Original research paper

Study of Elbow Joint for Estimation of Age in 11 to 18 Years in both Sexes of Andhra Pradesh

Kurugundla Sireesha[1], Sireesha Barika [2], Usha C[3], S Naveen Kumar[4]

[1]Assistant Professor, Department of Anatomy, GSL Medical College and hospital Rajahmundry, Andhra Pradesh-533296, [2]Assistant Professor, Department of Anatomy, Government Medical College Vizianagaram-535003. [3,4]Professor, Department of Anatomy, Malla Reddy Institute of Medical sciences Suraram Road, Quthbullapur, Hyderabad-500055.

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Abstract

Background: Age determination of individual is important in number of opportunities like education, sports, and medico-legal factors. Ossification centres of bones play vital role in age determination. It is accepted in court of law.

Method: 45 Boys and 45 Girls (total 90) children aged between 11 to 18 years were studied radiologically and classified their numbers as per age and sex, Appearance and fusion of bones of elbow joints.

Results: Equal number of boys and girls were selected from 11 years to 18 years of age. Appearance of trochlea at 11 years appeared only in girls. Fusion of trochlea was 14 to 15 years in boys, 12 to 14 years in girls. Appearance of lateral epicondyle was 11 to 12 year in boys and 11 year in girls. Fusion of lateral epicondyle was 13 to 16 years in boys and 13 to 14 years in Girls. Fusion of medial epicondyle 14 to 16 years in boys, 11 to 15 years in girls. Fusion of head of radius 11 to 16 years in boys and 11 to 13 in girls. Appearance of olecranon process- 11 to 13 years in boys and 11 years in girls. Fusionof olecranon process 17 to 18 years in boys and 15 to 16 years in girls.

Conclusion: This pragmatic radiological study of elbow joint between 11 to 18 years has regional, environmental, anatomical, anthropological and medico-legal importance because morphometric values of mesodermal origin are uncertain.

Keywords: Ossification, Elbow joint, age, medico-legal, radiological

Introduction

Age is an important demographic parameter in many fields yet the documents used to prove age such as birth certificates and national identity cards are liable to forgery. In medico-legal field, age is determinant in crimes committed by children or against children because punishment based on criminal responsibility determined by age [(1)]. Such cases involve rape, kidnapping, marriage, and in establishing competency of witness. Accurate age estimation, ensures authorities fulfil obligation in providing support to vulnerable groups especially below 18 years of age [(2)]. Age is likewise significant in sports mainly in the design of competitions according to age groups to guarantee equal chances.

Corresponding Author: Sireesha Barika, Assistant Professor, Department of Anatomy, GSL Medical College and hospital Rajahmundry, Andhra Pradesh-533296.

E-Mail: drsireeshagslmc@gmail.com

Ossification centres are reliable age indicators due to definite sequence and time of their appearance and fusion [3]. The scientific study of maturation of ossification centres is accepted by the law court globally as a method for age determination [4].

The appearance and fusion of ossification centres are influenced by geographical, ethnic, climatic and nutritional factors hence attempt was made to evaluate the bones of elbow joint for estimation of aged between 11 to 18 years.

Material and Method

45 Boys and 45 girls at different age groups (between 18 years) visited to GSL medical college along with their parents or as attender to patients admitted in GSL medical college hospital Rajahmundry. Andhra Pradesh – 533296 were studied.

Inclusion Criteria: Well-built healthy volunteers were selected for study.

Exclusion Criteria: Boys and girls with any apparent body physical disabilities, non - operative deformities, malnutrition, or prior fractures were omitted from the study**.**

Methods

The ossification of elbow joint was studied radiologically. Antero – posterior (AP) view was taken by placing the upper limb in full extension and supine position to visualise medial, lateral epicondyle and humero - radial joint. Lateral view was taken by flexing the elbow at 90^{o} degree and forearm in semi-pronated position to visualise olecranon process and Humero-radial joint.

The duration of study was July-2020 to December-2022.

Statistical analysis: Distribution of different age groups in both sexes were classified with percentage. Different ossification centres of elbow joint was noted and compared in both sexes. The statistical analysis was done using SPSS software.

The ratio of Boys and girls was 1:1.

Figure 1: Yellow arrows show the appearance of the ossification centre at the lateral epicondyle of the humerus.

Figure 2: Yellow arrows show the epiphyseal union of the lateral epicondyle of the humerus

Figure 3: Yellow arrows show ossification centre at medial epicondyle and olecranon process (right).

