

## Determination of age by appearance and fusion of ossifying centers in medial end of clavicle by digital x-rays in Bikaner region

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### Abstract

Determine the exact age is very useful in various field and it became more important when we do not have any specific date of birth certificate. Age has its very specific role in medico legal aspect, whether it is a juvenile case or a case of marriage or a case of retirement, in all we need somewhat near exact age so that we can lead to justice, but in this high-tech world we are still struggling to put specific ways to lay out correct age.

However fusion of bone gave us an edge to determine the specify age and here in this study were taking appearance and fusion of medial end of clavicle to determine age which can be very useful in medico legal aspect.

**Keywords:** Clavicle, Appearance, Fusion, Roentgenogram

### Introduction

Age in laymen's view is the time passed after birth and ageing is a continuous process in human as well as in all other living beings. The determination, of age presents a task of considerable importance from the point of view of the administration of justice. It is not possible to enunciate a hard and fast rule for age determination from this union for the whole India because the various geographical areas of our country differ in climatic, dietetic and disease factors.<sup>1</sup>

Estimation of reasonably accurate age, plays a pivotal role in civil/criminal cases like personal identification, fixing of criminal responsibility, judicial punishment i.e. in cases of rape, kidnapping, criminal abortion,

attempted or evident murder, theft, burglary, dacoity, offence of railway property. There is variation in the timing of union of the epiphysis of bones & it has been attributed to factors like climate, heredity, race, nutrition, dietary habits, gender & socioeconomic status of population for study.<sup>2</sup>

Thereafter, the range must lengthen and after 30 years, when the mature skeleton already begins to show signs of "Ageing" including the beginning of the progressive closure of the cranial suture, it is hardly be safe to estimate more closely than in decades.<sup>3</sup>

The present study was carried out to study roentgenographically the epiphyseal appearance and fusion of medial end of

clavicle in subjects between age group 14-25 years attending outpatients Department of P.B.M. and Associated Group of Hospitals, Bikaner.

**Materials and methods**

The present study a total number of cases is 150 (male & female) between age group of 14 to 25 years those were exposed to X-Ray (digital) at P.B.M. Hospital of Bikaner. The subjects are selected randomly from various schools as well as cases attending the OPD of the Forensic-Medicine Department of P.B.M. Hospital, Bikaner. The cases were studied with the help of X-Ray of Chest (AP View) for medial end of clavicle. Status of epiphyseal union is divided into following four stages.

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

The persons selected for study were grouped as per their stated age, viz.:- 14-15, years, 15-16 years, 16-17 years, 17-18 years, 18-19 years, 19-20 years, 20-21 years, 21-22 years, 22-23 years, 23-24 years and 24-25 years.

The persons belonging to the age group selected for the study of either gender were included in the study irrespective of their socioeconomic, religious and educational status, each person so chosen on the basis of criteria as mentioned above are evaluated clinically in detail.

**Selection criteria for inclusion of person in present study:**

For selection of subjects, following facts were recorded and considered:

1. They should be living in Bikaner region for more than 5 years.
2. They should be free from any physical disability or endocrinal anomaly.

3. Person should have accurate record of their date of birth.
4. Informed expressed verbal consent of the subjects was taken before proceeding to their physical, dental and radiological examination.

After obtaining informed expressed verbal consent for their radiological and clinical examination each person is x-rayed for chest AP view and subsequently the skiagrams are studied in detail in reference to various ossification centers, their appearance, process of fusion and post fusion scarring (Table 3).

**Radiological criteria for epiphyseal fusion**

The union is taken as complete when the:

- a) Diaphyseo-epiphyseal space is completely obliterated and become bony in architecture and density.
- b) There is continuity of the periosteum between epiphysis and diaphysis with no notching at the periphery of epiphyseal line.
- c) Presence or absence of epiphyseal scar (a white, transverse line) has been disregarded in this connection and considered as recent complete union.

For generalization, fusion in more than 75% cases is relied upon as complete fusion.

**Data collection**

Radiological data of appearance and fusion of various ossification centers were reduced to tables of various age groups along with other physical data noted previously. These data will be once again, examined and tallied by experts in Forensic Medicine and Radio-diagnosis. Data thus obtained finally, were analyzed and compared with the published work of various Indian and foreign workers.

