



MEASUREMENT OF UPPER LIMB BONE FOR CEREBRAL HEMISPHERE DOMINANCE IN WESTERN RAJASTHAN

Mantri Eti* , Kataria K.Sushma¹,Joya Hemakanwer²

*P.G. student, Department of Anatomy, Dr S.N. Medical College, Jodhpur , India. Phone No.9460055428 postal address- 1-GHA-35 dadabari, kota, Rajasthan 324009.

¹Professor and Head, Department of Anatomy, Dr. S.N. Medical College, Jodhpur, India.

²Senior Demonstrator, Department of Anatomy, Dr. S.N. Medical College, Jodhpur, India.

Corresponding author email:etimantri22@gmail.com

ABSTRACT

Aims and objective: - Most of the long bone of the body are developed from endochondral ossification . The growth of the length of long bone depends upon the cell present in the proliferative zone of epiphyseal plate. Growth of diameter depends mainly on the continuous deposition of sub periosteal region of the bone as periosteal ossification. As most of the people are right handed,the right dominance coincides with the dominant left cerebral hemisphere.

Material and method; - This study contributed 20 pairs of upper limb bones of the unknown sex. Bone of arms Humerus, bones of forearm Radius,Ulna of both sides are collected from the department of Anatomy , Dr S.N. Medical college ,Jodhpur . Length is measured on an Osteometric Board and Circumference measured by Vernier Caliper.

Result: - Length and circumference of Humerus, Radius and Ulna of right sided is more longer shows the right dominance coincides with left Cerebral Hemisphere in the Western Rajasthan.

Conclusion: - The present study conducted on the measurement of long bone of upper limb in western Rajasthan concluded that bones of right upper extremity are longer and more in circumference the left sided. Right dominance of upper limb bone seems to be dominated left cerebral hemisphere. Measurement of length and circumference of upper limb bone can be attributed to the type of movement.

Key words: - upper limb bones, length, circumference , Vernier Caliper.

INTRODUCTION

Most of the long bones of the body are developed by endochondral ossification. Limb developed at the end of the 4th week, limb buds become visible as outpocketings from the ventrolateral bodywall. Forelimb appear 1st then hindlimb. The limbs develop from somatopleuric mesenchyme the lateral wall. Regions of the somatopleuric mesenchyme at specific positions along the main body axis proliferate extensively to give rise to limb buds. These buds are 1st visible signs of limb development and are rimmed by a longitudinal ridge of high columnar epithelial cells, the apical ectodermal ridge.

Ultrasound recording has shown that by the tenth week of gestation, the majority of fetuses move the right arm more than the left and from 15th week most suck the right thumb rather than the left an asymmetry strongly predictive of later handedness.

Left hemisphere controls the dominant right hand; it came to be widely regarded as the dominant or major hemisphere and the right as non dominant as minor.

Browse through a list of history's most famous left handers and you are likely to see Albert Einstein's name. You may even see people typing Einstein's genius to his left handedness. The problem is , Einstein's left handedness is a myth. Myriad photos show him writing on chalkboard with his right hand for example.

But handedness has its roots in the brain-right handed people have left hemisphere – dominant brains and vice versa and the lefties who claim Einstein weren't all that far off. While he was certainly right handed, autopsies suggest his brain didn't reflect the typical left side dominance in language and speech areas. His brain's hemispheres were symmetrical-a trait typical of left handers and the ambidextrous.

Growth of the length of the long bone depends upon the cells present in the proliferative zone of epiphyseal plate. Growth of the diameter depends mainly on the continous deposition in sub periosteal region of the bone as periosteal ossification¹ .Growth of the bone is influenced by vitamins, minerals, hormones and gentic factors. As most of the people are right handed, the right dominance coincides with the dominant left cerebral hemisphere.

MATERIAL AND METHODS

This study contributed 20 pairs of upper limb bones of the unknown sex. Bone of arm Humerus, bones of forearm Radius and Ulna of both sides are collected from Department of Anatomy, Dr S.N. Medical College, Jodhpur. Fractured Or pathological bones were excluded from the study. Length is measured on an Osteometric Board and circumference measured by Vernier caliper.

