Comparison of the Manual, IVOS, and SCA Methods for Semen Analysis Reporting

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INTRODUCTION

Technological advances in computer-enhanced semen analysis reporting has given rise to a number of new systems that claim to be more accurate, efficient, and versatile in a healthcare setting, compared to older computer automated systems and manual microscopic methods. Infertility clinics and in vitro fertilization programs across the country greatly differ in their individual methods (either manually or computer assisted) for evaluating the fertility potential for male partners. This variability among methods has produced bias between different semen evaluation methods. Some studies have demonstrated a stance against replacing standard manual methods with computer assisted sperm analyzers (1,2). Proponents of computer automated semen analyzers address the ability to submit a more reproducible analysis within a very efficient system. Such a system also has the ability to generate more detailed sperm descriptions that may be indicative of fertility potential (3,4,5).

The Andrology laboratory at the Hospital System University Medical Group (HSUMG) currently utilizes a computer automated semen analysis system (CASA), the Hamilton-Thorne Research Internal Visual Optical System (IVOS; version 10.8; Hamilton-Thorne Research, Beverly, MA) as its primary method for evaluating semen when the sperm concentration is greater than 20 x 10^6. When samples fail to meet the 20 x 10^6 minimum, the manual method (as described by the World Health Organization (WHO) is the standard method for semen analysis (6). As technological advances are made to improve upon CASA systems, the GHSUMG andrology laboratory has begun to investigate new systems. One particular new system, the SCA (Sperm Class Analyzer; Microptic S.L., Barcelona, Spain), was compared to the validated IVOS (Hamilton Thorne Research, Beverly, MA), and the standard, non-computer assisted manual method (as described by WHO). The purpose of this study is to investigate the differences in concentration and motility among these three semen analysis methods and determine if the accuracy and efficiency is improved with the new system.

MATERIALS AND METHODS

This prospective study was approved by the Institutional Review Committee of the Greenville Hospital System. Fifty semen specimens were collected and analyzed from patients presenting at the Hospital System University Medical Group andrology lab from December 6, 2007 to February 23, 2008. Using MicroCell™ counting chambers (Conception Technologies, San Diego, CA), measurements of sperm concentration in the range of 5.5 to 250 x 10^6 were performed via manual, IVOS, and SCA. These same chambers and methods were used for motility parameter comparisons. The parameter settings for the SCA were synchronized with the IVOS settings described in Johnson et al., 1996 (6). These parameter settings used were as follows: frames acquired: 7; frame
rate: 30/s; minimum contrast: 8; minimum size: 6; LO/HI size gates: 0.6 to 1.6; LO/HI intensity gates: 0.6 to 1.6; nonmotile head size: 10; nonmotile brightness (head intensity): 20; medium VAP value: 25; low VAP value: 10; slow cells motile: yes; and threshold straightness (STR): 80. Each individual analysis was performed with each method, regardless of sperm concentration or motility.

RESULTS
Data are summarized in Table 1. The data did not differ among the manual, IVOS, and SCA in sperm concentration (P=0.9). While the same holds true for overall motility reporting with the manual, IVOS, and SCA (P=0.9), data did differ among the three semen analysis methods in the motility parameter of forward progression at the rapid (4), medium (3), and slow (2) levels (P=.0001 at each level). However, data did not differ among the three analysis methods at the forward progression static level, which classifies non-motile sperm (P = 0.4).

DISCUSSION
Technological advances in CASA systems have been deemed clinically valuable due to the ability of generating detailed descriptions of sperm capacity that are not achieved with the standard manual count. As our study indicates, sperm concentration and overall motility can be reported on a consistent basis between the three methods. However, the IVOS, and more predominantly the SCA, give additional sperm parameters that are used in making decisions regarding a patient’s treatment protocol. The SCA also has advanced capabilities that allow for digital recording of semen samples and compatibility to modern electronic medical records (The newest version 12 of the Hamilton-Thorne IVOS also has these capabilities; the IVOS used in this study has been in operation for 14 years in our laboratory and is out dated from these technological standpoints).

The results from this study indicated that while the concentration and overall motility parameters were not significantly different between the three analyses methods, the forward progression parameter did differ between the methods. This difference is potentially related to the fact that the three methods all analyze sperm characteristics by different mechanisms. The standard manual method assigns forward progression values from a subjective point of view that is independent between technicians. The values assigned are a result of an individual’s or a team of technician’s definition of sperm velocity. This method of analysis is different from the way that a CASA system operates, where computer software is actually measuring different angles of sperm velocity. However, the SCA and the

Table 1 Sperm parameter comparisons for manual, IVOS, and SCA semen analysis methods.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Manual</th>
<th>IVOS</th>
<th>SCA</th>
<th>P-Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration (million/mL; mean ± SD)</td>
<td>72.9 ± 53</td>
<td>77.6 ± 54</td>
<td>76.8 ± 52</td>
<td>0.9</td>
</tr>
<tr>
<td>Motility (%; mean ± SD)</td>
<td>56 ± 10</td>
<td>57 ± 14</td>
<td>56 ± 15</td>
<td>0.8</td>
</tr>
<tr>
<td>Rapid Progression (%; mean ± SD)</td>
<td>28 ± 15</td>
<td>39 ± 10</td>
<td>35 ± 12</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Moderate Progression (%; mean ± SD)</td>
<td>23 ± 8</td>
<td>16 ± 6</td>
<td>14 ± 4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Slow Progression (%; mean ± SD)</td>
<td>7 ± 5</td>
<td>2 ± 1</td>
<td>7 ± 2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Static (%; mean ± SD)</td>
<td>41 ± 12</td>
<td>43 ± 14</td>
<td>44 ± 15</td>
<td>0.4</td>
</tr>
</tbody>
</table>

*These continuous data were analyzed with Student’s t-test.
IVOS differ from the way that the optics is used to decipher this information. The SCA software uses positive phase objectives. These objectives produce an image with dark sperm tails and bright sperm heads that are characterized by a halo effect that defines individual sperm. The IVOS system utilizes negative phase objectives that produce a contrast of bright sperm against a dark field. These two systems have been deemed as effective CASA systems, the debate of which objective configurations are the optimum methods for semen analysis is under review.

CONCLUSIONS

The manual, IVOS, and SCA methods for reporting semen analysis results produced comparable results regardless of different degrees of sperm concentrations. Overall motility values also were compared among the methods tested. However, there were significant differences in the motility aspects of the forward progression parameter. These differences in forward progression may be explained by the different operational variables associated with each individual method.

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REFERENCES


