

The Result on 1 mcg ACTH Stimulation of the HypothalamicPituitary-Adrenal Axis

Alfred F Shwayhat

Division of Endocrinology and Metabolism, Department of Internal Medicine, Naval Medical Center San Diego, USA

The low dose (1 µg) Adreno-Cortico Tropic Hormone (ACTH) stimulation check (LDST) is beneficial within the analysis of the hypothalamicPituitary-Adrenal (HPA) axis. projected uses of the LDST embrace assessment of secondary adrenal insufficiency within the patient or important care setting. The appealing characteristic of the LDST is that it produces lower corticoid elevations than the quality Dose (250 µg) adrenocorticotropin Stimulation check (SDST) which can build it a additional sensitive check in delicate illness. Provided that the LDST produces smaller elevations in humor corticoid, variety of variables that haven't been absolutely elucidated might have an effect on its accuracy. Exercise is one in all the acknowledged stimulators of the HPA axis. Recognized factors which will have an effect on the extent of HPA stimulation in relevance exercise embrace temporal order of previous meals, gender, ethnicity, body composition, and athletic fitness level. Exercise of enough intensity and period might turn out a special response to HPA axis testing. The physical mechanisms of this method haven't been absolutely elucidated. Whether or not or not exercise influences testing of the HPA axis has not been established. This study's objective was to analyze the impact of exercise in healthy male subjects on the LDST. Establishing the impact of exercise on the LDST would assist in crucial its relevancy in several patient populations and clinical settings.

Twenty-six healthy men volunteered for the study when giving consent. They were every interviewed and examined by a Dr. and excluded if that they had important current health problem, past medical issues, case history or medications that were acknowledged to interfere with the HPA axis. Specifically, subjects with airway illness, reliance on steroid preparations, or a history in keeping with associate degree abnormal internal organ or respiratory organ method were excluded from the study. previous exercise histories were taken to estimate level of learning of every subject. Subjects received specific directions to eat 3 full meals within the twenty four hours the day before and on daily of the study. They were additionally taught to get a minimum of seven hours of sleep the night before testing. every subject signed a consent kind to voluntarily participate within the study. The protocol was reviewed and approved by the Investigational Review Board at the National service heart in Bethesda, Maryland.

A 250 µg ampul of artificial adrenocorticotropin or cosyntropin (Cortrosyn; system of rules, Inc., West Orange, New Jersey) was mixed with a pair of.5 mL of 0.9% sterile traditional saline. every ampul was diluted in 250 cc of zero.9% traditional saline making a amount of one µg/mL of cosyntropin. Testing day one Subjects reported to the laboratory at 0800 h. humor corticoid

levels were drawn at two-hour intervals for a complete of 5 blood samples. They were allowed to come to figure between blood attracts and taught to continue with routine work connected activities. Testing day a pair of Subjects reported to the laboratory at 1300 h. Very important signs were obtained and reviewed by a Dr.. every subject then received a anticoagulant lock blood vessel tubing in associate degree ginglymoid joint vein. when baseline blood samples for adrenocorticotropin and corticoid were obtained, 1.0 cc of the one µg/mL cosyntropin resolution was injected intravenously. Subjects remained in an exceedingly sitting, resting position throughout this section of testing. humor corticoid levels were obtained at thirty and hr when injection in accordance with customary testing as suggested by the manufacturer. Subjects were then monitored for a 1 hour amount when testing was complete. Testing day three Subjects reported to the laboratory at 1300 h. Associate degree graph and baseline very important signs were obtained and reviewed by a Dr associate degree blood vessel tubing was placed and blood adrenocorticotropin and corticoid levels were collected. Subjects were then asked to exercise on a treadmill following stages I-V of a typical Bruce protocol. In this protocol, subjects exercise for 5 intervals of 3 minutes beginning at a speed of one.75 mph and 100% grade. the most treadmill speed within the protocol is five.0 mph with associate degree eighteen grade. though subjects were inspired to finish the session, the take a look at was terminated at the discretion of the watching or if subjects requested to prevent. when surcease of exercise, subjects were allowed to rest. When one hour of rest, humour samples were drawn for post-exercise adrenocorticotropin and corticoid levels. Subjects were then given one.0 mL of the one µg/mL cosyntropin answer intravenously. humour corticoid levels were obtained once more at thirty and hr post injection. These testing days were consecutive days. Testing occurred for ten hours on take a look at day one, one hour on take a look at day two, and 4 hours on take a look at day three. nineteen hours occurred between the last blood draw on take a look at day one and also the initial blood draw on test day two. Between take a look at day two and take a look at day three, twenty four hours occurred between the blood attracts. process of blood samples All corticoid and adrenocorticotropin samples collected were in real time hold on at -20°C and processed along at the study's completion. corticoid determinations were obtained victimization the Abbott AxSYM System (Abbott Laboratories, Abbott Park, IL). This assay utilizes Fluorescence Polarization bioassay (FPIA) for the quantitative activity of corticoid in human humour. adrenocorticotropin samples were processed by machine-driven

competitive luminescence bioassay (Quest medicine Nichols Institute, Chantilly, VA). applied mathematics analysis The student's t take a look at was wont to calculate P values and compare means that.

