

Comparison of computer assisted semen analysis versus conventional semen analysis in predicting male fertility potential

J.H. CHECK, B. SHANIS, C.A. WINKEL
and A. BOLLENDORF

*Department of Obstetrics and Gynecology
Division of Reproductive Endocrinology and Infertility
The Jefferson Medical College, Thomas Jefferson University
Philadelphia, PA (USA)*

SUMMARY

The ability of the semen analysis either by routine methods (RSA) or computer assisted means (CSA) to predict male infertility was evaluated by determining the pregnancy rates during an eight month span in a large group of infertile couples where a female fertility factor was identified and presumably corrected. The males were untreated. Not only was CSA not found to be more effective than RSA in predicting a male infertility factor, neither one seemed capable of identifying infertility unless severely abnormal. These data suggest a strong need to find other more accurate methods of evaluating the spermiogram.

INTRODUCTION

Men with subnormal spermiograms have, on occasion, achieved pregnancies. Furthermore, men with subnormal semen parameters, as defined by the World Health Organization (WHO) have successfully fertilized their wives following various therapies eg. varicocelectomy,^{1,2} or following medical treatment eg. clomiphene citrate.^{3,4}

However, some of the "failures" these men experience in achieving pregnancies may be related to a failure to identify and correct any existing occult female factor. In fact, Check and Rakoff in 1977, indicated that the reason for their 90% pregnancy rate as compared to only 23% reported by Paulson and Wacksman despite similar improvement of the spermiogram in both studies was probably attributable to meticulously correcting the female factors (all 10 wives had an associated infertility problem requiring treatment).⁵

Conversely, the "success" of some of these "male therapies" might have been related primarily to having corrected a female infertility factor and had no bearing at all on the sperm

treatment. For these reasons, a study was initiated to evaluate the fertility outcome during an 8 month span in infertile couples where a female factor had been identified and was felt to be fully corrected. The intention was to evaluate the spermiogram initially but withhold any therapy for the 8 months even if the spermiogram was subnormal. Furthermore, the spermiogram would be measured by both computer assisted semen analysis and manual methods to see if the former offers any advantage over the latter.

MATERIAL AND METHODS

A total of 216 couples were enlisted for the present study in which the only infertility factor(s) identified in the wife was felt to be fully corrected eg. a luteal phase defect corrected by progesterone therapy and resulting in a normal biopsy; or anovulation with restoration of ovulation by bromocriptine (if hyperprolactinemia existed), clomiphene citrate or human menopausal gonadotropins (hMG); or a cervical factor treated with guaifenesin or estrogen and improvement demonstrated by sperm with progressive forward motion in the mucus.

The semen was initially evaluated twice at 3 - 5 week intervals and then averaged. In the first group of 155 couples, the semen analysis was performed by the manual method only, employing the Makler Chamber for count and motility. The quality of motility and sperm morphology was directly assessed using the phase contrast microscope. This group of tests are known as routine semen analysis (RSA). In an additional 61 couples, semen was evaluated by CellSoft (Cryo Resources, Ltd., New York) for a computerized semen analysis (CSA). This group of parameters for CSA included: computerized measurements of velocity, linearity, lateral head displacement (both ALH max and ALH mean) and beat/cross frequency. The percent motility and sperm count were also computer-derived as were the manual measurements of the quality of motility and morphology. This allowed evaluation and comparison of the new motility parameters with the routine semen analysis.

The norms (parameter of "normal" males) for routine semen analysis (RSA) can be found in Table 1. The norms for CSA are in Table 2. Patients with a sperm concentration of less than 5 million/ml were excluded from this study.

TABLE 1- ROUTINE NORMAL VALUES

Count	≥ 20 mill/ml
Motility	≥ 50%
Morphology	≥ 50% normal forms

These normal values are suggested by the World Health Organization.

TABLE 2 - CELLSOFT NORMAL VALUES

Velocity	≥ 40.000 microns/sec
Linearity	≥ 5.5
ALH mean	≥ 1.80 microns
ALH max	≥ 2.30 microns
Beat/cross frequency	≥ 13.00 Hz(1/sec)

These normals were established by the minimum value achieved by donor sperm.

Values correlate with suggested reference points obtained from Cryo Resources, NY for use with the CellSoft semen analyzer.

Quality of motility by RSA was judged on a scoring system of 1 to 4. The specimen was considered to be of subnormal quality if grade was 1 or 2.

