Hamilton M (1960): A rating scale for depression. *J Neurol Neurosurg Psychiatry* 23:56–62.

Holsboer F, Gerken A, von Bardeleben U, Grimm W, Beyer H, Müller OA, Stalla GK (1986): Human corticotropin-releasing hormone in depression—Correlation with thyrotropin secretion following thyrotropin-releasing hormone. *Biol Psychiatry* 21:601–611.

Jarrett DB, Greenhouse JB, Coble PA, Kupfer DJ (1986): Sleep-EEG and neuroendocrine secretion in depression. In Shagass C, Josiassen RC, Bridger WH, Weiss KJ, Stoff D, Simpson GM (eds), *Biological Psychiatry 1985, Proceedings of the IVth World Congress of Biological Psychiatry*. New York: Elsevier, pp 966–968.

Martin JB (1983): Neuroendocrine regulation of growth hormone secretion. In Laron Z (ed), *Pediatric and Adolescent Endocrinology*, Vol 12. Basel: Karger, pp 1–24.

Mendelson WB, Jacobs LS, Gillin JC (1983): Negative feedback suppression of sleep-related growth hormone secretion. *J Clin Endocrinol Metab* 56:486–491.

Mendlewicz J, Linkowski P, Kerkhofs M, Desmedt D, Golstein J, Copinschi G, Van Cauter E (1985): Diurnal hypersecretion of growth hormone in depression. *J Clin Endocrinol Metab* 60:505–512.

Rittmaster RS, Loriaux DL, Merriam GR (1987): Effect of continuous somatostatin and growth hormone-releasing hormone (GHRH) infusions on the subsequent growth hormone (GH) response to GHRH. *Neuroendocrinology* 45:118–122.

Rivier J, Spiess J, Throner M, Vale W (1982): Characterization of a growth hormone releasing factor from a human pancreatic islet tumor. *Nature* 300:276–278.

Struthers AD, Burrin JM, Brown MJ (1986): Exercise-induced increase in plasma catecholamines and growth hormone are augmented by selective alpha 2-adrenoceptor blockade in man. *Neuroendocrinology* 44:22–28.

Vance M, Kaiser D, Evans W, Throner M, Furlanetto R, Rivier J, Vale W, Persutti Frohman L (1985): Evidence for a limited growth hormone (GH)-releasing hormone (GHRH) releasable quantity of GH: Effects of 6-hour infusion of GHRH on GH secretion in normal man. *J Clin Endocrinol Metab* 60:370–375.

Lack of Effects of Hospitalization and Oral Contraceptives on DST Results in Control Subjects

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Introduction

The specificity of the Dexamethasone Suppression Test (DST) for the diagnostic confirmation of major or endogenous depression remains a controversial issue, even with regard to normal control subjects. Although an overall specificity of the DST in major depressives versus normal controls of 92.8% was calculated in a recent review paper, in surveying 30 studies involving a total of 1130 subjects (Arana et al. 1985), the figures for nonsuppression of cortisol after 1 mg (Carroll et al. 1981) of dexamethasone in normal control subjects varied widely: 4% (Carroll et al. 1981), 4.3% (Rush et al. 1982), 10.3% (Stokes et al. 1983), 11% (Coppen et al. 1983), 15.1% (Amsterdam et al. 1982), and 19% (Hällström

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et al. 1983). Among other confounding factors producing "false-positive DSTs," stress (Blumenfield et al. 1970; Sachar 1970; Baumgartner et al. 1985; Ceulemans et al. 1985; Mellsop et al. 1985), stress of hospital admission in particular (Haskett et al. 1983; Coccaro et al. 1984; Roy-Byrne et al. 1984), and low doses of estrogen (Holsboer et al. 1984) have been mentioned. Because of their practical implications, we decided to study the effect of stress (and in particular stress of hospital admission) and of modern oral contraceptives (with low doses of estrogen) in psychiatrically normal subjects.

Methods

Normal volunteers (mostly staff members) and presurgical patients, admitted to the hospital on a nonurgent basis for a minor orthopedic intervention, were screened for current or past psychopathology. Carroll's exclusion criteria (Carroll et al. 1981) were used, and a Beck Depression Inventory, short form (BDI) (Beck and Beck 1972), was administered. Only subjects without any current or past psychopathology, who did not meet any of Carroll's exclusion criteria, and who scored less than 5 on the BDI, i.e., none or minimal degree of depression (Beck and Beck 1972), entered the study. All subjects gave informed consent.