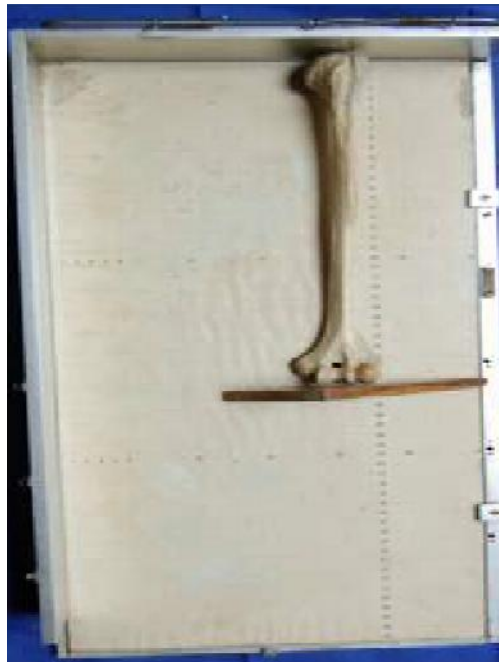


Figure1. Measuring length of Humerus on an Osteometric board



Figure 2 Measuring Circumference of Radius by Vernier Caliper

OBSERVATION AND RESULT

The absolute parameter of length and circumference of mid shaft of both the sides of upper limb bones are presented.

Table No.1 depicts the side dominance parameter of Humerus

Table No. 2 depicts the side dominance parameter of Radius

Table No. 3 depicts the side dominance parameter of Ulna

Table No.4 Mean, SD and P values of both side upper limb long bones were mentioned.

Table No.1 Parameter of Humerus

S.no	RIGHT SIDE		LEFT SIDE	
	Length	Circumference	Length	Circumference
1	32	7	29.5	8
2	32.5	8.2	31	7
3	35	8	28.5	6
4	32.5	8.2	31.5	7.2
5	30	6.2	31.5	6.2
6	31.5	7.5	27.5	6.2
7	33.5	8	32	7.5
8	31.5	7.2	32	7
9	32	8	31.5	7.1
10	32	8.5	29	7.5
11	30.5	8	33.5	7.2
12	32	8.2	24.5	7.5
13	31	7.2	32.5	6
14	31	8.5	33	7.5
15	27.5	7.5	26.5	7.2
16	32	8	31	6
17	30	8.2	31.5	7.2
18	27.5	7.2	24.5	7.5
19	31	7.5	29	7.5
20	30	8.5	30	7

Total	626.5	155.6	600	140.3
--------------	--------------	--------------	------------	--------------

Table No. 2 Parameters of Radius

RIGHT SIDE			LEFT SIDE	
S.no	Length	Circumference	Length	Circumference
1	22.5	4.45	24.5	4.7
2	24	4	23.5	4.5
3	21.5	3.2	23	3.23
4	25.5	4	26.5	4.5
5	24	4.86	26.5	3.4
6	24.5	4.34	24	3.2
7	25.5	4.7	24	4.4
8	24	4.44	21.5	3.3
9	25	4.2	26	4.4
10	23.5	4.7	25	4.5
11	23	4	23.5	4
12	25	4.4	22	4.2
13	25.5	4	23.5	3.2
14	23.5	4.2	20.5	4.5
15	25.5	5	24	4.4
16	22	4.2	21.5	4
17	24.5	4.4	24	4.2
18	25	3.23	26	3.2
19	23.5	4.45	20	4.5
20	25.5	3.2	23.5	4.4
Total	483	83.7	473	80.7

Table No.3 Parameters of Ulna

RIGHT SIDE			LEFT SIDE	
S.no	Length	Circumference	Length	Circumference
1	27	5.3	25	4
2	26	4.8	27.5	4.2
3	25.5	5.1	22	4.3
4	24.5	4.7	25	3.8
5	29	5.1	26.5	4.4
6	27.5	4.8	26	4.7
7	27.5	4.7	28	4
8	27	5	23.5	4.3
9	25	3.8	26.5	4.8
10	23	4.2	25.5	4
11	25	4.8	28.2	4.4
12	28.5	5.1	27.5	4.7
13	26.5	5.3	26	4.3
14	26.5	4.8	27.5	4.3
15	23	3.8	26	4.8
16	22.5	4	23	3.8
17	27	4.5	26	4
18	25.2	4.7	25	4.3
19	26	4.8	23.5	4.2
20	24	4.7	22	3.8

