

Sexual Dimorphism of Degree of Carrying Angle in South Indian Population

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Abstract

68 males and 82 females of adult aged between 20- 35 were selected for study. Their degrees of carrying angle were measured by Goniometer. The mean value of left carrying angle in males was 163.6 (SD±6.1) and females was 164.9 (SD ± 3.6) and 't' test value was 8.59 which was highly significant statistically ($p < 0.01$). The mean value of right carrying angle in males was 169.8 (SD±4.4) and in females 171.2 (SD± 3.4) 't' test value was 8.69 which has highly significant p value ($p < 0.01$). This study is very much important to orthopaedic surgeons to reconstruct the elbow joint during traumatic condition, radiologists to compare the normal degrees with fractured elbow joint. Moreover to the medico legal experts to differentiate the sex, to the Anatomists and anthropologists. These subjects belong to south Indian population, hence represent ethnic importance.

Keywords: Sex. Goniometer; Elbow Joint; South India.

Introduction

There are many criteria's for the sexual dimorphism in the human skeleton for example. Angle of the mandible, diameter of the foramen magnum, width of the zygomatic bone, length of mastoid process, prominence of superciliary arches, depth of the diagastric groove, subpubic angle of the pelvis, Articular facet of the sacrum, Sacral index, but least data is available regarding sexual dimorphism of carrying angle. Even some authorities claim that, there is no difference between degrees of carrying angle in males and females [1], although it is claimed by some authorities that it is greater in females.

The long axis of Ulna is not aligned with that of forearm that is the forearm is deviated somewhat

laterally from humeral axis. The deviation being known as 'carrying angle'. The carrying angle is usually 163- 173 degrees towards the body but in females it is more. Trochlea being eccentrically placed and it has been reported that it changes the carrying angle during elbow flexion, so that misalignment between arm and forearm decreases [2]. The range of motion of flexion and extension is primarily the joint architecture and approximately 140 degrees [3]. Hence attempt is made to study the carrying angle. Hence attempt is made to study the carrying angle in both the sexes of adult between 20-35 years.

Material and Method

68 males and 82 females having normal stature who were attendants of patients of AIMS medical college were selected for the study. The height was measured in centimetres and the carrying angle as per the description of text book 'An introduction to evolutionary anatomy' by Aeilo. L. And Dean Christopher.

Subject was made to stand in Anatomical position and the lesser tuberosity of humerus is located by a point (A) which is 3 cms below the lateral end of clavicle. Maximum prominence at the posterior aspect of elbow was located for the head of the ulna and

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Received | 24.01.2017, Accepted | 07.02.2017

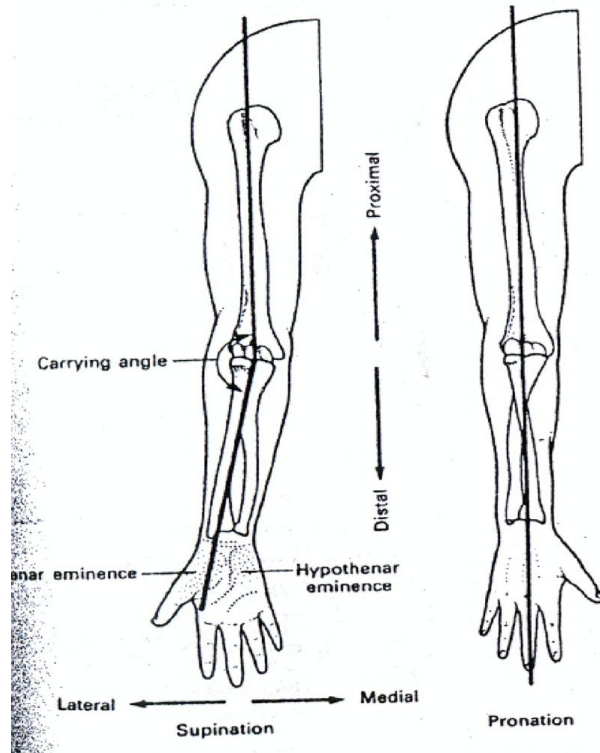


Fig. 1: Supination and pronation of the hand. Note that the bones of the forearm are parallel in supination and crossed in pronation. The carrying angle is present in supination and disappears in pronation when the axis of the forearm comes in line with the axis of the (upper) arm.

corresponding point on the anterior aspect of the elbow was marked (B). Now join A with B. Locate a point at the base of proximal phalanx of the second finger (index finger) most laterally which corresponds to the axis of ulna (c). Join AB and C. The angle at B was measured with Goniometer. The obtained values are measured statistically. The duration of the study was about one year.

