

Diffusion-weight MR Imaging in Preterm and Term Neonates and Infants in the Hypoxic Ischemic Brain Injury

O. Kupriyanova¹, F. Kostylev¹, G. Yatsyk¹

¹**Scientific Centre of Children's Health, Russian Academy of Medical Science, Moscow**

Purpose: To determine and evaluate the apparent diffusion coefficient in preterm and term neonates and infants with the hypoxic ischemic brain injury.

Material and methods: We prospectively studied 18 neonates and infants with hypoxic ischemic brain injury II-III stage: 6 preterm neonates age 1-4 weeks (gestational age 34-36 weeks), 6 term neonates age 1-2 weeks (gestational age 40 weeks), 6 term infants age 4-6 weeks (gestational age 40 weeks). Standard T1-, T2-, and diffusion-weight (b-value 1000 sec/mm²) sequences were performed in all patients. Apparent diffusion coefficient were measured in 10 region: three white matter regions (frontal, occipital, posterior limb of internal capsule), anterior and posterior pons, genu and splenum of corpus callosum, thalamus, frontal grey matter.

Results: ADCs in different anatomic regions vary in preterm neonates from $105 \cdot 10^{-5}$ mm²/sec to $172 \cdot 10^{-5}$ mm²/sec, in term neonates – from $101 \cdot 10^{-5}$ mm²/sec to $172 \cdot 10^{-5}$ mm²/sec, in term infants – from $96 \cdot 10^{-5}$ mm²/sec to $145 \cdot 10^{-5}$ mm²/sec. Comparison ADCs preterm and term neonates revealed lower ADCs in term neonates in genu ($p < 0.0005$) and splenum ($p < 0.007$) of corpus callosum, anterior ($p < 0.0002$) and posterior ($p < 0.00012$) pons, frontal grey matter ($p < 0.03$). Comparison ADCs term neonates and term infants showed lower ADCs in term infants in frontal ($p < 0.016$) and occipital ($p < 0.023$) white matter, posterior limb ($p < 0.007$) of internal capsule, anterior ($p < 0.036$) pons, thalamus ($p < 0.039$). Comparison ADCs preterm neonates and term infants determined lower ADCs in term infants in frontal ($p < 0.014$) and occipital ($p < 0.009$) white matter, genu of corpus callosum ($p < 0.0006$), posterior limb of internal capsule ($p < 0.0018$), anterior ($p < 0.00028$) and posterior ($p < 0.00044$) pons, thalamus ($p = 0.05$), frontal grey matter ($p < 0.0064$).

Conclusion: Our results suggest that water diffusion in preterm and term neonates and infants with hypoxic ischemic brain injury is highly dependent on the age of infants, the brain regions and the gestational age of the infants.

1. Arzoumanian Y. et al. AJNR. 2003. V. 24. P. 1646-1653.
2. Barkovich AJ. et al. AJNR. 2001. V. 22. P. 1786-1794.
3. Engelbrecht V. et al. Radiology. 2002. V. 222. P.410-418.
4. Forbes RP. et al. Radiology. 2002. V. 222. P. 405-409.
5. Wolf RL. et al. Radiology. 2001. V.218. P. 825-833.