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SERUM ß-hCG CONCENTRATION CHANGES FOLLOWING INTRAMUSCULAR hCG ADMINISTRATION

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ABSTRACT

In circumstances such as in vitro fertilization (IVF) or in patients with luteal phase defect, one needs to ensure the establishment of pregnancy as soon as possible. At the same time, a question arises: How can a physician make sure that the ß-hCG is of an endogenous source and not the residue of the prescribed drugs (hCG)? In this article we have studied the elimination time of IM injection of 5000 IU hCG in 11 normal, and IM injection of 5000 and 10,000 IU hCG in 11 Rokitansky patients. The time of complete elimination of ß-hCG from the circulation in 10 normal women and 5 Rokitansky patients receiving 5000 IU of hCG were 7-11, and 7-8 days respectively. There was no statistically significant difference between these two groups. Comparing the two groups of Rokitansky patients receiving 5,000 and 10,000 IU of hCG, the elimination time were dose-dependent, and were significantly different from each other ($P<0.01$). We conclude that when the serum level of ß-hCG is higher than 5m IU/ml after 11 and 14 days with 5,000 and 10,000 IU of hCG injection, it could be accepted as an implanted pregnancy.

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INTRODUCTION

Induction of ovulation in patients with ovulatory problems is currently performed by different methods. Administration of clomiphen citrate followed by human chorionic gonadotropin (hCG)[1] or treatment with human menopausal gonadotropin (hMG) plus hCG[2] are routine procedures. In some circumstances such as in vitro fertilization and embryo transfer (IVF-ET) or patients with luteal please defect, one needs to ensure the establishment of pregnancy as soon as possible in order to begin the proper therapy.

This article compares the elimination times of 5,000 and 10,000 IU hCG in 11 normal woman and 11 patients with Rokitansky syndrome in order to help differentiate endogenous from residues of prescribed hCG.

(Presented in part at the 1987 National American Society for Clinical Chemistry, San Francisco (Clin-Chemistry 33:889,1987).

MATERIALS AND METHODS

Eleven normal non-pregnant women participated in this study (group I) and received 5,000 IU hCG intramuscularly (IM). Due to the difficulty in convincing normal women of the low risk of complications, we invited 11 patients with Rokitansky syndrome to participate in our study in two other groups: group II-five patients which received 5,000 IU hCG (IM), and group III-six patients which received 10,000 IU hCG (IM). All the individuals from three groups were in the follicular phase of the cycle as indicated by their serum

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progesterone levels, except one patient from group 1 who was later eliminated from the study. Their laboratory parameters such as renal clearance, thyroid status, and liver function tests were all normal.

hCG Injection and Blood Samplings

The first blood sample was collected before injection of hCG (IM) and the next four samples were obtained at two hour intervals two, four, six, and eight hours after injection. Sampling was continued every 24 hours thereafter for 14 days.

Hormone-Assay

The serum ß-hCG levels were measured by RIA technique using Malichords Kits (RIA-mat hCG).

Evaluation of the Half-Life and Elimination Time of hCG

The half life of the drug was calculated from semi-log graphs plotted comparing concentration (Y-axis) with elimination time (X-axis).[3] The complete elimination of ß-hCG from the serum was considered to be the time when its concentration reached a level of less than 5 mIU/ml.

We used the T test for our statistical analysis.

