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# The Use of Novel Semen Quality Scores to Predict Pregnancy in Couples With Male-Factor Infertility Undergoing Intrauterine Insemination

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**ABSTRACT:** The purpose of this study was to determine whether 2 new semen quality (SQ) scores could predict pregnancy in patients undergoing intrauterine insemination (IUI) for male-factor infertility and whether an overall score could help in counseling these couples with assisted reproductive technique (ART) options. Ninety-three couples with male-factor infertility were examined for semen analysis. Samples were prepared by density gradient separation (47% and 90%), and IUI was performed. On the basis of the 2 semen scores (SQ and relative quality [RQ]), the IUI-semen pregnancy score (IUI-SPS) was calculated. Of the 192 IUI cycles, 14% (27 of 192) resulted in pregnancy. Both prewash SQ and RQ scores were significantly related to pregnancy ($P = .02$ and $P < .001$), as was the postwash RQ score ($P < .001$). Of the IUI cycles in which the postwash RQ score was greater than 125, 40% (13 of 32) resulted in pregnancy compared to 9% of cycles (14 of 160) in which the postwash SQ score was less than 125. The prewash IUI-SPS score was significantly related to IUI-induced pregnancy ($P < .001$). Both the pre- and postwash SQ and RQ scores can predict pregnancy in male infertility patients undergoing IUI. Patients with an IUI-SPS less than 150 may be advised to seek in vitro fertilization (IVF), whereas those with an IUI-SPS greater than 150 may be advised to seek IUI.

Key words: Overall semen quality, relative quality, semen pregnancy score, outcome prediction.

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Couples affected by long-term male infertility have an estimated spontaneous pregnancy rate of 2% per menstrual cycle (Collins et al, 1995). To help increase the chances of pregnancy, assisted reproduction techniques (ARTs) such as intrauterine insemination (IUI) and in vitro fertilization (IVF) are used. IVF fertilization and intracytoplasmic sperm injection (ICSI) offer higher success rates than IUI in couples with male-factor infertility, but they are more invasive and expensive. The success rate of IUI can be increased to near that of IVF by combining it with ovarian stimulation (Byrd et al, 1987; Dodson et al, 1988). However, this increases the cost of the procedure from about $500 to $1800 per cycle (Van Voorhis et al, 2001). Ovarian stimulation also can lead to a wide range of health risks, including ovarian hyperstimulation syndrome and multiple pregnancy. Although the results of IVF with or without ICSI are superior to those of IUI in couples with male-factor infertility, IUI remains a viable, simple, inexpensive, and less risky option, particularly for those who cannot afford the increasing costs of IVF/ICSI. Therefore, it is important to find a quick, simple, accurate, and clinically applicable tool to predict the chances of IUI-induced pregnancy for appropriate patient counseling. Unfortunately, at present, we have no method that provides consistently reliable and accurate results.

Semen analysis is arguably the most important clinical laboratory test available in the evaluation of male infertility. Measures of semen quality (SQ) are used as surrogate measures of male fecundity in clinical andrology, reproductive toxicology, epidemiology, and risk assessment. However, the implications of even moderate alterations in SQ are poorly understood, and only limited data are available for relating these measures to the likelihood of achieving pregnancy. In general, the number and concentration of motile spermatozoa are significant factors affecting success. In particular, success rates are poor when low numbers of motile spermatozoa ($<1 \times 10^6$/mL) are used for insemination (Campana et al, 1996). Some studies have suggested that computer-assisted semen analyzer (CASA) estimates of concentration and movement characteristics of progressively motile spermatozoa are significantly related to the fertilization rate in vitro and

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the time to conception (Aitken, 1990; Irvine, 1995; Mortimer et al, 1995). Sperm motion characteristics, specifically amplitude of lateral head displacement (ALH) and linearity (LIN), have been related to sperm fertilizing capacity (Aitken, 1990; Irvine, 1995). Despite the current high profile of morphology examination, few IUI studies provide details on sperm morphology. Burr et al (1996) found that pregnancy success rates were poor (4.3% per cycle) when sperm morphology in raw semen was less than 10% as assessed by Tygerberg criteria. In contrast, the IUI outcome was not significantly influenced when morphology was assessed on raw semen samples according to Tygerberg strict criteria (Karabinus and Gelety, 1997). Whether individual semen parameters are effective in predicting pregnancy outcome in couples with male-factor infertility undergoing IUI is a controversial issue (Crosignani and Rubin, 1996; Hughes, 1997; Cohlen et al, 1998).

