

Radiological Study of Fusion of Tri-radiate Cartilage in hip bone in Bikaner Region in 14-22 Years Age Group

Mathur Indubala¹, Sajjad Hussain², Agrawal Anjali³, Sharma Yogesh⁴

¹Associate Professor & HOD, Department of Forensic medicine and Toxicology, PCMS & RC, Bhopal (MP),

²Assistant Professor, Department of Forensic medicine and Toxicology, PCMS & RC, Bhopal (MP), ³PG final year, Department of Forensic medicine and Toxicology, PCMS & RC, Bhopal (MP), ⁴Professor & HOD, Department of Forensic medicine and Toxicology, RNT Medical College and Hospital, Udaipur (Rajasthan)

Abstract

Correct age determination has of great importance in legal prosecution. The principle means, which enable one to form fairly accurate opinion about age of an individual, are general physical development, dentition, secondary sex characters and ossification of bones. Among them Radiological examination of ossification process is most accurate than any other method up to 25 years of age.

This study involves radiological examination of Pelvis (AP view) of 169 individuals for the study of age related appearance and fusion of ossification center of Tri-radiate cartilage in hip in the individuals of age group of 14-22 years of both male and female in S P Medical college, Bikaner, Rajasthan.

Keywords: Age Estimation, Tri-radiate cartilage, X- Rays.

Introduction

Estimation of reasonably accurate age, plays an important 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 and in various schemes of Social Welfare department i.e. Employment, attainment of majority, marriage contract etc.

Various workers suggest that there is a variation in age estimation, not only in country to country but also in different states of India, so Survey Committee¹⁵ (1964) while reporting on medico legal practice in India has recommended to the government to encourage Zone wise study for the problem of determination of age.

Material and Method

This study is carried out in the Department of

Forensic-Medicine and Toxicology in association with the department of radio- diagnosis S.P. Medical College and the group of Hospitals, Bikaner. The subjects are selected randomly from various schools, from neighborhood of various faculty members and staff as well as cases attending the OPD of the Forensic-Medicine Department of P.B.M. Hospital, Bikaner. The persons selected for study were grouped as per their stated age, viz.:- 14-15years, 15-16 years, 16-17 years, 17-18 years, 18-19years, 19-20 years, 20-21years and 21-22 years. Here age 14-15 years means person of 13 years or more but below 14 years. Age, as stated by them is further confirmed by secondary school certificate, any document reflecting their exact age or entry in their school record.

Selection Criteria for inclusion of person in present study:

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.

Corresponding author :

Sajjad Hussain

email id: ksid786hussain@gmail.com,

dr.ibmathur@gmail.com

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.

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. Radiological data of appearance and fusion of ossification center of tri-radiate cartilage in hip were reduced to table, of various age groups. Data thus obtained finally, were analyzed and compared with published work of various Indian and foreign workers.

Observation

Table No. : 1: Appearance and Fusion of the Centre of Triradiate Cartilage in Boys

S. No.	Age (yrs)	No. of Cases	Appearance		Partial Fusion		Fusion	
			No.	%	No.	%	No.	%
1	12-13	12	11	91.67	-	-	-	-
2	13-14	9	7	77.78	3	33.33	-	-
3	14-15	7	7	100	5	71.42	-	-
4	15-16	10	10	100	1	10	9	90
5	16-17	17	17	100	2	11.76	15	88.23
6	17-18	25	25	100	-	-	25	100
7	18-19	19	19	100	1	5.26	18	94.73
8	19-20	10	10	100	-	-	10	100
9	20-21	11	11	100	-	-	11	100
10	21-22	12	12	100	-	-	12	100

In Boys - Table No. 1 shows appearance and fusion of ossification centre of tri-radiate cartilage in boys. The appearance of ossification centre of tri-radiate cartilage found in 91.67% of cases in 12-13 years, in 77.78% of cases in 13-14 years and in 100% of cases in 14-15 years age group and above. The complete fusion of the tri-radiate cartilage was observed earliest at the age of 15 year and 10 day in our study and found in 90% of case in 15-16 years of age group and in 100% cases in 19-20 years of age group and above. Average age of fusion of tri-radiate cartilage was observed at 15-16 years of age in our study. Age of oldest subject not showing complete fusion of tri-radiate cartilage was 18 years and 7 months in our study.

