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*Fascicular Structure of the Medial Cord of the
Brachial Plexus in Man*

Budowa pęczkowa pęczka przyśrodkowego splotu ramiennego u człowieka

The morphology of the medial cord has been known for a long time (2, 3, 11), however there is lack of publications concerning its internal structure. The purpose of this work was to examine the thickness of the medial cord, the number of fascicles, the size of their cross-section area and the index of the fascicles area during postnatal life.

MATERIAL AND METHODS

The study was carried out on 264 medial cords obtained bilaterally from cadavers of 61 males (M) and 71 females (F), who died at the age from 1st day to 87th year of life. They were free from any nervous system diseases. The material was divided into 6 age groups as described in the previous paper (10). Group I included 8 M and 13 F, group II — 11 M and 10 F, group III — 9 M and 12 F, group IV — 11 M and 12 F, group V — 13 M and 14 F, group VI — 9 M and 10 F. The methods used to visualise various parts of the brachial plexus, to obtain the samples and fix them, to stain the slides and determine the thickness of the examined parts of the peripheral nervous system, as well as the number of fascicles, the size of their cross-section area and the index of fascicles area were described in the previous papers (9, 10).

RESULTS

The medial cord was present in all the cases. It was formed solely by the anterior division of the inferior trunk in 93.9% and by its junction with the branch of the anterior division of the middle trunk in 6.1% of the cases.

THICKNESS OF MEDIAL CORD

The cross-section area of the medial cord ranged between 1.720 and 23.997 square mm. It showed no correlation with the number of roots of the medial cord. The discussed value was similar on both sides of the single body in 11.4%, greater on the right side in 44.7% and greater on the left side in 43.9% of cases. The average thickness equalled (in sq mm) 11.089 [on the right side (r) 11.120, on the left side (l) 11.057, in males (M) 11.448, in females (F) 10.780]. The value mentioned above came out to be 4.392 in group I, 7.260 in group II, 13.188 in group III, 13.606 in group IV, 14.205 in group V and 12.924 in group VI.

NUMBER OF FASCICLES

In the initial part of the medial cord 2 to 42 fascicles were observed. The cords formed by 10 or less fascicles constituted 17.8%, from 11 to 15 — 28.8%, from 16 to 20 — 25.4%, from 21 to 25 — 16.7% and by more than 25 fascicles — 11.3% of the cases. The same number of fascicles on both sides of one body was found in 8.4%, the greater number on the right side appeared in 49.2%, and on the left side in 42.4% of the cases.

The mean number of fascicles was 17.1 (r — 17.5, l — 16.7, M — 17.0, F — 17.2). In the age groups it was the following: 15.4 in group I, 16.5 in group II, 15.5 in group III, 18.9 in group IV, 19.3 in group V and 16.7 in group VI.

CROSS-SECTION AREA OF FASCICLES

The thickness of individual fascicles ranged from 0.001 to 9.259 sq mm. Five groups of fascicles were distinguished according to their cross-section area as described in the previous paper (10). Very thin fascicles (vtn) made 29.3% (r — 29.7%, l — 28.9%, M — 29.8%, F — 28.9%), thin fascicles (tn) — 35.7% (r — 36.7%, l — 34.6%, M — 34.6%, F — 36.6%), medium-thick fascicles (mtk) — 16.5% (r — 16.0%, l — 17.1%, M — 15.4%, F — 17.4%), thick fascicles (tk) — 11.9% (r — 11.3%, l — 12.4%, M — 12.5%, F — 11.3%), and very thick fascicles (vtk) — 6.6% (r — 6.2%, l — 7.0%, M — 7.6%, F — 5.8%) of all the fascicles.

The frequency of occurrence of differently thick fascicles in the discussed material was unequal in the age groups. The participation of fascicles came out as follows: in group I — vtn — 51.1%, tn — 36.3%, mtk — 8.0%, tk — 3.7% and vtk 0.9%; in group II it was 37%, 38.2%, 14.2%, 7.3% and 3.3%, in group III — 20.0%, 33.1%, 21.0%, 14.1% and 11.8%, in group IV — 26.8%, 32.7%, 16.3%, 16.8% and 7.4%, in group V — 23.8%, 33.5%, 20.5%, 14.1% and 8.1%, in group VI — 20.6%, 42.6%, 17.1%, 12.6% and 7.1% respectively.

