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Psychosocial Stress and Asthenozoospermia: Case Report

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Abstract

Background: Psychosocial stress is an increasing worldwide health problem. Our purpose is to highlight one probable effect of psychosocial stress on male natural fertility.

Case: In our clinical practice, we could identify a paradigmatic case of secondary infertility due to psychosocial stress. While the patient revealed a flat profile of saliva cortisol, no other changes in his hormone profile were observed. Serum cortisol was 31.9µg/ml (Reference Value: 5-25 µg/ml). He showed a particular type of sperm motility characterized as having high energy but low progressiveness. His sperm kinetic (SCA-microoptic) could be contrasted to a group of proven fertility (n:19). In terms of sperm kinetic, he was in the 5th percentile for rapid progressive sperm and in the 90th for amplitude of lateral head displacement, achieving the 75th for the beat cross frequency (BCF).

Conclusion: According to our results we can hypothesize that psychosocial stress may cause a particular type of asthenozoospermia, the most frequent feature in Clinical Andrology Laboratory, with direct impact on natural fertility.

Keywords: Male Infertility; Psychosocial stress; Sperm kinetic; Cortisol

Introduction

Several researches have shown that individuals with fertility problems experience psychosocial problems [1]. The question of whether stress contributes to conception delay is a controversial issue that has received much attention in recent years, in part owing to the fact that despite advances in medicine some cases of infertility remain unexplained [2]. What remains unclear is the role that stress, defined as a physiological or psychological response to a positive or negative external stimulus, may play in reproductive function, in part due to an inability to separate cause and effect.

Case Presentation

A patient (37 years old) and his couple (36 years old) attended the Male Fertility Section of our Hospital, for secondary infertility. Although they tried to conceive, they could not succeed after two years of unprotected and frequent intercourses. His partner did not evince fertility abnormalities. At the moment of the study he had a daughter aged five with his first wife. He worked as a jailer being thus exposed to violent situations. Except for this feature no chronic diseases or andrological disorders were recorded at the clinical examination. His hormone profile was determined and the obtained values were into the reference ranges (Table 1). However, cortisol level was located above the population median.

Psychosocial stress was evaluated in the studied patient through Holmes & Rahe Life Events Scale [3] which was self-administered. This included 40 items, where the man indicated which event he experienced during the past 5 years and obtained a score of 428, which was higher than the expected one for a non-stressed person (cut-off value: 300).

The patient returned one year later and his hormonal profile remained between reference values, excepting for serum cortisol which increased, 31.9µg/dl (reference range: 5.0-25.0 µg/dl). Moreover, seminal plasma cortisol was measured, showing a value of 1.06µg/dl. In the same day, salivary cortisol was assessed at basal time in the morning, 30min and 23hrs being 0.46, 0.2 and 0.2 µg/dl respectively.

A Sperm Class Analyzer CASA system (SCA Microptic SL Barcelona, Spain) was employed to assess kinetic parameters and sperm count, it was standardized and validated [4]. Recently we proved its use to evaluate patient´s individual response to varicocelectomy [5].

Seminal parameters of the case in study were compared with a control group (19 donors who proved fertility by their partner's giving birth in the last 12 months); these parameters were divided in percentiles and are shown in table 2. Sperm count decreased in the second visit as well as progressive motility and the beat cross frequency increased (BCF), being located in 75th percentile.

Discussion

The current study describes the possible association between psychosocial stress and male infertility using a case study. In the studied patient, no abnormalities were found in hormonal levels, neither at the first medical consultation nor one year later. Only cortisol increased in this period while changes in the spermiogram could be documented.

In our study stress was evaluated trough Holmes and Rahe scale (1967). By using the scale, several researches demonstrated that a score higher than 300 was predictor of diseases such as diabetes mellitus, myocardial acute infarction and cancer [6]. Furthermore, the flat profile obtained when measuring salivary cortisol reflects that HPA axis is completely compromised thus reflecting the severe psychosocial status of the patient. It is interesting to note that the

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Table 1: Hormonal Profile.