Fifteen normal volunteers (10 women, 5 men, mean age 35) and 27 presurgical patients (10 women, 17 men, mean age 37.1) underwent a DST. Of the 20 female subjects, 7 took oral contraceptives with low doses of estrogen [Sequilar, Microgynon 50 ($n = 3$), Trigynon, Microgynon 30, and Diane), i.e., with an estrogen content of ≤ 50 μg. The normal volunteers took 1 mg of dexamethasone at 11:00 PM, and blood for cortisol assay was drawn the next day at 4:00 PM. The presurgical patients took 1 mg of dexamethasone on the evening of their admission to the hospital; blood for cortisol assay was drawn the next day at 8:00 AM, 4:00 PM, and 11:00 PM, and surgery was performed a day later.

Blood was collected on ice, separated, and frozen at −20°C within an hour until assayed by a radioimmunoassay (RIA) method (Clinical Assays, Travenol, Cambridge, MA), with inter- and intraassay coefficients of variation, respectively, 9.7% and 7.9% at 38 μg/liter and 5.0% and 3.2% at 116 μg/liter. A subject was considered to be a nonsuppressor when the cortisol level in the 4:00 PM sample was greater than or equal to 50 μg/liter (Carroll et al. 1981).

Results

Individual results are displayed in Figure 1. None of the 15 normal volunteers and only one 1 of the 27 presurgical patients (i.e., 3.7%) were nonsuppressors, using a cutoff point of 50 μg/liter. The only nonsuppressor was a 16-year-old female presurgical patient who took no contraceptives. However, there was a trend for presurgical patients to have higher postdexamethasone cortisol levels, though not a statistically significant one (Mann-Whitney U-test, $p = 0.0761$). In the presurgical group no subject was a nonsuppressor at either the 8:00 AM or 11:00 PM tests.

Discussion

Our results indicate that hospital admission as such (in psychiatrically normal subjects) does not impair DST results, considering 50 μg/liter as the cutoff point, although there was a (statistically not significant) trend for presurgical patients to have higher postdexamethasone cortisol levels than the normal volunteers. These figures are at variance with those of Haskett et al. (1983), Coccaro et al. (1984) and Roy-Byrne et al. (1984), who found a higher rate of nonsuppression in depressed patients when the DST was performed in the first days after admission, compared to a later point of time. This may be because depressed patients experience a higher degree of stress on hospital admission, and may not be due to hospital admission per se.

However, our findings are also different from those of Ceulemans et al. (1985), who also studied presurgical patients (but not hospital admission as such: indeed, it is not clear from their study how many days after admission the DST

