Semen quality and age-dependent changes among male participants with normal sperm count in Qom, Iran

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Abstract

Background: One of the most conventional causes of male infertility is increasing age, which has significant effects on sperm physiology. In advanced ages, degenerative alterations in germinal epithelium, decreased number of Leydig cells, and their functions affect spermatogenesis through a decrease in testosterone level. So it is important to know whether advanced paternal age is associated with decreased semen quality.

Methods: Semen samples of 144 men were collected and semen parameters (volume, concentration, and normal morphology) were evaluated after semen liquefaction at room temperature. Statistical analyzes of data was done using SPSS software.

Results: we showed that increased total sperm count was correlated with increasing age (P≤0. 05). Analyzing the percentage of normal morphology showed a significant difference between group I and III (p≤0. 05) while there was no significant difference in comparison of other groups. In terms of the semen volume, no significant difference was shown.

Conclusion: We showed that with increasing age sperm concentration significantly increases. It may be possible that spermatogenesis could be abnormally accelerated because of an impaired responsiveness of the testes to endocrinological influences. Moreover, we obtained results in terms of normal morphology percentage pursuant to previous studies, while in older group this parameter was lower than the youngest group significantly. The present study predicted that aging negatively affect the morphology of sperms.

Keywords: Male, Aging, Sperm count, Morphology

1. Introduction

The inability to contribute conception after 12 months of unprotected intercourse is known as infertility; this may be due to male, female or some unexplained factors. The males alone contribute 35% to 40 % of infertility cases (1, 2). Many factors are involved in pathogenesis of male infertility (3) and any changes to the normal physiology of reproductive organs may affect sperm functions and cause conditions, including oligozoospermia (low sperm count), asthenozoospermia (loss of motility), teratozoospermia (abnormal morphology), azoospermia (absence of sperms in the ejaculate) and in severe form, oligoasthenoteratozoospermia (OAT) which lead to problem for a successful/fruiful fertilization (2). Beside the most conventional cases, it is shown that age and abstinence can have significant effects on sperm physiology.

Reduced fertility typically occurs among women in production decreases (4). However, 25% or more of infertilities are related to male factors (5). Unlike women, who are more fertile below the age of 40, men can conceive children well beyond their 40s and there is no known critical threshold in terms of sperm production in men. In contrast to oogenesis, spermatogenesis continues men, even in elderly ages. The mitotic replications which adult male germ cells pass through are significantly more than adult female’s. In men, there is an age associated increase in the incidence of fragmentation in sperm DNA, decrease in apoptosis, and a higher number of point mutations. Advanced paternal age is related to an increased time to pregnancy and decreased pregnancy rates. As a result, it is important to know whether advanced paternal age is associated with decreased semen quality and a higher risk of infertility.

It is universally accepted that semen analysis is one of the most important and common tests to evaluate the potential fertility of a man, which
provides both quantitative and qualitative information. However, recent reports have suggested that the semen analysis is unreliable (6, 7). Congruent with the World Health Organization manual (8), it is necessary for each region to establish its own reference values to evaluate the sperm parameters. Several factors may change sperm characteristics because of nutrition pattern, life style and geographical location. Nevertheless, it is important to know whether advanced paternal age is associated with impaired semen quality and a higher risk of infertility. For this reason, the aim of this study was to find a possible association between the age of individuals and semen parameters.

2. Materials and Methods
A total of 144 men consulting for infertility evaluation at our laboratory of highly specialized jihad daneshgahi infertility treatment center, were included in this study. This study was approved by the local ethics committee of The Academic Center for Education, Culture and Research, Qom Branch and all patients had previously given informed consent for the study.

Semen samples were collected by masturbation into sterile cups following 3-7 days of sexual abstinence and semen analysis was performed after semen liquefaction for 30 min at room temperature. Basic semen parameters (volume, concentration, and normal morphology) were assessed according to the World Health Organization guidelines (9). Sperm concentration was determined with an improved Neubauer Hemocytometer® counting chamber (VWR Scientific; West Chester, PA). Sperm morphology was evaluated using the Diff-Quick staining method. Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) Software (Version 17, Chicago, IL, USA) and Microsoft Excel 2007 (Microsoft, Redmond, Washington, USA). All variables were initially tested in order to determine variance homogeneity and data normality. The distributions of the variables (i.e., semen parameters) were examined separately for every male participant and were found to be approximately normal for some parameters but not for all.

