

Analysis of endometrial receptivity based on morphological Aspects

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Keywords: endometrium, pinopodes, scanning electron microscopy

Introduction

Infertility is a condition that affects a couple and is defined as the lack of conception after an arbitrary period of 12 months with regular sexual intercourse and without using any contraception. Infertility is a common medical problem present in about 10% of couples in reproductive age. Tubal factor infertility (TFI) is one of the leading causes of infertility in the world including Estonia. The most common method treating infertility due to TFI is *In Vitro Fertilization* (IVF). In the IVF-procedure oocytes are fertilized in *in vitro* conditions followed by incubation for 2-5 days. Finally 1 to 3 embryos will be transplanted into the uterus. Occurrence of TFI decreases receptivity of the uterine mucosa by lowering the expression of $\alpha\beta3$ integrins on the endometrial endothelium, which reduces the possibility of implantation. For the interaction between the endometrium and the embryonic cells special structures called pinopodes are needed [1, 2]. The role of endometrial pinopodes in TFI has not been thoroughly studied yet.

Materials and methods

Endometrial biopsies of patients with infertility problems were carried out in Nova Vita Clinic (Tallinn, Estonia). Material for light microscopy and immunohistochemistry were fixed in 10% buffered formalin solution and embedded in paraffin. Histological methods were used to specify the stage of menstrual cycle. Immunohistochemical staining was used to detect integrin beta3 (CD61) in the endometrium. For transmission electron microscopy (TEM), scanning electron microscopy (SEM) and atomic force microscopy (AFM) material was embedded in Epon 812 according to classical methods. SEM was used to assess endometrial glands, endometrial epithelial cells and pinopodes. AFM was used to detect glandular epithelial cells organelles and structure.

Results

Light microscopy studies of biopsies revealed no pathologic changes in endometrial morphology. The ratio between glandular and stromal components varied from 1:1 to 2:1. Immunohistochemical staining for CD61 showed an intense reaction only in one patient biopsy, while in other cases reaction was weak. Thus, in these patients low expression of $\beta3$ integrins on the endometrial endothelium may be the cause of decreased receptivity of the uterine mucosa. TEM studies showed changed epithelial cell nuclei with irregularly dispersed chromatin. In the cytoplasm of cells there were mitochondria with large dimensions. In one patient SEM showed normal endometrial epithelial cells (Fig. 1), but in many cases morphological changes in ciliated epithelial cells were seen (Fig. 2). Pinopodes, essential components for embryonic implantation, were present in only one of the patients' samples. AFM studies showed normal structure of epithelial cells and cell nucleus.

Conclusion

Morphological studies showed that TFI patients have clearly lower number of endometrial pinopodes, which are essential for the successful implantation of an embryo, decreased expression of $\beta 3$ integrins and changed ciliated epithelial cells.

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This research was supported by project No. 0182688s05 with targeted financing from the Estonian Ministry of Education and Science and Estonian Science Foundation grant No. 7301.



Figure 1. Surface ultrastructure of normal ciliated cells (SEM study).

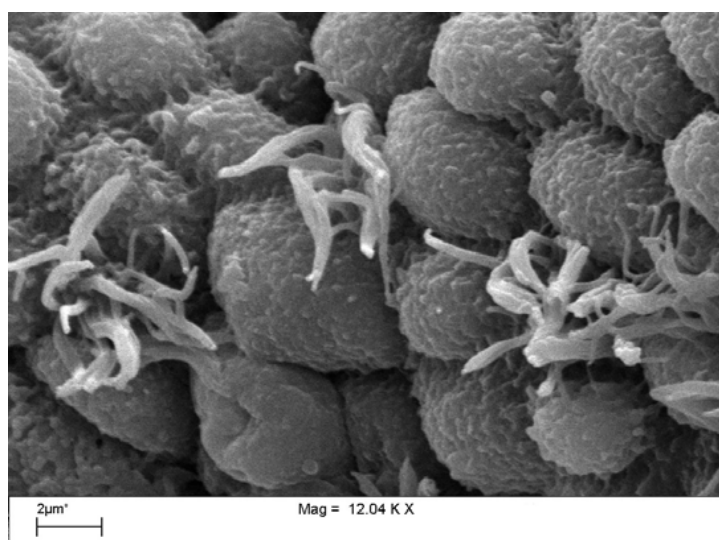


Figure 2. Surface ultrastructure of damaged ciliated cells (SEM study).