ORIGINAL RESEARCH

Total reactive antioxidant potential and DNA fragmentation index as fertility sperm parameters

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SUMMARY

There is a growing evidence that oxidative stress play a major role in the etiology of defective sperm function including impaired morphology, motility, metabolism and fertility. The aim of the present study was to examine: 1/ total reactive antioxidant potential (TRAP) in seminal plasma; 2/ sperm DNA fragmentation index (DFI), 3/ sperm morphology and motility and 4/ cellular membrane integrity (hypoosmotic swelling test: HOS test) in patients attending *in vitro* fertilization/intracytoplasmatic sperm injection (IVF/ICSI) program. According to the DFI value, the men were divided into: group 1 with DFI ≤15% (n=38) and group 2 with DFI ≥15% (n=37). Significant differences between the two groups were found in TRAP, sperm motility, morphology and concentration as well as HOS test scores. In group 1, DFI was negatively correlated with sperm motility and HOS test scores ($p<0.05$). The sperm morphology was positively correlated with sperm motility and HOS test scores in both groups. There was no correlation between TRAP and sperm chromatin fragmentation. Our results suggest that seminal plasma TRAP level may be a DFI independent parameter of sperm fertility. *Reproductive Biology* ***11*** *2*: 35-144.

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INTRODUCTION

Many reports proved the standard sperm analysis including sperm morphology, concentration and motility is not a sufficient fertility diagnostics. Besides psychological, environmental and genetic factors influencing fertility, the overproduction of reactive oxygen species (ROS) and the failure of the antioxidant system seem to draw great attention from the scientific world. In comparison with fertile patients, the patients with idiopathic infertility generally present a significantly higher seminal ROS level and lower antioxidant potential [8]. Spermatozoa are very susceptible to damage by reactive oxygen species, and an oxidative stress status reflected by a balance between ROS and antioxidants may be necessary for the survival and normal functions of spermatozoa [9, 17, 20].

The production of ROS by spermatozoa is a normal physiological process required for the occurrence of the capacitation and acrosome reaction. However, the production of an abnormal ROS level is associated with human male infertility due, among others, to the high content of polyunsaturated fatty acids within plasma membranes and the low content of scavenging enzymes in the cytoplasm [7]. It was demonstrated that the imbalance between the production of ROS and the amount of ROS scavenged by antioxidants resulted in sperm damage and correlated with idiopathic infertility [19]. Moreover, male infertility has been linked with the excessive generation of reactive oxygen species by defective spermatozoa [11].

ROS overproduction may cause peroxidation of sperm cell membrane lipids, affecting structure of enzymes, receptors and/or transporting proteins [4]. Lipid peroxidation triggers the loss of membrane integrity and results in the increased cell electrolyte permeability. This may affect cellular energy metabolism and cause the depletion of ATP [2, 18]. Excessive ROS generation may also be involved in structural DNA damage [21]. High ROS levels mediate DNA fragmentation commonly observed in the spermatozoa of infertile patients. The percentage of sperm with DNA damage is negatively correlated with the fertilization rate. As a result, a normal cellular mechanism required for fertilization is impaired [13].