In the preceding article, we described that because semen parameters are interrelated, they can be reduced into 2 semen scores termed the SQ and relative quality (RQ) scores. These scores could provide a more efficient way of predicting the outcome of natural conception and ARTs, but further evaluation is needed. The first objective of this study was to determine whether SQ and RQ scores could be used to predict pregnancy in couples undergoing IUI for male-factor infertility. Second, we wanted to determine whether these 2 scores could further be combined as 1 score to produce an IUI-semen pregnancy score (IUI-SPS) that might serve as a quick and reliable method for directing couples with male-factor infertility either to IUI (high IUI-SPS score) or IVF (low IUI-SPS score).

## Materials and Methods

### Patient Recruitment

Following the Institutional Review Board approval, a total of 93 couples attending our infertility clinic for male-factor infertility were recruited between 1999 and 2001. A diagnosis of male-factor infertility was made according to World Health Organization ([WHO] 1999) guidelines.

All couples had a history of at least 1 year of primary or secondary infertility with the current partner and had completed a basic evaluation that a included medical history, a physical examination, and at least 2 semen analyses. All women had at least unilateral tubal patency, as demonstrated by a hysterosalpingogram, a chromopertubation at laparoscopy, or both. Women with suspected female-factor infertility due to pelvic disease (endometriosis or adhesions) were evaluated via laparoscopy to rule out any female factors.

Ovulation was evaluated by baseline body temperature monitoring, midluteal-phase serum progesterone, or endometrium biopsy. Patients were included in the study whether or not they were receiving ovarian stimulation. Those receiving gonadotropin stimulation were monitored with transvaginal ultrasonography and serial estradiol determinations.

Couples were excluded from the study when the female partner was more than 39 years old, had cycle disorders, had untreated endometriosis (graded according to the revised 4-stage American Fertility Society scoring system) (Schenken and Guzick, 1997), or was diagnosed with bilateral tubal block.

### Sperm Preparation

Semen was collected by masturbation after 2–3 days of sexual abstinence. After liquefaction, semen analysis was performed by manual semen analysis and CASA semen analysis (IVOS, 10.7s, Hamilton Thorne Research, Beverly, Mass).

PureCeption (Sage BioPharma, Bedminster, NJ) was used to prepare a density gradient for centrifugation. Aliquots (3 mL) of liquefied semen were placed on the upper (47%) layer of a 2-layered density gradient (47% and 90%) in a sterile conical centrifuge tube. Specimens were centrifuged for 20 minutes at 600 $\times$ *g*. The supernatant was removed, and the pellet was resuspended in 2 mL of human tubal fluid medium (Irvine Scientific, Santa Ana, Calif). The specimen was then centrifuged for 7 minutes at 600 $\times$ *g*, and the supernatant was removed again. The final pellet was resuspended in a volume of 0.5 mL of human tubal fluid, and postwash semen analysis was performed. The pre- and postwash semen characteristics that were reported include semen volume, sperm concentration, total sperm count, percent motility, total motile sperm count, percent with normal morphology by WHO guidelines and Tygerberg strict criteria, and motion characteristics by CASA.

### Insemination Procedure

IUI was performed under sterile conditions using a flexible plastic Wallace catheter (Cooper Surgical, Shelton, Conn) with the patient in the lithotomy position. We recorded only clinical pregnancies, defined as a visible gestational sac on a vaginal ultrasonography. Successful pregnancies were defined as live births. Cycles of IUI that failed to result in pregnancies or that resulted in spontaneous abortions were considered unsuccessful.

