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Evaluation of the Kruger Strict Method for Sperm Morphology in Predicting Infertile Males

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Some researchers consider sperm morphology as the best parameter of the semen analysis in predicting fertilization potential [1]. Sperm morphology (as determined by the World Health Organization) has been a semen variable used to evaluate the male factor with the outcome of in vitro fertilization of human eggs.

Recently, a new strict method used by Kruger et al. [2] has been demonstrated to correlate with success of ova fertilization by in vitro methods. They found a very poor fertilization rate and subsequent pregnancy rate when the strict method demonstrated only 4% or less of the sperm to have normal morphology. However, by increasing the number of sperm inseminated per egg in men with poor morphology, improved pregnancy rates have been recorded [3]. They demonstrated a very low fertilization rate in men with poor Kruger tests when the standard 50,000 motile sperm/oocyte was added but increased the percent of oocyte fertilization significantly to 62.6% by increasing the number of sperm inseminated to 500,000 motile sperm/oocyte. Interestingly, however, poor pregnancy outcome still occurred.

A study was conducted to determine if in a group of infertile couples not undergoing in vitro fertilization where a female factor has been identified and seemingly corrected, would a correlation with normal morphology in the male partner be seen in the couples achieving pregnancies and would poor morphology correlate with those failing to conceive? Furthermore, the Kruger strict criteria would be compared to WHO morphologic standards to see if the former better identifies the subfertile males.

Table 1. Kruger method criteria for sperm morphology

Normal	Must have smooth oval shape Well-defined acrosome, consisting of 40–70% of the head Cytoplasmic droplets less than half the size of the sperm head Length of head 5–6 μm Diameter of head 2.5–3.5 μm No neck, midpiece or tail defects
Slight amorphous	Head diameter 2.0–2.5 μm Slight abnormalities in the shape of the head Must have a normal acrosome Neck – debris of thickness, but normal head
Severe amorphous	No acrosome or < 30% or > 70% Completely abnormal shape Neck – bend in neck or midpiece

Materials and Methods

Two separate studies were conducted. The first study consisted of 41 infertile couples (group 1) where the male counterpart's semen analysis was evaluated for morphology by the Kruger strict criteria (table 1). The second study consisted of 145 couples (group 2) where the WHO criteria were used for assessing morphology. The two groups were composed of entirely different patients.

A requirement for both groups was that a female factor be identified and seemingly corrected. Motile densities were determined using a Makler chamber. Men with less than 5×10^6 sperm/ml were excluded from these studies. The pregnancy rates in 6 months were determined.

Results

The correlation of strict morphologic changes in group 1 males and 6-month pregnancy rates in their female partners are seen in table 2. Though the numbers are small, just as many if not more patients with 5–14% normal forms achieved pregnancies in their wives compared to those wives of men with 14%. There were not enough cases yet to fully investigate the less than 5% category. Though not part of this study, so far 2 men out of 233 have achieved a pregnancy in their wives with strict morphological criteria under 5%. Of interest was also the fact that the motile density did not effect the pregnancy rate. A total of 24/33 men

Table 2. Correlation of morphology (as determined by Kruger's stricter criteria) and pregnancy rates (6 months)

	MD > 10 × 10^6/ml			MD < 10 × 10^6/ml		
	Kr > 14	Kr 5–14	Ke < 5	Kr > 14	Kr 5–14	Ke < 5
Patients	24	8	1	2	6	0
Pregnancies	9	4	0	1	4	0
Pregnant, %	33	50	0	50	67	0

Table 3. Correlation of morphology (as determined by WHO criteria) and pregnancy rates (8 months)

	MD > 10 × 10^6/ml		MD < 10 × 10^6/ml	
	normal WHO	subnormal WHO	normal WHO	subnormal WHO
Patients	98	22	20	8
Pregnancies	83	18	20	6
Pregnant, %	87	82	100	75

(73%) were found normal. Though 84.6% conceived when the motile density by WHO was normal; nevertheless so did 82% with abnormal WHO morphology as seen in table 3. Again, motile densities failed to correlate with achievement of pregnancies in the female partners.

Discussion

With in vitro fertilization (IVF), theoretically, fertilization may be achieved by a lower percentage of normal sperm since the sperm are placed almost immediately together with the ova directly, rather than traverse the large distance reproductive tract and be required to survive many hours before the egg is naturally prepared and in position for fertilization. Though Kruger has found only 4% or lower correlates with IVF fertilization, the possibility exists that this number is low for situations more

demanding for the sperm, i.e. in vivo fertilization. However, there were no statistically significant differences ($p = 0.41$) between men $> 14\%$ normal versus 5–14% concerning their fertilization potential.

Whether we will corroborate the conclusions from IVF data in the in vivo system, i.e. that morphology $< 5\%$ can distinguish fertile from subfertile males, will have to await a larger series. The reason for the higher pregnancy rates in female partners of group 2 men versus group 1 is not clear but may be related to a fortuitous difference in average age for the females (36.5 in group 1 and 30.3 in group 2). The data was surprising in that even males with the combination of subnormal motile densities (MD) with strict criteria only 5–14% did not demonstrate a reduced fertility rate in comparison to normal MD and normal morphology.

References

1 Rogers, B.J.; Bentwood, B.J.; Van Campen, H.; Helmbrecht, G.; Soderdahl, D.; Hale, R.W.: Sperm morphology assessment as an indicator of human fertilizing capacity. J. Androl. *4:* 119–125 (1983).

2 Kruger, T.F.; Acosta, A.A.; Simmons, K.F.; Swanson, R.J.; Matta, J.F.; Oehninger, S.: Predictive value of abnormal sperm morphology in in vitro fertilization. Fertil. Steril. *49:* 112–117 (1988).

3 Oehninger, S.; Acosta, A.A.; Morshedi, M.; Veeck, L.; Swanson, R.J.; Simmons, K.; Rosenwaks, Z.: Corrective measures and pregnancy outcome in in vitro fertilization in patients with severe sperm morphology/abnormalities. Fertil. Steril. *50:* 283–287 (1988).

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