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Some Features of the Internal Structure of the Brachial Plexus Lateral Cord in Man

Niektóre cechy wewnętrznej budowy pęczka bocznego splotu ramiennego u człowieka

The lateral cord was examined in man on a quite big material repeatedly. However, in the literature there is lack of investigations concerning the internal structure of the lateral cord. Due to this fact the author took an interest in some of its features.

The study was carried out on material obtained bilaterally from cadavers of fifty nine males (M) and seventy two females (F), who died at the age from 1st day to 87th year of life, and who did not suffer from any disease of the nervous system. The material was divided into 6 age groups. Group I included 9 M and 12 F up to 1st year of life, group II — 12 M and 12 F between 1st and 14th year, group III — 8 M and 11 F between 15th and 22nd year, group IV — 12 M and 11 F between 23rd and 40th year, group V — 10 M and 15 F between 41st and 60th year, group VI — 8 M and 11 F above 60th year of life. The dissection method visualised the brachial plexus roots, trunks and cords. The segments of the lateral cord were excised, fastened to glass frames and fixed in formalin. Further preparation of the excisions, staining of the slides, methods of determining the lateral cord and its fascicles' thickness as well as the number of fascicles and the index of the fascicle's area were described in previous papers (9, 10).

RESULTS

The lateral cord was present in all the cases and formed by the junction of anterior divisions of the upper and middle trunks.

THICKNESS OF LATERAL CORD

Cross-section area of the lateral cord ranged between 1.582 and 27.801 sq mm. It was similar on both sides of the single body in 6.9%, greater on the right side in 46.6% and greater on the left side in 46.5% of the cases. The thickness of the lateral cord was greater than the thickness of its upper and lower root in all the cases. The comparison of the cross-section area of the lateral cord with the sum of the cross-section areas of two roots showed similar value in 28.1%, in 37.1% it was greater and in 34.8% of the cases it was smaller.

The average thickness of the lateral cord equalled (in sq mm) 9.263 [on the right side (r) 9.270, on the left side (1) 9.256, in males (M) 9.171, in females (F) 9.339]. The discussed value came out to be 3.622 in group I, 6.224 in group II, 10.891 in group III, 11.602 in group IV, 11.938 in group V and 11.358 in group VI.

NUMBER OF FASCICLES

The examined middle segments of the lateral cord were composed of 1 to 45 fascicles. The cords formed by 10 or less fascicles constituted 19.8%, from 11 to 15 — 26.0%, from 16 to 20 — 21.0%, from 21 to 25 — 16.4% and by more than 25 fascicles — 16.8% of the cases. The number of fascicles of the lateral cord compared with the sum of its roots fascicles number was equal in 1.5%, greater in 86.4% and smaller in 12.1% of the cases. The same number of fascicles on both sides of one body was found in 5.3%, the greater on the right side in 50.4%, and on the left side in 44.3% of the cases.

The mean number of fascicles equalled 17.6 (r — 17.9,1 — 17.4, M — 16.6, F — 18.4). In the age groups it was: 13.3 in group I, 17.4 in group II, 17.4 in group III, 18.9 in group IV, 19.9 in group V and 18.5 in group VI.

CROSS-SECTION AREA OF FASCICLES

The thickness of an individual fascicle of the lateral cord ranged from 0.001 to 8.410 sq mm. Five groups of fascicles were distinguished as

described in the previous publication (10). Very thin fascicles (vtn) made 31.4% (r — 30.3%, l — 32.4%, M — 31.8%, F — 31.0%), thin fascicles (tn) — 37.8% (r — 39.1%, l — 36.4%, M — 37.0%, F — 38.3%), medium-thick fascicles (mtk) — 16.2% (r — 16.8%, l — 15.6%, M — 15.5%, F — 16. 8%), thick fascicles (tk) — 10.9% (r — 10.4%, l — 11.3%, M — 11.6%, F — 10.3%), and very thick fascicles (vtk) — 3.8% (r — 3.3%, l — 4.2%, M — 4.0%, F — 3.6%) of all the fascicles of the lateral cord.

The frequency of occurrence of differently thick fascicles was unequal in the age groups. The participation of fascicles came out as follows: in group I — vtn — 49.9%, tn — 37.9%, mtk — 8.4%, tk — 2.7% and vtk 1.1%; in group II it was 42.3%, 39.4%, 11.4%, 5.6% and 1.3%, in group III — 25.9%, 34.6%, 18.9%, 14.1% and 6.5%, in group IV — 27.1%, 34.0%, 18.3%, 15.4% and 5.2%, in group V — 22.4%, 42.7%, 18.7%, 11.8% and 4.4%, in group VI — 26.7%, 36.4%, 19.6%, 13.7% and 3.6% respectively.

