

RESULTS

Three cords occurred in all the cases. The posterior cord was formed by the union of posterior divisions of three trunks, the lateral cord – by the union of the anterior divisions of the upper and the middle trunks. The medial cord was formed usually only by continuation of anterior division of the lower trunk, and in 16 cases, with share of a branch of the anterior division of the middle trunk.

THICKNESS OF CORDS OF THE BRACHIAL PLEXUS

The dimensions of the cross-section area of cords in males are presented in Figure 1, and in females in Figure 2. The age of subjects is marked on abscissa axis, and the age groups are separated by vertical lines. The values of cords cross-section areas are plotted on the ordinate axis.

The discussed value was similar on both sides of the single body in the lateral cord (lc) in 6.7%, in the medial cord (mc) in 14.4% and in the posterior cord (pc) in 10.6% and it was greater on the right side in 45.2%, 45.2% and 48.1% and greater on the left side in 48.1%, 40.4% and 41.3% of the cases respectively.

Pc was the thickest in 68.8%, mc in 25.0%, lc in 6.2%. Lc was the thinnest in 69.2%, mc in 25.5%, pc in 4.8% of the cases. In 0.5% lc and mc had similar thickness and smaller than pc. The average thickness of lc was (in sq mm) 9.314 (on the right side (r) 9.343, on the left side (l) 9.284, in males (δ) 9.097, in females (♀) 9.515); mc 11.116 (r – 11.200, l – 11.031, δ – 11.533, ♀ – 10.730); pc 13.897 (r – 13.970, l – 13.825, δ – 14.451, ♀ – 13.385). The discussed values came out to be: 3.617, 4.588 and 5.223 in the first age group I, 6.063, 7.358 and 8.941 in group II, 10.513, 12.814 and 15.841 in group III, 11.602, 13.748 and 16.857 in group IV, 12.118, 14.521 and 17.591 in group V and 11.557, 13.185 and 18.596 in age group VI respectively.

NUMBER OF FASCICLES

The were observed up to 5 fascicles in lc in 2.4%, in mc in 1.9%, in pc in 1.0%, 6-10 fascicles in 17.8%, 15.4% and 5.3% respectively, 11-20 fascicles in 51.0%, 52.9% and 40.4%, 21-30 fascicles in 22.1%, 25.5% and 38.0%, and more than 30 fascicles in 6.7%, 4.3% and 15.4% of the cases. The same number of fascicles on both sides of one body was found in 7.7% in lc, in 6.7% in mc and in 7.7% in pc, and it was greater on the right side in 48.1%, 51.9% and 51.9%, and greater on the left side in 44.2%, 41.3% and 40.4% of the cases respectively.

The number of fascicles was equal on the same side of one body in all cords in 0.5% of the cases. It had greatest values in pc in 56.2%, in mc in 23.1%, in lc in 14.9%. The number of fascicles was the same in pc and mc but greater than in lc in 2.9%, the same in pc and lc but greater than in mc in 0.5% and alike in mc and lc but greater than in pc in 1.9% of cases. It was the lowest in lc in 40.8%, in mc in 36.5%, in pc in 13.5% of cases. The number of fascicles was the same in mc and lc but smaller than in pc in 5.3% and the same in pc and lc but smaller than in mc in 3.4% of the cases.

The mean number of fascicles in lc equalled 17.2 (r – 17.4, l – 17.0, δ – 16.2, ♀ – 18.1), in mc 17.4 (r – 18.0, l – 16.9, δ – 17.1, ♀ – 17.7), in pc 22.5 (r – 22.9, l – 22.0, δ – 20.1, ♀ – 24.0). In the age groups it was as follows: in group I 13.0, 16.3 and 19.8, in group II 16.7, 17.4 and 23.7,

in group III 14.4, 15.7 and 23.1 in group IV 18.7, 18.6 and 21.9, in group V 19.5, 18.5 and 23.3, in group VI 18.2, 17.4 and 23.2.

SIZE OF THE CROSS-SECTION AREA OF FASCICLES

In the studied material there were distinguished: very thin fascicles (up to 0.1 sq mm), thin fascicles (0.101-0.3 sq mm), medium-thick fascicles (0.301-0.5 sq mm), thick fascicles (0.501-1 sq mm) and very thick fascicles (over 1 sq mm). Very thin fascicles (vtn) formed 30.6% in lc, 30.7 in mc and 30.9% in pc, thin fascicles (tn) 37.1%, 35.0% and 34.3%, medium-thick fascicles (mtk) 16.7%, 16.1% and 15.8%, thick fascicles (tk) 11.5%, 11.7% and 12.5%, very thick fascicles (vtk) 4.1%, 6.5% and 6.6% respectively.