FSH (mUI/ml)	LH (mUI/ml)	E2 (pg/ml)	ToT (ng/ml)	TL (pg/ml)	SHBG (nmol/l)	Tbio (ng/ml)	PRL (ng/ml)	Vit D (ng/ml)	TSH uUI/ml	Cort ser (ug/dl)
6.2	3.8	31	3.3	100	13.2	2.32	5.7	28	1.86	19.6

Reference values: FSH 1.4-18.1 mUI/m; LH 1.5-9.3 mUI/ml; E2 hasta 43 pg/ml; ToT 2.49-8.36 ng/ml; TL 66-174 pg/ml; SHBG 14-52 nmol/l; Tbio 1.5-4.0 ng/ml; PRL 2.1-17.7 ng/ml, Vit D Sufficient: 30-100 ng/ml; TSH 0.35-5.5 uUI/ml, Cortisol 5-25 ug/dl FSH, LH, PRL, TSH, SHBG, Serum, Salivary and Semen Cortisol were determined by the chemoluminiscent method (Immulite auto analyzer, Siemens, LA, USA). Total testosterone, estradiol and Vitamin D were performed by electro chemiluminescent immunoassay, (Cobas e411 auto analyzer, Roche Diagnostics, Mannheim, Germany). Free-testosterone and bio-testosterone were calculated from the measurement of total-testosterone and SHBG, according to the mass action law using Vermeulen formula (Vermeulen, Verdonck & Kaufmanl, 1999).

Table 2: Location of the patient´s sperm kinetic parameters in regard to a fertile population.

	Control Group			Case Report	
	Median	*P 2.5*	*P 97.5*	First visit	Second visit
Vol (ml)	2.5	0.5	8.7	2.5	3.1
Sperm concentration (10^6 ml^{-1})	46.9	6.9	237.3	38.7	11.3
Total sperm count (10^6 $ejac^{-1}$)	150.8	18.7	701.2	96.8	35.0
Ga (%)	25.0	8.0	57.0	12.0	11.0
PM (%)	43.0	14.0	80.0	23.0	16.0
Total Motility (%)	47.0	25.0	81.0	31.0	19.0
VCL (μm s^{-1})	78.8	46.4	106.5	70.5	81.5
VSL (μm s^{-1})	51.9	29.3	90.0	36.9	50.0
VAP (μm s^{-1})	63.2	35.0	95.0	49.2	57.1
LIN (%)	67.5	44.4	84.6	52.3	63.6
SRT (%)	84.5	72.4	94.8	75.0	88.5
WOB (%)	79.5	60.5	89.3	69.8	71.6
ALH (μm)	2.2	1.7	3.4	3.0	3.3
BCF (Hz)	8.9	7.2	10.8	8.4	9.6

Data are expressed as median. Ga: Rapid progressive sperm (CASA: VCL >35 μm s^{-1}; LIN >50%; STR >80%); PM: Progressive motility (CASA: VCL >10 μm s^{-1}); Total motility: Progressive motility + Non-progressive motility. VCL: curvilinear velocity; VSL: straight-line velocity; VAP: average path velocity; LIN: linearity; STR: straightness; WOB: wobble; ALH: amplitude of lateral head; BCF: beat cross frequency. (LIN = VSL/VCL; SRT = VSL/VAP, WOB=VAP/VCL).

seminal plasma cortisol values in this patient represent the 3.3% of the serum cortisol, similar proportions to the reported by in saliva [7]. Thus, it could be inferred that cortisol transudates from serum to seminal plasma through the annexed glands, which may alter the environment of sperm in semen and exert a direct effect on sperm kinetic, which could be previous to hypothalamic-pituitary-gonadal axis damage, generating per se sperm kinetic modifications. Another hypothesis could be that the effect exerted by cortisol could be pre-testicular, thus affecting spermatogenesis.

In asthenozoospermia the progressively motile spermatozoa percentage is below the lower reference limit (32%) [8]. The CASA allows bettering characterizing the different patterns of movements. In terms of sperm kinetic parameters our patient had not only lower progressive motility that the expected one, he was in the 5th percentile for rapid progressive sperm (Ga) and in the 90th percentile for amplitude of lateral head displacement (ALH) while considering sperm kinetic of a fertile population. The CASA system translates our observation "sperm moving with high energy but low progressiveness" in measurable variables. Later on, while the level of serum cortisol increased and saliva cortisol showed a flat profile the beat cross frequency was in the 75th percentile, further giving kinetic tools to evidence our observation.

In this way, we are characterizing a particular type of asthenozoospermia, highlighting one probable molecular mechanism involved in the process where a chemical substance, like cortisol produces biophysical changes, namely sperm kinetic. More generally speaking we are giving a new tool to understand how psychosocial stress may affect male infertility.

Conclusions

Psychosocial stress may cause a particular pattern of asthenozoospermia [9] that might be observed as sperm moving with high energy but low progressiveness. In terms of sperm kinetic they have high beat frequency but low progressive motility, the main functional skill to achieve natural fertility.

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