Table No. : 2 Appearance and Fusion of the Centre of Triradiate Cartilage in Girls

S. No.	Age (yrs)	No. of Cases	Appearance		Partial Fusion		Fusion	
			No.	%	No.	%	No.	%
1	12-13	8	8	100	1	12.5	-	-
2	13-14	2	2	100	2	100	-	-
3	14-15	2	2	100	-	-	-	-
4	15-16	4	4	100	-	-	4	100
5	16-17	6	6	100	-	-	6	100
6	17-18	19	19	100	-	-	19	100
7	18-19	10	10	100	-	-	10	100
8	19-20	5	5	100	-	-	5	100
9	20-21	4	4	100	-	-	4	100
10	21-22	8	8	100	-	-	8	100

In Girls - Table No. 2 shows appearance and fusion of ossification centre of tri-radiate cartilage in girls. The appearance of ossification centre of tri-radiate cartilage was observed in 100% cases of 12-13 years age group and above. The complete fusion of the tri-radiate cartilage was observed earliest at the age of 15 year, 1 month and 1 day in our study. The complete fusion of the tri-radiate cartilage was observed in 100% of cases in age group 15-16 years and above. Average age of fusion of tri-radiate cartilage was observed 15-16 years of age in this study. Age of oldest subject not showing complete fusion of tri-radiate cartilage was 14 years, 8 months and 1 day in our study.

Discussion

In present study average age of fusion of tri-radiate cartilage was observed at 15-16 years of age in both male as well as female, which is consistent with the observation of the Nagi Abdul Wahab Abdulla¹ et al (Yemen) as they observe that it is 15-16 years of age. The findings in our study are also consistent with the observation of the Alok Kumar⁸ et al (Kanpur) as they

observe that it is 15 years of age. The findings in our study are consistent with the PC Dikshit⁴, who stated that it is 15 years of age.

The finding in our study is slightly higher than the observation of study of Apurba Nandy⁹ that it is 14-15 years of age, finding of study by Pillai¹⁰ in Madrasian showed that age of fusion of Tri-radiate cartilage is 11-14 years of age which is far less than our present study's finding and it is also higher than the age as stated by different authors of standard textbooks as VV Pillay¹¹ and G Nagesh kumar Rao¹² stated in their textbooks that it is 13-15 years of age, Krishan Vij¹⁶ stated that it is 11-14 years of age. and N.Reddy¹³ stated in his textbook that it is 14 years of age.

The finding in our study is slightly below than the age 16-17 years, as stated by authors of standard textbooks of anatomy as BD Chourasia².

But some of the studies also show variation in male and female as describes below-

In females - The findings in females, in our study is slightly higher than the observation of Galstaun⁶ (Bengal) as he observed that it is 14 years of age, Dharmesh Shilajiya¹⁴ et al in Gujarat that it is 14-15 years of age in female and also higher than the observation of Flecker⁵ (Australia), as he observed that it is 13 years of age in their studies. The finding in our study is slightly below than the age 16-17 years, as stated by authors of standard textbook of anatomy, Gray's Anatomy⁷.

In Male: In present study we found the average age of fusion of tri-radiate cartilage was 15-16 years of age in male, which is consistent with the observation of the Galstaun⁶ (Bengal) as he observe that it is 15-16 years of age in male and also consistent with the observation of Flecker⁵ (Australia), as he observe that it is 15 years of age and also it is consistent with the observation of the Davies & Parsons³ (England), as he observe that it is 16 years of age.