The mean subject age was thirty three.2 \pm 6.4 years; vary 23-51. Mean total weekly aerobics was eight.5 \pm 6.3 sessions. The mean length was 316.3 minutes with a variety of 20-1170 minutes (Table 1). The mean baseline adrenocorticotropin level on day one was eighteen.2 \pm 14.7 pg/ml. On consequent days two and three, the mean baseline adrenocorticotropin levels failed to dissent considerably (p=0.09). the worth on day two was twelve.4 \pm 10.0 pg/ml and on day three it absolutely was fifteen.0 \pm 10.5 pg/ml. As graphed in Figure one, the mean corticoid levels on day one collected at two-hour intervals were as follows: 0800 h, 15.3 \pm 4.3 μ g/dL; one thousand h, 10.4 \pm 3.6 μ g/dL; 1200 h, 9.0 \pm 3.7 μ g/dL; 1400 h, 8.8 \pm 3.4 μ g/dL; 1600 h, 6.9 \pm 3.1 μ g/dL. The mean baseline corticoid level on day two was eight.7 \pm 3.5 μ g/ml. compared, on day three the baseline corticoid was considerably larger at eleven.0 \pm 3.2 μ g/mL, p=0.01. One hour post exercise on day three, the humour corticoid was below the baseline level at seven.9 \pm 2.6 μ g/dL; p<0.001. Mean peak corticoid levels at thirty and hr when the LDST ar graphed in Figure two. The mean peak corticoid level at half-hour when one μ g adrenocorticotropin stimulation on day two was nineteen.0 \pm 3.7 μ g/dL. This failed to dissent considerably between the mean peak corticoid levels of eighteen.9 \pm 2.5 μ g/dL at half-hour when one μ g of adrenocorticotropin stimulation on day three. At hr, the mean peak corticoid levels additionally failed to dissent between day two (14.0 \pm 2.0 μ g/dL) and three (13.6 \pm 1.8 μ g/dL). Figure three shows that the mean top amendment in corticoid levels from zero to half-hour still as from thirty to hr when one μ g adrenocorticotropin stimulation failed to dissent between day two (10.4 \pm 4.3 μ g/dL) and day three (11.0 \pm 3.6 μ g/dL; p=0.48).

Discussion

The LDST produces lower elevations in humour corticoid compared to the SDST and is so affected to a larger degree by several variables. during this study, we've shown that previous exercise in healthy, active, adult males has no impact on peak corticoid or top amendment in corticoid achieved with the LDST. This study implies that people undergoing the LDST might exercise on the day of the take a look at. In our study, subjects reportable exercise histories with a mean total weekly length of 316.3 minutes however a large vary of variability in activity was determined. A quantitative determination of athlete fitness level was not performed but guidelines for exercise

provided by the American College of Sports Medicine suggest our subjects who were all active duty officers in the United States Navy were in the mild to moderate fitness range. It is precisely this type of subjects who are exercising regularly in a variety of activities who would be most likely to have exercised on the day of a planned test. The Bruce protocol was used to simulate routine exercise because it the commonly used measure of exercise capacity in clinical practice. Various societies such as the American Heart Association have advocated its use as a standard test that is inexpensive, easy to administer, and safe. While we did not aim to standardize exercise capacity, the treadmill has been shown to be a reasonably accurate method of estimating exercise capacity compared to direct measures such as maximal oxygen uptake. In this study we chose to examine whether prior exercise would affect the LDST and by using the Bruce protocol have made it more applicable to an average patient. When the LDST was performed, a mean post-exercise cortisol peak at both 30 and 60 minutes was not statistically different from levels drawn after the test on a day of rest. Found that serum cortisol levels were significantly elevated after two hours of rest following vigorous exercise above levels drawn at rest. Despite increased baseline values, these authors did not find any difference between peak cortisol levels after the SDST was performed. However, when the same individuals were exercised at 70 and 90% of maximal oxygen concentration, they had proportional elevations in ACTH and cortisol levels which remained elevated at 60 minutes. This group did not find a significant difference in degree of cortisol elevations between their study's groups of untrained, moderately trained or highly trained endurance athletes after exercise. In marathon runners who were made to run on a treadmill until exhaustion, higher cortisol levels were sustained 120 minutes post exercise [24]. In another study in which moderately fit young men were exercised on a treadmill at gradually increasing speeds for 30 minutes to target a VO₂ max induces . Timing of exercise also could have played a role in our findings. We chose for our subjects to exercise in the early afternoon precisely in order to avoid the confounding effects of hormonal diurnal variations. Also, since our study was limited to males only, it is unknown whether these findings can be generalized to females. In this study we have shown that prior exercise in healthy, active, adult males has no effect on the accuracy of the LDST. To our knowledge, this is the first study to demonstrate the utility of the LDST in post exercise conditions. Further research is warranted to examine whether other variables such as psychological stressors may affect the LDST.