In vitro fertilisation when normal sperm morphology is less than fifteen per cent

Results of *in vitro* fertilisation and embryo transfer at H. F. Verwoerd Hospital, Pretoria

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Summary

The outcome of *in vitro* fertilisation and embryo transfer in 90 couples where the husband's normal sperm morphology was less than 15% were analysed. Based on the percentage of morphologically normal spermatozoa the patients were divided into three groups: group A — normal morphological features 0 - 5%; group B — 6 - 10%; and group C — 11 - 14%. A control group had normal morphological features ⩾ 15%. The fertilisation rate and number of embryos transferred was not significantly different in these groups. However, the pregnancy rate per embryo transfer was significantly different for groups A and B compared with group C and the control group (0% and 5,9% for groups A and B v. 13,9% and 18,3% for group C and the control group, respectively). It is concluded that when the normal sperm morphology is less than 11% the prospect of a pregnancy is poor.

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In vitro fertilisation (IVF) and embryo transfer (ET) were originally devised as treatment for patients with tubal disease. At present IVF and ET are being used for other infertility problems. Such problems include unexplained infertility, endometriosis, cervical factor infertility, and infertility due to a male factor.

It is now realised that sperm morphology is of great significance in the outcome of an IVF and ET programme.[1]

A retrospective study was therefore undertaken to evaluate the outcome of IVF and ET in patients where the only abnormality was that the husband's normal sperm morphology was < 15%.

Subjects and methods

During the period June 1986 - September 1988, 90 couples underwent IVF and ET at the H. F. Verwoerd Hospital, Pretoria, because of a male factor infertility problem. This factor was a normal sperm morphology of < 15%. All the men had a normal spermatozoa concentration of ⩾ 20 × 10^6/ml, normal motility of ⩾ 40%, and a normal forward progression of ⩾ 2+. The patients were divided into three groups according to the sperm morphology: group A — normal morphological features 0 - 5% (13 patients); group B — 6 - 10% (34); and group C — 11 - 14% (43).

Evaluation of sperm morphology was done by the personnel of the andrology unit, using the strict criteria described by Van Zyl *et al.*[2]

The control group consisted of 61 patients undergoing IVF and ET for indications other than a male factor during the same period.

The IVF and ET procedures were similar for all groups. The ovulation induction regimen consisted of clomiphene citrate 50 mg/d plus 1 ampoule of human menopausal gonadotrophin (HMG) for days 5 - 9. From day 10 of the cycle, evaluation of the follicular response was by daily ultrasonography and measurement of serum oestradiol levels. Additional HMG (1 - 2 ampoules) was given during the next 2 - 3 days if follicular growth was insignificant. Human chorionic gonadotrophin (HCG) 5 000 IU was given when the average size of three diameters of the dominant follicle measured in two planes was ⩾ 20 mm and the serum oestradiol level was > 3 000 pmol/l. Oocyte recovery took place 36 hours after injection of the HCG.

The husband's semen was collected in a sterile jar approximately 2 - 3 hours after aspiration and positive identification of oocytes. After liquefaction at room temperature the quality of semen was evaluated and documented. For semen processing 2 ml of Ham's F-10 culture medium enriched with 10% heat-inactivated maternal serum was added to 1 ml semen in a Falcon tube. The mixture was centrifuged at 500 *g* for 10 minutes. The supernatant was carefully withdrawn using a sterile glass pasteurpipette and discarded. The pellet was gently resuspended in 2 ml of culture medium, centrifuged at 500 *g* for 10 minutes and the supernatant again withdrawn and discarded. Without disturbing the pellet, 2 ml of culture medium was added to the pellet and incubated for 30 minutes at 37°C in a gas phase of 5% carbon dioxide and 90% nitrogen to allow the swim-up of sperm. Thereafter the quality of the sperm was again evaluated and documented.

Insemination of the oocytes was performed 6 - 8 hours after oocyte recovery using 100 000 motile sperm per oocyte in all patients. The oocytes were examined for the presence of pronuclei with a stereoscopic microscope 15 - 18 hours after insemination. The fertilised oocytes were then transferred to new growth medium. Approximately 40 hours after insemination the embryos were transferred to fresh growth medium and screened for the presence of blastomeres. Embryo transfer was performed 44 - 48 hours after insemination of the oocytes.

The fertilisation rate, number of embryos transferred and pregnancy rate per embryo transfer were compared between the three study groups and the control group.

For statistical significance Fisher's exact test was used (P = 0,10).

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TABLE I. FERTILISATION RATE, NO. OF EMBRYOS TRANSFERRED/PATIENT AND CLINICAL PREGNANCY RATE/ET

	Study group			
	Group A	Group B	Group C	Control group
No. of patients	**13**	**34**	**43**	**61**
Oocyte fertilisation rate (%)	**76,9**	**88,2**	**83,7**	**78,8**
No. of embryos transferred/patient	**2,0**	**2,2**	**2,0**	**2,5**
Pregnancies reported	**0**	**2**	**6**	**11**
Clinical pregnancy rate/ET (%)	**0**	**5,9**	**13,9**	**18,3**

Results

The fertilisation rate, average number of embryos transferred and pregnancy rate for each group are shown in Table I. The pregnancy rate for group C was not significantly lower than that of the control group ($P = 0,3921$).

Discussion

IVF and ET are becoming a more widely accepted form of treatment for infertility caused by a male factor. The morphology of spermatozoa plays an important role in the fertilisation process. Rogers *et al.*[3] reported that 73% of infertile men can have a normal sperm count and motility but have lower than normal sperm morphological features.

Morphological features of sperm must be evaluated by personnel with sufficient experience. Evaluation of sperm morphology by strict criteria is a valuable tool in predicting a couple's chance of achieving pregnancy after embryo transfer. Various studies[4] have been designed to evaluate the fertilisation and cleavage rate of human oocytes where the normal sperm morphology is < 15%.

Mahadevan and Trounson[5] indicated that the percentage of morphologically abnormal sperm was significantly related to the fertilisation rate. Kruger *et al.*[6] reported a fertilisation rate of 37% when the normal sperm morphology was < 15%. In our study the fertilisation rate for the three study groups was similar to that of the control group (Table I).

In the study by Kruger *et al.*[6] no pregnancies were reported in patients where the husband had a sperm morphology of < 15%. In our study there were 8 pregnancies in groups B and C where the sperm morphology was between 5% and 14% (Table I). It was, however, clear that the pregnancy rate in cases with a sperm morphology of < 11% was significantly reduced (Table I).

The implication of the reduced pregnancy rate in groups A and B is of practical relevance to the clinician and the patient. These results can be used as a prognostic tool in counselling and treating couples where the husband's normal sperm morphology is < 15%.

It is concluded from this study that IVF for couples where the husband's normal sperm morphology is < 11% is poor and that this should be discussed with the people concerned.

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