Dharmesh Shilajiya¹⁴ et al in Gujarat and Yatiraj Singi¹⁷ et al in their studies found the age of fusion of Tri-radiate cartilage is 16-17 years of age in male, which is slightly higher than the findings of our present study.

The finding in our study is slightly below than the age as stated by authors of standard textbook of anatomy, Gray's Anatomy⁷ that it is 16-18 years of age.

Conclusion

Following conclusions are drawn from the present study that average age of fusion of tri-radiate cartilage in both boys as well as girls are 15-16 years of age in Bikaner region of Rajasthan.

Findings of our study are again giving the strength to the workers and Survey Committee¹⁵ report, as they suggest to the government to encourage Zone wise study for the problem of determination of age. This study is an attempt which may be a valuable aid to a forensic practitioner to give the approximate age certificate in medicolegal cases.

Ethical Clearance- Taken from Ethical committee of S.P. Medical College and Group of Hospitals, Bikaner Rajasthan.

Source of Funding- Self

Conflict of Interest – Nil

References

1. Abdulla NAW, Bhasharaheel ABS. Age Estimation by using Pelvic Radiography in Yemen Population. *Journal of Islamic Countries Organization for Forensic Medicine* 2008; 23-8.
2. Chaurasia BD. *Human Anatomy Regional and Applied Dissection and Clinical*. 4th ed: CBS Publishers & Distributors, New Delhi; 2007. (2) 5-30.
3. Davies DA & parsons FG. Age order of the appearance and union of the normal epiphysis as seen by x ray. *J Anat*. 1927; 62: 58-71.
4. Dixit PC. *Textbook of Forensic Medicine and Toxicology*, 3rd ed: PEEPEE Publishers and Distributors (P) Ltd. 2010; 56-57.
5. Flecker H. Roentgenographic observations of the time of appearance of epiphysis. *J Anat*. 1932; 67: 164-88.
6. Galstaun G. A study of ossification as observed in indian subjects. *Ind. J Med. Res* 1937; 25: 267-324.
7. Gray's Anatomy. Editor Susan Standring. 39th ed: *The Anatomical Basis of Clinical Practice*; 2005. 97-103, 1421-37.
8. Kumar Alok et al. Estimation of age from Pelvis – A Radiological study. *IJFMT* 2004; 1(3): 1-7.
9. Nandy Apurba. *Principles of Forensic Medicine Including Toxicology*. 3rd ed: New Central Book Agency (Pvt) Ltd. London; 2010. 119-127.
10. Pillai MJS. The study of epiphyseal union for determination of age of south Indians. *Ind j Med Res*. 1936; 23: 1015-7.
11. Pillay VV. *Textbook of Forensic Medicine and Toxicology*. 16th ed: Paras Medical Publisher; 2011. 66-7.
12. RAO NageshKumar G. *Textbook of Forensic Medicine and Toxicology*. Jaypee Brothers Medical Publisher (P) LTD. New Delhi; 2000. 19.
13. Reddy KS Narayan. *The Essentials of Forensic Medicine and Toxicology*. 30th ed: K Sugana Devi Hyderabad; 2011. 59-69.
14. Shilajiya Dharmesh, Patel dharmesh, Shah Kalpesh, Govekar Ganesh, Patel Gaurang. Radiological Study of Disappearance of Tri-Radiate Cartilage in Pelvic Bone in Gujarat Population. *J Indian Acad Forensic Med*. July-September 2011; 33(3): 232-236.

15. Survey committee. Survey committee report on Medicolegal practice in India, Ministry of health 1964; 63.
16. Vij Krishan. Textbook of Forensic Medicine and Toxicology Principal and Practice. 2nd ed: B L Churchill livingstone Pvt. Ltd. New Delhi; 2002. 74-81
17. Yatiraj Singi, Deshmukh Kiran, Bijapur Nagaraj. Assessment of age in adolescents by Radiological examination of pelvis & hipjoint. International journal of Medical and Health Sciences, April 2012; 1(2): 10-16.