

A Comparative Study of Age Between Radiological Examination of Pelvis and Birth Certificates in Cricket Players

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ABSTRACT

Introduction: Evaluation of ossification centers of bones, their appearance, growth and union with epiphyseal ends by radiological examination is the most preferable method for age estimation. Among the bones, the study of pelvis, wrist and elbow are found to be simple and more useful. They cover many number of bones and ossification centers that help to determine different age groups. Malpractices are often observed in teenagers playing cricket. Such malpractices can be checked by assessing bone age of the disputable player over the date of birth records

Material and methods: 100 Students playing cricket under two teams were selected. One team was under 17 years and the second team was under 19 years. The skiagram of half of pelvis including the upper part of femur is taken in one film of 8-10 mA/Sec at 45 to 55 k.v. The Hindustan photo film screen sensitive films of 15" x 10" are used by optomum processing method.

Result: Out of 50 subjects playing in the age group of 16-17 years, 14 subjects showed fusion of epiphysal centers which proved that they are above 17 years and their birth certificates showed wrong date of births. Out of 50 subjects playing in the age group of 18-19 years, 13 subjects showed complete fusion of ossification centers which proved that they are above 19 years and their birth certificates showed wrong date of births.

Conclusion: It is clear from the study that there was considerable amount of malpractice in the records of date of births of the cricket players. Bone age assessment from radiographs of wrist and elbow joint and dental examination along with the done pelvic examination help In assesment of accurate bone age.

Keywords: Bone age; Date of birth records; Cricket players; Malpractice

INTRODUCTION

The assessment of age by radiological examination of ossification centers of bones is useful to solve several medico-legal and civil cases like judicial punishments, rape, kidnapping, infanticide, crimes committed by children and also in employment and educational matters, major declarations, marriage disputes, contract agreements, court evidences, child labour, election related disputes, inheritance of property, consent for medical examination, for sports and identity disputes. Evaluation of ossification centers of bones, their appearance, growth and union with epiphyseal ends by radiological examination is the most preferable method for age estimation. Among the bones, the study of pelvis, wrist and elbow are found to be simple and more useful. They cover many number of bones and ossification centers that help to determine different age groups.^{1,2}

In the present study, radiological examination of the ossification centers of pelvis - iliac crest, ischial tuberosity and

upper end of femur is done to assess the age of the students who are zonal cricket players from Kurnool district. Present study is also done to know the correlation between cricket players' bone age and age from date of birth certificates produced in their schools.

MATERIAL AND METHODS

Material

The number of students chosen for the study are 100 (based on inclusion and exclusion criteria) and their consent has been taken for the procedure. Students playing cricket under two teams were selected. One team was under 17 years and the second team was under 19 years.

All are male students playing zonal cricket selected from the Kurnool district and are studying in different schools and colleges in Kurnool district. They are healthy without any malformations or visible physical abnormalities.

Inclusion criteria: Male students playing cricket.

Exclusion criteria: Students having endocrinal abnormalities, malformations and physical abnormalities were excluded.

Methods

Radiographic positioning of the parts: Pelvis including upper 1/3 of the thigh bone is viewed in the film of pelvic joint in order to visualize all the ossification centers

Radiographic factors: The skiagram of half of pelvis including the upper part of femur is taken in one film of 8-10 mA/Sec at 45 to 55 k.v. The Hindustan photo film screen sensitive films of 15" x 10" are used by optomum processing method.

RESULTS

Out of 50 subjects playing in the age group of 16-17 years, 36 showed nonfusion of ossification centers of femur head, greater trochanter and lesser trochanter. That proved that they are below 17 years of age. 14 subjects showed fusion of epiphysal centers which proved that they are above 17 years and their birth certificates showed wrong date of births.

Out of 50 subjects playing in the age group of 18-19 years, 37 showed nonfusion of ossification centers of iliac crest and

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ischial tuberosity. That proved that they are below 19 years of age. 13 subjects showed complete fusion of ossification centers which proved that they are above 19 years and their birth certificates showed wrong date of births.

