

Original article:

Morphometric analysis of lumbricals of upper limb-hypertrophied 1st lumbrical

¹ Dr.Neelima.P., ² Dr.Ravi sunder R.

¹Associate professor ,Department of Anatomy,GIMSR,Visakhapatnam

²Associate professor ,Department of Physiology,GIMSR,Visakhapatnam

Corresponding author : Dr.Neelima.P.

Abstract

Background : Lumbricals of the hand are the key muscles for skilful functions. Variations are common in their size and origin. This forms the basis for the study.

Aims and objectives : To measure the size of each lumbrical and to compare the values with those given in standard books.

Materials and methods : 16 upper limbs kept for routine dissection for 1st MBBS students were taken. The upper limbs are from the cadavers of both genders between the age groups 40-60 years. The lengths and breadths of each lumbrical was measured, tabulated and graphically represented. The values from the study were compared with those given in the standard textbook.

Result : The mean values of lengths of 1st ,2nd ,3rd & 4th lumbricals were 86.125, 75, 70.68 & 67.875mm respectively. The mean values of the breadths were 6.6875, 3.5, 3.375 & 3.3125mm respectively. The results showed a slight variation when compared to those given by James R Doyle for the other lumbricals but there was a gross difference in the values for the 1st lumbrical. The study revealed hypertrophied 1st lumbrical in right upper limb measuring 99mm x 11mm and its counterpart measured 97mm x 10mm. p value calculated from chi square came to be 0.0025 and is considered very statistically significant.

Conclusion : It is evident from the study that variations in the size of lumbricals are common. There is hypertrophy of the 1st lumbrical in two upper limbs from the study. This may be an etiological factor for various clinical implications.

Keywords : Morphometry, hypertrophy, lumbrical, variations, cadaver

Introduction

Lumbricals are the peculiar muscles connecting palmar and dorsal aspects of the hand. They are named after their resemblance to the round worm *Ascaris lumbricoides*. Lumbricals are four small fasciculi which arise from the tendons of flexor digitorum profundus^[1]. These small motor units help to perform various skilful movements contributing to the prehensile function of the hand. Lumbricals are numbered from lateral to medial side. Lateral two are unipennate arising from the radial sides and palmar surfaces of the tendons of index and middle fingers

respectively^[1]. Medial two lumbricals arise from the contiguous sides of the tendons for middle, ring and ring, little fingers respectively. They are attached to the lateral margin of the dorsal digital expansion of extensor digitorum. Variations are common in lumbricals regarding their origin and size. A good number of studies were conducted to study the variations and also its relation to carpal tunnel syndrome^[2-5]. The present study was done to determine the variations in the size of lumbricals of the upper limb.

Materials and methods

16 upper limbs (both right and left) from the cadavers of both sexes between the ages of 40-60 yrs were dissected. The length and breadth of each lumbrical

was measured to the nearest millimeter. The results were tabulated, graphically represented and compared.

Result

The lengths and breadths of each of the lumbricals of the 16 hands were depicted as below:

Table 1: lengths and breadths of the lumbricals in mm

S No.	Hand number	Lumbrical number	Length (mm)	Breadth (mm)
1.	1	1	99	11
2.		2	81	3
3.		3	74	3
4.		4	72	2
5.	2	1	97	10
6.		2	80	4
7.		3	75	3
8.		4	71	3
9.	3	1	87	5
10.		2	79	3
11.		3	73	4
12.		4	65	3
13.	4	1	87	6
14.		2	76	4
15.		3	74	3
16.		4	63	4
17.	5	1	88	8
18.		2	77	3
19.		3	70	4
20.		4	68	3
21.	6	1	85	5
22.		2	75	3

23.		3	74	3
24.		4	74	3
25.	7	1	84	7
26.		2	79	4
27.		3	72	3
28.		4	68	3
29.	8	1	85	7
30.		2	76	3
31.		3	70	4
32.		4	69	4
33.	9	1	82	8
34.		2	69	4
35.		3	65	3
36.		4	64	3
37.	10	1	80	5
38.		2	71	4
39.		3	68	4
40.		4	64	3
41.	11	1	83	6
42.		2	75	4
43.		3	70	3
44.		4	70	4
45.	12	1	86	5
46.		2	72	3
47.		3	67	3
48.		4	63	4
49.	13	1	83	7
50.		2	74	3
51.		3	72	3

52.		4	73	4
53.	14	1	84	5
54.		2	73	4
55.		3	69	4
56.		4	66	3
57.	15	1	83	6
58.		2	70	3
59.		3	68	3
60.		4	67	4
61.	16	1	85	6
62.		2	73	4
63.		3	70	4
64.		4	69	3

Table 2: mean value of lengths and widths of the lumbricals

Lumbrical	Mean length(mm)	Mean width(mm)
1	86.125	6.6875
2	75	3.5
3	70.68	3.375
4	67.875	3.3125

P value was calculated using chi square test and degree of freedom from standard p value calculator. Chi square was calculated using the following formula

