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The Human Sperm Head: A Key for Successful Fertilization

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In order to examine the predictive value of determining the sperm head shape, the acrosomal size, the presence of acrosomal vacuoles, and the challenged acrosome reaction (AR) on the outcome of a standard in vitro fertilization (IVF) program, a prospective study was conducted that included 75 couples undergoing IVF treatment. An assessment of sperm morphology was performed using the Hobson Sperm Tracker (Hobson Tracker Limited, Sheffield, United Kingdom). The assessment of the AR was performed before and after adding pooled undiluted human follicular fluid (FF). The outcome measure was an IVF rate of inseminated oocytes. A positive correlation was found between the fertilization rate (FR%) and the proportion of the sperm with a normal (oval) head shape ($P < .001$), the sperm exhibiting acrosomal vacuoles ($P < .003$), the sperm with a normal acrosomal size (40%–70% of total head area, $P < .025$), and the sperm undergoing AR after adding FF ($P < .001$). Multiple logistic regression analysis revealed that by incorporating the above 4 parameters, the sensitivity of prediction of IVF FR% values was 79%, and the specificity was 93%, with a positive predictive value of 96%. This study shows that the multiparametric assessment of the sperm head is useful in predicting the FR% values of a standard IVF treatment. The automated analysis used in this study is shown to maintain a level of precision and accuracy acceptable for application in a routine semen analysis situation.

Key words: Fertilization rates, in vitro fertilization, computer-assisted sperm analysis, acrosome, vacuoles, sperm morphology