

Hypothalamic Para-Ventricular and Supra-Optic Nucleus Histo-Morphological Alterations in the Streptozotocin-Diabetic Gerbils (*Gerbillus Gerbillus*)

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Abstract : Aims and objective: In the present work, we investigate the impact of both acute and chronic diabetes mellitus induced by streptozotocin (STZ) on the hypothalamus of the small gerbil (*Gerbillus gerbillus*). In this purpose, we aimed to study the histologic structure of the gerbil's hypothalamic supraoptic (NSO) and paraventricular nucleus (NPV) at two distinct time points: two days and 30 days after diabetes onset. Methods: We conducted our investigation using 19 adult male gerbils weighing 25 to 28 g, divided into three groups as follow: Group I: Control gerbils (n=6) received an intraperitoneal injection of citrate buffer. Group II: STZ-diabetic gerbils (n=8) received a single intraperitoneal injection of STZ at a dose of 165 mg/kg of body weight. Diabetes onset (D0) is considered with the first hyperglycemia level exceeding 2,5 g/L. This group was further divided into two subgroups: Group II-1: Experimental Gerbils, at acute state of diabetes (n=8) sacrificed after 02 days of diabetes onset, Group II-2: Experimental Gerbils at chronic state of diabetes (n=7) sacrificed after 30 days of diabetes onset. Two and 30 days after diabetes onset, gerbils had blood drawn from the retro-orbital sinus into EDTA tubes. After centrifugation at -4°C, plasma was frozen at -80°C for later measurement of Cortisol, ACTH, and insulin. Afterward, animals were decapitated; their brain was removed, weighed, fixed in aqueous bouin, and processed and stained with Toluidine Bleu stain for histo-stereological analysis. A comparison was done with control gerbils treated with citrate buffer. Results: Compared to control gerbils, at 02 Days post diabetes onset, the neuronal somata of the paraventricular (NPV) and supraoptic nuclei (NSO) expressed numerous vacuoles of various sizes, we distinct also a neuronal juxtaposition and several unidentifiable vacuolated profiles were also seen in the neuropile. At the same time, we revealed the presence of à shrunk and condensed nuclei, which seem to touch the parvocellular neurons (NPV); this leads us to suggest the presence of an apoptotic process in the early stage of diabetes. At 30 days of diabetes mellitus, the NPV manifests a few neurons with a distant appearance, in addition the magnocellular neurons in both NPV and NSO were hypertrophied with a rich euchromatin nucleus, a well-defined nucleolus, and a granular cytoplasm. Despite the neuronal degeneration at this stage, unexpectedly, ACTH registers a continuous significant high level compared to the early stage of diabetes mellitus and to control gerbils. Conclusion: The results suggest that the induction of diabetes mellitus using STZ in the small gerbils lead to alterations in the structure and morphology of the hypothalamus and hyper-secretion of ACTH and cortisol, possibly indicating hyperactivity of the hypothalamo-pituitary adrenal axis (HPA) during both the early and later stages of the disease. The subsequent quantitative evaluation of CRH, immunohistochemical evaluation of apoptosis, and oxidative stress assessment could corroborate our results.

Keywords : diabetes type 1., streptozotocin., small gerbil., hypothalamus., paraventricular nucleus., supraoptic nucleus.

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