The frequency of occurrence of differently thick fascicles in plexus cords was unequal in the age groups. In group I vtn were present in 49.5% in lc, in 52.8% in mc and in 56.9% in pc, tn – 37.5%, 34.7% and 31.6%, mtk – 9.2%, 7.8% and 6.6%, tk – 3.0%, 3.7% and 3.5%, vtk – 0.9%, 1.0% and 1.4% respectively. In the group II vtn constituted 44.8% in lc, 38.9% in mc and 38.1% in pc, tn – 37.5%, 36.7% and 38.1%, mtk – 10.3%, 14.3% and 11.7%, tk – 5.8%, 7.2% and 8.4%, vtk – 1.7%, 2.9% and 3.7% respectively. In group III vtn formed 23.1% in lc, 21.8% in mc and 24.7% in pc, tn – 35.4% 32.7% and 32.5%, mtk – 21.2%, 20.2% and 18.7% tk – 14.0%, 13.2% and 15.3%, vtk – 6.3%, 12.1% and 8.8%. In group IV vtn were present in 26.1% in lc, in 26.3% in mc and in 22.8% in pc, tn – 34.1%, 32.0% and 33.9%, mtk – 18.3%, 16.8% and 16.6%, tk – 15.8%, 17.3% and 18.1%, vtk – 5.7%, 7.6% and 8.6% respectively. In group V vtn were present in 21.9% in lc, in 23.5% in mc and in 24.5% in pc, tn – 41.8%, 34.0% and 36.9%, mtk – 19.4%, 20.0% and 17.4%, tk – 12.2%, 13.5% and 13.9%, vtk – 4.7%, 9.0% and 8.3% respectively. In group VI vtn were present in 26.1% in lc, in 21.9% in mc and in 22.4% in pc, tn – 35.5%, 40.7% and 33.5%, mtk – 19.4%, 17.1% and 23.0%, tk – 15.1%, 13.3% and 14.1%, vtk – 3.9%, 7.0% and 7.0% respectively.

The size of cross-section area of fascicles (csaf) was similar on both side of the single body in 14.4% in lc, in 12.5% in mc and in 11.5% in pc. It was greater on the right side in 39.4%, 47.1% and 39.4% respectively, greater on the left side in 46.2%, 40.0% and 49.0%. It had the greatest values in pc in 71.2%, in mc in 20.2%, in lc in 6.7%. The sum of the csaf have shown equal values in pc and mc but greater than in lc in 1.4% and the same in pc and lc but greater than in mc in 0.5%. It was the lowest in lc in 69.7%, in mc in 24.1%, in pc in 4.8%. The described sum had equal values in mc and lc but smaller than in pc in 1.0% and the same in pc and lc but smaller than in mc in 0.5% of the cases.

The average value of csaf was (in sq mm) in lc 4.893 ($r = 4.818$, $l = 4.968$, $\delta = 4.678$, $\varphi = 5.092$), in mc 5.898 ($r = 5.959$, $l = 5.837$, $\delta = 6.062$, $\varphi = 5.746$), in pc 7.476 ($r = 7.409$, $l = 7.544$, $\delta = 7.732$, $\varphi = 7.240$). The discussed values in the age groups come out to be: in group I 2.032, 2.543 and 3.110, in group II – 3.299, 3.990 and 5.273, in group III – 5.689, 7.318 and 8.641, in group IV – 6.190, 7.450 and 9.469, in group V – 6.183, 7.603 and 9.248, in group VI – 5.774, 6.231 and 8.867.

INDEX OF THE CROSS-SECTION AREA OF FASCICLES

The greatest values of IAF were found in pc in 39.9%, in mc in 24.0%, in lc in 28.4%. They were similar in pc and mc but smaller in lc in 3.4%, similar in mc and lc but smaller in pc in 3.4%,

and similar in pc and lc but smaller in mc in 0.9%. The lowest values of IAF were observed in lc in 36.6%, in mc in 32.7% and in pc in 25.5%. They were similar in pc and lc but greater in mc in 2.4%, similar in mc and lc but greater in pc in 1.9% and similar in pc and mc but greater in lc in 0.9% of the cases.