### Statistical Analysis

For all couples, the SQ and RQ scores were calculated from the semen analyses using principal component analysis as described in detail in the preceding article. We attempted to predict an IUI-induced pregnancy from male and female characteristics using multivariate logistic regression and generalized estimating equations (GEEs). These equations used a compound symmetry correlation structure to account for the fact that couples may attempt more than 1 IUI cycle. We also used multivariate GEE logistic regression analysis to predict IUI-induced pregnancy from the SQ and RQ scores based on 9 semen parameters taken from the semen analyses. These parameters were 1) concentration ($\times 10^6$/mL); 2) motility (percent); 3) curvilinear velocity (VCL); 4) straight-line velocity (VSL); 5) average path velocity (VAP); 6) LIN; 7) ALH; and sperm morphology by both 8) WHO guidelines (1999) and 9) Tygerberg strict criteria (Mortimer and Menkveld, 2001). Female-factor infertility characteristics (ovarian stimulation, nonstimulation, age, and infertility duration) were also evaluated. If these characteristics were significant in

Table 1. *Relationship between prewash and postwash semen scores and IUI pregnancy**†

| Variable | Nonpregnant Cycles (n = 165) | Pregnant Cycles (n = 27) | Odds Ratio (95% CI) | *P* Value | AUC (%) |
|---|---|---|---|---|---|
| Prewash | | | | | |
| SQ score | 81.7 (76.6, 95.2) | 86.5 (73.7, 95.8) | 1.6 (1.1–2.5) | .02 | 80 |
| RQ score | 102.2 (92.3, 114.7) | 117.3 (109.2, 129.5) | 2.5 (1.6–3.8) | <.001 | . . . |
| Postwash | | | | | |
| SQ score | 90.5 (77.4, 100.9) | 83.3 (76.3, 94.6) | 1.2 (0.8–1.6) | .34 | 78 |
| RQ score | 107.6 (97.1, 118.7) | 124.7 (112.6, 128.2) | 2.0 (1.4–2.8) | <.001 | . . . |
| IUI-SPS | | | | | |
| Prewash | 147.5 (136.2, 156.5) | 159.2 (152.4, 166.2) | 2.4 (1.6–3.7) | <.001 | 81 |
| Postwash | 153.3 (141.0, 164.9) | 164.7 (160.0, 173.9) | 2.0 (1.3–2.9) | <.001 | 78 |

* AUC indicates area under the curve; IUI-SPS, intrauterine insemination-semen pregnancy score; RQ, relative quality; and SQ, semen quality.

† Results are reported as median and interquartile range; the *P* value indicates a relationship with IUI pregnancy from logistic regression with generalized estimating equation (GEE) methods to account for multiple attempts of couples; the odds ratio is the increased odds of pregnancy for each 10-point increase in SQ, RQ, or IUI-SPS; the AUC, particularly that under the receiver-operating characteristic curve (ROC), represents a summary statistic of the sensitivity and specificity of the association with IUI pregnancy.

our univariate analyses, they were included in the logistic regression analyses. To summarize the overall sensitivity and specificity of the scores in predicting pregnancy, we calculated receiver-operating characteristic curves. The area under the curve (AUC) can range from 50% (no predictive value) to 100% (perfect prediction accuracy). Results of these analyses were reported using a median and an interquartile range (25th–75th percentile). Statistical computations were performed with SAS version 8.1 (SAS Institute Inc, Cary, NC), and statistical significance was assessed using 2-tailed tests and an $\alpha$ level of $P < .05$.

### Calculation of the IUI-SPS

The semen scores were combined to provide an IUI-SPS using the logistic regression coefficient estimates of both the prewash SQ and RQ scores as weights. The regression coefficient of the RQ score was approximately twice as much as the SQ score, so the combined IUI-SPS score was calculated as follows:

$$\text{IUI-SPS} = \text{RQ score} + (\text{SQ score}/2)$$

The sample size was sufficient to detect, with 90% power, whether a 10-point increase in IUI-SPS resulted in an increase in the odds of pregnancy of 1.5 times vs the null hypothesis of an odds ratio of 1.0 for such an IUI-SPS change.

