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Short Communication

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Effects of Practical Examination Stress on Serum ACTH and Cortisol Concentrations in Normal and Anxious Students

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In the majority of human psychoneuroendocrinological and -immunological research, psychosocial stress has been operationalized using experimental and natural situations deemed to be stressful, e.g., parachute jumping, mental arithmetic, fake job interviews, performance tasks, loud noise or academic exams. Whether anxious students respond like normal students in stressful situations? To determine the difference between their responses, students were divided into two groups (n = 36) as normal and anxious by their state-anxiety scores of anxiety standard questionnaire. Blood sampling was carried out in none-stressful period and 20 min before practical examination between 8-9 am. Serum ACTH and cortisol concentrations were measured by RIA. The results showed that stress of examination increased level of ACTH and cortisol in both groups significantly. The ACTH and cortisol concentrations did not differ between normal and anxious students in both situations. Therefore, stress examination can increase stress hormones in stressful situations, but scores of anxiety standard questionnaire is not useful for determination of subject's anxious behavior.

Key words: Stress examination, anxiety, ACTH, cortisol

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INTRODUCTION

The hypothalamus pituitary adrenocortical (HPA) system with the secretion of cortisol has been of specific interest in the study of stress and health. Cortisol secretion is regulated by the adrenocorticotrophic hormone (ACTH) from the pituitary gland and reaches a peak in blood about 30 min after an acute stress exposure. Cortisol secretion increases in response to novel conditions, emotional challenge, fear, anxiety and helplessness and during heavy workload (Abelson *et al.*, 1994; Makino *et al.*, 1994).

The permissive, stimulatory, suppressive and preparative effects of HPA axis hormones released in response to stress are believed to ensure the maintenance of homeostasis through activation and coordination of various psychological and physiological processes, such as memory consolidation, immune functioning, cardiovascular activation, glucose metabolism and emotional processing (Nutt, 1989). Besides these adaptive short-and medium-term consequences of acute stress-induced HPA axis responses, chronic dysregulation and/or enduring excessive secretion of its hormones corticotrophin-releasing hormone (CRH), adrenocorticotropin-releasing hormone (ACTH) and cortisol have been shown to exert detrimental long-term effects on both somatic and mental well-being (Roy *et al.*, 1986; Young *et al.*, 1993).

In the majority of human psychoneuroendocrinological and-immunological research, psychosocial stress has been operationalized using experimental and natural situations deemed to be stressful, e.g., parachute jumping, mental arithmetic, fake job interviews, performance tasks, loud noise, academic exams, etc. (Rubin *et al.*, 1985). These situations were validated as stressful by their potency to elicit a psychobiological stress response. Responses of people can be different in stressful situations.

So, in this study, we compared the physiological responses of normal and anxious students in stress examination. The serum cortisol and ACTH levels have compared in non-stressful and stress examination situations in normal and anxious students.

MATERIALS AND METHODS

A total of 72 healthy volunteers ranged in age 20-24 years were divided into control and anxious students (n = 36) by anxiety standard questionnaire. In this questionnaire, subjects expressed their feelings about their future, jobs, families and etc. The blood sampling was done in none-stress situation and before practical

examination between 8-9 am. Serum cortisol and ACTH levels were measured by radioimmunoassay kit.

All data were expressed as mean±SEM. Statistical analysis was done by t-test and New-man Keuls. For all analysis, the significance level was $p < 0.05$.

RESULTS AND DISCUSSION

The results showed that stress examination increase serum cortisol and ACTH in normal and anxious students ($p < 0.01$) (Fig. 1). Also, the present results showed that stress examination increase serum cortisol in normal ($p < 0.01$) and anxious students ($p < 0.001$) (Fig. 2).

The data showed that there is not difference between serum cortisol and ACTH levels in normal and anxious students in none-stressful situation and stress examination.