Discussion

Present study of elbow joint of estimation of age in 11 to 18 years in both sexes of Andhra Pradesh. 45 boys and 45 girls elbow joints were studied radiologically. Equal number of boys and girls were selected from 11 years to 18 years of age (Table-1). Trochlea appeared in girls around age 11 but not in boys. Fusion of trochlea was 14 to 15 years in boys and 12 to 14 years in girls, Appearance of lateral epicondyle was noticed in boys aged 11 to 12 years and 11 years in girls, Fusion of lateral epicondyle 13 to 16 years in boys and 13 to 14 in girls, Fusion of medial epicondyle 14 to 16 years in boys and 11 to 15 years in girls, Fusion of Head of Radius 14 to 16 years in boys, 11 to 13 years in girls, Appearance of olecranon 11 to 13 years in boys and 11 years in girls, Fusion of olecranon 17 to 18 years in boys and 15 to 16 in girls (Table-2) (Figure-1 and 2). These findings are more or lessin agreement with previous studies [5] [6] [7].

Table 1: Distribution age in both sexes

Total No: 45 Boys & 45 Girls

Age in year	Boys (45)		Girls (45)		Total	
	No	%	No	%	No	%
11 year	5	11.1	5	11.1	10	11.1
12 year	7	15.4	7	15.4	14	15.4
13 year	9	20.1	9	20.1	18	20.1
14 year	7	15.4	7	15.4	14	15.4
15 year	3	7.3	3	7.3	6	7.3
16 year	5	11.2	5	11.2	10	11.2
17 year	4	8.4	4	8.4	8	8.4
18 year	5	11.1	5	11.1	10	11.1

Table 2: Appearance of ossification centres in Bones of Elbow joint

Appearance of Trochlea		Fusion of trochlea		Appearance Of Lateral Epicondyle		Fusion of Lateral Epicondyle		Fusion of Medial Epicondyle		Fusion of Head of Radius		Appearance olecranon		Appearance of olecranon	
B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
-	11 yrs	14 to 15yrs	12 to 14yrs	11 to 12yrs	11yrs	13 to 16yrs	13 to 14yrs	14 to 16yrs	11 to 15yrs	14 to 16yrs	11 to 13yrs	11 to 13yrs	11yrs	17 to 18yrs	15 to 16yrs

B = Boys, G = Girls

It has been noted that female bones ossify before male bones do. The ossification of bone in bilaterally symmetrical variation is a heritable feature.[8]. Earlier fusion in female than male bones occurs because centres of fusion act according to the state of endocrine secretion, health and nutrition of individual.

Undoubtedly there are racial, geographical and hereditary differences. All these factors have not been adequately determined [9]. A youngster who is larger than average or obese is often subjected toun-warranted epiphyseal stress. His/ Her bulk may give rise to a false impression of degree of bone maturity. Earlier fusion of epiphysis in female is observed in previous studies of India and abroad. The probable reasons could be (a) the rate of bone growth fusion (maturation) is influenced not only by age and sex but by socio-economic status, the individual total body weight and possibly by function. Therefore racial difference is also required to be taken into account. (b) The internal structure of bone is adapted in a very remarkable way to resist the various stress to which it is subjected to during the life. Hence tubercles and tuberosities are formed in direct response to pull of tendons and ligaments [10]. (c) The process of ossification is associated with appearance, not directly determined by any local cellular elements but controlled by extrinsic chemical factors related to general metabolism of the body and local variations in the blood supply [12] because until maturity is reached at the epiphysis, the growing ends of the bones are the seat of great proliferative activity.

Summary and Conclusion

The present study was done to estimate the age by using radiographs of elbow joint in the age group 11-18 years in Andhra Pradesh. Age determination based on appearance of ossification centres and epiphysealunion of bones radiologically is accepted scientific method worldwide. However geographical location, diet, race, ethnicity and hormonal factors could ensure the accuracy in age determination. The present study demands further embryological, genetics, nutritional, hormonal, environmental studies because the greater activities of osteocyte and osteoclast cells still remain uncertain. Moreover all the factors which determine the time of ossification are still obscure.

Limitation of study – Owing to tertiary location of research centre, we have our own limitations regarding sample size and access to latest technology which can have a bearing on the results.

Ethical Clearance: This research paper work approved by Ethical committee of GSL Medical College and hospital Rajahmundry, Andhra Pradesh-533293.

Conflict of Interest: NIL

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