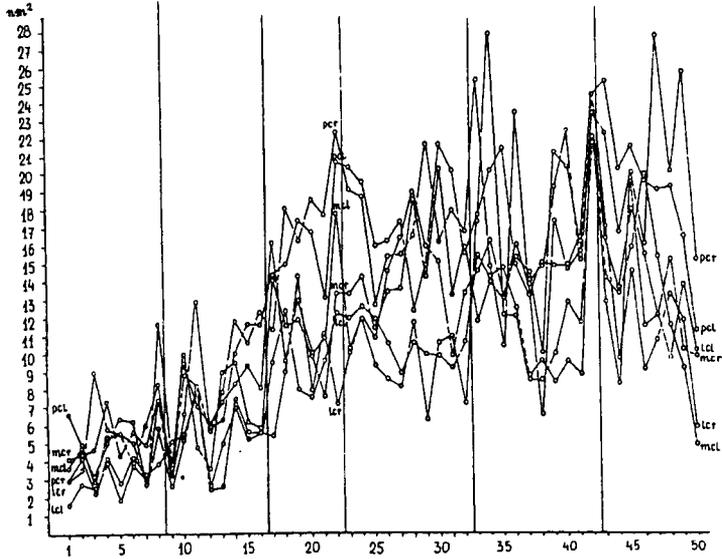


Fig. 1. Thickness of cords of the brachial plexus in males; lcr – right lateral cord, lcl – left lateral cord, mcr – right medial cord, mcl – left medial cord, pcr – right posterior cord, pcl – left posterior cord

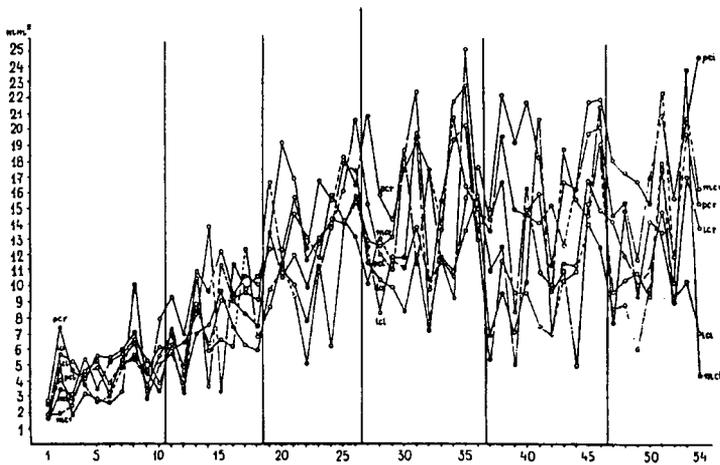


Fig. 2. Thickness of cords of the brachial plexus in females; for explanation see Fig. 1

The IAF showed similar values on both sides of one body in 10.6% in lc, in 10.6% in mc and in 8.7% in pc. They were greater on the right side respectively in 35.6%, 43.3% and 32.7%, and greater on the left side in 53.8%, 46.2% and 58.6% of the cases. The average value of IAF equalled: 52.5 in lc ($r = 51.6$, $l = 53.5$, $\delta = 51.4$, $\eta = 53.5$), 53.1 in mc ($r = 53.2$, $l = 52.9$, $\delta = 52.6$, $\eta = 53.6$), 53.8 in pc ($r = 53.0$, $l = 54.6$, $\delta = 53.5$, $\eta = 54.1$). They were different in the age groups: in group I 56.2, 56.1 and 59.5, in group II – 54.4, 54.2 and 59.0, in group III – 54.1, 57.1 and 54.5, in group IV 53.4, 54.1 and 56.2, in group V 51.0, 52.4 and 52.6, in group VI – 50.0, 47.3 and 47.7 respectively.

DISCUSSION

The study of some features of internal structure of three cords in material derived from the same cadavers increases our knowledge of the brachial plexus morphology. The results obtained show great individual variability and asymmetry. Numerous authors, who examined the structure of different parts of peripheral nervous system, have already paid attention to it (1, 2, 5–14). In the examined material similar values of all 4 features were not found on both sides of a single body, 3 of them were observed only in 1.9% in lc and in 1.9% in mc, and two of them in 3.8% in lc, in 5.8% in mc and in 4.8% in pc. The same or similar values of a single feature on both sides of one body were found rather seldom: the thickness of lc in 2.9%, of mc in 8.7% and of pc in 8.7%, the size of csaf respectively in 11.5%, 7.7% and 8.7%, the number of fascicles in 5.8%, 3.8% and 4.8%, IAF in 5.8%, 6.7% and 8.7% of the cases.

The cords differed between each other in thickness, number of fascicles, size of csaf and value of IAF.