Total	516.2	94	512.5	85.1
--------------	--------------	-----------	--------------	-------------

$$\text{MEAN :- } \frac{\text{Total or sum of the bones}}{\text{Number of the bones taken}}$$

$$= \frac{[x_1+x_2+\dots\dots\dots+x_n]}{n}$$

$$\mu = \frac{X}{n}$$

Table No. 4 The Statistical Significance Of Mean \pm S.D And P Value Of The Length And Circumference Of Right And Left Humerus , Radius And Ulna

Parameter	Right	Left	P Value
Humerus			
Length	31.32 \pm 1.77	30 \pm 2.61	.068 NS
Circumference	7.78 \pm 0.06	7 \pm .604	.0002 ES
Radius			
Length	24.15 \pm 1.22	23.65 \pm 1.86	.32 NS
Circumference	4.18 \pm 0.50	4.0 \pm .55	.28 NS
Ulna			
Length	25.81 \pm 1.8	25.62 \pm 1.94	.74 NS
Circumference	4.7 \pm 0.44	4.2 \pm 0.31	.0001 ES

Mean length of Humerus , Radius and Ulna was greater on right side than left side, the difference on the both sides for Humerus ,Radius and Ulna is not significant ($P < 0.068, 0.32, 0.74$).

Mean Circumference of mid part of shaft of Humerus , Radius , Ulna was greater on right side then Left side , difference on the both sides for Humerus and Ulna is extremely significant ($P < .0002, .0001$).

DISCUSSION

The results of the present study suggest that the overall incidence of Circumference and length of bones were more on right upper extremity as compared to the left. Many researchers have demonstrated asymmetry in length of long bones of upper limbs and lower limbs along with weight of long bones.

According to Tonka Cuk (2001) ^[8] Asymmetry is more pronounced in the upper extremity than lower because we use our arms in countless one handed or both handed and bilateral asymmetry of the Humerus is reflecting the hand performance.

According to Pande BS (1971) ^[3] Taylor (1977) ^[7] right dominance of long bones are considered as congenital phenomenon.

According to Prives MG (1960) ^[4] the dominance pattern could be influenced by postnatal adaptation and physical work.

Latimer HB (1965) ^[2], Ingalls NW (1931) ^[1] these authors observed the predominance of right dominance in the upper limbs than lower limb long bone.

The results of the present study is in line with the conventional view that one dominant hemisphere leads to dominance of the contra lateral extremities. As in majority of the population, the left cerebral hemisphere is dominant; it may be resulting in dominance of the right upper limb.

CONCLUSION

The Present study conducted on the measurement of long bones of upper limb in western Rajasthan concluded that the Bones of right upper extremity are longer and more in Circumference than left sided.

Right dominance of the upper limb bone seems to be dominated left cerebral hemisphere. Measurement of Length and Circumference of the upper limb bone can be attributed to the types of movement.

To conclude, the bones of the right upper extremity are longer. The right dominance seems to be a congenital phenomenon coinciding with the dominant left cerebral hemisphere.

REFERENCES

- 1) Ingalls NW (1931) Observations on bone weights. *Am J Anat* ; 48: 45- 98.
- 2) Latimer HB, Lowrance EW (1965), Bilateral asymmetry in weight and in length of Human bones. *Anat Rec* ; 152: 217 – 224.
- 3) Pande BS, Singh I, (1971) One sided dominance in the upper limbs of human fetuses as evidence by asymmetry in muscle and bone weight. *J Anat* ; 109: 457 – 459.
- 4) Prives MG (1960) Influence of Labour and sports upon Skeleton structure in man. *Anat Rec* ; 136: 261.
- 5) Singh G, Mohanty C (2005) Asymmetry in the weight and linear measurements of the bones of the upper limb. *Biomed Res* 16 (2):125-127
- 6) Standring S. *Gray's Anatomy* (2008) The Anatomical basis of clinical practice. 40th ed. Edinburg. Elsevier Churchill Livingstone; (5): 95.
- 7) Taylor JR, Halliday MJ (1977) Limb Assymetry. *J Anat* ; 124: 520 – 521.
- 8) Tonka Cuk, Petra Leben – Seljak, MarijaStefancic (2001) Lateral Asymmetry of Human long bones. *Variability and Evolution*; (9): 19 – 32.