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Effects of smoking cigarette on intrauterine insemination outcomes

Sigara içiminin intrauterine inseminasyon sonuçlarına etkisi

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Abstract

The aim of this study was to investigate the effect of cigarette smoking on intrauterine insemination (IUI) outcome in men with normal sperm concentrations. Semen samples were obtained from smoker (n=120) and non-smoker (n=125) IUI couples in our center. Semen analysis were performed manually according to WHO guidelines and Kruger's strict criteria. We found that the quality of sperm parameters in the smoker men was not significantly different than that of the nonsmoker men ($p>0.05$) except for ratios of chromatin condensation and progressive motility ($p<0.05$). Pregnancy rate of the smoker group was significantly lower than that of the nonsmoker group ($p<0.001$). In conclusion, smoking cigarette has a negative effect on chance of conceiving after IUI in couples with smoking male partners.

Keywords: Infertility, sperm parameters, intrauterine insemination, pregnancy rate

Özet

Bu çalışmada sperm konsantrasyonları normal olan erkeklerde, sigara içmenin intrauterin inseminasyon (İUİ) başarısı üzerindeki etkisi incelendi. Semen örnekleri sigara kullanan (n=120) ve kullanmayan (n=125) İUİ hastalarından sağlandı. Semen analizi WHO önerileri ve Kruger kriterlerine göre manuel olarak yapıldı. Kromatin kondensasyon ve progresif motil spermatozoa yüzdesi ($p<0.05$) haricindeki sperm parametreleri, sigara içen ve içmeyen erkekler arasında benzer bulundu ($p<0.05$). Gebelik oranı ise, sigara içen grupta sigara içmeyenlere göre anlamlı olarak düşük izlendi ($p<0.001$). Sonuç olarak, eşin sigara içmesi İUİ yapılan kadınlarda gebelik şansı üzerine olumsuz etki göstermektedir.

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Anahtar sözcükler: Kısırlık, sperm parametreleri, intrauterin inseminasyon, gebelik oranı

Introduction

Cigarette smoke contains a large number of substances, including nicotine, carbon monoxide and recognized carcinogens and mutagens such as radioactive polonium, benzopyrene, dimethyl benzantracene, naphthalene and methylnaphthalene [1]. Many of its constituents have not been evaluated for toxicity on male sperm production. Inhalation of cigarette smoke whether through active or passive smoking leads to absorption of these chemicals through the pulmonary vasculature and blood-borne circulation through the body [2]. It is also possible that those same substances could end up in the seminal plasma of smokers via various modes of diffusion and active transport. Although the effect of smoking o male infertility remains inconclusive, the evidence of adverse effects of smoking on semen parameters suggest that smoking reasonably may be regarded as an infertility risk factor, smoking should therefore be discouraged for both male and female partners in couples with a history of infertility or recurrent pregnancy loss, particularly when marginal or frankly abnormal semen parameters have been documented [3-5]. Thus, the aim of this study is to evaluate the relationship between cigarette smoking and IUI outcome in infertile couples undergoing infertility treatment.

Material and Methods

Infertile couples (245) that had undergone IUI treatment at Cerrahpaşa In vitro Fertilization Centre were included in the study. Retrospective analyses were performed on 120 couples whose male partners were cigarette smoking (smoker group) and on 125 couples whose male partners were not cigarette smoking (non-smoker group). Among all couples, women under 35 years old and having day 3 FSH value below 15 IU/mL and men having a sperm concentration above 10 million/mL were included. Clomiphene citrate was used for ovulation induction. To evaluate sperm chromatin quality and DNA integrity after fixation of sperm smears (2.5% glutaraldehyde) aniline blue staining were applied both groups. The slides were analyzed by light microscopy and to determine the percentage of mature spermatozoa, 200 spermatozoa were counted in each slide. Pregnancy rates after IUI in couples where male partners with a smoker and nonsmoker were compared.

Data analysis was performed by using SPSS package (version 16.0, SPSS Inc., Chicago, Il, USA). Data were expressed as mean± SD. The nonparametric Wilcoxon signed-'rank test and Mann-Whitney test were applied for statistical analysis. A p value < 0.05 was considered statistically significant.

Results

Table 1 shows female parameters of the study groups. Smoker and non-smoker groups were found comparable ($p>0.05$). Table 2 presents male parameters of the study groups. The ratios of progressive motility, chromatin condensation, and pregnancy rate of the

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non-smoker group were found significantly higher than those of the smoker group ($p<0.05$).

Table 1. Female characteristics of the group I and II.

	Smoker group (n=120)	Non-smoker group (n= 125)
Female age (y)	30.4 ± 6.0	33.0 ± 3.4
Duration of infertility (y)	4.1 ± 2.7	4.8 ± 3.5
BMI	25.9 ± 5.7	25.9 ± 3.3
Endometrial thickness (mm)	9.0± 3.4	9.4 ± 3.2
E2 (pg/mL)	42.9± 24.7	49.0 ± 37.1
FSH (mIU/mL	6.3 ± 1.3	7.4 ± 3.7
LH (mIU/mL)	4.9 ± 1.9	6.5 ± 4.3
Study groups were found similar (p>0.05).		

Table 2. Sperm parameters and the IUI outcome of the smoker and non-smoker groups.

	Smoker group (n=120)	Non-smoker group (n= 125)
Male age (y)	34.1 ± 6.0	36.1 ± 5.3
Sperm concentration (mm3)	69.5± 52.9	75.8 ± 48.7
Normal morphology (%)	4.5 ± 4.0	50 ± 4.2
Motility (%)	31.6± 14.1	36.2 ± 17.0
Progressive motility (%)	13.6±8.7	16.6± 4.3[a]
Chromatin condensation (%)	35.5± 8.0	45.8 ± 6.2[b]
Pregnancy rate (%)	5.6	12.1[c]
[a]P<0.05 vs. smoker group. [b]P<0.05 vs. smoker group. [c]P<0.05 vs. smoker group.		

Discussion

In this study, higher progressive sperm motility, chromatin condensation and pregnancy ratios have been found in nonsmokers. Studies have shown that cigarette smoking is associated with a decrease in sperm counts and motility and an increase in abnormal forms and sperm DNA damage [6-8]. Also it was reported that the DNA fragmentation index (% DFI) was significantly higher in fertile men who smoked ($p=0.02$) [9]. This observation was first described in 35 smokers included in IVF program; these subjects had a significantly higher percentage of spermatozoa with DNA damage than did non-smokers (4.7 ± 1.2 versus 1.1 ± 0.2 %; $P=0.01$) [10]. A possible explanation for these finding could be the increased leucocytes-induced oxidative stress on developing or mature sperm.

Metabolites of cigarette smoke components may induce an inflammatory reaction in the male genital tract with subsequent release of chemical mediators of inflammation these inflammatory mediators such as interleukins 6 and 8 can recruit and activate leucocytes [9]. In turn, activated leucocytes can generate high levels of reactive oxygen species in

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semen which may overwhelm the antioxidant strategies and result in oxidative stress [11]. Another causative factor would be the fact that the seminal plasma in smokers contains lower levels of antioxidants than that of non-smokers [12]. Additional studies are needed to fully clarify the clinical value of testing of smoking on sperm DNA damage and its impact on reproduction. The relationship between conventional semen parameters and sperm maturity is not strong enough to eliminate maturation defects as a potential source of infertility in normozoospermic men and requires a distinct assessment of sperm maturity in male infertility. The clinical significance of the present finding should be to develop effective interventions aimed at helping patients stop smoking for the benefits to general health and for their fertility.

Conflict of Interest

The authors stated that they have no conflict of interest.

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