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The influence of hyperinsulinaemia on male fertility

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INTRODUCTION:

The investigation of the role of insulin in male infertility is of clinical importance as insulin levels have an impact on the reproductive ability of men. The effect of raised insulin levels and poor glycaemic control on sperm quality and male fertility has not been documented to date. This lack of clinical data on hyperinsulinaemia in male infertility patients contributed to the need for research in this field.

AIM:

- 1) To determine the prevalence of hyperinsulinaemia in a group of young, normozoospermic men and their performance in an in vitro fertilisation (IVF) program.
- 2) To compare a normo- and hyperinsulinaemic group of infertile men with respect to semen parameters and IVF performance.
- 3) To investigate the effect of metformin and an anti-oxidant intervention prior to IVF treatment in hyperinsulinaemic men.

MATERIALS AND METHODS:

Blood samples were taken for measuring fasting/basal insulin levels (I_0) before 10H00 and then repeated 120 minutes (I_{120}) after participants had a normal breakfast. Insulin, FSH, LH, SHBG, GH and testosterone assays were performed on the fasting blood sample using an Immulite[®] Automated Analyser. Semen samples were obtained from each male research participant and were assessed according to the World Health Organization recommendations. The controlled ovarian stimulation of IVF female patients was achieved after GnRH suppression with Lucrin, using recombinant FSH (Gonal F[®], Serono-Merck, Gauteng, South Africa) and Luveris. Embryo development and quality was noted for each patient. Pregnancy was confirmed by serum human chorionic gonadotrophin (HCG) levels and a clinical pregnancy was confirmed with ultrasound two weeks later. The outcome of the pregnancy was noted and clinical pregnancy rates were determined. Hyperinsulinaemic men were treated for the last part of the study with Glucophage[®] and StaminoGro[®].

RESULTS:

The prevalence of raised insulin was high (44%) in the normozoospermic donor group. A higher number of good quality blastocysts (37%) and pregnancies (30.7%) were obtained in the IVF programme from donors with normal fasting insulin levels. The normo-insulinaemic group of infertile men had a statistically significantly higher pregnancy rate (57.9%) compared to the group with abnormal insulin levels (31.8% $p \leq 0.05$). Hyperinsulinaemic males showed a higher percentage of sperm with poor DNA chromatin packaging and DNA fragmentation. Improvement in sperm morphology (4.2 ± 1.6 to 5.5 ± 2.8) and CMA₃ levels (64.3 ± 11.6 to 52 ± 6.8) were demonstrated in infertile hyperinsulinaemic men after treatment with metformin and supplements in the fourth phase of the study ($p=0.016$)

CONCLUSION/DISCUSSION:

Hyperinsulinaemia has a negative effect on male fertility. Hyperinsulinaemic men undergoing ART can benefit from metformin and anti-oxidant treatment prior to IVF treatment.