Bone age and DOB certificates	16-17 yrs	18-19 yrs	Total
Correlated	36	37	73
Uncorrelated	14	13	27
Total	50	50	100

DISCUSSION

The need to assess age in cricketers is important as malpractices are often observed in teenagers playing cricket. Malpractice may be in registering birth dates in municipal records or withholding the entry in birth records during the birth of the child. This allows an over aged player to play in an under aged cricket team. Sometimes malpractice of age of the player will be done at the level of the educational institute. This gives added advantage to the senior player over the junior. Such malpractices can be checked by assessing bone age of the disputable player over the date of birth records. False age is seen in other sports as football also.

According to African football journalist Oluwashina Okeleji players sometimes reduce their age by nearly 10 years in order to meet their personal ambition of excellence.(1) Various methods are evolved for age estimation. One such method is assessment by bone ossification center examination.

A radiographic method to estimate age from the diaphyseal length of either femur or tibia from 1 to 18 years has been evolved by Hunt and Hatch² who have studied the annual formation of transverse lines in these bones. According to Hoffmann the diaphyseal length is a reasonably acceptable means for age estimation of children below 12 years, especially in skeletons where epiphyseal and dental data are missing. An excellent review of ossification centers in relation to gestional age has been published by Karmarkar MD and Wase VV (2000).

The epiphyseal lines on the long bones of a young individual appear as circular grooves around the ends of the bones, and on radiographs as irregular lines resembling a fracture.

The process of ossification varies depending on health, hereditary, nutritional, endocrinal and environmental factors. Typically, a long bone such as the tibia becomes ossified throughout its shaft (diaphysis) at birth; whereas its two ends (epiphyses), are later ossified by secondary centers. A layer of hyaline cartilage persists between the diaphysis and epiphysis. The bone increases in length at this epiphyseal plate or disc (growth plate or growth cartilage), until its final dimensions are attained. The process of union of epiphysis and diaphysis is called fusion. Union is a process, not an event. The long limb bones show epiphysial arrangements at both ends, while metacarpals, metatarsals, phalanges, clavicles and ribs possess an epiphysis at one end only. In some bones, the epiphysial centers at one or both ends are more complex, e.g., in the proximal end of the humerus, which is wholly cartilaginous at birth, three separate centers appear during childhood. They soon unite to form a single epiphysial mass, which later fuses to the diaphysis.

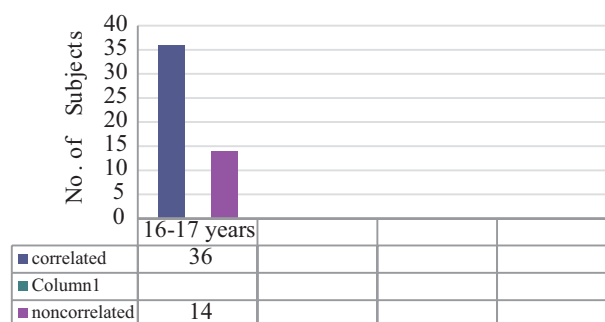


Figure-1: Age vs DOB

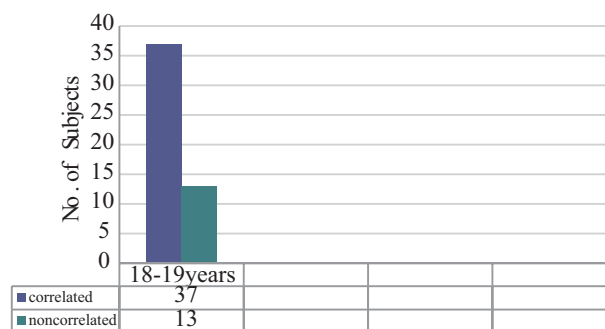


Figure-2: Bone age and DOB

Growth cartilages do not grow at the same rate at all points throughout their substance. By differential rates of growth, the two bony surfaces usually become reciprocally curved, commonly in such a way that the epiphysis fits like a shallow cap over the convex end of the shaft. There may be maturity imbalance between bones from different parts of the same individual. Racial differences are not observed.

Age determination by skeletal maturity is said to be an accurate process. The anatomical area comprising of maximum number of bones is usually selected to be more economical and as much free as possible, from exposure to radiation. Hand-wrist, elbow, pelvis are the areas that are commonly assessed.

