Currently there is an obvious lack of data for assessment of time of fusion of epiphyseal union for bones of ankle joint for Western Rajasthan population. The current study is first to present data for same. The presence of one more stage i.e. “partial fusion” between incomplete and complete stages of fusion provides furthermore defined age range estimations for the process of epiphyseal fusion at ankle. Definitely this is going to help Forensic experts more efficiently for estimation of age in Western Rajasthan population for medico legal purpose.

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