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Dimensions of the pons, the medulla oblongata and the fourth ventricle fundus in people aged 18-91 years

Wymiary mostu, rdzenia przedłużonego i dna komory IV człowieka w wieku 18-91 lat

The structure of human central nervous system has not been fully known yet. There were studies concerning the anatomical structure of the human brain and anatomical and experimental studies performed in animals (4, 7, 10, 18). The new methods of CT and MRI (15) enable the intravital studies of CNS which cause no visible side-effects in patients. The present paper reports the anatomical studies of the human brain stem in autopsy material.

AIM

The aim of the paper was to measure the dimensions of the pons, the medulla oblongata and the fourth ventricle fundus in people aged 18-91 years.

MATERIAL AND METHOD

The material examined was collected from the unfixed cadavers of both sexes aged 18-91 years with no pathological lesions of CNS. 144 specimens were collected – 72 male and 72 female. The material was divided according to sex and age into 8 age groups in the intervals of every 10 years.

The cerebella were prepared and the specimens cut off at the level of mamillary bodies and above optic tracts and then the measurements were performed.

The dimensions of the fourth ventricle fundus were measured on the dorsal surface of the brain stem: the length – in the median line from the superior angle to the valve, and the half width – on both sides of median line at the level of the lateral recess (Fig. 1).

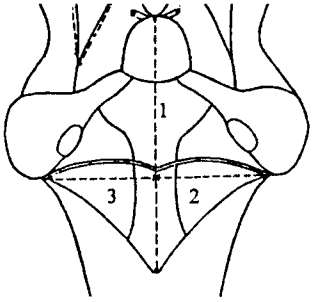

Fig. 1. The fundus of the fourth ventricle; 1 – the length, 2 – the right width, 3 – the left width

The dimensions of the pons and the medulla oblongata were measured on the ventral surface of the specimens (Fig. 2): the pons length and width and the medulla oblongata length. The pons length was determined in the median line along the basilar groove. The longest distances between the pons lateral margins represented its width, which was most often observed above the middle cerebellar peduncle ramifications. The medulla oblongata length was measured in the median line.

The results were compiled in tables and presented in figures.

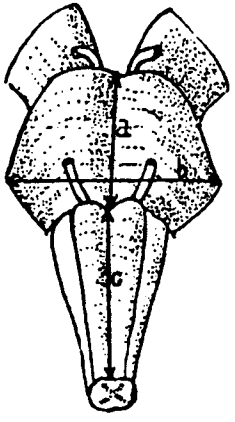

Fig. 2. The pons and the medulla oblongata; a – the pons length, b – the pons width, c – the medulla oblongata length

EXAMINATIONS

Beneath the tectal lamina there is a rhomboid fossa representing the fourth ventricle fundus limited by the pons and medulla oblongata dorsal surfaces (su-

perior-median and inferior-median parts, respectively). The widest fundus is found at the lateral recess level where the fourth ventricle medullary striae run.

The pons is visible on the ventral surface as a cube- or cuboid-shaped prominence with rounded margins. Underneath there is the narrowing downwards medulla oblongata.

Table 1. Results of average values in individual age groups in males. The pons, the medulla oblongata and the fundus of the fourth ventricle

Age groups		Pons		Medulla oblongata	Fourth ventricle fundus		
Age	Number of prep.	Length	Width	Length	Length	Half a width	
						right side	left side
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
18-20	5	28.30	28.7	31.50	39.72	14.70	15.44
21-30	10	26.20	30.45	27.90	36.20	13.30	13.80
31-40	10	26.20	29.00	28.40	33.75	14.29	14.51
41-50	10	25.85	28.50	32.10	34.10	13.40	13.70
51-60	10	25.24	27.89	31.55	31.84	12.30	12.51
61-70	10	26.31	28.82	29.90	35.30	13.03	13.04
71-80	10	24.00	27.00	31.72	33.78	13.20	13.26
81-90	7	25.65	27.31	26.95	37.74	13.48	13.92

Table 2. Results of average values in individual age groups in males. The pons, the medulla oblongata and the fundus of the fourth ventricle

Age groups		Pons		Medulla oblongata	Fourth ventricle fundus		
Age	Number of prep.	Length	Width	Length	Length	Half a width	
						right side	left side
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
18-20	2	22.85	28.50	19.50	37.00	12.60	12.90
21-30	10	24.10	29.05	28.70	34.30	13.36	13.07
31-40	10	26.30	28.98	29.15	34.55	13.66	14.03

41-50	10	25.10	28.84	29.49	34.99	13.95	13.99
51-60	10	24.36	27.94	33.80	32.70	12.80	12.96
61-70	10	24.82	28.96	31.65	32.60	13.36	13.45
71-80	10	25.62	28.62	30.60	30.10	12.51	12.33
81-90	10	22.72	28.05	26.68	32.26	12.55	12.98

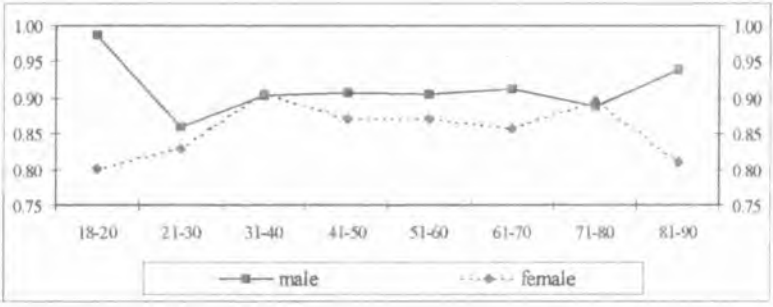

Fig. 3. The comparison of the length/width relations of the pons in males and females

