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Semen analysis workshops: 17 years' experience

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Abstract

The study reports on the results recorded during a series of semenology workshops presented from 1997 to 2014. The results were obtained from training workshops that were conducted in 6 continents in 38 cities including 1124 individuals. All workshops consisted of 2 sessions namely a pre-and post-training session. Results recorded from the pre-training sessions were used as a baseline value of current knowledge. In most cases pooled fresh or cryopreserved semen samples were provided by the organizing institution. The mixed effect linear regression model showed a significant decrease in the mean scores from the pre-training scores, $p < .001$. Training of technicians as well as regular proficiency testing will ensure continuous communication with the referring laboratory.

Key words: **Examination, semen, technicians, training.**

Introduction

The value of a standardized semen analysis remains an important diagnostic tool and when properly done should guide clinicians to an appropriate therapeutic approach (Keel, 2002; Keel, 2004). This is especially true for developing countries that are often in distant rural areas without the necessary clinical and laboratory resources. Unfortunately the results of the semen analysis are often unreliable due to inter-and intra-technician variations that are caused by the lack of trained or inexperienced laboratory staff. Several factors are responsible for this technical variation including differences in the methods used and differences in proficiency among technicians. These differences in methodologies between laboratories are well documented (Ombelet et al., 1998), but since the publication of the WHO 2010 manual the between-laboratory variation should be negated in case the relevant individuals responsible for the analysis of semen are well trained. Intra-and inter-individual variability should therefor decrease to non-significant levels. This report provides information on semenology training workshops that were conducted in 6 continents in 38 cities including 1124 individuals.

Materials & Methods

All workshops consisted of 2 sessions namely a pre-and post-training session. In most cases pooled fresh or cryopreserved semen samples were provided by the organizing institution. Participants were divided into pairs each manning a semen work station. The workstations were equipped with a bright field/phase contrast microscope with 20×, 40× and 100× objectives. Prior to the training participants were requested to record the values for morphology (% normal cells), concentration, motility and vitality. Morphology recordings were done on Hemacolor (Merck Chemicals, Cat no 1.11661./1) or Papanicolaou stained slides. Sperm concentrations and motility were done on the supplied semen samples. The results of the pre-and post-training sessions were compared with the values recorded for the reference slides by an experienced andrologist.

Following the pre-training evaluation session delegates were lectured on the WHO guidelines on the analysis of human semen. During the morphology training session's high quality micro-photographic images of numbered sperm were projected on a large screen. Individual spermatozoa were discussed

during group session to underline the specific aberrations responsible for the sperm to be classified as abnormal. Sperm concentration and motility were also explained using video clips of counting chamber grids as well as motile sperm samples, respectively. The results of the morphology training program for example were as follows: The pre-training slide contained 17% normal forms while the delegates recorded 46.1 ± 22%, while the post training slide contained 12% normal forms while the delegates reported 8.6 ± 10%.

Statistical analysis

The mixed effect linear regression model showed a significant decrease in the mean scores from the pre-training scores, $p < .001$. The adjusted mean scores were calculated from the mixed effects model. The post mean is equal to -0.19 with 95% confidence interval of -0.98 to 0.61. Since this interval spans 0 it shows that the mean morphology reading after training by the participants was not significantly different from 0. After training the participants read the morphology slides close to the true value. In contrast the pre- training readings were substantially biased – the Z-score of 6.5 indicates this (Fig. 1).

Results

Morphology: External quality control

Since 1997 our experience indicated that hands-on training provides satisfactory results as far as maintenance of technical skills during the evaluation of morphology, sperm concentration, and vitality is concerned. During a series of workshops the department of Obstetrics & Gynaecology at Tygerberg Hospital in conjunction with the World Health Organization's Special Programme for Human Reproduction (HRP) initiated an external quality control programme for Sub Sahara andrology laboratories (Franken et al., 2000). In that programme 15 of the 19 participating individuals (78%) consistently reported sperm morphology readings for example over a 40 month period within ± 0.5SD limits of error. The results of the external quality control study were used to record the technical reading skills for morphology and the participants were classified according to their results over the 40-month period.

