Glial features in the cerebral wall in cystic and non-cystic white matter injury of preterm infants with special emphasis on subplate

Preterm infants have an increased risk for periventricular white matter injury (PWMI). Recent studies suggest that PWMI does not involve only the white matter (WM), but could also involve the cortical layers near and/or far from the lesion. The aim of this study is to describe laminar differences in glial distribution and morphology in telencephalic wall in non-cystic and cystic PWMI. We analyzed 29 postmortem human brains diagnosed as cystic and non-cystic PWMI and 10 control brains without any neuropathological abnormalities. On paraffin sections, we performed single and double labelings of astrocytes (GFAP, MCT1); microglia-macrophages (Iba-1, CD68); vessels (MCT1, CD34) and axonal neurofilaments (SMI311). The phenotypic features of these glial cells in different layers from ventricle to the pial surface (WM, deep and superficial subplate-SP and cortical plate-CP) were analyzed in the frontal lobe. In very preterm infant (24-29 postovulatory weeks, pow) in cystic lesions GFAP astrocytes displayed a non reactive phenotype and their density was similar to controls. In non-cystic lesions large GFAP astrocytes were found in all layers. In deep SP they were exceptionally large and protoplasmic with numerous processes. Their density was not significantly different from the controls. The density of Iba1microglia/macrophages was increased in upper WM, deep and superficial SP compared to controls. In preterm infants (30-35 pow) in cystic lesion all glial cells displayed the same features as in cystic lesion of earlier stage. In non-cystic lesion large GFAP astrocytes display peculiar short hairy phenotype in upper WM and in deep SP. The density of GFAP astrocytes was significantly increased in deep and superficial SP and CP. This study presents laminar differences in glial phenotypic expressions in non-cystic compared to cystic lesions in PWMI. Supported by Croatian Ministry of Science grant No. 108-1081870-1876 (IK) and scholarship from the French Government (IP).