Sperm abnormalities: Adverse effects of thyroid dysfunction

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Abstract

Introduction: Despite the importance of thyroid hormones in reproduction, there are only a few studies that focus on male infertility. The objective of this study was to evaluate semen parameters in patients with hypothyroidism or hyperthyroidism.
Materials and methods: Totally, 28 patients with thyroid disorders were evaluated for the semen parameters. Serum TSH and T4 concentrations were measured by ELISA. Complete semen analyses were performed based on WHO.
Results: Pathozoospermia was seen in 32.14% of our patients. Two hyperthyroid patients and seven hypothyroid patients suffered sperm defects. None of pathozoospermia patients showed an alone sperm defects. Sperm multiple anomalies were our main findings.
Conclusion: It seems that sperm characterizes strongly were affected. Although, we have a limited sample size, but sperm multiple abnormalities made our interest findings.

Keywords: Infertility, Semen, Sperm abnormality, Hypothyroidism, Hyperthyroidism

Introduction

Fertility and childbearing may be one of the desired goals in the couples' life. Unfortunately, approximately 50 to 80 million of people suffer from infertility in worldwide (1-3). Male factor infertility is considered responsible for 30 % of these cases. However, in approximately 15 % of cases, the etiology remains unclear (4). This complex procedure is influenced by varying factors such as hormones. It is now well-established that endocrine system has an important physiological role in maintaining and regulation of sexual development and reproductive function (5-7).

There are many studies that target thyroid hormones level variations in infertile couples, commonly female partner. The objective of this study was to compare semen parameters in hypo/hyper thyroid patients without any infertility complaint. Similar study, to the best of our knowledge, has not published from Iran previously.

Material and methods

Subject: This single center study was approved by the Research committees of AJA University of Medical Sciences in Tehran, Iran (code: 85/90/400) and

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informed consent was obtained from all patients. In a during 20 months, those patients, who had been untreated for their thyroid disease, were introduced to the research team by thyroid endocrinology clinic, Emam Reza Hospital, Tehran , Iran. Subjects were excluded if they were /are taking medications or any drug known to potentially interfere with thyroid function or semen characteristics, also had experienced prior vasectomy and cryptorchidism.

Serum assay: Serum TSH and T4 concentrations were measured by ELISA (BioVendor, Heidelberg, Germany). This hormone assay was performed according to the DIAPLUS kit (Toronto, Canada) protocol. The reference ranges of TSH and T4 were 0.39-5.95 μg/dl and 4.4-10.8 μg/dl, respectively. Experimental bias was diminished by using a double-blind procedure.

Semen analysis: According to WHO guidelines of 2010, semen samples were collected by masturbation after a 4 day sexual abstinence (8). Following liquefaction for a period of 15 to 30 minutes at room temperature, complete semen analyses were performed. As soon as possible after liquefaction, each sample's motility was evaluated at room temperature with a heated microscope stage that was standardized for our laboratory. Sperm motility was classified as follows: Progressive (class A+B), Non-progressive (class C) and Immotile (class D). The Sperm count assessment was performed with usual manner wet preparation. Using haemocytometer chamber, at least 200 spermatozoa were counted. Concentration in spermatozoa per ml was calculated. Sperm morphology was evaluated using the Diff-Quick staining method. Briefly, two slides were prepared from each fresh semen sample. After air-drying, fixing and staining, the slides were examined with bright field optics at ×1000 magnification with oil immersion. In this assessment approximately 200 spermatozoa were counted in five squares.

Statistical analysis

All patients were divided into 2 subgroups according to laboratory hallmarks: hypothyroids and hyperthyroid. Then statistical analyses were carried out using SPSS (v. 15.0) and a value of $P<0.05$ was considered significant. Continuous variables were summarized as mean and standard deviation and categorical variables as absolute and relative frequencies.

Results

The participants included 28 individuals ranging in age from 24 to 38 years (mean ±SD: 29.5±3.8). A total of 6 (21.42%) of 28 patients had considered as hyperthyroidism, which was identified in serum levels of TSH and T4. The average serum levels of TSH and T4 were found 0.8±0.06 μg/dl and 14.1±1.5μg/dl (mean ±SD), respectively. Our results also showed that other participants (n= 22) may be in place Hypothyroidism for their TSH and T4 serum levels (mean ±SD: 9.6 ±2.3 μg/dl and 3.4±0.8 μg/dl, respectively).

