THE EFFECT OF CIGARETTE SMOKING ON SEMEN QUALITY OF INFERTILE MEN

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ABSTRACT
Objective: To evaluate the effects of cigarette smoking on semen quality of infertile men.
Methodology: Two hundred fourteen infertile men who had been smoking cigarette and one hundred thirty infertile non-smokers men participated in this study. Seminal volume, sperm concentration, motility, viability, and morphology were examined.
Results: The quality of spermatozoa obtained from smokers were much lower than non-smokers (P<0.01). The sperm concentration, viability and forward progression were negatively correlated with cigarette smoking (P<0.01).
Conclusions: Smoking does affect the semen quality of infertile men.

KEYWORDS: Cigarette smoking, Male infertility, Semen quality.

INTRODUCTION

Despite worldwide anti-smoking campaigns, cigarette smoking is very common. Experimental studies indicated that in rats exposed to smoking, serum levels of nicotine and cotinine were increased which adversely affected spermatogenesis and sperm fertilizing potential. However, in regard to the clinical studies on relationship between smoking and male reproduction, the literature results have been no conclusive. Cigarette smoking may be associated with sub-fertility in men and my result in decreased sperm concentration, lower sperm motility, and a reduced percentage of morphologically normal sperm. Some studies have reported that the association between man smoking and semen quality was stronger in healthy men than in the infertile population. The objective of this study was to evaluate the effects of cigarette on the sperm quality of men attending the infertility center.

SUBJECTS AND METHODS

Patients: This study was conducted in the academic university Hospitals. Men with age of 25-45 years, including one hundred thirty non-smokers and two hundred fourteen smokers, with a history of infertility, who were able to provide an ejaculate, were consecutively evaluated. Subjects who participated in the study had never had urogenital or serious systemic disease. They never used any contraceptive. Their spouses were apparently fertile women as indicated by physical and laboratory examinations, seventy five fertile, non smoker men, with age of 25-40, who had children, served as the controls.

The smokers were categorized as mild (≤10 cigarettes per day), moderate (10-<20 cigarettes per day), and heavy smokers (≥20 cigarettes per day). The smokers according to the duration of smoking were divided into short term, 1-10 years and long term, 11-20 years.
Semen Analysis: Semen samples were collected by masturbation in a clean specimen container after a sexual abstinence for 3-6 days, allowed to liquefy and evaluated immediately thereafter according to WHO guidelines. Ejaculate volume, PH, and time to liquefaction were measured. The results of semen analyses were classified according to the nomenclature of semen viabiles.

Normozoospermia was diagnosed when sperm concentration, motility and morphology were within the reference values. The reference value for sperm concentration was ≥50% sperm with forward progression (categories ‘a’ and ‘b’) or ≥25% sperm with category ‘a’ movement, and for morphology 30% sperm with normal morphology respectively.

Statistics: Data were presented as mean as, if applicable, and the significance of differences were analyzed by t-test. Statistical analysis was performed by means of SPSS 7.5 for windows software packet. The significance of differences was set at P<0.05.

RESULTS

In all, three hundred forty four men were evaluated for infertility; of these, one hundred thirty were nonsmokers and two hundred fourteen smokers respectively. The semen volume, acidity, and the sperm concentration, viability and forward progression (Grade) were much lower in the smokers than in the nonsmokers (p<0.01, Table-I). The semen parameters were much lower in the nonsmokers of infertile men than in the fertile men (P<0.01).

No significant differences in the results of semen quality were seen between mild, moderate and short term smokers and nonsmokers. Most semen parameters in the heavy and long term smokers are significantly lower than their corresponding values in the nonsmokers (P<0.05 or 0.01, Table-II).

DISCUSSION

The possible detrimental effects of cigarette smoking on male reproductive performance, and specifically on semen parameters, is of great interest and available data is quiet conclusive. In addition, because of the recent desire to better understand and treat infertility in men, it has become important to assess the possible side effects of cigarette smoking on male reproduction. Chemical agents or mutagens may affect male reproduction via direct effect on the testes and their ability to produce sperm.

<table>
<thead>
<tr>
<th>Table-I: Semen quality of infertile and fertile groups</th>
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<td>Sample</td>
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<tr>
<td>Volume (ml)</td>
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<td>PH</td>
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<td>Count (×10⁶/ml)</td>
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<td>Viability (%)</td>
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<td>Grade (0-4)</td>
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Note: All values are means±SD. P<0.01.

