SELECTIVE VOLUME REDUCTION OF ANTERIOR CINGULATE CORTEX IN YOUNG ADULT RATS AFTER NEONATAL EXCITOTOXIC LESION OF VENTRAL HIPPOCAMPUS

Gianluca Casu,[*] Giorgio Marchese,[*] Paola Casti,[*] Gabriele Pinna Spada,[*] Luca Pani.[*, §]

[*]Neuroscienze PharmaNess S.c.a r.l., c/o POLARIS, Edificio 5, Loc.Piscinamanna, 09010 Pula (CA), Italy
[§]C.N.R. Istituto di Tecnologie Biomediche, Sezione di Cagliari, c/o Neuroscienze PharmaNess S.c.a r.l.

Several studies suggested that neonatal excitotoxic lesion of rat ventral hippocampus might alter development and plasticity of pre-frontal cortical circuitry, producing behavioural and cellular alterations that mimic many aspects of schizophrenia (1). Recent neuro-imaging studies showed a volume reduction of pre-frontal cortex gray matter in schizophrenic individuals when compared to healthy subjects (2).
Aim of this study was to verify whether similar neuro-anatomical alterations could be observed in adult rats following neonatal ventral hippocampal lesion. Bilateral ibotenic acid-induced lesion of the ventral hippocampus was made in Sprague-Dawley pups at postnatal day 7 (PD7). Volume and total neurons number of anterior cingulate and infralimbic cortex were estimated in lesioned and sham adult rats (PD56) using unbiased stereological analyses (Cavalieri's method and Fractionator). Neuronal cells of anterior cingulate and infralimbic cortex were labelled using NeuN immunostaining. Acetylcholinesterase and cresyl violet labelling were carried out in adjacent sections to properly define cortical-area boundaries and layers, respectively.
Stereological analyses indicated a significant volume reduction in all layers of anterior cingulate cortex when lesioned rats were compared with shams. A slight, but not significant, increase of infralimbic-cortex volume was observed in lesioned rats. No significant differences between lesioned and sham rats were found when total neuron number was estimated in the different layers of anterior cingulate and infralimbic cortex.
The present results suggest that neonatal lesion of ventral hippocampus might induce structural brain abnormalities in adult rats resembling those observed in pre-frontal cortex of schizophrenic individuals. Further studies are needed to evaluate whether cortical cyto-architecture of specific neuronal populations might be particularly affected in this animal model.

References

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