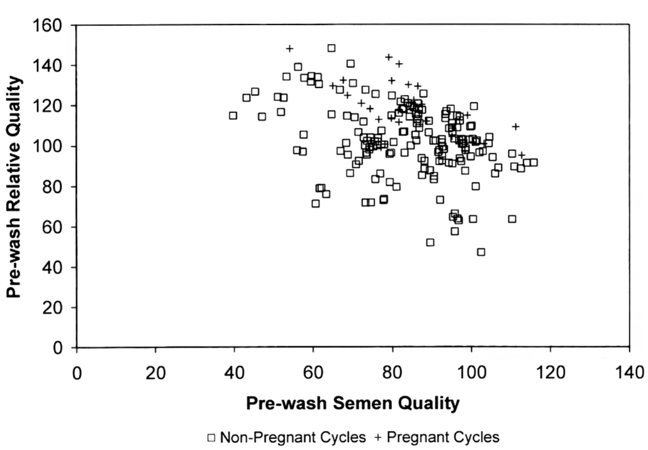


Figure 1. Distribution of prewash semen quality (SQ) and relative quality (RQ) scores in pregnant and nonpregnant intrauterine insemination (IUI) cycles.

## Results

### Relationship of SQ and RQ Scores to IUI Pregnancy Rates

Couples recruited in the study received a total of 192 IUI treatment cycles. Of these, 14% (27 of 192) resulted in pregnancy. Both the SQ and RQ prewash scores were significantly associated with the IUI-induced pregnancies ($P = .02$ and $P < .001$, respectively) (Table 1). Of the postwash scores, only the RQ score ($P < .001$) was related to pregnancy outcome. Of the 32 cycles in which the postwash RQ score was greater than 125, 40% (13 of 32) resulted in pregnancy. Only 9% (14 of 160) resulted in pregnancy when the RQ score was less than 125.

The significance of the prewash SQ score is illustrated by the following data. When the postwash RQ score was greater than 125 and the prewash SQ score was greater than 70, 53% of 17 cycles resulted in pregnancy. When the postwash RQ score was greater than 125 but the prewash SQ score was less than 70, 25% of 16 cycles were successful. When both the postwash RQ and SQ scores were less than 125 and the prewash SQ score was less than 70, none of the 15 cycles resulted in pregnancies. The remaining 144 cycles with prewash SQ scores greater than 70 and postwash RQ scores less than 125 resulted in a 10% pregnancy rate. The distribution of SQ and RQ scores in cycles with and without pregnancies is illustrated in Figure 1.

### Relationship of IUI-SPS to IUI Pregnancy Rates

When using the combined IUI score (IUI-SPS) as calculated by regression coefficients, it was found that the pre-