<table>
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<th>Table-II: Semen quality of different group</th>
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<td>Count (×10⁶/ml)</td>
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<td>Sperm viability (%)</td>
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<td>Grade (0-4)</td>
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* p<0.01, ·p<0.05
viathec process known as spermatogenesis.\textsuperscript{13-16}
Those mechanisms may involve the hormonal
control of spermatogenesis or may directly
affect the germ and sertoli cells within the
spermatiferous tubules.\textsuperscript{11,13,17,18,19-21}

Although there is some evidence to the con-
trary, a number of studies have shown higher
incidences of abnormally shaped sperm cells
as well as decreased motility and sperm con-
centration in men who smoke.\textsuperscript{9,11,16,22-26}

In the current study, we investigated the
effect of smoking on the semen quality of in-
fertile men, particularly in heavy and long term
smokers. The results indicated that smoking
significantly reduced the ejaculate volume:
Every smoker should be encouraged to stop
smoking, especially if a pregnancy is planned.
Cigarette smoke contains a lot of known tox-
ins, which may have detrimental effects on fer-
tility. Simply stopping smoking could prevent
the toxins contained in cigarette smoke.

REFERENCES

1. Yamamoto Y, Isoyama E, Sofikitis N, Miyagawa I.
   Effects of smoking on testicular function and fertiliz-
2. Reddy A, Sood A, Rust PF, Busby JE, varn E, Mathur
   RS, et al. The effect of nicotine on in vitro sperm
motion characteristics. J Assist Reprod Genet
3. Lewin A, Gonen, O, Orvieto R, Schenker J. Effect of
   smoking on concentration, motility and zona-
   free hamster test on human sperm. Arch Androl
4. Sofikitis N, Miyagawa I, Dimitriadiks D, Zavos P,
   Sikka S, Hellstrom W. Effects of smoking on testicu-
lar function, semen quality and sperm fertilizing ca-
   quality and human fertility: a prospective study with
6. Vine F. Smoking and male reproduction: A review
7. World Health organization. Laboratory manual for
   the examination of human semen and sperm cervical
   mucus interaction. 3rd/ed. Cambridge: Cambridge
8. Stillsman J. Smoking and reproduction. Fertile Steril
   Testicular Function in sperm donors: Normal ranges
   and the effects of smoking and varicocele. Int J Androl
   1984;7:369-82.
10. Karagouniscs, Papanikolav A, Zavous M. Semen
   parameters compared between smoking and non-
   smoking men: smoking intensity and semen param-
11. Hoidas S, Williams E, Tocher L, Itargreave B. Scoring
   sperm morphology from fertile and infertile ciga-
   rette smokers using the scanning electron microstope
12. Kulikauskas V, Blaustein D, Ablm R. Cigarette smok-
ing and its possible effects on sperm. Fertile Steril
13. Fisher-fischbein J. The effects of pharmaceuticals,
   enviromental, and occupational aspects on sperm
   motility. In Gagnon C, editor. Controls of sperm
   motility: biological and clinical aspects. Boca Raton
14. Mattison DR. The effects of smoking on fertility from
   gametogenesis to implantation. Environ Res
15. Ravenholt RT. Circulating mutagens from smoking.
16. Corrao A, Guindon E, Sharma N, Shokoohi F. To-
   bacco control country profiles. American Cancer
   Society, Atlanta 2000;32.
   J, Sherer F. Interrelationships of cigarette smoking,
testicular varicoceles, and seminal fluid indexes. Fer-
18. Kraiber L, Brovenman M. Dynamics of estradiol and
testosterone and seminal fluid indexes in smokers
19. Ramlau-Hansen CH, Thulstrup AM, Aggerholm AS,
   Jensen MS, Toft G, Bonde JP. Is smoking a risk factor
   for decreased semen quality? A cross-sectional analy-
20. Gaur DS, Talekar M, Pathak VP. Effect of cigarette
   smoking on semen quality of infertile men. Singapore
   EB, Lucon AM. Cigarette smoking is related to a de-
crease in semen volume in a population of fertile
22. Rantala L, Koskimies L. Semen quality of infertile
couples comparision between smokers and non-
23. Saaranen M, Suonio S, Kauhanen O, Saarikoski S. Ciga-
   rette smoking and semen quality in men of repro-
24. Martini AC, Molina RI, Estofan D, Senestrari D, Fiol
   de Cuneo M, et al. Effects of alcohol and cigarette
25. Martini AC, Molina RI, Estofan D, Senestrari D, Fiol
   de Cuneo M, et al. Effects of alcohol and cigarette
   smoking and non-smoking men in infer-
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