INTRODUCTION

Male infertility is a relatively common medical condition affecting up to 12% of men globally. Semen parameters are poor surrogate measure of a man’s ability to fertilize. Advanced tests of sperm function have been proposed as alternative methods that can enhance the diagnostic accuracy of male infertility, particularly in cases of unexplained infertility, one or more abnormal semen parameters, recurrent pregnancy loss, or failure of assisted reproduction technologies. Oxidative stress (OS) results from a number of endogenous and exogenous stresses is believed to play a central role in the pathogenesis of male infertility. A delicate balance in the redox system is required for essential physiologic functions of the spermatozoon such as chromatine compaction in maturing spermatozoa, capacitation, hyperacrosion, acrosome reaction and sperm-oocyte fusion. The World Health Organization (WHO) has also acknowledged OS as an important parameter that plays a significant role in male infertility, and thus its assessment and management are critical for patient care.

RESULTS

Background information on the study population is presented in Table 1 along with a comparison of the control group and infertility patients.

1. The median ORP (mV/106 sperm/mL) in the semen of the infertility patients was 6.22±1.10 mV/106 sperm/mL whereas that of the control group was 1.59±0.29 mV/106 sperm/mL (p = 0.008). Of the 106 male infertility patients, 51 and 55 were evaluated for both macroscopic parameters such as color, pH, ejaculate volume, age of the sample and viscosity. An aliquot of the sample (5 μL) was examined for sperm concentration, total sperm count, sperm motility and round cell concentration. If the concentration was <1X106 /mL, the aliquot was examined for the presence of white blood cells using the Enditz or the Haemocytometer test (World Health Organization). All 106 infertile men were examined.

2. The distribution of subjects in the control and infertile groups above or below the established cutoff value of 1.36 mV/106 sperm/mL is depicted in Figure 3. The Kruskal-Wallis one-way ANOVA on ranks test was applied. The Kruskal-Wallis test is the non-parametric analoue of ANOVA, and the test statistic is the sum of the square ranks for each sample, divided by the number of items in the sample. The null hypothesis is that the population medians of all of the groups are equal. From Figure 3, it is clear that the ORP levels in the infertile patients are significantly higher compared to the control group. ORP levels were significantly higher in patients with idiopathic infertility (p = 0.007).

3. The median ORP (mV/106 sperm/mL) level was below the established cutoff value of 1.36 mV/106 sperm/mL in the control group, whereas it was above this cutoff in the group of infertility patients (p = 0.004). Only 1 of the 51 (less than 2%) participants in the control group fell below this cutoff. In men undergoing evaluation for male-factor infertility (n = 106), 44.3% (47/106) presented with sperm concentration <15 x 106/mL in the seminal ejaculates. The distribution of ORP (mV/106 sperm/mL) within different sub-groups of controls and infertile patients was also assessed and is presented in Figure 4.

4. Correlation of ORP (mV/106 sperm/mL) with semen parameters in all subjects.

A. Concentration

B. Total sperm count

C. Motility

D. Morphology

Correlation of ORP (mV/106 sperm/mL) with semen parameters in all subjects.

5. Box-plot distribution of ORP (mV/106 sperm/mL) in normal healthy controls, controls with proven infertility, and controls with unproven infertility.

A. Normal healthy controls

B. Controls with proven infertility

C. Controls with unproven infertility

D. Infertile patients

E. Infertile patients presenting with a clinical antecedent

F. Infertile patients with idiopathic infertility

CONCLUSIONS

1. ORP test in semen using the MiOXSYS System is an alternative method for measuring OS and distinguishing normal men from male factor infertility patients.

2. Sperm parameters related to male infertility are under a state of oxidative stress.

3. An ORP cutoff value of 1.36 mV/106 sperm/mL in semen can distinguish between normal men and patients with male factor infertility.