Serum Cortisol Levels in Pregnancy Induced Hypertension Patients

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FURUHASHI, N., KONO, H., HIRUTA, M., TAKAHASHI, T., TANAKA, M., FUKAYA, T., SHINKAWA, O. and YAJIMA, A. *Serum Cortisol Levels in Pregnancy Induced Hypertension Patients*. Tohoku J. exp. Med., 1986, **149** (1), 21-24 — We measured the serum cortisol levels in 15 normal and 8 pregnancy induced hypertension (PIH) primigravidas. The normal pregnancy had a significant ($p < 0.05$) higher cortisol level than that of PIH patient. Especially, 4 severe PIH patients had a significantly ($p < 0.05$) lower cortisol level. The lower maternal cortisol level of PIH patients became more significant with the severity of clinical symptoms of PIH. After the onset of labor, the cortisol levels of PIH patients did not elevate compared with normal pregnancy. These data suggest that in the PIH patient the reactivity of the adrenal cortex to adrenocorticotrophic hormone (ACTH) may be blunted or the cortisol production in the adrenal cortex may be decreased by the tissue circulation insufficiency due to PIH. ——— pregnancy induced hypertension; cortisol; primigravida

The pregnancy induced hypertension (PIH) remains one of the major causes of maternal death in Japan and is responsible for a significant proportion of the total perinatal mortality. However, the etiology of PIH has remained elusive and the treatment is symptomatic and empirical. Considerable evidence suggests that serum cortisol may play some important role in the pathophysiology of PIH (Kopelman and Levitz 1970; Weir et al. 1976). Although serum cortisol levels in pregnancy have been studied, there have been few systematic studies of PIH in relation to the levels and physical state of serum cortisol.

In this study, serum cortisol levels were assayed in PIH patients and normal third trimester primigravidas. In addition, changes in serum cortisol levels were followed up along the course of labor in normal and PIH patients.

MATERIALS AND METHODS

All patients studied were in the 3rd trimester primigravidas. Normal 15 primigravidas were free of hypertension and proteinuria. All 8 primigravida PIH patients either had a blood pressure of 140/90 mmHg or higher on two occasions, or showed a sustained rise in

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systolic blood pressure more than 30 mmHg and diastolic more than 15 mmHg. In addition, all showed recurrent proteinuria and a rapid weight gain not accounted for polyhydramnios.

The radioimmunoassay techniques for serum cortisol have been reported previously (Furuhashi et al. 1982). The coefficients of variation of this method were less than 15%. Values were given in terms of mean $\pm$ s.d. Statistical analysis was performed with Student's *t*-test. Differences were taken to be significant when *p* values were less than 0.05.

RESULTS

During the last week of pregnancy, the cortisol level of normal primigravida ($47.1 \pm 14.7 \mu\text{g}/100 \text{ ml}$, $n = 15$) was significantly higher than that of PIH patients ($33.8 \pm 9.4 \mu\text{g}/100 \text{ ml}$, $n = 8$).

We analyzed the cortisol levels in relation to the clinical symptoms and severity of PIH. The severe systolic hypertension cases ($160 \text{ mmHg} \leq$) had lower cortisol levels ($22.1 \pm 2.3 \mu\text{g}/100 \text{ ml}$, $n = 3$) than mild hypertension ($140 \leq - < 160 \text{ mmHg}$) and normal patients. The severe diastolic hypertension ($110 \text{ mmHg} \leq$) also had the lower cortisol levels ($27.3 \pm 9.2 \mu\text{g}/100 \text{ ml}$, $n = 4$) than those of other 2 groups. The patients with severe proteinuria ($200 \text{ mg}/100 \text{ ml} \leq$) had the lower serum cortisol level ($22.1 \pm 2.3 \mu\text{g}/100 \text{ ml}$, $n = 3$) compared with mild proteinuria ($30 \text{ mg}/100 \text{ ml} \leq - < 200 \text{ mg}/100 \text{ ml}$) patients ($40.8 \pm 2.6 \mu\text{g}/100 \text{ ml}$).

The changes in the maternal serum cortisol levels after the onset of labor in normal and PIH patients are shown in Fig. 1. In normal pregnant women, serum

Fig. 1. Maternal serum cortisol levels and duration of labor.

○ — ○, normal; ● — ●, PIH.

Values are given as mean $\pm$ s.e.

p* < 0.05; *p* < 0.01.

Numbers in parenthesis means the numbers of samples.

cortisol level elevated gradually along the course of labor. However, the cortisol levels of PIH patients were not significantly elevated.

DISCUSSION

In this study, we found significantly suppressed serum cortisol levels in PIH patients within one week before the labor. These data confirmed the report of Galvao-Teles and Burke (1973) that plasma unbound cortisol in pre-eclampsia patients was significantly lower than that in normal pregnancy. However, some reports could not find any significant difference in maternal cortisol levels between PIH and normal pregnancy (Kopelman and Levitz 1970 ; Weir et al. 1976). The one possible explanation for this discrepancy might be the timing of blood sampling. In this study, we measured just within one week before the onset of the labor. However, the previous two reports described that they measured it during the labor or in the 3rd trimester.

The lower maternal cortisol levels of PIH patients became more significant with the severity of systolic blood pressure, diastolic blood pressure and proteinuria. These data suggest that the adrenal circulation insufficiency have occurred with tissue circulation compromised by the vascular contraction in PIH.

After the onset of the labor, the maternal cortisol levels in normal pregnancy elevated with the duration of labor. On the other hand, the maternal cortisol levels in PIH patients did not elevate (Fig.1). These findings confirmed Tuimala's report (1975) which measured serum ACTH and cortisol levels during the labor. They suggested that the hypertensive complications of pregnancy did not affect the secretion of ACTH. The rise of cortisol was significant during the labor in normal pregnancy, but insignificant in the cases of hypertensive complications. This was in agreement with the earlier observation, in which the reactivity of the adrenal cortex to exogenous ACTH was weaker and less sustained when pregnancy was complicated by pre-eclamptic disorders (Garst and Assali 1956 ; Kauppila et al. 1973).

Further investigations are required in evaluating more accurately the complex of hormonal and metabolic changes and their relationships in the PIH.

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