Most often the posterior cord was the thickest one and most rarely was the lateral cord. The greatest mean value of thickness of pc, was bigger than respective values of mc by 25.0% ($r = 24.7\%$, $l = 25.3\%$, $\delta = 25.3\%$, $\eta = 24.7\%$), and of lc by 49.2% ($r = 49.5\%$, $l = 48.9\%$, $\delta = 58.9\%$, $\eta = 40.7\%$), whereas in age group I respectively by 13.8% and 44.4%, in group II by 21.5% and 47.5%, in group III by 23.6% and 50.7%, in group IV by 22.6% and 45.3%, in group V by 21.1% and 45.2%, in group VI by 41.0% and 60.9%. In postnatal life the thickness of lc increased by 3.4 times, of mc by 3.2 times, and of pc by 3.6 times.

The number of fascicles was the same in three cords in 0.5%, in two cords – pc and mc in 2.9%, pc and lc in 0.5%, and lc and mc in 1.9% of the cases. The biggest number of fascicles was found most often in pc, and most rarely in lc. The greatest average number of fascicles was observed in pc, and it was bigger

than the discussed value of mc by 29.2% (r – 27.2%, l – 30.2%, ♂ – 17.5%, ♀ – 35.6%), and of lc by 30.8% (r – 31.6%, l – 29.4%, ♂ – 24.1%, ♀ – 32.6%), whereas in age group I by 21.5% and 52.3%, in group II by 35.6% and 41.3%, in group III by 47.1% and 40.9%, in group IV by 17.7% and 17.1%, in group V by 25.9% and 19.5%, in group VI by 33.3% and 27.5% respectively. The mean number of fascicles was the smallest in lc and pc in age group I, and in mc in group III, and the biggest lc in group V, in mc in group IV, and in pc in group II.

The sum of csaf was similar in pc and mc in 1.4% and in pc and lc in 0.5% of the cases. It had the biggest values most often in pc, and most rarely in lc. The greatest average value of csaf, recorded in pc, was bigger than the respective value of mc by 26.8% (r – 24.3%, l – 29.2%, ♂ – 27.5%, ♀ – 26.0%), and of lc by 52.8% (r – 53.8%, l – 51.9%, ♂ – 65.3%, ♀ – 42.2%), whereas in age group I respectively by 20.8 and 53.1%, in group II by 32.2% and 59.8%, in group III by 18.1% and 51.9%, in group IV by 27.1% and 53.0%, in group V by 21.6% and 49.6%, in group VI by 42.3% and 53.6%. In postnatal life the size of csaf of brachial plexus cords increased 3 times.

The participation of the fascicles of different thicknesses in the structure of cords was similar. Little differences concerned mainly tn which most often appeared in lc, and most rarely in pc and vtk was observed most rarely in lc and was equally present in mc and pc. On the right side vtn and tk in pc, tn in mc and mtk in lc were found most often, but on the left side more often mtk in pc, tk in lc and mc, and vtk in lc were seen. Certain differences in the fascicular structure were observed in relation to the sex too. In lc the mtk appeared more often in females, but vtk in males. In mc the mtk occurred more often in females too, but tk and vtk in males. In pc the vtn and tn were found more often in females, but mtk, tk and vtk in males. The participation of fascicles of different thicknesses in the cords structure, apart from tn, underwent big changes in postnatal life. The percentage of vtn decreased considerably, and of mtk, tk and vtk increased.

The size of IAF was similar in lc and mc in 5.3%, in lc and pc in 3.4% and in mc and pc in 4.3% of the cases. The biggest index attained pc in 39.9%, mc in 24.0% and lc in 28.4%. The greatest average value of IAF, observed in pc, was bigger than the respective value of mc by 1.3%, and of lc by 2.5%. The size of all cords decreased in postnatal life: lc by 11.0%, mc by 15.7%, pc by 10.8%. It results from the increase of the connective tissue which is part of their structure.

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STRESZCZENIE

Grubość pęczków spłotu ramiennego – bocznego, przyśrodkowego i tylnego, wielkość powierzchni poprzecznego przekroju ich pęczków, liczbę pęczków i wskaźnik powierzchni pęczków badano obustronnie na materiale 104 osób obojga płci. Pęczek boczny charakteryzują najniższe średnie wartości, pęczek przyśrodkowy – średnie wartości, pęczek tylny – najwyższe średnie wartości wszystkich cech. Udział pęczków o różnej grubości w budowie pęczków spłotu jest podobny.

