Influence of Human Sperm Motility Ability and Sperm Morphology on Fertilization Rate and Pregnancy Rate in Conventional IVF

Shimada T, Nojiri K, Harada M, Hamai H, Katoh H, Handa M, Kobayashi SI, Isojima S.

Advanced Fertility Center, Fuchu Hospital, Osaka 594-0076, Japan

Kruger's strict criteria (KSC) and Sperm Motility Index (SMI) calculated by a Sperm Quality Analyzer were used to evaluate the fertilization ability of sperm in conventional IVF. Patients between November 1996 and July 1997 were divided into 3 groups by SMI on oocyte aspiration day. The fertilization and pregnancy rates were 68.5% (575/840) and 28.8% (38/132) respectively in group G (SMI $\geq$ 100). They were 34.9% (45/129) and 10.5% (2/19) in group M (100 > SMI $\geq$ 50) respectively. In group P (50 > SMI), they were 13.7% (7/51) and 0% (0/6). Higher fertilization and pregnancy rates were recognized in group G than other groups. The fertilization ability of sperm taken from patients between March 1998 and August 1998 were also examined using SMI and KSC. In the normal KSC group (KSC $\geq$ 14%, SMI $\geq$ 100), fertilization and pregnancy rates were 84.0% (200/238) and 42.9% (15/35) respectively, but in the subnormal KSC group (14% > KSC, SMI $\geq$ 100), they were 67.3% (68/101) and 6.7% (1/15). The normal and subnormal groups showed statistical differences between the fertilization rate (P < 0.01) and pregnancy rate (P < 0.02). Combined estimations using KSC and SMI could predict the fertilization and pregnancy possibilities for conventional IVF.
Key words: fertilization ability, IVF, sperm quality analyzer, sperm motility index, Kruger's strict criteria.

Performance of the sperm quality analyser in predicting the outcome of assisted reproduction

Mahmoud AM, **Gordts S**, **Vereecken A**, **Serneels A**, **Campo R**, **Rombauts L**, **Comhaire FH**.

University Hospital, Department of Internal Medicine, Section of Endocrinology, Ghent, Belgium.

The present study was undertaken to assess the relationship between the results of conventional semen analysis and the sperm motility index (SMI) as measured by the sperm quality analyser (SQA), and to evaluate these in relation to the fertilization and/or pregnancy outcome of assisted reproduction. SMI determinations and conventional semen analyses were performed on 223 samples from subfertile men in two laboratories in Leuven (n = 136) and Antwerp (n = 87), and on spermatozoa prepared on a Percoll gradient (n = 136) used for treatment of male factor infertility in 57 cycles of intrauterine insemination (IUI), 44 attempts at in vitro fertilization (IVF) and 31 attempts at intracytoplasmic sperm injection (ICSI). SMI values for native semen correlated significantly with sperm concentration, motility and morphology. Multiple regression analysis revealed sperm concentration after preparation, and the concentration of motile spermatozoa with normal morphology and SMI (before preparation) to be the independent determinants for SMI after preparation. SMI values were significantly higher after, than before, preparation (p < 0.0001). In regular IVF (n = 44) the percentage of fertilized oocytes correlated significantly (p < 0.05) with sperm motility (A + B%, r = 0.33), with the percentage of spermatozoa with normal morphology (r = 0.46) before preparation, with the values of SMI both before and after preparation (r = 0.54, r = 0.48), with sperm concentration (r = 0.34) and with the motile sperm concentration (r = 0.29) after preparation. For the occurrence of pregnancy (all treatment methods), comparison of areas under ROC curves (AURC) indicated motile sperm concentration after preparation, as well as SMI both before and after preparation, to have the highest AURC, with no significant difference between these values as far as predictive power was

concerned. These results indicate that the SQA allows for rapid evaluation of sperm characteristics and of the effectiveness of sperm preparation techniques. However, it is not superior to conventional semen analysis in predicting the outcome of assisted reproduction.

PMID: 9639151 [PubMed - indexed for MEDLINE]

Evaluation of sperm fertilizing ability using the Sperm Quality Analyzer

Shibahara H, **Naito S**, **Hasegawa A**, **Mitsuo M**, **Shigeta M**, **Koyama K**.

Department of Obstetrics and Gynecology, Hyogo College of Medicine, Nishinomiya, Japan.

