USE OF TOTAL ANTIOXIDANT CAPACITY AS A DIAGNOSTIC TEST IN SEMINAL PLASMA OF INFERTILE MEN

Gulfam Ahmad, PhD1,2, Sajal Gupta, MD1, Rakesh Sharma, PhD1, Edmund Sabanegh, MD1, Ashok Agarwal, PhD1

1American Center for Reproductive Medicine, Cleveland Clinic, Cleveland, Ohio, 2Pharmacy and Biochemistry, University of Health Sciences, Lahore, Pakistan, 3Department of Urology, Cleveland Clinic, Cleveland, OH

ABSTRACT

Objective: Seminal plasma contains large effective system of antioxidants that protects the spermatozoon from oxidative stress. The aim of the present study was to measure the level of total seminal antioxidant capacity (TAC) in a cohort of controls and patients with proven and unproven infertility. We wanted to review our current capacity assay which can distinguish between infertile men and controls. We further validated the sensitivity and specificity of the calorimetric assay using ROC curve.

Case control study

Materials and Methods: A total of 325 semen samples were collected after 2-3 days of abstinence from intake (n=279) and controls (n=46). The total seminal assay was performed according to WHO (2010) guidelines. Seminal plasma was separated after centrifugation at 300 g for 7 minutes, TAC measurement was done after the antioxidant assay kit. All seminal plasma samples were diluted 1:10 with the assay buffer and were run in duplicate. Determination of the reaction rate was done by calculating the average absorbance of the assay standards and the samples and results were reported in micromoles of Trolox equivalent. Sensitivity, specificity, and cutoff values were calculated by receiver operating characteristic (ROC) curve.

Results: Significantly lower levels of seminal TAC were seen in infertile men compared to the controls (p=0.005). A cutoff of 1947 micromoles of Trolox can differentiate infertile men from the controls. At this threshold the positive predictive value was 90.7% compared to 20.4% negative predictive value.

Conclusions: Total seminal antioxidant capacity reflects the seminal potential against oxidative stress. Higher the TAC levels better the quality of semen. Infertile men have significantly reduced levels of antioxidants. The new cutoff value substantially distinguishes infertile men from the controls. However, each andrology center must establish its own cutoff value.

RESULTS

1. Significantly lower seminal plasma TAC levels were observed in infertile patients compared to controls (p = 0.019).
2. The distribution of TAC levels for healthy donors and infertile patients is shown in Figure 2.
3. Receiver operator characteristic (ROC) curve was used to calculate the TAC cutoff, test sensitivity and specificity (Figure 3). A cutoff of 1947 µM was ideal to distinguish between infertile patients and donors. At this threshold the positive predictive value of the test was 90.7% compared to 20.4% negative predictive value.
4. The percentage population of controls and infertile patients above and below the cutoff value along with sensitivity and specificity of the test is given in Table 1.

CONCLUSIONS

1. Total seminal antioxidant capacity reflects the seminal potential against oxidative stress.
2. Infertile men have significantly reduced levels of seminal antioxidants.
3. The new cutoff value substantially distinguishes infertile men from the controls.