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Patterns of Decussation of Bulbar Pyramids and Distribution of Pyramidal Tracts on Two Sides of the Spinal Cord

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Flechsig's myelogenetic method was used in this study. The fetal and neonatal autopsy material consisted of 43 medullae oblongatae and spinal cords, 57 medullae oblongatae without spinal cords, and 87 spinal cords without medullae oblongatae, or a total of 100 medullae oblongatae and 130 spinal cords. The celloidin embedded material was cut in serial sections at 35 micra. Every tenth to twentieth section was stained with Loyez method for myelin sheaths. The pyramidal tracts being not yet myelinated, they can be followed in their course and distribution in the medulla and in the spinal cord.

The Results: I. The "Right-of-way" in the Decussation of the Pyramids. In the sample of 100 medullae oblongatae the decussating bundles of the left pyramid were larger and crossed the midsagittal plane first, i.e., at higher levels than the decussating bundles of the right pyramid, in 87 specimens or 87% of the sample. The fibre bundles of the right pyramid held the "right-of-way" in crossing the midsagittal plane in only 13 specimens or 13% of the sample.

II. The Patterns of Decussation. Pattern A: Partial or Semi-decussation: All four pyramidal tracts are present in the spinal cord. This is the commonest or "standard" pattern in which a larger number of fibres of each pyramid crossed and a smaller number remained uncrossed. This pattern was found in 87 specimens or in 66.9% of the sample of 130 specimens. *Pattern B: Complete Decussation of One Pyramid:* The ventral (direct or uncrossed) pyramidal tract is absent on the side of the spinal cord ipsilateral to the completely crossed pyramid. This pattern was found in 18 specimens or in 13.9% of the total sample. A complete decussation of the left pyramid has occurred six times more often than a complete decussation of the right pyramid. *Pattern C: Complete Non-Decussation of One Pyramid:* The lateral (crossed) pyramidal tract is absent on the side contralateral to the noncrossed pyramid. This pattern, predictable a-priori, was not encountered in the present sample of 130 specimens. *Pattern D: Complete Decussation of One Pyramid with a Complete Absence of Decussation of the Other Pyramid:* The lateral and the ventral pyramidal tracts are absent on the side of the completely crossed pyramid. Such a pattern was

found in only one specimen (0.8%). *Pattern E: Complete Inter-decussation of Both Pyramids:* Both ventral (uncrossed) pyramidal tracts are absent. This pattern was the commonest deviation from the pattern A (semi-decussation) and occurred in 21 specimens or in 16.2% of the sample. The bundles of the left pyramid held the "right-of-way" in crossing midsagittal plane eight times more often than the bundles of the right pyramid. *Pattern F: Complete Absence of Inter-decussating Bundles in Both Pyramids:* Both lateral (crossed) tracts are absent. This pattern was found in three specimens or 2.3% of the sample of 130 specimens.

III. Distribution of the Pyramidal Tracts in the Spinal Cord. The pyramidal tracts were distributed symmetrically on two sides of midsagittal plane and the lateral (crossed) tracts were larger than the ventral (uncrossed) tracts in 51 of the 130 specimens or in 39%. Both ventral tracts were absent in 21 specimens or in 16.2% of the total sample of 130 spinal cords. The absence of both lateral (crossed) tracts occurred in only three specimens or 2.3% of the sample. In 79 specimens or 61% of the total sample the pyramidal tracts were not symmetrical. The most interesting and significant asymmetries were shown by the ventral (uncrossed) tracts. The right ventral tract was absent in only four specimens or in 3% of the total sample and in 5% of the sample of asymmetry, while the absence of the left ventral tract was encountered more than three times as often and occurred in 14 specimens or 10.9% of the total sample and in 17.7% of the sample of asymmetry. In 55 specimens or in 69.4% of the latter sample the right ventral tract was larger than the left ventral tract at all levels of the cord and, decreasing in the area of cross section, descended farther caudad in the spinal cord than the left ventral tract.

Conclusions: It appears to follow then that, in more than two-thirds of medullae and spinal cords of fetuses and neonates: 1) The fibres of the left pyramid hold the "right-of-way" and cross to the right side of the spinal cord at higher levels in the decussation than the fibres of the left pyramid which cross next below. 2) More fibres of the left pyramid cross to the right side of the spinal cord than fibres of the right pyramid cross to the left side. 3) More fibres of the right pyramid descend directly into the right side of the spinal cord than fibres of the left pyramid descend into the left side and, therefore, a) the right side of the spinal cord, at least in the cervical region, receives more pyramidal tract fibres from both cerebral hemispheres than the left side, and b) with regard to corticospinal (pyramidal) innervation, the right side of the spinal cord appears to be the preferred ("dominant") side.