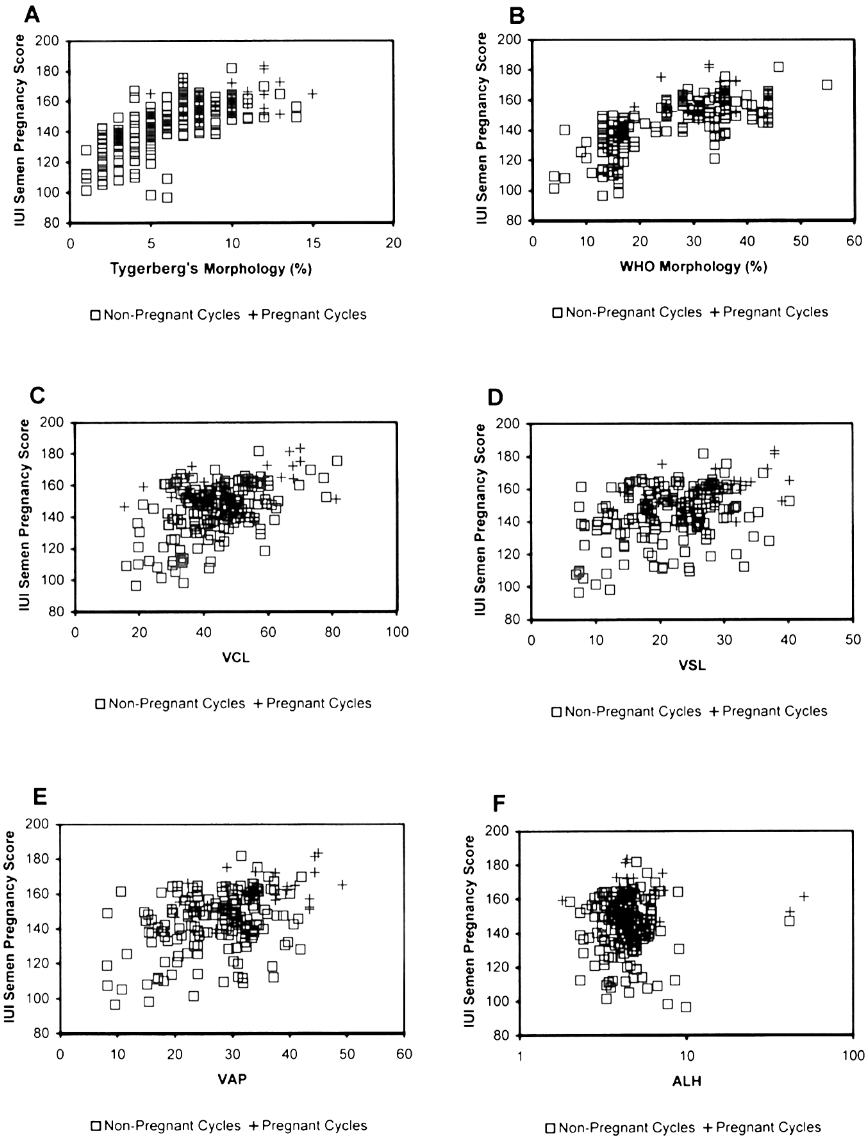


Figure 2. Relationship between individual prewash semen parameters and the composite intrauterine insemination-semen pregnancy score (IUI-SPS).

wash IUI-SPS was significantly related to the IUI pregnancy rate with an AUC of 81%. This score had a greater ability to predict the pregnancy rate as measured by the AUC of pregnancy than the postwash semen scores (Table 1). Sperm morphology examined by Tygerberg strict criteria was the only semen parameter that approached the predictive ability of the IUI-SPS with an AUC of 79%. In IUI studies and other ARTs, motility or concentration is univariately most related to fertilization. The advantage of using the semen scores is that they are flexible enough to be predictive, regardless of which of the individual semen parameters are important. If motility were highly predictive of outcome rather than morphology, the semen scores would still be sensitive enough to detect it, because they utilize all of these measures. The fact that several prewash parameters are associated with IUI-induced pregnancies illustrates that combining the parameters can provide an improvement in the prediction of pregnancy. The relationship between the composite IUI-SPS and individual semen parameters is illustrated in Figure 2.

Logistic regression analysis indicated that IUI pregnancies could be predicted using the IUI-SPS (Figure 3). Of the 196 cycles, more than half (56%) had an IUI-SPS less than 150. Patients with an IUI-SPS greater than 150 had a pregnancy rate of 28% (24 pregnancies out of 87 cycles) compared with 3% (3 pregnancies out of 109 cycles) in patients with an IUI-SPS less than 150. No pregnancies occurred in the 48 cycles in which the IUI-SPS was less than 137.

Measures of predictive ability using several cutoff values of the IUI-SPS are illustrated in Table 2. At a cutoff value of 130, the IUI-SPS had a sensitivity and negative