Aiello.L.and Dean Christopher .Introduction to human evolutionary anatomy –Chapter 8 . Evolution of bones of upper limb 5TH edition. Her court brace and company. A cademic press publisher. London, Sandeigo, Newyork 1990 , 309.page.310–313 [4].

Observation and Result

Table 1 - Left carrying angle. No of males 68 and females 82. The mean value of left carrying angle of male is 163.6 (SD ±6.1) and in females the mean value is 164.9 (SD±3.6), 't' test value is 8.59 which is statistically highly significant ($p < 0.01$).

Table 2 –Right carrying angle. The mean value of right carrying angle in male is 169.8 (SD± 4.4) and in female the mean value is 171.2 (SD ±3.4), 't' test value is 8.6 which is statistically highly significant ($p < 0.01$).

Table 1: Sexual dimorphism of left carrying angle in south Indian population

| Mean value | Sex | No | 't' test value | P value |
|-----------------|--------|----|----------------|--------------------|
| 163.6(SD+ _6.1) | Male | 68 | 8.69 | P < 0.01 |
| 164.9(SD+_3.6) | Female | 82 | | Highly significant |

Table 2: Sexual dimorphism of right carrying angle in south Indian population

| Mean value | Sex | No | 't' test value | P value |
|----------------|--------|----|----------------|----------|
| 169.8(SD+_4.4) | Male | 68 | 8.59 | P < 0.01 |
| 171.2(SD+_3.4) | Female | 82 | | |

Discussion

In the present study, mean value of left carrying angle in male is 163.6 (SD ± 6.1) and in females it is 164.9 (SD ±3.6) 't' value is 8.5 which is statistically highly significant ($p < 0.01$) – Table 1. The mean value of right carrying angle in male is 169.8 (SD ± 4.4) and in females it is 171.2 (SD ±3.4), 't' test value is 8.6 which is highly significant statistically ($P < 0.01$).

These present values are more or less in agreement with the previous studies although the method of measurement is different [5,6].

The reason of more degree in female could be olecranon–coronoid angle which exhibits high sexual dimorphism [7] and due to wider pelvis elbow joint is kept away. Carrying angle develops in response to pronation and is dependent on the length of forearm bone, greater the length, lesser is the angulations of proximal articulation of proximal articular surface [8]. Hence it is treated as secondary sexual characteristics in females. It can also be hypothesised that the variations in the secretions of hormones such as calcitonin which act on bone formation might have impact on the active joint like elbow. So females could have more carrying angle.

Moreover laxity of ligaments of elbow joint is

observed more in females than males; hence the carrying angle might have increased in females [9].

In our study, maximum females are housewives, Hence due to continuous domestic work, there could be stress on the elbow joint and to adapt to the stress bone remodelling might have occurred resulting into more degree of carrying angle in females [10].

In addition to this females have bone resorption due to loss of blood in menses every month. Hence to overcome the resorption there could be non alignment of the bones of elbow and hence the non alignment of long axis of Ulna, which could have deviated more and increase in carrying angle.

It is established fact that majority of Indian women suffer from obsessive compulsive disorder (OCD). Due to variation in the discharge of neurotransmitters at the neuromuscular junction at the joints, this condition might have deviated the axis of bones at the elbow and increased the carrying angle in females as compared to males. Majority of females have short stature and they have more degree of carrying angle than the long statured [11].

Summary and Conclusion

The present study of sexual dimorphism of degree of carrying angle in south Indian population is more important to orthopaedic surgeons, radiologists, Anthropologists and Anatomists. These obtained statistical values indicate the drifting population of the present scenario, because morphometric values of the mesodermal derivatives are uncertain. This study further demands biomechanical, embryological, genetic and nutritional studies, because exact formation, mechanism and duration of formation of the joint is unclear. Moreover nutritional status plays vital role in the intra and extra embryonic life. The formation and movement of the joint is the outcome of genetic makeup, but genetic activities acting on the particular joint is still obscure.

Acknowledgment

Authors are thankful to Dr. M.G. Shivaramu, Principal AIMS, BG Negara -571448., Mandya district for his constant encouragement.

No Conflict of Interest

No funding

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