- Grade 1 - minimal forward progression
- Grade 2 - poor to fair motility
- Grade 3 - good activity with linear forward progression
- Grade 4 - full activity with both fast and linear forward progression

RESULTS

In 155 couples where the husband was evaluated only by RSA and in an additional 61 couples evaluated by RSA and CSA, 81 of 216 men (38%) had subnormal RSA versus 18 of 61 (30%) having a subnormal CSA and 22 of 61 (36%) who had both RSA and CSA subnormal. In the group of 155 patients, pregnancies were achieved in 30 of 48 (63%) with a subnormal RSA. Overall, 165 of 216 couples (76%) achieved pregnancies. (Table 3)

The pregnancy rate in the 61 patients having both CSA and RSA performed was as follows: pregnancies were achieved in 9 of 11 (82%) of the women with husbands with subnormal RSA but normal CSA, in 15 of 18 (83%) men with subnormal CSA but normal RSA, in 15 of 22 (68%) with both RSA and CSA abnormal, and 7 in 10 (70%) with normal RSA and CSA. (Table 3)

The percentage motility was subnormal (less than 50%) in 59 of 216 patients (27%) and pregnancies were achieved in 41 of 59 (69%) compared to 126 of 157 (80%) where the motility was judged normal. The specific CSA parameter that correlated the best with poor quality motility (grade 2 or less) by RSA was slow velocity (11/13 = 85% matched) as compared to decreased linearity (8/13 = 62%), or abnormal ALH (8/13 = 62%) or abnormal beat/cross

TABLE 3 - PREGNANCY RATES FOR RSA AND CSA

	155 COUPLES		61 COUPLES	
	NO. PATIENTS	PREGNANCIES	NO. PATIENTS	PREGNANCIES
All normal RSA	107/155 (69%)	91/107 (85%)	26/61 (43%)	19/26 (73%)
RSA only subnormal	48/155 (31%)	30/48 (63%)	11/61 (18%)	9/11 (82%)
CSA only subnormal			18/61 (30%)	15/18 (83%)
RSA and CSA normal			10/61 (16%)	7/10 (70%)
RSA and CSA subnormal			22/61 (36%)	15/22 (68%)

TABLE 4 - COMPARISON OF NORMAL VERSUS SUBNORMAL PARAMETERS OF CSA IN PREDICTING ACHIEVEMENT OF PREGNANCY

	NO.	NO.	%	NO.	NO.	%
	NORMAL	PREG.		SUBNORMAL	PREG.	
Count	55	42	76	6	4	67
Motility	34	24	76	27	20	74
Morphology	51	37	73	10	9	90
Velocity	37	29	78	24	17	71
Linearity	36	27	75	25	19	76
ALH mean	46	35	76	15	11	73
ALH max	43	34	79	18	12	67
Beat/cross	51	37	73	10	9	90
Quality	48	37	77	13	9	69

frequency (3/13 = 28%).

When the data were analyzed using multiple abnormal parameters, a lower percentage of patients were found with two or more abnormal parameters in the pregnant group, 28/46 or 61%, versus 12/15 or 80% in the non-pregnant group. This data shows that only when multiple parameters are abnormal especially count, motility, velocity and linearity - can the fertility potential be impaired. Table 4 demonstrates that no single parameter is useful in predicting the fertility potential of human sperm.

CONCLUSIONS

These data are suggestive in that neither the RSA nor CSA accurately predicts fertility potential in the male. There were no differences found in the pregnancy rates of the wives who had husbands with normal or subnormal semen analysis. A previous study did suggest that a greater number of subnormal men could be identified by CSA (80%) than by RSA (50%)⁶. However, since finding a subtle defect does not seem to be capable of predicting abnormal human sperm fertilizing potential, the extra expense involved with CSA versus RSA does not seem justified based on this data. The CSA seems more appropriate for research purposes.

Perhaps certain modifications will improve the clinical efficacy of the CSA system such as the evaluation of motion characteristics in hyperactivated sperm. The results dictate the need for finding more clinically relevant semen parameters to evaluate (other than oligospermia and asthenospermia) to help determine when a male factor is contributing to a couple's infertility. Until that time, aggressive therapy of the female partner should be commenced even if there appears to be a male factor present. The data further suggests that some of the successful outcomes of male directed therapy as evidenced by achievement of pregnancy may, in fact, have had nothing to do with treating the male but to concomitant correction of female infertility factors.

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