Two neuroendocrine systems have been of specific interest in the study of stress and health: the sympathetic adrenomedullary system with the secretion of the two catecholamines, epinephrine and norepinephrine and the hypothalamic pituitary adrenocortical system with the secretion of cortisol. The ACTH from the pituitary gland regulates cortisol secretion and reaches a peak in blood about 30 min after an acute stress exposure

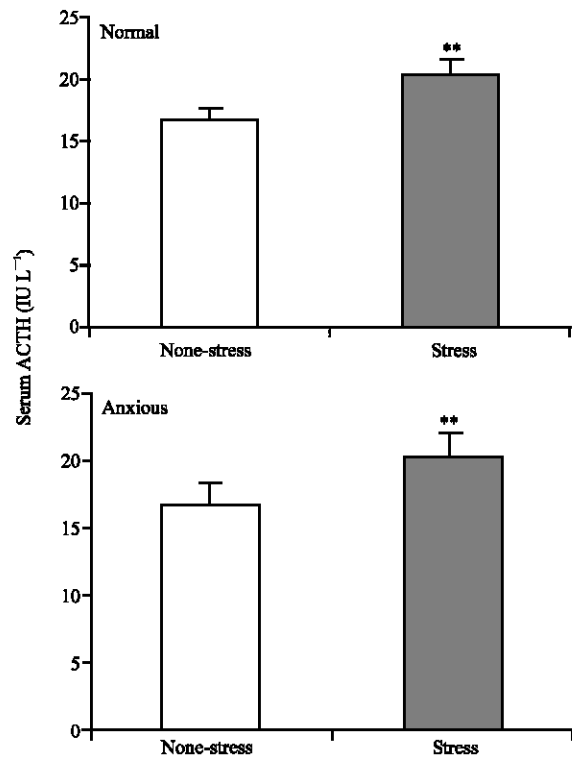


Fig. 1: Stress examination in serum ACTH in normal and anxious students

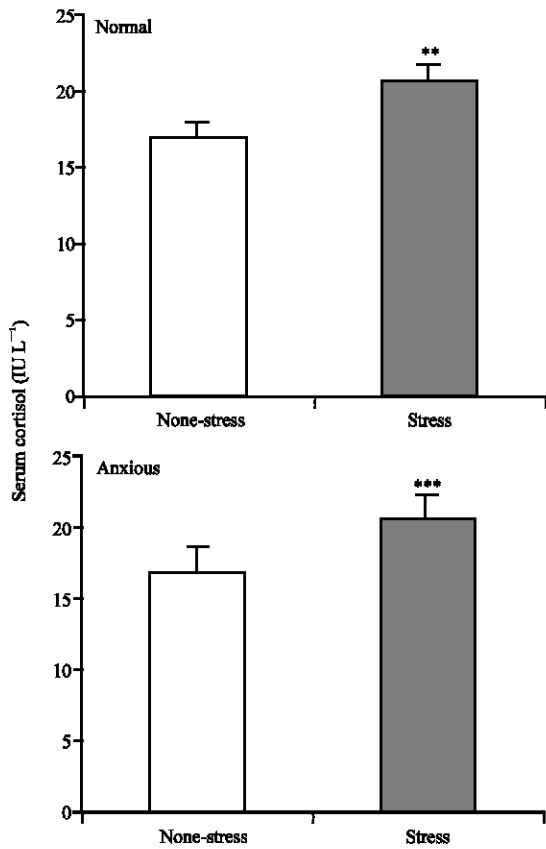


Fig. 2: Stress examination in serum cortisol in normal and anxious students

(Lundberg, 2005). Stress activates a number of systems including the hypothalamic pituitary adrenal (HPA) axis and the brain noradrenergic system controlling autonomic output (Pacak and Palkovits, 2001; Sved *et al.*, 2002). Both systems have been extensively studied in depression and anxiety disorders, although rarely in the same patient. Basic science data suggest these systems are linked via corticotropin releasing hormone (CRH) (Pacak and Palkovits, 2001; Sved *et al.*, 2002).

The present results showed that stress examination increase serum cortisol and ACTH in both normal and anxious students. So, stress examination affected HPA in both groups and increased stress hormones. On the other hand, the present data showed that there is not difference between serum cortisol and ACTH levels in normal and anxious students in none-stressful situation. Also, the

present results showed that there is not difference between serum cortisol and ACTH levels in normal and anxious students in stress examination. So, scores of a questionnaire is not a valuable criteria for anxiety classification.

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