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HUMAN SPERMATID CENTRIOLE ABNORMALITIES ARE CAUSATIVE FOR INTRACYTOPLASMIC SPERM INJECTION (ICSI) FERTILIZATION FAILURE.

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Aims: Fertilization failure in human after assisted reproduction technique with ICSI (Intracytoplasmic Sperm Injection) may be due to different dysfunctions affecting the spermatozoon. Because the mature oocyte is devoid of centrioles, an impaired capacity to promote the growth of microtubule (MT) arrays from the sperm centrosome may preclude pronuclear opposition required for syngamy resulting in developmental arrest of the embryo [1].

Methods: Native ejaculate with motile sperm evidence (50%) from an 40-years old healthy man with a history of 2 unsuccessful homologous ICSI cycles (woman= intact mature oocyte function evidenced by polar body "spindle-view"; one embryo transfer with one irregular embryo) resulting in pronuclear stage arrest of the zygotes, was Karnovsky-fixed, processed for electron microscopy examination, and evaluated for potential ultrastructural abnormalities.

Results: A significant number (80% of examined) of abnormal spermatozoa with an aberrant acrosomal complex (agenesia, dysgenesia, crater-deformation, vacuoles/membranous inclusions), head deformations (round-shaped, tapered-shaped, binuclear, uncompacted chromatin), and multiple centrosome lesions was observed.

In eight spermatozoa out of 11 with optimally visible centrosomes (73%), the transversal centriole sections revealed a distinct loss of the MT-triplets or their reduction to a MT-doublet, and a coupled additional smaller centriole structure was evidenced. In the longitudinal centrosome sections overlong MT protruding laterally the spermatid neck were displayed.

Conclusions: The spectrum and relatively high incidence of the observed centriolar aberrations suggest the causative sperm defect responsible for the early embryo development failure [2]. At present no help could be offered to couples affected by totally impaired centrosome function, first heterologous trials to restore human sperm centrosomal function using cytoskeletal stabilizers were reported [3].

[1] Van Blerkom J. (1996): Sperm centrosome dysfunction: a possible new class of male factor infertility in the human. Hum Reprod 2, 349-54.

[2] Rawe V.J. et al. (2002): A pathology of the sperm centriole responsible for defective sperm aster formation, syngamie and cleavage. Hum Reprod 17, 2344-49.

[3] Nakamura S. et al. (2005): A trial to restore human sperm centrosomal function. Hum Reprod 20, 1933-37.