



Mechanical and Genotypic Insurgencies in Sperm Quality: A Facet in Sperm Cryopreservation

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Commentary

With increasing reproductive problems and frivolity in European society developed a new concept of "social infertility", influenced scientists to realize the importance of natural process of parenting and generation through fertility period distensibility in both gender especially male partners so as to keep fertility nearer to nature. However fertility preservation in assisted reproductive technology (ART) so far declared the last resort to become father who has been apprehended either with severe attenuated semen picture or sought cancerous treatment at younger age. Moreover very lately, among 50% male factor infertility, 30%- 40% males are implicated idiopathic since showing normal semen parameters, though justifying the 15% idiopathic infertility but emphasizing on need of further sperm functional screening for both to cure infertility and preserve the fertility in subjects with oligoasthenotrazoospermic and azoospermics [1,2]. While severe oligozoospermics are more likely to face the problem hence sperm cryobanking in these subjects seems inevitable though spermatozoa chromatin remains at risk of detrimental effects. Xenografting and immature testicular tissue cryopreservation are the procedure that can bypass the direct chromatin cryo-insult and might be most suitable fertility preserver but scanty information for human is available so far.

Mechanical and biochemical rationale seems more likely address the sperm DNA susceptibility to cryo-insult and subsequently in eluded processes. Most of the extenders, with supplementation are hitherto being trailed for better sperm thaw quality [3], which protects the sperm from mechanical injury, but intensive chromatin shrinkage and twisting around itself more likely inevitable. While the natural extent of twist, roll and slide motion of base-pairs may elaborate the reduced area of contact between the bases and water. One can speculate the freezing-torsional stress probably generated by twist either accounts as increased repulsive forces among the base-pairs or greater contact of base-pairs with water molecules. Convincingly, this chromatin over-twisting seem more startled aspect among all, during freeze-thaw cycles, to avoid and shunned by enzymes like topoisomerase as in DNA replication. Whereas S.Ward and associates accentuated other structural association of DNA to its function and susceptibility to ROS and never let this part ruled out from major domain of sperm structure research [4].

However genotype-phenotype correlation between the chromatin repair capacity and aspects of genomic integrity become more focused recently, since more likely to address the intricacy in mechanism of sperm DNA damage [5]. Whereas Aitken and coworkers suggested two phase theory of sperm DNA damage was very comprehensive and scaffolding for prospective studies on ROS mediated DNA damage [6]. Among all functional aspects of sperm DNA integrity have been extensively reckoned since last few decades especially pathways involved in oxidative stress mediated sperm DNA anomalies [7,8]. However the mutagenic and pro-mutagenic alterations are equally devastating for male germ line and are likely caused several dominant genetic diseases those have strong correlation with paternal age as well. Paternal age independent mechanism of DNA fragmentation in male germ line was first speculated by Sharma emphasized on oxidative stress, abortive apoptosis and defective chromatin packaging [9]. This equilibrium between DNA damage and repair become more interesting when insulin resistance and inflammatory capability of adipose tissue accounts for partial role of HMGB1 in autophagy activation through oxidative stress and HMGA1 polymorphism in DNA repair suppression [10,11].

Apart from ascertained results of studies on extenders and their efficacy in maintaining post thaw sperm DNA integrity, it is remained to suggest how crosstalk between autophagy & apoptosis and autophagy & necrosis limit the spermatogenesis and startled mature sperm DNA and subsequently drop chromatin compactness after few freeze-thaw cycles. More lately, assessment of autophagy markers in ejaculated human sperm has revealed their continuous involvement in switch on/ and

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off mechanism of autophagy and apoptosis and subsequently drop sperm structural integrity.

Thence, a comprehensive mechanical and biochemical-cum-genotypic dissection of spermatozoa associated with its fertilizing potential is now unavoidable that implicate not only its fertilizing integrity but also its freeze-thaw cycles tolerance spectrum.

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