FINE STRUCTURE OF LEYDIG CELLS IN PATIENTS WITH NON-OBSTRUCTIVE AZOOSPERMIA

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Leydig cells are an important source of testosterone, the male sex hormone that stimulates spermatogenesis [1,2]. These cells are situated in the testicular interstitial compartment, together with blood vessels and other cells of connective tissue. The structural integrity of Leydig cells is necessary for the normal sperm production [3,4].

The purpose of the study was as follows: 1. to describe ultrastructural changes of Leydig cells in patients with a non-obstructive azoospermia; 2. to check the testosterone production in situ in testicular biopsies of these patients and 3. to define the levels of this hormone in the blood serum.

A total of 60 testicular biopsies from infertile patients with the non-obstructive azoospermia and 8 control biopsies were analysed. In control biopsies, Leydig cells displayed their normal ultrastructure. Round or oval nucleus was situated mostly in the centre of the cell. The chromatin of the nucleus was predominantly euchromatic, with a small presence of heterochromatin associated with the nuclear envelope. A prominent nucleolus was frequently observed. The cytoplasm of the cell was rich in cisternae of smooth endoplasmic reticulum and mitochondria with tubular cristae. Occasional cisternae of rough endoplasmic reticulum, glycogen, lipid droplets and Reinke’s crystals were also observed (Fig. A). Leydig cells in infertile men with non-obstructive azoospermia had a significantly changed ultrastructure. The nucleus of such cells was often indented with the increased presence of heterochromatin. Within the cell cytoplasm, a lot of lipid droplets and vacuoles of the electron low-density content could be noticed (Fig. B). There was a reduction in the cisternae of smooth endoplasmic reticulum, glycogen and mitochondria. In the pathologically changed cells, the presence of Reinke’s crystals seemed to be reduced. However, it should be pointed out that all biopsies contained a limited number of Leydig cells with the normal fine structure. Immunohistochemical analysis (IHC) pointed out a decreased testosterone production in situ (assessed by stereological analysis of IHC positive cells) in testicular biopsies of infertile group. However, when blood serum testosterone levels were considered, 86% of patients with non-obstructive azoospermia had normal testosterone levels. In only 3% of cases testosterone levels were decreased, whereas in the remaining 11% they were slightly increased.

In conclusion, Leydig cells in patients with the non-obstructive azoospermia displayed a significant change in their ultrastructure. The cells with the normal (unchanged) morphology were also observed within the same biopsies, but were less numerous. IHC data indicated the decreased production of testosterone in situ. However, in the vast majority of cases with non-obstructive azoospermia the peripheral levels of testosterone were normal. Electron microscopic and IHC observations on the fine structure of Leydig cells could help in the understanding of factors contributing to the male-factor infertility.
Fig. A. Normal ultrastructure of human Leydig cell. N-nucleus; ser- smooth endoplasmic reticulum; R- Reinke’s crystals (scale = 2 µm)
Fig. B. Leydig cell in an infertile man (arrow = phagolysosome with lipid droplets) (scale = 2 µm)

Fig. C. Lattice structure of a Reinke’s crystal (inset shows the TEM diffraction pattern).