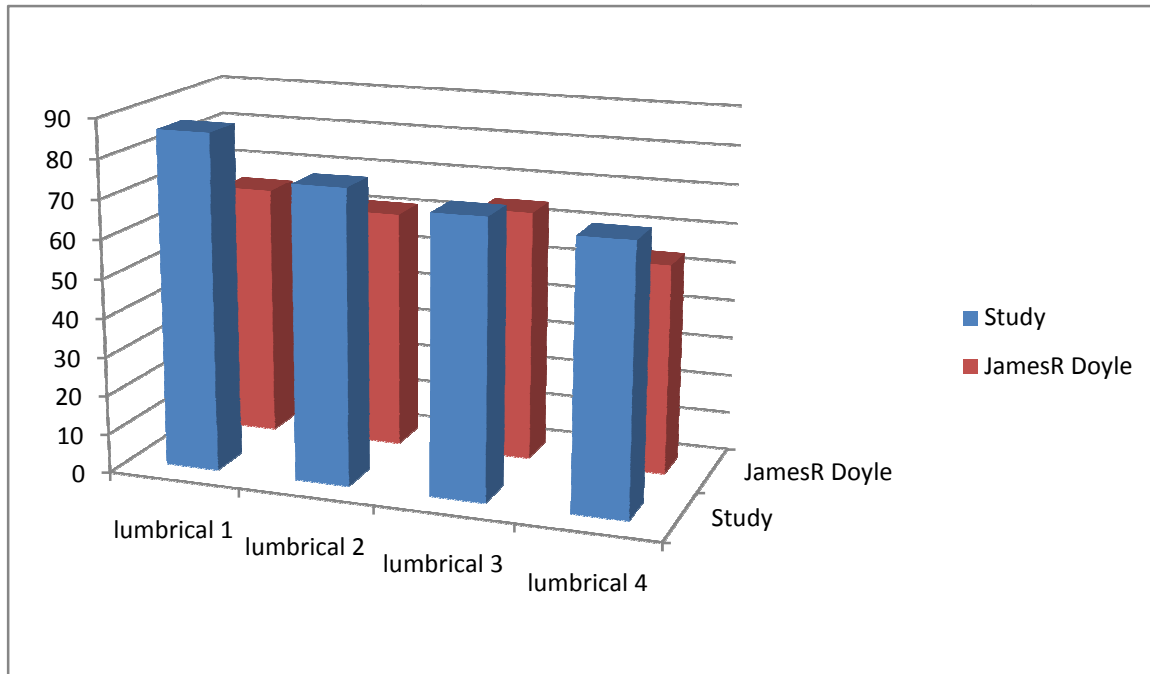
$$X^2 = \sum \frac{(O-E)^2}{E}$$

Where X^2 is chi square, O is observed value and E is expected value.

Chi square=14.36; degree of freedom=4-1=3

P value from chi square test = 0.0025 very significant statistically

Graph 1: Comparison of the values of present study with James R Doyle



Picture 1: hypertrophied 1st lumbrical right palm



Picture 2: left palm of the same cadaver showing hypertrophied 1st lumbrical measuring less than that of its right counterpart



Picture 3: Normal sized lumbricals



Discussion

Lumbricals owe special characteristic features of having tendinous origin and connecting dorsal and palmar tendons thereby play a major role in prehensile function of the hand. Variations are common in their origin and size (Gray's anatomy 40th Ed.). Proximal origin of the lumbricals in the carpal tunnel may be a cause for the carpal tunnel syndrome (Joshi et al 2005). Hypertrophied lumbricals may compress radial and ulnar arteries of the fingers that may likely cause chronic sub ischaemia (Singh et al, 1975).

It is obvious from the present study that there is a slight increase in the lengths of all the lumbricals when compared to those values given by James R Doyle. The lengths of the 1st lumbricals showed a gross increase when compared to others. There were

2 palms from the study which showed marked hypertrophy of the 1st lumbrical while other lumbricals were normal. P value showed that it is very significant statistically. Hypertrophy of the 1st lumbrical may compress the radial artery or it may be the cause for the carpal tunnel syndrome as it is having a proximal origin extending into the carpal tunnel.

Conclusion

The study depicted a variation of the lengths of the lumbricals which is very statistically significant. There were 2 palms in the study (of same cadaver) showing varying degrees of hypertrophy of the 1st lumbrical. Knowledge regarding the variations in the sizes of the lumbricals of the palm may be helpful while performing surgeries on the palm or while diagnosing the etiology of carpal tunnel syndrome.

References:

1. Gray's anatomy: The anatomical basis of clinical practice; 40th edition Churchill Livingstone: pg 886
2. Surgical anatomy of hand and upper extremity James R Doyle ;Lippincott Williams & Wilkins, 2003
3. Mahendra NJ, Imran M. Hypertrophy of the First Lumbrical Muscle. Int J Health Rehabil Sci. (2013), [cited February 16, 2016]; 2(2): 136-139.
4. Mamatha Hosapatna, Hemalatha Bangera , Naveen Kumar , Suhani Sumalatha and Nitya. Morphological Variations in Lumbricals of Hand – A Cadaveric Study IBIMA Publishing Plastic Surgery: An International Journal Vol. 2013 (2013)
5. Chaudruc, J. M., Florenza, F., Riviere, C. & Arnaud, J. P. (2000). "White Finger and Hypertrophy of the Lumbrical Muscles," Chir Main, 19 (4) 232-34.
6. Goldberg, S. (1970). "The Origin of the Lumbrical Muscles in the Hand of the South African Native," The Hand, 2, 168-71.
7. Lister, G. (1991). "Musculus Lumbricalis Pollicis," J Hand Surg [Am], 16(4) 622-5.
8. Kaplan EB, Hunter JM.: Kaplan's Functional and Surgical Anatomy of Hand. In: The Hand. 3rd ed. Spinner M, ed.; J. B. Lippincott Company, Philadelphia; 1984, pp 109-112; 346-349.