The neuroinflammation and neurodegeneration in epileptic patients with affective disorders

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Background

At present time, there are many experimental and clinical study on the inflammatory theory of epileptogenesis and depressive disorders [1, 2]. The activation of microglia and astrogliosis contribute the chronic inflammatory process in epilepsy and damage neurons. The inflammation in the central nervous system based on damage to the blood-brain barrier (BBB) [3]. Cytokines influence on neuronal transmission of mediators and contribute the development of hyperexcitability of neurons [4]. The cell-mediated immune activation and the process of inflammation induce the dysregulation of a brain-derived neurotrophic factor (BDNF) and decrease in the hippocampal neurogenesis and neurodegeneration associated with epileptogenesis and the development of depression [5].

Objectives

The aim is to investigate the cytokine status and concentration of BDNF in blood plasma in epileptic patients (EP) with associated depression.

Materials and Methods

The concentration of cytokines IL-1 β , IL-2, IL-6, IL-8, IL-10, TNF- α , RAIL-1, sIL-2R and BDNF were analyzed in blood and cerebrospinal fluid (CSF) samples of 60 PE and 31 healthy donors (HD) using enzyme-linked immunosorbent assay (ELISA).

Results

The study showed a significant disbalance of cytokines: the increased levels of pro-inflammatory cytokines (IL-1 β (306,5 $\pm$ 14,0 pg/ml), IL-8 (157,1 $\pm$ 99,4 pg/ml) and TNF- α (14 $\pm$ 3 pg/ml)), decrease of the concentration of the receptor antagonist IL-1 (RAIL-1) (38 pg/ml) and significantly reduced the content of BDNF (4448,9 $\pm$ 780,4 pg/ml).

Cytokine (pg/ml)	Epileptic patients	Healthy donors
In blood (plasma)		
IL-1b	306,5 $\pm$ 4,0	0,36 $\pm$ 0,01
RAIL-1	38,1 $\pm$ 23,1	420 $\pm$ 116
IL-8	157,1 $\pm$ 99,4	0,94 $\pm$ 0,2
In the cerebrospinal fluid		
IL-1b	77,1 $\pm$ 17,3	N/A
RAIL-1	0	N/A
IL-8	6,4 $\pm$ 2,5	N/A

Tabl. 1. The concentration of cytokines IL-1 β , IL-8, RAIL-1 in plasma and cerebrospinal fluid of patients with epilepsy.

Fig. 1. The concentration of cytokines in blood plasma of patients with epilepsy and healthy donors.

The direct correlation established between immune disbalance and the presence of depressive disorders in EP ($r = 0,67$; $p < 0,01$) ($r = 0,71$; $p < 0,01$) ($r = -0,83$; $p < 0,01$) (Fig. 1).

Fig. 2. The level of cytokines in PE with various depressive disorders.

Conclusion

The results confirm the data on the inflammatory and neurodegenerative hypothesis of epilepsy and depressive disorders. The immune disbalance is more expressed in EP with severe depressive disorders.

References

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