The cross-section area of all the fascicles forming the medial cord ranged from 1.149 to 12.686 sq mm. It was similar on both sides of one body in 15.9%, greater on the right side in 45.5%, and on the left side in 38.6% of the cases. The average value of the cross-section area of fascicles equalled (in sq mm) 5.987 (r — 6.007, l — 5.950, M — 6.097, F — 5.877). It was different in the age groups: 2.467 in group I, 4.115 in group II, 7.642 in group III, 7.337 in group IV, 7.459 in group V and 6.288 in group VI.

INDEX OF THE CROSS-SECTION AREA OF FASCICLES (IAF)

The value of the index of the fascicle's area ranged between 33.2 and 80.3. It was similar on both sides of the single body in 11.4%, greater on the right side in 43.2% and greater on the left side in 45.4% of the cases. The mean value of IAF equalled 53.9 (r — 54.0, l — 53.8, M — 53.3%, F — 54.5%). It ranged in the age groups as follows: 56.2 in group I, 56.7 in group II, 57.9 in group III, 54.2 in group IV, 52.5 in group V and 48.7 in group VI.

DISCUSSION

The fascicular structure of the medial cord is characterised by asymmetry and a great individual variability, like in other parts of the peripheral nervous system (1, 4 — 10, 12). The similar values of all the features mentioned above were not found on both sides of one body. Similar values of the three of them were observed in 0.8% and of two of them in 6.8% of cases. Similar values of a single feature on both sides of one body were also found rather seldom: the thickness of the cord in 4.6%, the size of cross-section area of fascicles (csaf) in 7.6%, the number of fascicles in 4.6% and IAF in 6.9% of the cases.

The following features were greater in the single person on the right than on the left side: thickness in 44.7%, csaf in 45.4%, fascicles number in 49.2% and IAF in 43.2%. They were greater on the left side in 43.9%, 38.6%, 42.4% and 45.4% of the cases respectively.

The mean values of the three features, namely thickness, size of cross-section area of fascicles and IAF, were similar on both sides of one body, but the number of fascicles was greater by 4.8% on the right side. They differed a little in relation to sex. In males the thickness was greater by 6.2%, and the cross-section area of fascicles by 3.7% than in females. On the contrary, in females the number of fascicles was greater by 1.2%, and the index of the fascicle's area by 2.3% than in males.

The participation of fascicles of various thickness in the structure of medial cord differed a little between the sides of a single body and in relation to sex. Very thin and thin fascicles occurred more often on the right than on the left side, while medium-thick, thick and very thick fascicles more often on the left than on the right side. Very thin, thick and very thick fascicles were found more often in males than in females, but thin and medium-thick fascicles were present more frequently in females.

The thickness of the medial cord, the size of cross-section area, the number of fascicles and IAF were not related to the number of roots forming the medial cord.

The studied features were undergoing big changes during postnatal life. The following increased: the cord thickness — 3.2 times, cross section area of fascicles — 3 times, and the number of fascicles by more than 25%, but IAF decreased by 13.5%. The biggest changes appeared up to

the 22nd year of life. The participation of fascicles of different thickness in the cord structure changed in this period too: the occurrence of very thin fascicles decreased 2.5 times, and the participation of medium-thick, thick and very thick fascicles increased about 3 times.

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STRESZCZENIE

Pęczek przyśrodkowy, badany obustronnie na zwłokach 132 osób, występował we wszystkich przypadkach i powstawał z części przedniej pnia dolnego w 93,9%, a w 6,1% przypadków z połączenia jej z odgałęzieniem części przedniej pnia środkowego. Wewnętrzna budowę pęczka cechuje duża osobnicza zmienność i asymetria. W życiu pozapłodowym badane cechy pęczka ulegają dużym zmianom. Powiększają się: grubość 3,2 razy, wielkość powierzchni poprzecznego przekroju pęczków 3 razy i liczba pęczków o ponad 25%, natomiast zmniejsza się o 13,5% wskaźnik powierzchni pęczków. W budowie pęczka ulega także dużym zmianom udział pęczków o różnej grubości: zmniejsza się — pęczków bardzo cienkich, a zwiększa — pęczków o grubości ponad 0,3 mm².