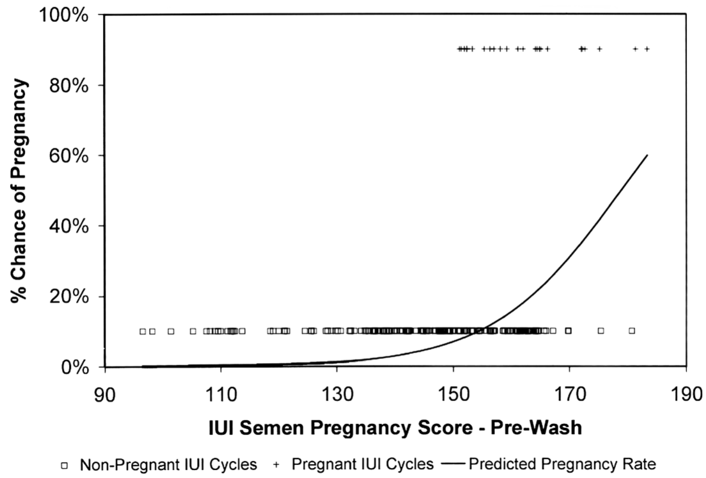


Figure 3. Illustration of the intrauterine insemination-semen pregnancy score (IUI-SPS) of the pregnant and nonpregnant IUI cycles and the prediction equation of pregnancy from logistic regression of the observed IUI-SPS.

predictive value of 100%. However, the specificity and positive predictive values were low (18% and 16%, respectively). The specificity of IUI-SPS was as high as 81% at a cutoff value of 160. Negative predictive values were greater than 90% as long as the IUI-SPS was greater than 130 (Table 2).

### *Relationship Between Female Characteristics and Pregnancy Rate*

In univariate analyses of female characteristics, the duration of infertility was significantly ($P = .05$) related to pregnancy rate. On evaluating the effect of ovarian stimulation, it was found that mild ovarian stimulation (either with clomiphene citrate or low-dose gonadotrophin) in the IUI cycles was significantly related to pregnancy ($P = .01$) with respect to the per cycle rate. However, when mild ovarian stimulation was evaluated per couple, the pregnancy rate was nonsignificant (using logistic regression with GEEs) (Table 3). In a multivariate logistic GEE regression, ovarian stimulation ($P = .19$) and infertility duration ($P = .15$) were not related to pregnancy after adjusting for semen scores, whereas the prewash IUI-SPS was significantly related even after adjusting for these factors ($P < .001$).

Table 2. *Meaures of accuracy to predict IUI pregnancy with different cutoffs of the prewash IUI-SPS**

| IUI-SPS Cutoff | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|---|---|---|---|---|
| 130 | 100 | 18 | 16 | 100 |
| 140 | 93 | 36 | 19 | 97 |
| 150 | 89 | 63 | 28 | 97 |
| 160 | 48 | 81 | 29 | 91 |

* IUI-SPS indicates intrauterine insemination-semen pregnancy score; PPV, positive predictive value; and NPV, negative predictive value.

## *Conclusions*

For many years, predicting the outcome of different ARTs has been the focus of infertility specialists to aid in the accurate selection of the appropriate technique for the appropriate couple. IUI is a viable, simple, noninvasive, and inexpensive option, particularly for male-factor infertility patients. The accurate prediction of IUI success is important for many reasons: 1) to appropriately counsel the couple about their chances of conception using the different ARTs available (IUI or IVF with or without ICSI) and help them make the right decision; 2) to avoid conducting a procedure on a couple knowing in advance that its potential benefit is slim; 3) to avoid the economic, emotional, and psychological trauma of repetitive failed IUI cycles; and 4) to save time, which is a crucial factor in infertility management, by directing the couple toward more effective techniques (IVF with or without ICSI), particularly for those with advanced maternal age.

Data examining the individual semen parameters as predictors of IUI success in patients with male-factor infertility have been accumulating over the years, and 4 noteworthy features have been identified. First, although

Table 3. *Relationship between ovarian stimulation and per cycle and per couple pregnancy rates*

| Group | Per Cycle Pregnancy Rate, % | Per Couple Pregnancy Rate, % |
|---|---|---|
| Ovarian stimulation* | 19 (22 of 115) | 29 (17 of 57) |
| No ovarian stimulation | 7 (5 of 77) | 14 (5 of 36) |
| Total | 14 (27 of 192) | 24 (22 of 93) |

* Ovarian stimulation was significantly related to per cycle pregnancy rate ($P = .01$) but not to per couple pregnancy rate ($P = .08$) in univariate analysis.