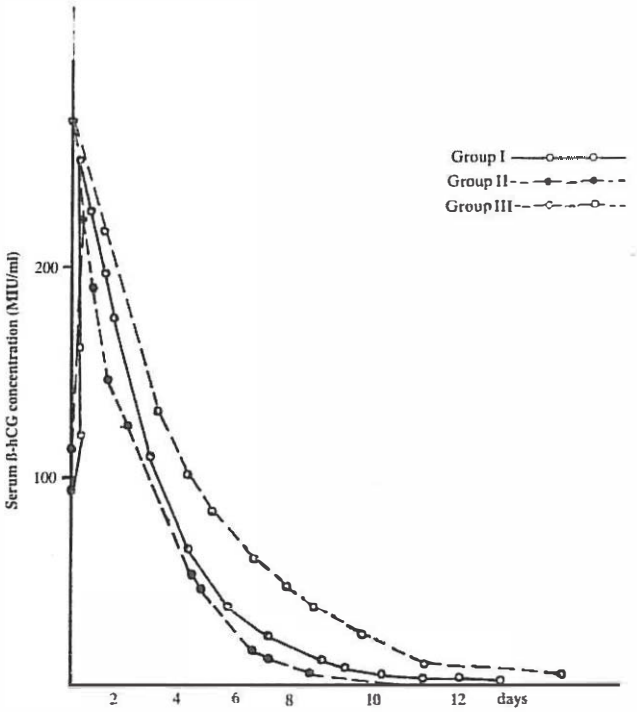

Fig.1. Disappearance curve of IM injected hCG in 3 groups of patients and healthy volunteers.

RESULTS

As shown in Fig. 1, the ß-hCG curve after reaching its maximum in the seven to eight hours post-injection, declined biphasically in all three groups. The average half life of two phases were 9.7±0.7, and 30.6±1.8 hours, respectively. The time of complete elimination of ß-hCG from the circulation in groups I and II were seven-11, and seven-eight days. There was no statistically significant difference between these two groups with the average elimination time of 8.5±1.2 days, compared to 7.8±0.4 days. Comparing the two groups of Rokitansky patients receiving 5,000 and 10,000 IU of hCG, the elimination times (7.8±0.4 versus 10.3±1.9) were dose dependent and significantly different from each other ($p<0.01$). Our results demonstrate that the higher the dose of hCG injected, the longer the elimination time and the higher the serum ß-hCG concentration.

DISCUSSION

The doses of hCG administered for induction of ovulation varies according to the conditions and needs of the patients.[4] The dose may range from 1,500 up to 40,000 units, in single or multiple injections. Whatever the procedure used, knowledge of implantation time is necessary for continuation of therapy to support the pregnancy. In our study we clearly demonstrated that the maximum elimination time of 5,000 and 10,000 IU of hCG injected intramuscularly is 11 and 14 days, respectively. We know that the time of appearance of endogenous ß-hCG with *in vitro* fertilization is 11-17 days after embryo-transfer.[5]

By the knowledge of the authors there is no article to compare the concentration of serum ß-hCG after injection of 5,000 and 10,000 IU of hCG intramuscularly. We are not also aware of any articles to study the elimination time of ß-hCG in Rokitansky patients after

Table I. Characteristics of healthy volunteers

No. of volunteers	Age (years)	Weight (kg)	Major disease	Major surgery	Age of puberty	Menstrual cycle	Length of cycle (day)	Duration of bleeding (day)	Drug sensitivity
11 (Group 1)	22.4±2.0 One case 38 yr. old	52.7±5.4 One case 72 kg	None	None	14.2±1.3 (11-15)	Normal	28±1.8 (26-32)	6.8±1.5 (3-10)	None

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Table II. Characteristics of patients with Rokitansky syndrome

No. of patients	Age (year)	Weight (kg)	Major disease	Major surgery	Kidney condition IVP	Kidney condition Function	Karyotype	Sex chromatin	Drug sensitivity	Ovarian biopsy
5 (group# 2)	20.2±4.4	51±3.0	None	None	One case with renal agensis	Normal	46 XX	+	None	Normal ovary
6 (group#3)	23.8±3.0	53±3.9	None	None	One case with right ectopic kidney	Normal	46 XX	+	None	Normal ovary

Table III. Disappearance time of injected hCG (IM) in healthy volunteers and patients with Rokitansky syndrome.

	Units of hCG	Disappearance time (days)			
		Fastest	Slowest	Mean	SD
Group # 1 (healthy volunteers)	5000	7	11	8.5+1.2	
Group # 2 (Rokitansky syndrome)	5000	7	8	7.8+0.4	
Group # 3 (Rokitansky syndrome)	10,000	9	14	103#	

receiving hCG intramuscularly.

According to the results of our study we conclude that when the serum level of ß-hCG is higher than 5 mIU/ml after 11 and 14 days of 5,000 and 10,000 IU hCG injection, it could be accepted as an implanted pregnancy. Before these times we must comfirm pregnancy with a rising ß-hCG level. We can surmise that when we use higher doses of hCG (more than 10,000 IU) the elimination time will be extended. We also concluded that there was no significant difference between elimination times of ß-hCG in normal women and patients with Rokitansky syndrome.

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