Poor reading skills

If 50% readings, recorded over the 40-month period were inside the limits of error i.e. the ± 0.5SD-score,

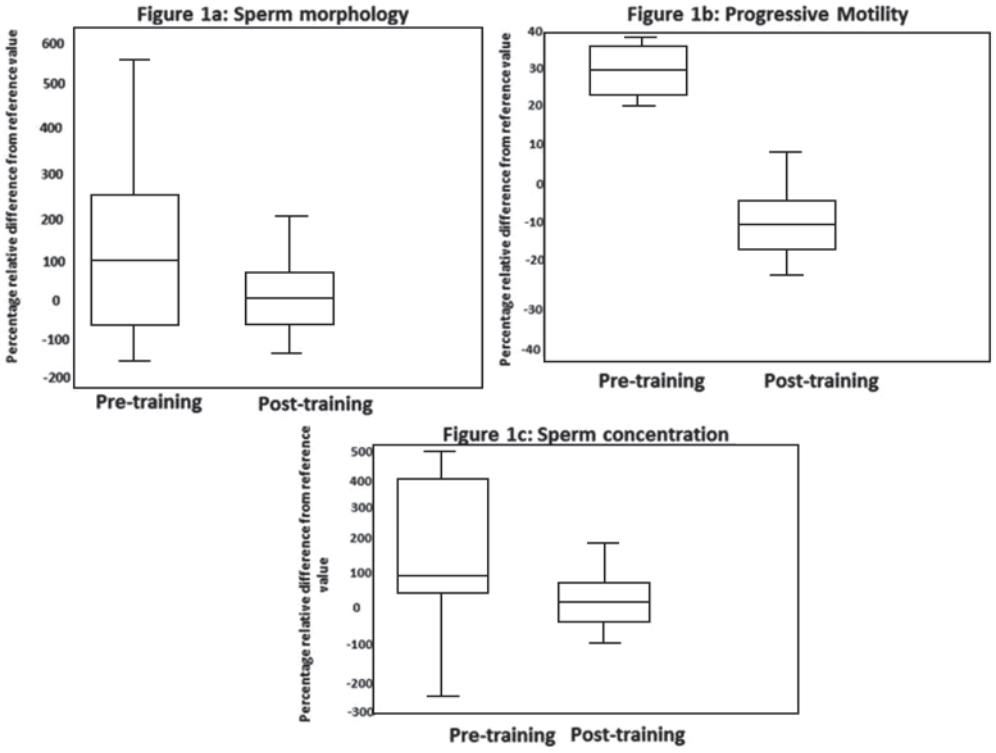

Fig. 1. — Pre- and post-training: Percentage normal sperm, sperm concentration and progressive motility values recorded by laboratory technologists'. Box–Whisker plots illustrating the percentage difference from the reference value.

marginal reading standards were assumed. We recorded 5.7% of participants in this category.

Marginal reading skills

If 51-60% readings recorded over the 40-month period were within the ± 0.5SD-score, marginal-to-good reading skills were assumed. We recorded 11.3% of participants in this category.

Good reading skills

If 60-69% of the readings, recorded over the 40-month period, fell inside the limits of error i.e. the ± 0.5SD-score, good reading standards are assumed. We recorded 83% of participants in this category.

The results recorded by the delegates for the percentage sperm with progressive motility and sperm concentration are depicted in Figure 1. In both motility and concentration evaluations the pre-training results were vastly overestimated. Overestimation seems to be more of a problem with high-concentration specimens (Brazil, 2010). As far as the evaluation of sperm concentration is concerned the results during the pre-training session showed a wide variation amongst the delegates.

Discussion

Training of technicians as well as regular proficiency testing will ensure continuous communication with the referring laboratory. Proficiency testing of technician skills is of the utmost importance if andrology laboratories want to secure a professional code of conduct. The authors firmly believe that global quality control measurements in andrology laboratories will eventually become mandatory. A high quality semen analysis still represents the cornerstone in the investigation of the infertile couple. In order to maintain low intra- and inter-technician variation and high quality proficiency testing among laboratory technicians, continuous teaching programmes should be available to all.

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