The Sperm Quality Analyzer is an inexpensive device which provides a quantitative estimation of sperm motility. To evaluate the fertilizing ability of human spermatozoa using a Sperm Quality Analyzer, correlations amongst the sperm motility index, the sperm penetration index (as assessed using the sperm penetration assay; SPA), and the fertilization rate in the treatment of standard IVF-ET were analysed retrospectively. The sperm motility index demonstrated a significant correlation with sperm concentration ($p < 0.001$), sperm motility ($p < 0.001$) and the motile sperm concentration ($p < 0.001$) in a total of 104 fresh semen samples from 81 men donating samples for IVF-ET. The sperm motility index also showed a significant correlation ($p < 0.001$) with the sperm penetration index in 60 patients, assessed using the SPA, before they were treated by standard IVF-ET. The correlation between the sperm motility index and the IVF-ET fertilization rate was higher than that between the sperm penetration index and the fertilization rate. The sperm motility index was classified into three categories: 'poor' (sperm motility index < 80), 'medium' (sperm motility index 81-160) and 'good' (sperm motility index > 160). The relationships between the IVF-ET fertilization rate and each category of the sperm motility index values were also evaluated. For the three categories in the sperm motility index, the fertilization rates (76.0%) of 60 samples judged as 'good' were significantly higher than those (44.2%) of 15 samples judged as 'medium' ($p < 0.001$) and those (34.7%) of 13 samples judged as 'poor' ($p < 0.001$). These results indicate that the Sperm Quality Analyzer provides a reliable estimation of the fertilizing ability of human spermatozoa.

PMID: 9292322 [PubMed - indexed for MEDLINE]

Assessment of sperm quality analyzer II B: comparison with manual semen analysis and CASA

Fuse H, **Akashi T**, **Nozaki T**, **Nishio R**, **Mizuno I**.

Department of Urology, Faculty of Medicine, Toyama Medical and Pharmaceutical University, Toyama, Japan. fuse@ms.toyama-mpu.ac.jp

Two hundred and seven patients with male infertility were investigated. Total sperm concentration and percent progressive motility by SQA IIB showed high correlations with those of conventional manual method. Percent of normal morphology showed a significant correlation among these techniques. The sperm motility index (SMI) and total functional sperm concentration (TFSC) demonstrated high correlations with any variables of manual analysis. Only velocity and amplitude of lateral head displacement showed significant correlations with the variables obtained by SQA IIB, especially with SMI and TFSC. It was suggested that SQA IIB could be a useful instrument in the clinical practice of infertility as a screening test for semen quality.

Comparison of the Sperm Quality Analyzer IIC variables with the computer-aided sperm analysis estimates

Suzuki T, **Shibahara H**, **Tsunoda H**, **Hirano Y**, **Taneichi A**, **Obara H**, **Takamizawa S**, **Sato I**.

Department of Obstetrics and Gynecology, Jichi Medical School, Kawachi-gun, Tochigi, Japan.

Sperm Quality Analyzer (SQA) IIC, an upgrade version, is an inexpensive device and provides a quantitative estimation of sperm motility, whereas the use of computer-aided sperm analysis (CASA) provides high precision and provision of quantitative data on sperm kinetics. The aim of the present study was to evaluate if the SQA IIC variables correlated with the CASA estimates. Semen quality analysis of 71 fresh semen samples was performed using SQA IIC and CASA. Total sperm concentration, percentage of progressively motile sperm, percentage of normal morphology, motile sperm concentration, sperm motility index (SMI) and functional sperm count (FSC) determinations were performed using SQA IIC. Sperm concentration, sperm motility, and sperm motion variables including amplitude of lateral head displacement (ALH), beat cross frequency (BCF), curvilinear velocity (VCL), straight line velocity (VSL), average path velocity (VAP), linearity (LIN=VSL/VCL), and straightness (STR=VSL/VAP) were evaluated simultaneously on the same semen samples using CASA. The sperm characteristics were compared between SQA IIC and CASA. There were significant correlations of sperm concentration (r=0.634, p < 0.0001), sperm motility (r=0.697, p < 0.0001), and motile sperm concentration (r=0.757, p < 0.0001) between the two devices. Both SMI and FSC significantly correlated with eight CASA estimates, including sperm concentration, sperm motility, motile sperm concentration, ALH, VCL, VSL, VAP, and Rapid. SQA IIC is simple and easy to use. Moreover, the SQA IIC variables well correlated with the CASA estimates. As a screening test for semen quality, SQA IIC is considered as useful in the management of male infertility.

Sperm motility index: a quick screening parameter from sperm quality analyser-IIB to rule out oligo- and asthenozoospermia in male fertility study

Martinez C, **Mar C**, **Azcarate M**, **Pascual P**, **Aritzeta JM**, **Lopez-Urrutia A**.

Laboratorio de Bioquimica and Servicio de Ginecologia, Hospital Galdakao, Vizcaya, Spain.

