Direct Correlation between Serum β-hCG levels prior to Oocyte Retrieval and Blastocyst Formation.

How Come We All Missed It?

Background: For over thirty years, reproductive endocrinologists have been involved in studies of human IVF cycles in an attempt to achieve better understanding of ovarian activity to improve IVF success. A literature search will yield thousands of studies addressing multiple combinations of different gonadotropins in use but only a handful of investigations that address the use of β-hCG and its isolated effect on the results of IVF cycles. Triggering final oocyte maturation with β-hCG injection is the final step before oocyte retrieval and the most commonly used dose is 10000 IU. This dosage has been considered adequate although multiple studies have indicated that 5000 IU or even 2500 IU will be able to effect oocyte maturation. With the exception of patients with high BMI or at high risk for ovarian hyperstimulation syndrome (OHSS), most clinics do not routinely adjust β-hCG dose based on the patient's characteristics.

For over ten years at our center, serum β-hCG levels are tested on the morning before oocyte retrieval, the morning after β-hCG administration, to reduce "empty follicle syndrome". The serum levels of β-hCG noted after administration are widely disparate. Patients with low serum β-hCG levels in a previous IVF cycle are given 20000 IU β-hCG trigger for a subsequent cycle. Examination of these numbers prompted questions about the impact the serum β-hCG levels may have in patient outcomes after IVF.

Methods: We conducted a retrospective review of 728 fresh IVF cycle data at our center between 2014 and 2016. We abstracted information on age, BMI, number of retrieved oocytes, oocyte maturity and blastocyst formation rates. We evaluated the correlation of these parameters with different serum β-hCG levels the day prior to oocyte retrieval. The patients were divided into three groups based on their BMI (normal <25, overweight 25-29.9, and obese >30). The mean level of serum β-hCG was calculated for each group. One standard deviation (1 S.D.) below the mean was considered a low serum β-hCG level and in a similar fashion, 1. S.D. above the mean was considered a high serum β-hCG level.

Results: A positive correlation was seen between the level of serum β-hCG and the rate of blastocyst formation. This correlation existed regardless of the patient's BMI. Across all groups, BMI was inversely correlated with the serum level of β-hCG. 8.3%, 7.3%, and 7.8% of patients in the normal, overweight and obese groups respectively had serum levels that were 1 S.D. below the mean. These patients had significantly lower rates of blastocyst formation than all the other patients: 41.8% vs. 57.7% - 67.6% for the normal BMI group; 42.5% vs. 61.7% - 69.8% for the overweight group; and 30.8% vs. 58.7 % - 66% for the obese group. Total oocyte and MII oocyte number per retrieval was not significantly different regardless of β-hCG trigger dose, but the number of blastocysts formed were significantly higher for the patients who received the 20000IU β-hCG trigger (5.7 vs. 2.1). Administration of 20000IU β-hCG to obese patients resulted in a significant increase in the rate of blastocyst formation (54% vs. 42%). 20000 IU β-hCG given to patients with BMI >35 resulted in equal rates of blastocysts/MII oocyte formation as patients with BMI <24.9. There was no case of OHSS with the administration of 20000IU β-hCG. So far, we have seen similar improvement with blastocyst formation outcomes with the normal BMI group who had a low serum β-hCG level in a previous IVF cycle, and were treated with 20000IU in the subsequent cycle.