Iron-induced Damage in Corpus Striatal Cells of Neonatal Rats: Attenuation by Folic Acid

Heba M. Saadeldien, Aml A. Mohamed, and Mahmoud Rezk Abdelwahed Hussein

Abstract:

Background: Iron supplementation is recommended during pregnancy to meet the needs of the rapidly growing fetus. However, its intake is associated with the generation of destructive free radicals, i.e., oxidative damage to the fetal brain. Folic acid supplementation is needed during pregnancy to reduce the risk of neural tube defects. Hypothesis: Intake of folic acid can ameliorate the morphological features of cell damage in the striatal tissue (brain of neonatal rats) associated with the intake of iron. Objectives and methods: To test this hypothesis, an animal model (pregnant Albino rats) was established. The animals were divided into three groups: group A, control animals treated with saline only; group B, animals treated with iron gluconate; and group C, animals treated concomitantly with iron gluconate and folic acid. The striatal brain tissues of the neonates were examined for features of cellular damage, using immunohistological and ultrastructural methods. Results: The authors found significant variations among the three groups. The intake of iron (group B) and its deposition in the striatal tissue (neurons and glial cells) was associated with changes indicative of both cellular injury and regeneration. The former includes neuronal apoptosis and necrosis, and destruction of the organelles, including the mitochondria, endoplasmic reticulum, Golgi apparatus, and lysosomes of the neurons and glial cells. The latter includes microgliosis, astrogliosis, upregulation of glial fibrillary acidic protein, and inducible nitric oxide synthase. These changes were absent in the striatal tissue of the control group (group A) and in animals treated concomitantly with both iron gluconate and folic acid (group C). Conclusion: Intake of folic acid can protect the neonatal striatal tissue against iron-induced oxidative stress damage.

Keywords:

Brain, folic acid, GFAP, iron gluconate, ultrastructure

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