

IMMUNOHISTOCHEMICAL STUDY OF REORGANIZATIONAL PROCESSES IN THE HUMAN FETAL CINGULATE GYRUS

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The transient fetal zones of the presumptive cingulate gyrus in humans differ from the rest of the medial telencephalic wall, suggesting some specificity in timing of the morphogenetic processes such as neuronal and glial migration, differentiation, afferent axon ingrowth and reorganization in this region. The aim of this study was to elucidate these regional specificity correlating spatial-temporal expression pattern of neuronal, glial and extracellular immunohistochemical markers among transient zones of particularly the future anterior and midcingulate region in comparison with other limbic areas and other regions of the telencephalic wall. Analysis included 27 post mortem fetal human brains, aged from 17 post conception weeks (PCW) to 40 PCW, stained by Nissl method, neuronal (MAP2), glial (GFAP) and extracellular neurocan (NCAN) and tenascin-C (TNC) immunohistochemical markers. The MAP2 immunoreactivity in the cortical plate of the cingulate gyrus is visible before 20 PCW, but pyramidal-like cellular staining appears clearly just at 20 PCW. The early signs of lamination of the cortical plate of cingulate gyrus are seen at 33 PCW, coincidentally with the appearance of mature astrocytes morphology in the cortical plate shown by GFAP. The NCAN, a proteoglycan proven to play a number of roles in the brain development, is expressed in the cortical plate of the future cingulate region stronger than in the rest of the medial telencephalic wall before 22-23 PCW and at the beginning of late fetal period (33 PCW). By the end of gestation, distribution of the NCAN is the same in cingulate gyrus as it is in the rest of the medial telencephalic wall. Significant differences in TNC immunoreactivity between the presumptive cingulate region and other telencephalic areas were found. In the marginal zone expression of TNC was up-regulated during the mid-gestation in comparison to the other brain regions, while in the same period TNC expression in the subplate zone (SP) was down-regulated. The TNC immunoreactivity in the subplate zone (SP) shows decreasing gradient from deep to superficial, and differences in the timing and level of expression from anterior to posterior cingulate areas, appearing later in mid and posterior areas. Expressions of TNC and NCAN coincide in the intermediate zone from 17 PCW until 28 PCW and in the cortical plate from 20 PCW until 33 PCW. Altogether, these findings imply on one side involvement of these extracellular molecules in autocrine stimulation of astrocyte/oligodendrocyte differentiation and possible axon guidance for projecting subplate neurons, and on other side possible role in the ingrowth of afferents, that will be focus for further research of the insights from fetal human cingulate gyrus.

Keywords: limbic cortex, cortico-cortical connections, tenascin C, neurocan.

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