Differences between semen parameters in this participants were examined both by means of Analysis of variance (ANOVA) and Duncan test. P<0.05 was considered statistically significant. The Pearson’s correlation was performed to examine the relationship between paternal age and semen parameters. All hypothesis testing were two sided with a probability value of 0.05 deemed as significant.

3. Results
In this study, increased total sperm count was correlated with increasing age (Figure 1 and 2). Analyzing the percentage of normal morphology among three groups showed a significant difference between group I and III (p≤0.05), while there was no significant difference in comparison to other groups with each other (Figure 3 and 4). In terms of the semen volume, no significant difference was shown (Figure 5 and 6). An equal distribution (P>0.05) of the other characteristics was observed in all three groups.

Table 1 summarizes the general characteristics of the study population. The result of the Duncan test showed that there is a significant difference (p=0.043) in total sperm concentration (106) between group I and III, but this parameter is not significantly different between I and II or II and III groups (Figure 1-8 and Table 2).

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Number</th>
<th>Volume (ml)</th>
<th>Total Concentration (106)</th>
<th>Normal morphology (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤35 (group I)</td>
<td>54</td>
<td>3.43±1.829</td>
<td>61.28±44.536</td>
<td>56.67±12.488</td>
</tr>
<tr>
<td>36 – 40 (group II)</td>
<td>49</td>
<td>3.2±1.373</td>
<td>87.87±51.965</td>
<td>52.69±18.777</td>
</tr>
<tr>
<td>≥41 (group III)</td>
<td>41</td>
<td>3.08±1.833</td>
<td>92.85±52.789</td>
<td>42.78±21.879</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>3.33±1.741</td>
<td>71.15±48.679</td>
<td>46.89±20.659</td>
</tr>
</tbody>
</table>

All values expressed as Mean±SED
Table 2. Correlation between semen parameters and age in the male participant with normal sperm count in Qom, Iran

<table>
<thead>
<tr>
<th>Sperm parameter</th>
<th>Correlation with age</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (ml)</td>
<td>-0.061</td>
<td>0.585</td>
</tr>
<tr>
<td>Concentration ($\times 10^6$/ml)</td>
<td>0.224</td>
<td>0.043</td>
</tr>
<tr>
<td>Motility (%)</td>
<td>-0.515</td>
<td>0.00</td>
</tr>
<tr>
<td>Morphology (%)</td>
<td>0.149</td>
<td>0.181</td>
</tr>
</tbody>
</table>
4. Discussion

Males have the advantage over females that they can contribute to conception even after the age of 40 and up to an age beyond 40 years of sexual maturity (10). However, in advanced ages, degenerative alternations in germinal epithelium (11), decreased number of Leydig cells (12), and their functions affect spermatogenesis through a decrease in testosterone level (13), starting at the age of 30 years (14). On the other hand, semen quality also affects the implantation loss to the fertilized embryo (15) and possible autosomal dominant disorders by wrongly selecting a sperm among the semen pool of aging males (16). However, the threshold age of sperm production in males is not exactly defined yet (17, 18).

There have been several publications in recent times on the issue of the effect of age on human sperm parameters. In some studies decline in semen parameters, such as volume, concentration, motility and morphology in men of increasing age is shown (19, 20), also, because of a decline in blood concentration of testes with advancing age (21), a quantitative and qualitative decrease in spermatogenesis can be induced (20). In this study, there were a significant correlation in increased sperm concentration and increasing age, while in some other studies similar result is obtained (22–25, 26, 27). With increased age narrowing and sclerosis of the tubular lumen, a decrease in spermatogenic activity, degeneration of germ cells, and decreased number and function of Leydig cells happens (28, 29). However, concentration may be increased with age, as it may be possible that spermatogenesis could be abnormally accelerated because of an impaired responsiveness of the testes to endocrinological influences (26). As it is shown in Figure-2a, the mean of total sperm count in the older group (III) significantly increases in comparison to the youngest group (I) (p≤0.05). In some studies an age-related decrease in normal sperm percentage is reported (23, 25, 27, 30). Also, Schwartz et al. (30) noted that coiled tails and microcephalic heads increased with age, although a statistically significant trend across age groups remained after excluding these two types of abnormalities. Our obtained result was pursuant to previous studies, while the percentage of normal sperm in the older group (III) was significantly lower than the youngest group (I) (p≤0.05). In terms of the semen volume, no significant difference was found among three groups.

Conclusions

In conclusion, the present study predicted that aging negatively affect the morphology of sperms.

Acknowledgments

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References