Semen characteristics and malondialdehyde levels in men with different reproductive problems

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Oxidative stress is an important factor in the aetiology of poor sperm function, inducing morphological alterations and oxidative damage to DNA, membrane and proteins. Previous studies reported that malondialdehyde (MDA), the end product in membrane lipid peroxidation, correlates with abnormal seminal parameters (Atig et al., 2012; Benedetti et al. 2012). In this study MDA was dosed in semen of men who had consulted Interdepartmental Centre for Research and Therapy of Male Infertility, University of Siena to know their seminal status. They had a normal 46,XY karyotype evaluated by conventional cytogenetic analysis, no history of radiotherapy and chemotherapy. They were subjected to microbiological analysis of semen specimen and urethral fluid to verify the presence of genitourinary infections, to clinical and physical examinations and scrotal Eco-color Doppler to investigate the presence of varicocele or other anatomical problems. MDA levels in seminal plasma was determined by a reverse -phase HPLC method with UV detection. Semen samples were examined by light microscopy according WHO guidelines (2010) and transmission electron microscopy (TEM). TEM data were quantified with a mathematical formula furnishing a fertility index and the percentage of sperm apoptosis, immaturity and necrosis (Collodel et al. 2008). On the basis of the presence of reproductive problems men were divided in three groups: men with genitourinary infections (group I), men with varicocele (group II) and individuals without varicocele and infections (group III); in each group we evaluated semen quality (concentration, motility, percentage of apoptosis, necrosis, immaturity and fertility index) and MDA levels in seminal plasma. Sperm concentration was comprised between 10 centile and 25 centile in groups II and III, between 25 centile and 50 centile in group I. Progressive sperm motility appeared similar in all examined groups (around 5 percentile). TEM analysis indicated that all the groups had fertility index lower than controls. Regarding sperm pathologies, the percentage of apoptosis was higher in all groups compared to control (group I: 7.3%, group II: 7.8%, group III: 8.5% vs 4.05%), the immaturity percentage was significantly elevated in group II (70.34%) compared to control (48.83%) and the other groups (group I: 49.3%; group III: 58.6%; $p<0.001$) and necrosis in group I (57.53%) compared to control (32.13%) and group II and III (respectively 24.99%, 24.95%; $p<0.001$). MDA concentration in group I was significantly higher than in group II (4.05 nmoli/ml vs 1.70; $p<0.001$) and group III that showed level significantly lower than group II (0.62 vs 1.70; $p<0.001$). A negative correlation was observed between MDA levels and progressive sperm motility in group I ($r=-0.58$). Regarding sperm pathologies evaluated by TEM, MDA concentrations were positively correlated with necrosis in groups I and II (group I: $r=0.68$; group II: $r= 0.61$). These preliminary data indicate that MDA levels were significantly elevated in patients with genitourinary infections (group I) compared those measured in group II and group III. Moreover, group I had significantly higher levels of necrosis but this alteration was correlated with MDA also in groups II and III. Necrosis is a pathology characterised by disrupted chromatin, disassembled axonemal and periaxonemal structures, swollen mitochondria and broken plasma membrane. Also other authors reported that MDA and sperm decondensation are significantly linked (Montjean et al. 2010), and that MDA negatively correlated with sperm motility (Zribi et al., 2011). The role of MDA, important marker for oxidative stress, in semen of men with reproductive problems deserve further attention.

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