Normozoospermia was observed in 68.75% (n=19) of our patients (four in the Hyperthyroidism group vs. fifteen in Hypothyroidism group). Also, pathozoospermia was seen in 32.14 % (n=9) of our participants (Two in the hyperthyroidism group vs. seven in hypothyroidism group).

Five patients in this study suffered from asthenospermia; 1 patients of hyperthyroidism group and 4 patients of hypothyroidism group. No significant difference was observed among groups ($P = 0.571$). Our results showed that six patients have morphologically abnormal sperm cells (one in the Hyperthyroidism group vs. five in Hypothyroidism group). There was no significant difference in sperm morphology ($P = 0.657$) between two groups. Also, no significant difference ($P = 0.515$) was also seen to exist between total sperm count in both groups (18.5±3.9 × 106 per ml in Hyperthyroidism group vs. 20.8±4.2 × 106 per ml in Hypothyroidism group).

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Discussion

The interesting finding of the present study is teratospermia. Hyperthyroidism group showed 16.7% teratospermia and hypothyroid patients demonstrated totally 22.7% teratospermia. Based on Karras and Pontikides review article, there is a study that reports sperm morphology defects in non-euthyroidism men: De La Balze et al. (5). We observed teratospermia not only in hypothyroids group, but also in hyperthyroid ones. Recently Krassas et al. showed morphology was affected at significant levels in hypothyroid patients (9). Several studies support an association between thyroid hormones and Sertoli cells functions. These studies have demonstrated that thyroid hormones receptors exist in proliferating Sertoli cells. At this point Sertoli cells are introduced as a major target for thyroid hormone. Their effects are probably mediated through the duration of Sertoli cell division and involved in the maturational changes (10). **Comparison of studies:** Sperm motility is probably a main change in hyperthyroid patients.

Abalovich et al. found that 18 patients (n=21, 85.7%) had a motility problem (astenospermia). The same result was obtained by Krassas et al. In their study all patients (n=23) showed astenospermia without any other sperm defects (7). But our results were different. We observed astenospermia associated with teratospemia with one of hyperthyroid patients. In hypothyroid group five patients (22.7%) indicated astenospermia that in comparison with Wortsman et al. is much lower. Wortsman et al. found astenospermia in 87.5% of their hypothyroid patients (n=8) that was associated with oligoteratospermia. A remarkable point in their study could be age. Age could be a remarkable point in these studies. The participants age ranged varied from 17 to 77 years: De La Balzed et al. (17-59) y; Wortsman et al. (37-77) y and present study (24-38) y. This viewpoint is consistent with studies which indicated a significant age-dependent reduction in sperm quality (11-13). Although there are few studies that investigated thyroid hormones alterations in the male reproductive system and semen quality, but animal models helped well establish the testicular changes' mechanism. In Wistar rat have been demonstrated that hypothyroidism reduces seminiferous tubules and lumen diameters significantly (14). Also, other studies indicated that Sertoli cell differentiation postponed in hypothyroid rats and these rats showed a prolongation of Sertoli cell proliferation time. It is notable that transient hypothyroidism associated with less damage to the testes (15). Furthermore, sperm count deficiency was emerged as a common defect in our groups. In hypothyroid group, oligospermia was observed in seven patients that was associated with astenospermia and teratospermia and teratoastenospermia. Only two patients of hyperthyroids group showed pathozoospermia in the present study that was not their single sperm defects. This finding is almost near to Clyde et al. (1976) and Kidd et al. (1979) reports in hyperthyroid man, 3 and 5 patients respectively. But there is a main difference; we observed oligospermia was associated with other sperm defects and was not seen as an alone defects in our patients. Moreover, multiple abnormalities made our main finding in this study. Although there are few published studies that report semen analysis in hypo/hyper thyroid patients, but there is no study that report multiple anomalies. In our study, none of hypothyroid affected men demonstrated only a single defect ((n= 2: O+T), (n=3: O+A), and (n=2: O+A+T)). And we observed no alone form of pathozoospermia in hyperthyroid affected men ((n= 1: O+T), (n=1: A+O)). It seems there is not same published report from Iranian population, therefore it plays a role as a pilot study. Our study lacked a control population and included a limited

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number of patients in a different age range that make it difficult to draw definitive conclusion. This said, we need to perform further studies on larger appropriate case and control Iranian populations to confirm these observations.

Conclusion

Scientific investigations support the impact of thyroid hormones on reproductive. These findings demonstrated that thyroid hormones' dysfunction associated with sperm defects. It seems that these effects are strongly dependent upon the timing of onset and severity. Therefore, more precision is suggested in work up assessment in the clinic.

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