

Original Article

Histomorphologic Effects of Smoking on Fallopian Tubes in the Rats

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ABSTRACT

Background and Objective: The Fallopian tube plays an essential role in tubal transport of both gametes and embryos and successful pregnancy. We assessed the histomorphological effect of smoking on the fallopian tubes in rats, in this study.

Patients and Methods: Twelve female rats were divided to two groups as subjects (n=7) and controls (n=5). They have been exposed to smoke four times daily for 4 weeks. The histomorphological effect of smoking on the fallopian tubes was assessed by H&E.

Results: The findings were hydrosalpinx in two cases and inflammation in one of them. There was no reduction in the number of either the ciliated cells or the cilia.

Conclusion: The findings did not confirm our theory regarding smoking effect on the fallopian tubes' tissue. Further studies with electronic microscope are recommended.

Keywords: Smoking, Fallopian Tube, Histology, Rats

Introduction

Women who smoke have a markedly increased incidence of tubal infertility and ectopic pregnancy (1). Some of the epidemiologic studies have reported 21% rate of infertility among smoker women versus 14% in nonsmoker ones (2). These statistics are especially valid about women who smoke more than 16 cigarettes everyday. In animal models, nicotine alters tubal motility (3). Exposure of hamsters to doses of cigarette smoke within the range received by active or passive human smokers causes a small but significant increase in the secretory-to-

ciliated cell ratio within the infundibulum (4). Acute in vitro exposure of the hamster infundibulum to smoke solutions causes a rapid reduction in ciliary beat frequency, which is reversible upon washout of the smoke solution (5). Oocyte cumulus pick-up rate by the hamster oviduct is inhibited in a dose-dependent manner by smoke solutions, and this effect is not easily reversed by washout of the solution, demonstrating that the effect of smoking on ovum pick-up is separate to the effect on ciliary beat frequency (6). Animal data demonstrating reduced efficacy of ovum pick-up and delayed transport along the tube because of decreased ciliary beat frequency

Received: 24 March 2008

Accepted: 6 September 2008

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may explain the higher rates of infertility and ectopic gestation seen in women who smoke(5,6).

This study was designed to assess the histomorphological effects of smoking on the fallopian tubes in rats.

Material and Methods

The protocol was approved by the Institutional Review Board of the Obstetrics and Gynecology department and Ethics Community of Shahid Beheshti University, Tehran, Iran.

This was an experimental study on the female rats at the same age. The excluding criteria were a history of a previous pregnancy or past sexual contact. Accordingly, 12 rats were considered for the study and they were divided to 2 groups: seven subjects in the case group and five in the control group.

The cases were exposed to cigarette smoke, 4 times daily, for 4 weeks. Meanwhile, the controls were kept in the same place and condition without exposing to the cigarette smoke. At the end of the fourth week, tubectomy was done on them. The aim was providing enough samples to study the morphology and anatomy of the uterine tubes. The concern was doing the surgery without any impact on general health of the rats. Finally, all samples were assessed by a pathologist, in run.

The goals in this study were any exhibited change in the morphology or histology of the tubes, infiltration of the inflammatory cells and edema in the tubes' tissue as well as reduced ciliated cells or cilia of the cells in exposure to the cigarette smoke. SPSS program (SPSS, software 11.0, Chicago, USA) was used for data analysis and performing Fisher's exact test. *P* value less than 0.05 was considered as significant.

Results

The morphology of tubes was assessed in the second stage of the study while the surgery was being done. There were some changes in the tubes' morphology of two cases such as hydrosalpinx; whereas, it had not been found in the controls.

In pathologic assessment, the only confirmed finding was inflammation and edema, which was found in one case and it, did not exhibit in the control group. Nonetheless, there was reduction in the number

neither of ciliated cells nor in the number of cilia on the membrane of the tubes in both groups.

Although all means based on taking care about subjects' health were considered, two mortalities happened in the case group although it seems the reason was anesthetic medications side effects.

Discussion

We could not show the histomorphologic effects of smoking on fallopian tubes in these rats, definitely. The 1st theory of this research was to confirm morphological and histological changes in the fallopian tubes caused by cigarette smoke. Indeed cigarette smoke had not made any change in the mentioned terms.

The 2nd theory was about infiltration of inflammatory cells and edema in the tissue. No meaningful relation between taking cigarette smoke and tissue inflammation and edema was proved after assessing data by fisher's exact test.

The 3rd and 4th theories were not also approved as there was no case of reduced ciliated cells or cilia on the cells. Some studies have claimed that there is a relation between smoking and raised incidence of ectopic pregnancy; however, no mechanism has been still detected for it (2). It has been proved that morphological changes of the fallopian tube such as hydrosalpinx could have a role in this complication. Therefore, the morphological changing was considered in the recent study.

In this case, all the rats were virgin; accordingly, the factors, which might affect the tubes such as infections, were excluded. Although, in 2 case subjects an obvious hydrosalpinx was found; but, the morphological changes of tubes were not confirmed to be related to the cigarette smoke.

All of the available valid articles and studies impress on diminished fallopian tube function by the effect of cigarette smoke (4,7). They have all related this problem to the reduced function of ciliated cells which can result in impaired oocyte pick up by the tube as well as its transfer inside it (4,6,8,9).

Logically, this dysfunction could also associate with decrease in the number of the ciliated cells and/or cilia. Therefore, the recent study chased the histological changes in the fallopian tube tissue of rats that had been exposed to cigarette smoke. However, there was no trace of changes in the number of either the ciliated cells or the cilia.

The researchers have found that cigarette's nicotine can impair the ovary function as well as the ovum transfer inside the fallopian tube, which give rise to a kind of subfertility. Nonetheless, if even the fertilization happens, the implantation might happen inside the fallopian tubes because of the slow transfer of the egg (8,10,11). All these complications are resulted from the pathologies and cilia dysfunction, which emerge due to the smoking (9-13).

It has been remarked that smoking could result in an inflammation in the tissue of the bronchi and impairment of the ciliated cells. Similarly, this problem may occur in the fallopian tubes (10).

Regarding that, the recent survey looked for the pathological changes in the fallopian tubes tissue following an exposure to cigarette smoke. Surprisingly, the inflammation marks and edema were found only in one case subject and accordingly its relation with the cigarette smoke could not be confirmed.

Conclusion

This study did not confirm the effects of smoking on the fallopian tubes. Further studies with electronic microscope are strongly recommended.

Acknowledgment

We would like to appreciate Mrs. Vida Fallahian for her association and Dr. Nariman Mosafa as provided dye for histological assessment.

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