total motile sperm count has received much attention as a potential predictor, there is a lack of consensus with respect to a cutoff value that should be used (Kang and Wu, 1996; Hughes et al, 1998). Estimates regarding the threshold number of motile sperm that should be used for insemination to achieve the best chance for pregnancy vary widely between 800 000 and 80 million (Negri et al, 1996; Ombelet et al, 1997; Pasqualotto et al, 1999; Stone et al, 1999). Second, although the overall sperm motility and sperm motion characteristics (CASA values) have been reported to be related to the outcome of IUI and IVF (Ishikawa et al, 1989; Marshburn et al, 1992; Chu et al, 1997; Larsen et al, 2000), there is a lack of standardization, and the clinical utility of their results is debatable. A recent meta-analysis suggested the need for a reappraisal of these parameters and more studies to better understand their role as sperm function measures and the need for a more accurate definition of their clinical utility (Oehninger et al, 2000). Third, although prewash sperm morphology by WHO guidelines and Tygerberg strict criteria was reported to predict IUI pregnancy (Matorres et al, 1995; Lindheim et al, 1996; Goverde et al, 2000), this was debated by other investigators (Karabinus and Gelety, 1997). One study reported that prewash sperm morphology might predict IUI pregnancy (Lindheim et al, 1996), while another study debated its predictive value (Karabinus and Gelety, 1997). Although the effect of sperm morphology on the success of IVF has been well studied, the utility of strict criteria has not been studied extensively in couples undergoing controlled ovarian hyperstimulation and IUI. The strict criteria methodology was reported not to be a useful prognostic factor when IUI was performed because of male infertility (Matorres et al, 1995). While advanced reproductive techniques have been able to overcome the disadvantage of morphologically abnormal sperm, assisted reproduction utilizing in vivo conditions with IUI does not appear to be able to circumvent these inherent abnormalities in sperm. Finally, the fourth notable feature is that none of these studies has looked into the potential use of a scoring system that can express these parameters altogether.

Given the extreme importance of each sperm feature and the documented correlation between individual variables, we hypothesized that a single semen score based on a weighted sum of the cardinal variables (we selected 9) for each semen analysis might have the following advantages: 1) it would express the overall quality of the semen rather than rely on only a single feature, 2) it would include the inherent predictive power of any of its components, and 3) it would avoid the bias of relying on one variable more than the other.

In order to achieve our objectives, we examined the variability of semen parameters among couples with male infertility undergoing IUI and, on the basis of that variability, calculated SQ and RQ scores and the IUI-SPS. Furthermore, the efficacy of these scores was calculated using per cycle and per couple pregnancy rates as an end point. The cycle fecundity rate was found to be 14% (27 of 192), which was higher than the 8.7% reported by Goverde et al (2000). Other investigators (Karlstrom et al, 1993; Balasch et al, 1994; Karande et al, 1995; Guzick et al, 1999; Ecochard et al, 2000) have reported a similar pregnancy rate with or without ovarian stimulation.

Both the prewash SQ score ($P = .02$) and the RQ score ($P < .001$) were positively associated with the increased likelihood of pregnancy. On the other hand, only the postwash RQ score ($P < .001$) was related to a successful outcome. Of the cycles in which the postwash RQ score was greater than 125, 40% resulted in pregnancy compared with 9% of cycles when the postwash SQ score was less than 125. When the prewash SQ score was greater than 70 and the postwash RQ score was less than 125, the success rate was low (10%), which illustrates the feasibility of using the scores in predicting pregnancy outcome. The advantages of the SQ and RQ scores are that they enable clinicians to quickly compare SQ and provide an easy method of identifying patients with abnormal SQ, thereby facilitating improved assessment of male fertility for clinicians. These scores can also provide information about the fertilizing potential and the prediction of pregnancy in an IUI setting. We anticipated that SQ might be more important in assessing the chances of natural conception and that RQ might be more important in ART procedures since, in these controlled situations, RQ measures quality after adjusting for concentration, thus reducing the importance of concentration.

SQ and RQ scores were combined to yield IUI-SPS, which was significantly related to pregnancy rate ($P < .001$) with an AUC of 81%. When the predictive ability of the IUI-SPS as measured by the AUC was compared with that of the individual semen parameters, IUI-SPS was found to be greater than all the individual semen parameters as well as the postwash semen scores. Of all the parameters examined, only strict criteria approached the predictive ability of the IUI-SPS with an AUC of 79%. The presence of other significant prewash parameters such as WHO morphology, VCL, VSL, VAP, and ALH illustrates that combining all of the parameters can improve the prediction of pregnancy.