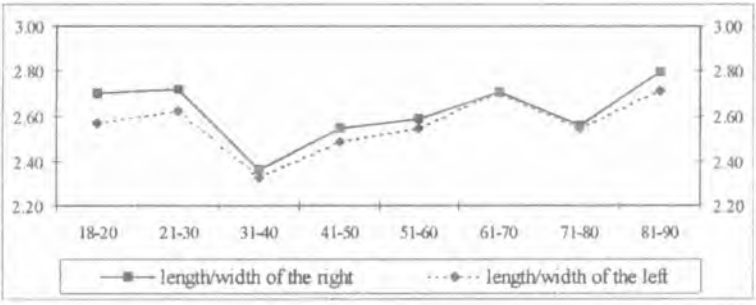

Fig. 4. The comparison of the right length/width relations of the fourth ventricle fundus in males

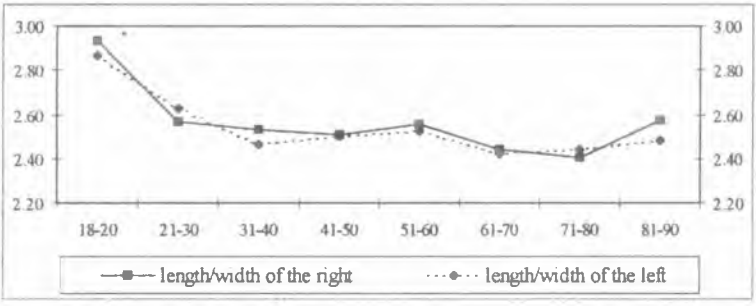

Fig. 5. The comparison of the right length/width relations of the fourth ventricle foundus in females

CONCLUSIONS

1. The values determined in the paper include: the length and width of the pons, the length of the medulla oblongata and the dimensions of the fourth ventricle fundus – the right and left length and width.

2. The left side dimensions in the majority of age groups re higher than the right side ones.

3. The pons shows similar values of length and width in males aged 18-19 and 81-90 years; in the remaining age groups the width is bigger than the length and the pons is a horizontally placed rectangle. The length/width ratio of the pons is higher in males than in females.

4. The length values of the medulla oblongata show wide ranges in each age group.

5. The length of the fourth ventricle fundus is bigger than the sum o the right and left side widths. In males from all age groups the length/width ratio of the right fourth ventricle fundus is higher compared to the left side ratio. However, this does not concern the females aged 21-30 and 71-80 years.

6. All dimensions showed changes specific for certain ages. The highest average values were observed most often in males aged 18-19 years, less often in the age groups of 31-40 and 21-30, in females aged 61-70, 31-40 and 41-50. The lowest average values were mainly found in the age group of 71-80 years.

7. The majority of the highest average values were observed earlier in males than in females.

DISCUSSION

In the available literature the pons dimensions given by Rauber-Kopsch (12) are: length – 20.0-30.0 mm, width – 30.0-36.0 mm and thickeness – about 25.0 mm while those reported by Lize (8) – length 21.0-30.0 mm, cephalad width – 23.0-28.5 mm. In our studies the pons length varied from 20.0 mm in women aged 51-60 to 32.0 mm in men aged 31-40 while the width ranged from 23.0 mm in women aged 51-60 to 36.0 mm in men aged 21-30.

Testut and Latarjet (17) found that the medulla oblongata length was 27.0-30.0 mm, the anterio-posterior dimension – 12.0-15.0 mm and the transverse one – 10.0-12.0 mm. In the studies performed by Rauber-Kopsch (12) the length of the medulla oblongata was about 25.0 mm, the inferior width

– 10.0-11.0 mm and the superior width – 17.0-18.0 mm. The medulla oblongata length according to R ó ż y c k i (14) was about 26.0 mm and according to L i z e (8) – 32.2 mm. Our measurements showed that the medulla oblongata length ranged from 16.0 mm in males aged 81-90 to 41.5 mm in males aged 51-60.

According to T e s t u t and L a t a r j e t (17) the length of the fourth ventricle fundus from the inferior to superior angle was 35.0-38.0 mm, the width from the median line – about 16.0 mm. According to Rauber-Kopsch (12) the fourth ventricle fundus length was about 25.0 mm and in the results presented by Lize (8) it ranged from 27.0-39.2 mm (max. 50.1 mm) while the width between the lateral angles varied from 10.0 mm to 19.8 mm and the right half width from 5.1-10.4 mm, the left half from 4.8-10.0 mm. Our results show the following values: the length ranges from 26.0 mm in women aged 61-70 and 71-80 years to 43.0 mm in men aged 18-19 years, the right half width from 10.0 mm in women aged 81-90 to 18.0 mm in men aged 31-40 years, the left half width from 10.0 mm in women aged 51-60 to 17.5 mm in men aged 31-40. The limits of most dimensions were wider than those reported in literature, which obviously resulted from the wide age range of the people examined (from 18 to 91 years). The average values of the measurements were similar to the literature data. No differences between the right and left side dimensions were found in the literature.

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STRESZCZENIE

Badania przeprowadzono na 144 zwłokach, 72 męskich i 72 żeńskich. Mierzono: długość i szerokość mostu, długość rdzenia przedłużonego, długość dna komory IV, szerokość prawej i lewej połowy dna komory IV. W badaniach obserwowano zmienność zależną od płci i wieku. Wyniki zebrano w tabelach i przedstawiono na wykresach.