The cross-section area of all fascicles of the examined cord ranged from 0.841 to 15.168 sq mm. It showed similar values on both sides of one body in 13.7%, was greater on the right side in 39.7%, and on the left side in 46.6% of the cases. The sum of cross-section area of fascicles of the lateral cord compared to the respective sum of its roots was similar in 9.8%, greater in 14.4% and smaller in 75.8% of the cases. The average value of the cross-section area of fascicles of the lateral cord equalled (in sq mm) 4.883 (r — 4.770, l — 4.996, M — 4.716, F — 5.020). The discussed value in the age groups was: 2.018 in group I, 3.378 in group II, 5.926 in group III, 6.147 in group IV, 6.211 in group V and 5.630 in group VI.

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

The value of the index of the fascicle's area ranged between 38.6 and 75.1. It had similar values on both sides of one body in 11.5%. The index was greater on the right side in 36.6% and greater on the left side in 51.9% of the cases. The mean value of IAF equalled 52.5 (r — 51.5, l — 54.0, M — 51.4%, F — 53.8%). The value mentioned above ranged in the

age groups as follows: 55.7 in group I, 54.3 in group II, 54.4 in group III, 53.0 in group IV, 52.0 in group V and 49.6 in group VI.

DISCUSSION

The lateral cord belongs to regular structures of the brachial plexus. Lack of it, which appears seldom (3, 5), happens most often through the union of upper and middle trunks or through forming musculocutaneous nerve directly by anterior branches of spinal nerves or by trunks of plexus. It is formed most often by the junction of anterior divisions of upper and middle trunks. This cord was observed in all the examined cases, and was always made by anterior divisions of upper and middle trunks.

The internal structure of the lateral cord showed great individual variability and asymmetry, like it is observed in many cranial and spinal nerves (1, 2, 4, 6—11). In the examined material similar values of all four studied features were not found on both sides of a single body. Similar values of the three of them were observed in 1.5% and of two of them in 2.3% of the 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 10.7%, the number of fascicles in 4.6% and IAF in 8.4% of the cases.

The following features were greater in a single person on the right side than on the left side: thickness of the lateral cord in 46.6%, csaf in 39.7%, fascicles number in 50.4% and IAF in 36.6%. They were greater on the left side in 46.5%, 46.5%, 44.3% and 51.9% of the cases respectively.

The mean values of the features mentioned above differed a little between the sides of a single body and in relation to sex. The thickness of the lateral cord had similar values on both sides of one body, but it was by 1.9% greater in males than in females. The value of csaf was by 4.7% greater on the left side than on the right side and by 6.4% greater in females than in males. The number of fascicles was greater by 2.9% on the right side than on the left side and by 10.8% greater in females than in males. IAF was greater by 5.1% on the left side than on the right side and greater by 4.7% in females than in males.

Different thickness fascicles' participation in the lateral cord structure was similar in persons of both sexes, but it showed some differences in relation to the sides of the body. Very thin, thick and very thick fascicles appeared more often on the left side than on the right side, while thin and medium-thick fascicles more often on the right side than on the left side.

The examined features were undergoing big changes during postnatal life, mostly between 1st and 22nd year of life. The following increased: the cord thickness — 3.3 times, cross section area of fascicles — 3.1 times, and the number of fascicles by about 50%, whereas the index of fascicles' area decreased by 11%. The participation of fascicles of different thickness in the cord structure changed too: the percentage of very thin fascicles decreased by about half, of medium thick, thick and very thick fascicles increased 3 times, while of the thin fascicles has not really changed.

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STRESZCZENIE

Grubość pęczka bocznego, wielkość powierzchni poprzecznego przekroju jego pęczków, liczbę pęczków oraz wielkość wskaźnika powierzchni pęczków badano na materiale pobranym obustronnie ze zwłok 131 osób obojga płci. W życiu pozapłodowym zwiększały się: grubość 3,3 razy, wielkość powierzchni poprzecznego przekroju pęczków 3,1 razy, liczba pęczków o około 50%, natomiast zmniejszał się o 11% wskaźnik powierzchni pęczków. Zmieniał się także w jego budowie udział pęczków o różnej grubości: zmniejszał się — pęczków bardzo cienkich, zwiększał — pęczków średniej grubości, grubych i bardzo grubych, a nie ulegał istotnym zmianom — pęczków cienkich.