NOTE

Effect of Arginine and Arginine-Glucose Infusion on Serum Human Chorionic Gonadotropin Response in Postpartum Women

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Synopsis

The metabolic patterns of HCG in response to 5% glucose, arginine-saline and arginine-glucose infusion were investigated in normal postpartum women. Serum HCG concentration was measured by a double antibody radioimmunoassay method. Following arginine-glucose infusion, serum HCG level declined significantly within 30 min of the infusion, while 5% glucose or arginine-saline infusion failed to produce any change in HCG concentration. Changes of blood glucose concentration during arginine-glucose infusion was similar to that during 5% glucose infusion. The possible reasons for the decline of serum HCG level after arginine-glucose infusion are discussed in this paper.

Arginine-monochloride has been reported as stimulating release of growth hormone and immunoreactive insulin (Parker *et al.*, 1967; Knopf *et al.*, 1965). However, to our knowledge, no reports have been made on the effects of arginine infusion on gonadotropin, especially on human chorionic gonadotropin (HCG) response. The purpose of this study is to determine the response of serum HCG level to arginine or glucose infusion in normal postpartum women.

Materials and Methods

Blood samples were obtained from eighteen normal postpartum patients two or three days after delivery. The subjects were divided into three groups: Group 1, 6 subjects which received 500 ml of 5% glucose solution; Group 2, 6 subjects which received arginine in saline solution; Group 3, 6 subjects which received arginine in 5% glucose solution.

Infusion test: All subjects were tested after an overnight fast. Five hundred mg/kg body weight of L-arginine monochloride (Levargin, Taisho Seiyaku Co., Ltd., Tokyo) in saline solution or in 5% glucose

solution was infused into the antecubital vein at a constant rate within 40 min period. Blood samples were drawn immediately before the infusion and at 15, 30, 45, 60 and 90 min intervals after the start of the infusion. No side effects occurred in all cases during and after infusion.

To prove the effect of arginine-glucose solution upon serum HCG level, sera from three pregnant subjects were incubated with arginine-glucose solution. To 1.0 ml of the serum, 0.05, 0.1 or 0.2 ml of arginine-glucose solution (40 mg/ml in 5% glucose solution) was added respectively, and the mixtures were incubated for 60 min at 37°C.

Serum HCG activity was measured in duplicate by a double antibody radioimmunoassay previously described (Kato, 1970). Anti-HCG serum obtained from guinea pig cross-reacted very weakly with HTSH. Purified HGH, ACTH (porcine), prolactin (porcine) and L-arginine-monochloride had no effects in this assay system. Blood glucose level was determined by a glucose-oxidase method.

Results

Changes of the serum HCG and blood glucose levels are shown in Figure 1. No significant changes of HCG levels were noted after 5% glucose or arginine-saline infusion.

Fig. 1. Mean glucose and HCG levels during 5% glucose, arginine-saline and arginine-glucose infusion in normal postpartum women.

A significant decline in serum HCG levels was observed after arginine-glucose infusion at 30 min of the infusion. The maximal decline was $43 \pm 23\%$ of the preinfusion level which was statistically significant ($p < 0.05$). The serum HCG levels returned to the preinfusion level after 60 min. Blood glucose levels after arginine-glucose infusion rose from 100 ± 20

mg/100 ml to 176 ± 48 mg/100 ml, which was similar to that during 5% glucose infusion.

Effect of arginine-glucose solution upon serum HCG level *in vitro*: The results are shown in Table 1. No degradation of immunological activities of HCG were noted after the incubation with arginine-glucose solution.

Table 1. Effect of arginine-glucose solution on immunological activity of serum HCG *in vitro*. Each serum was incubated with different amounts of arginine-glucose solution (40 mg/ml in 5% glucose solution).

SUBJECT	HCG, IU/ml			
	ARGININE-GLUCOSE SOLUTION ADDED, μ l			
	0	25	125	250
K.F.	26.0	26.6	22.6	25.4
K. U.	34.0	33.2	33.2	32.0
T. O.	62.0	60.0	64.0	65.0

Discussion

Tyson *et al.* (1969) reported that arginine administration, in saline solution, had failed to change the maternal chorionic somatomammotropin levels during pregnancy. Reitano *et al.* (1971) showed that, in premature infants, infusion of arginine plus glucose produced higher serum insulin levels than do arginine alone. In our data, the serum HCG levels remained unchanged after arginine-saline infusion or 5% glucose infusion, whereas following the infusion of arginine-glucose solution a significant decrease in serum HCG levels was noted. The decrease levels of serum HCG may be caused by the combined effect of arginine and glucose.

The explanation for the decline of HCG levels after arginine-glucose infusion is not known yet. In several cases during the first trimester of pregnancy, the serum HCG declines were also observed after arginine-glucose infusion (Kato, unpublished data). Three possible explanations may be suggested: First, the increase of HCG metabolism; Second, inactivation of HCG activity; Finally, suppression of HCG secretion. The metabolic clearance rate of HCG has been discussed by several investigators. Tawfik *et al.* (1969) reported that following intravenous injection of HCG, the disappearance rate of HCG in

plasma had two exponential components, an initial fast component with a half-life of 5.6 hr and a second slower component with a half-life of 23.9 hr. In this respect, the third hypothesis seems to be an inadequate explanation for the decline of HCG levels, because serum HCG levels declined about 50% within 30 min.

To prove the direct effects of arginine-glucose solution on the HCG activity, several serum specimens from pregnant subjects were incubated with arginine-glucose solution. No significant changes of immunological activities of HCG were observed. The mechanism of HCG metabolism *in vitro* is different from that *in vivo*, and the nature of the rapid decline of serum HCG levels following arginine-glucose infusion remains to be verified. However, the first hypothesis seems to be the possible explanation for this phenomenon.

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