**Results**

The present study shows (Table 1 & 2) the appearance in 100% case from 17-18 years to 24-25 years of age group in girls & 19-20 years to 24-25 years of age group , 14.28%

cases shows appearance of centre in 15-16 appearance seen in 14-15 years & 16-17 years of age group in girls and 42.85% in 16-17 years, 80.00% in 17-18 years, 87.50% in 18-19 years of age group in boys. Partial fusion seen in 40.00% cases in 19-20 years of age group, 71.42% cases in 20-21 years of age group & 50.00% cases in 21-22 years of age group in girls and in boys 6.25% cases in 18-19 years of age group, 62.50% cases in 19-20 years of age group, 53.33% cases in 20-21 years of age group, 85.71% cases in 21-22 years, 37.50% cases in 22-23 years and 28.57% cases in 23-24 years of age group. Complete fusion seen in 28.57%

years age group in girls and boys but no cases in 20-21 years of age group, 50% cases in 21-22 years of age group and complete fusion seen in 100% cases from 22-23 years to 24-25 years of age group but there is no fusion seen from 14-15 years of age group up to 18-19 years in girls and Complete fusion seen in 12.50% cases in 19-20 years of age group, 62.50% cases in 22-23 years of age group, 71.43% cases in 23-24 years and 100% cases seen in 24-25 years of age group but there is no fusion seen from 14-15 years of age group up to 17-18 years in boys.

**Table1: appearance and fusion of the centre of medial end of clavicle in girls.**

Sr. No.	Age (yrs)	No. of Cases	Appearance		Partial Fusion		Fusion	
			No.	%	No.	%	No.	%
1	14-15	4	-	-	-	-	-	-
2	15-16	7	1	14.28%	-	-	-	-
3	16-17	1	-	-	-	-	-	-
4	17-18	3	3	100%	-	-	-	-
5	18-19	7	7	100%	-	-	-	-
6	19-20	5	5	100%	2	40%	-	-
7	20-21	7	7	100%	5	71.42%	2	28.57%
8	21-22	4	4	100%	2	50%	2	50%
9	22-23	1	1	100%	-	-	1	100%
10	23-24	2	2	100%	-	-	2	100%
11	24-25	2	2	100%	-	-	2	100%

**Table 2: Appearance and fusion of the centre of medial end of clavicle in boys.**

Sr. No.	Age (yrs)	No. of Cases	Appearance		Partial Fusion		Fusion	
			No.	%	No.	%	No.	%
1	14-15	10	-	-	-	-	-	-
2	15-16	7	1	14.28%	-	-	-	-
3	16-17	7	3	42.85%	-	-	-	-
4	17-18	10	8	80%	-	-	-	-
5	18-19	16	14	87.5%	1	6.25%	-	-
6	19-20	8	8	100%	5	62.5%	1	12.5%
7	20-21	15	15	100%	8	53.33%	-	-
8	21-22	14	14	100%	12	85.71%	-	-
9	22-23	8	8	100%	3	37.50%	5	62.50%
10	23-24	7	7	100%	2	28.57%	5	71.43%
11	24-25	5	5	100%	-	-	5	100%

**Table 3: Appearance & fusion of ossification centre of the medial end of clavicle by different workers & authors.**

Sr. No.	Authors	Medial end of Clavicle			
		Appear		Fusion	
		M	F	M	F
1	Present Study	15-19	15-16	22-24	20-23
2	Apurba Nandy	15-17	14-16	22	20
3	Ajay Kumar	15	15	22	22
4	Anil Agarwal	15-17	15-17	20-22	20-22
5	KrishanVij	15-16	15-16	20-22	20-22
6	B.V.Subhramanayam	15	15	20-22	20-22
7	Bardale Rajesh	15-19	14-16	22	20
8	Rao G. Nageshkumar	15-16	15-16	20-22	20-22
9	Dikshit P.C.	15-19	15-19	20-22	20-22
10	Gray's Anatomy	17	15	22	21
11	Davies& Parsons (England)	17	17	25	25

### Discussion

Determination of age of a person is important legally, medically and anthropologically. With increase in the number of the litigations both civil and criminal, the forensic specialist is presently heavily burdened with cases of estimation of age sent to him by different investigation agencies.

In present study the average age of appearance of the medial end of clavicle was observed at 15-16 years in girls and 15-19 years of age in boys and fusion of the medial end of clavicle was observed at 20-23 years of age & 22-24 years of age in girls & boys respectively, which is consistent with the observation of the Apurba Nandy<sup>4</sup>, Ajay kumar<sup>5</sup>, Anil agarwal<sup>6</sup>, Krishna vij<sup>7</sup>, B.V.Subramanayam<sup>8</sup>, Bardale Rajesh<sup>9</sup>, Rao G. Nagesh Kumar<sup>10</sup> and Gray's Anatomy<sup>11</sup>.

The finding in our study is very much accordance with the observation of Krishna vij<sup>7</sup>, B.V.Subramanayam<sup>8</sup>, Rao G. Nagesh Kumar<sup>10</sup> and Gray's Anatomy<sup>11</sup> who stated that the appearance of medial end of clavicle is 15-16 years of age and fusion of epiphysis is 20-22 years.

Dixit P.C.<sup>12</sup> stated that appearance of medial end of clavicle is 15-19 years of age and fusion of epiphysis is 20-22 years.

Davies & Parsons<sup>13</sup> who stated that appearance of medial end of clavicle is 17 years of age and fusion of epiphysis is 25 years.

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