On examining the female factors, the duration of infertility and induction of ovulation were significantly related to the chances of pregnancy, which is in agreement with previous reports (Aafjes et al, 1978; Karande et al, 1995; Guzick et al, 1999; Kaplan et al, 2000). In another report, pregnancies occurred in 7.3% of patients with ovulatory dysfunction (Stone et al, 1999). None of these female factors were related to pregnancy after adjusting for semen scores and using GEE multivariate logistic regression. When the semen scores in our study were stratified, these factors became nonsignificant, and the scores retained their significance in relation to both cycle fecundity and cumulative pregnancy rates. The reported success of IUI in the treatment of male-factor infertility varies widely from 0% to 57% per patient (Byrd et al, 1987), although the number of subjects in most published studies is low. In larger studies, pregnancy rates determined for couples with male-factor infertility were between 8% and 10% (Dickey et al, 1999; Stone et al, 1999). Patients with idiopathic infertility had a 13.2% conception rate per cycle (Byrd et al, 1987; Stone et al, 1999). These results emphasize the importance of etiology in the counseling of couples for IUI.

When we measured the predictive accuracy of IUI-SPS at different cutoff values, it produced satisfactory sensitivity values and negative predictive values. However, both specificity and positive predictive values were less than sensitivity and negative predictive values. IUI-SPS had 100% sensitivity and a negative predictive value at a cutoff of 130, indicating that those patients with an IUI-SPS less than 130 have a very low chance of inducing pregnancy with IUI. These patients should be directly counseled to undergo IVF without trying IUI, thereby avoiding unnecessary IUI cycles.

When we compared the sperm quality necessary for successful IUI with WHO threshold values for normal sperm, we found that the sperm quality necessary for successful IUI was lower than the WHO threshold values. It was therefore concluded that IUI is effective therapy for male-factor infertility when the total motile sperm count is $5 \times 10^6$ or greater and the initial sperm motility is 30% or greater (Branigan et al, 1999). When initial values were lower, IUI was associated with a lower chance of success. In one study, the likelihood of pregnancy was maximized when motile sperm numbers were $5 \times 10^6$ or greater and sperm motility was 60% or greater (Stone et al, 1999). However, these authors did not provide the relationship between the cycle fecundity rate and the motion parameters as measured by CASA and the morphology characteristics as measured by WHO guidelines or strict criteria. In our study, appropriate weight was given to the SQ parameters, notably morphology and sperm motion characteristics. Using baseline semen analysis and the 24-hour sperm survival, it was found that the number of motile sperm available for insemination (especially their 24-hour survival) is highly predictive of IUI success (Bonde et al, 1998). Although the WHO-published thresholds for normal semen parameters are widely used, there is a growing concern among clinicians, technicians, and biostatisticians about the available normal values of semen measures (Zinaman et al, 2000).

In conclusion, prewash SQ and RQ scores are positively correlated with pregnancy in couples undergoing IUI because of male-factor infertility. The postwash RQ score appears to be more important in predicting pregnancy in the IUI setting, particularly when it is greater than 125. The IUI-SPS score based on prewash semen parameters for those patients could be used to counsel them about their chances of success with IUI. Up to half of the failed IUI attempts in patients with male-factor infertility could be avoided on the basis of their IUI-SPS. Patients with an IUI-SPS below 150 may be advised to seek IVF, whereas IUI may be recommended for couples with an IUI-SPS above this cutoff value. Moreover, the prewash IUI-SPS can potentially be used to screen individuals for the feasibility of IUI attempts among couples with male-factor infertility. Calculation of these scores can be done easily using a software program without any additional costs. These values can be added as a footnote to each semen analysis report. Similar studies from other laboratories and programs are needed in order to determine whether the IUI-SPS varies from one laboratory to another and from population to population. These novel scores provide a quick, simple, and reliable tool to predict pregnancy in patients undergoing IUI for male-factor infertility.

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