Hand-wrist radiographs are more useful for age estimation before puberty; assessment of elbow radiographs is a reliable tool to assess skeletal age during puberty; assessment of pelvic radiographs is a reliable tool to assess skeletal age after puberty.

Bone age can be assessed by different methods. Assigning and rating the data for age estimation:

There are two basic types of methods that are used for medico-legal age certification.

1) The Atlas method: This method is developed by “Cleveland School”, first by Todd. The Greulich - Pyle (1971) atlas for the hand wrist has separate standard of series for boys and girls in which an atlas is used to compare the radiographic films taken of different joints and that have been matched with the films printed in the atlas. Once a match is found the age is read directly from the atlas.

2) The secondary method: Tanner and Whitehouse (TW-1-developed in 1962 and TW2 developed in 1975) in which a score is given to every bone that is X-rayed, in accordance with existing rules of assessment. Finally the scores are added up and the final age read from a standard table.³

3) The third method is radiographing the joints on one side of the body and counting the number of ossification centers and number of epiphyses that have fused.⁴

Recent studies show that cephalograms coincide with radiographs of hand and wrist and can be used in assessing bone age.⁵

In addition to examination of epiphysis of bones, apophyseal ossification centers can also be used for age estimation. Though apophysis does not form a direct articulation with another bone at a joint, it often forms an important insertion point for a tendon or ligament.

Multi-detector computed tomography (mdct) is one of the methods of age assessment. Applying this method in assessing the distance of iliac crest apophysis to iliac bone, and pubic apophysis to pubic bone is used as a method of age estimation.⁶ The apophysis appears laterally on a pelvic X ray, and moves towards the spine as the patient approaches adulthood (Risser's Sign).

Epiphysis of Crest of ilium is known to appear at 15–16 years in males and 14–16 years in females; epiphysis of ischial tuberosity is known to appear at 16–17 years in males and 15–17 years in females. Epiphysis of crest of ilium is known to fuse at 21–22 years in males and at 20–21 years in females and ischial tuberosity is known to fuse at 21–22 years in both genders.

According to Major Hepworth ages at which the epiphyses of the long bones join the diaphyses is as follows:^{7,8}

Epiphyseal union at:	Years
1. Humerus, head	17-18
2. Humerus, lower end	14 ½
3. Humerus, lateral condyle	14-15
4. Radius, head	16-17
5. Radius, lower end	16-17
6. Ulna, lower end	16-17
7. 1 st metacarpal base	16 ½ - 17 ½
8. Femur, head	15 1/2 - 17 ½
9. Femur, lower end	16 1/2- 17 ½
10. Femur, great trochanter	16-17
11. Tibia, upper end	16 1/2- 17 ½
12. Tibia, lower end	16- 17 ½
13. Fibula, upper end	16 1/2- 17 ½
14. Fibula, lower end	17-18

After observing epiphyses of iliac crest and ischial tuberosity, fusion of epiphyses is graded, according to William Sangma et al and Mckern and Stewart into five stages as follows:

Stage 1 (F1) Non-union of the epiphysial cartilage

Stage 2 (F2) Commence of union

Stage 3 (F3) Incomplete union

Stage 4 (F4) Complete union

Stage 5 (F5) Complete union⁹

Present study is done based on the above observation. Hundred cricket players were tested. Fifty players belonged to under 16 cricket team and another fifty belonged to under 19 team.

In under 16 team, age assessed by ossification of bones correlated with age shown in date of birth certificates in 36 cases out of fifty. The remaining showed non correlation between bone age and DOB as there was ossification of ischial tuber-

osity and trochanters of femur showing that the age of the players was more than 16.

In under 19 team, age assessed by ossification of bones correlated with age shown in date of birth certificates in 37 cases out of fifty. The remaining showed non correlation between bone age and DOB as there was ossification of iliac crest of pelvis showing that the age of the players was more than 19.

CONCLUSION

It is clear from the study that there was considerable amount of malpractice in the records of date of births of the cricket players. Bone age assessment from radiographs of wrist and elbow joint and dental examination along with the done pelvic examination may help in assessment of accurate bone age.

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