The aim of this study was to evaluate the sperm quality analyser (SQA)-IIB, a new automated sperm analyser, and to compare its results with those obtained with a method based on the World Health Organization recommendations. Eighty-nine unprocessed semen samples and 53 selected sperm suspensions were analysed. Concentration, motility and morphology were evaluated using the routine laboratory method. The SQA-IIB measured the sperm motility index (SMI) and estimated the previously mentioned parameters. In the imprecision assay a maximal coefficient of variation (CV) of 18.8% was found. A semen sample with immunological factor showed a CV of 75.75%, which invalidates its use for these types of samples. A good correlation was obtained between SMI and concentration of progressively motile spermatozoa (CPMS) (r = 0.87), and a fair correlation with the other parameters. There was no statistically significant correlation between both methods for normal sperm morphology. The sensitivity and specificity of the SMI test in relation to CPMS were 96 and

84% respectively, for an SMI threshold value of 160. The results obtained make the SQA-IIB a good screening test to rule out oligozoospermia and asthenozoospermia when studying the male factor in the sterility outpatient clinics. However, the results suggested that it is not a valid method to evaluate morphology.

PMID: 10920094 [PubMed - indexed for MEDLINE]

Evaluation of Sperm Quality Analyzer

Kazama T, Ohta S, Iwasaki M, Fuse H.

Department of Urology, Toyama Medical and Pharmaceutical University, Toyama 930-01, Japan

In order to assess the usefulness of the Sperm Quality Analyzer (SQA, United Medical Systems Inc., Santa Ana, CA) in evaluating fertilizing ability of men, sperm motility index (SMI) values, which were determined using the SQA, were compared with the results of manual and computer-assisted semen analyses and various sperm function tests, including hypoosmotic swelling test, Penetrak test, acrobeads test, and zona-free hamster ovum human sperm penetration test (ZSPT).
The SMI value demonstrated statistically significant correlation with sperm concentration, sperm motility, motile sperm concentration, and linearity, Penetrak value and the percentage of sperm penetration in ZSPT also related to the SMI values.
These results indicate that the SQA is an easy and useful method for routine semen evaluation, and also has a possibility to be used as a substitute for complicated sperm function tests, such as Penetrak test and ZSPT.
Key words: semen analysis, sperm quality analyzer, sperm motility index.

Assessment of the Sperm Quality Analyzer

Johnston RC, Clarke GN, Liu DY, Baker HW.

Prince Henry's Institute of Medical Research, Clayton, University of Melbourne, Victoria, Australia.

OBJECTIVE: To assess the relationship between the results of the Sperm Quality Analyzer (United Medical Systems Inc., Santa Ana, CA), which measures motile sperm concentration by light scattering, conventional manual semen analysis characteristics, and computer-assisted sperm motility analyses. DESIGN: Sperm Quality Analyzer measurements and manual and computer-assisted semen analyses were performed on 150 (50, 62, and 38) samples in three laboratories and the results were compared. SETTING: The study was performed in the Andrology Laboratory of Prince Henry's Institute of Medical Research, Monash Medical Centre, and Andrology Laboratory and Reproductive Biology Unit at the Royal Women's Hospital, Melbourne, Victoria, Australia. PATIENTS: Patients presented to the laboratories for routine fertility evaluation in the male and were selected at random to reflect the range of normal and abnormal samples seen in the laboratories. INTERVENTIONS: None. MAIN OUTCOME MEASURES: Sperm count, motility (percent motility, motility index, velocity, and amplitude of lateral head displacement [ALH]), morphology, and normal acrosomes were evaluated by manual and computer-assisted semen analysis and sperm quality analyzer motility index. RESULTS: Spearman nonparametric univariate analysis showed strong correlations between sperm motility index and manual sperm concentration, motility, abnormal morphology, and normal acrosomes by Pisum sativum agglutinin; and computer-assisted sperm motility analysis sperm concentration, motile concentration, and percent static. Curvilinear velocity, straight-line velocity (VSL), and linearity also were related significantly to sperm motility index values. By multiple regression analysis, the significant covariates of the sperm motility index were motile sperm concentration, abnormal morphology, ALH, and straight-line velocity and these accounted for 85.5% of the variance of the sperm motility index. CONCLUSIONS: The Sperm Quality Analyzer is

easy to use. The good correlation between the sperm motility index, motile sperm concentration, and, in addition, a number of other semen parameters supports the use of the Sperm Quality Analyzer for screening patients and in situations that warrant a rapid verification of semen quality, such as in the IVF or artificial insemination clinic. Further investigation of the Sperm Quality Analyzer in the management of male infertility is warranted.

PMID: 7720920 [PubMed - indexed for MEDLINE]