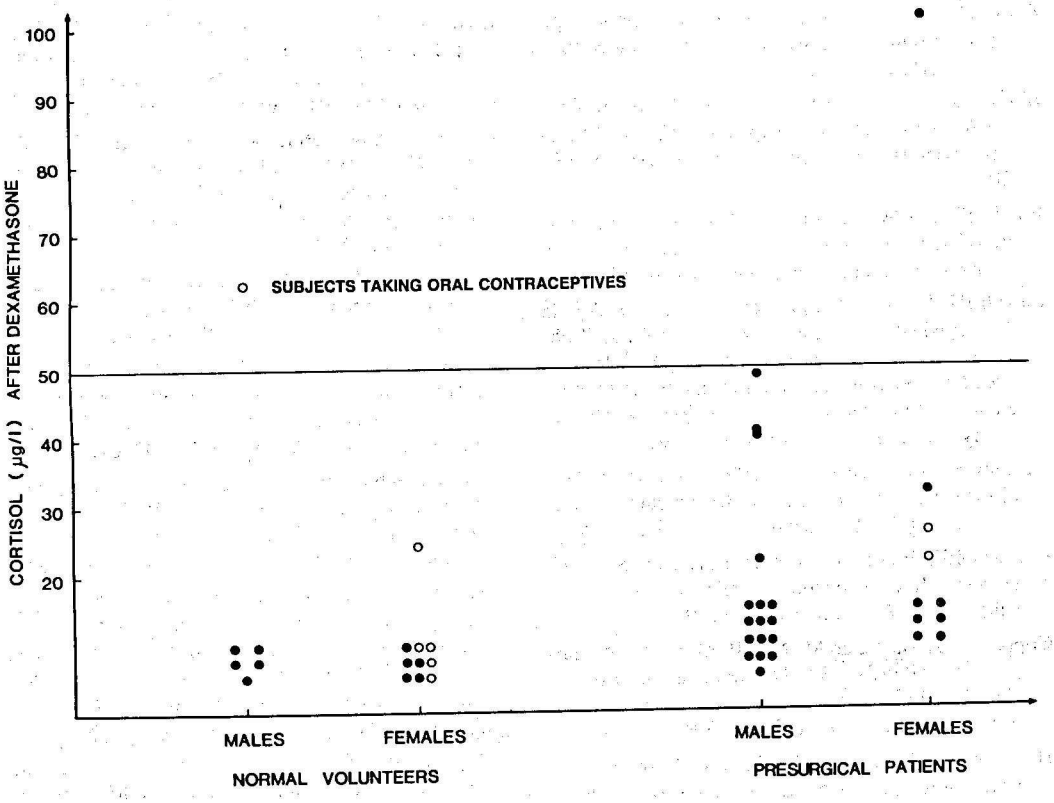

Figure 1. Postdexamethasone cortisol values at 4:00 PM in individual subjects.

was performed). They found a 47.5% non-suppression rate in their patients (compared to 0% in normal controls). Our patients had a DST on the first day of admission, which was also the day prior to a surgical procedure, so that in a way, they were exposed to a double stress. However, our patients were possibly less distressed by their affection, as they had to undergo only minor surgery (while those of Ceulemans et al. suffered hernia nuclei pulposi). Moreover, our exclusion of patients having a score of 5 or more on the BDI could have excluded the more distressed ones.

As for oral contraceptives, those with low estrogen content (≤ 50 μg) did not impair DST results. Although it is well known that oral contraceptives raise the level of total cortisol through an increase in corticosteroid-binding globulin, this effect seems less evident with contraceptives containing lower levels of estrogen (Bondy 1985).

In conclusion, it can be stated that hospital admission per se and modern oral contraceptives do not seem to produce false DST results.

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References

Amsterdam VP, Winokur A, Caroff SN, Conn J (1982): The Dexamethasone Suppression Test in outpatients with primary affective disorders and healthy control subjects. *Am J Psychiatry* 139:287–291.

Arana GW, Baldessarini RJ, Ornsteen M (1985): The Dexamethasone Suppression Test for diagnosis and prognosis in psychiatry. *Arch Gen Psychiatry* 42:1193–1204.

Baumgartner A, Gräf KJ, Kürten I (1985): The Dexamethasone Suppression Test in depression, in schizophrenia, and during experimental stress. *Biol Psychiatry* 20:675.

Beck AT, Beck RW (1972): Screening depressed patients in family practice. A rapid technique. *Postgrad Med* 52:81–85.

Blumenfield M, Rose LI, Richmond LH, Beering SC (1970): Dexamethasone suppression in basic trainees under stress. *Arch Gen Psychiatry* 23:299–304.

Bondy PhK (1985): Disorders of the adrenal cortex. In Wilson JD, Foster DW (eds), *Textbook of Endocrinology*. Philadelphia: Saunders, pp 816–890.

Carroll BJ, Feinberg M, Greden JF, Tarika J, Albala AA, Haskett RF, James NMcI, Kronfol Z, Lohr N, Steinen M, de Vigne JP, Young E (1981): A specific laboratory test for the diagnosis of melancholia: Standardization, validation and clinical utility. *Arch Gen Psychiatry* 38:15–22.

Ceulemans DLS, Westenberg HGM, Van Praag HM (1985): The effect of stress on the Dexamethasone Suppression Test. *Psychiatry Res* 14:189–195.

Coccaro EF, Prudic J, Rothpearl A, Lurnberg HG (1984): Effect of hospital admission on DST results. *Am J Psychiatry* 141:982–985.

Coppen A, Abou-Saleh M, Mill P, Metcalfe M, Harwood J, Bailey J (1983): Dexamethasone Suppression Test in depression and other psychiatric illness. *Br J Psychiatry* 142:498–504.

Hällström T, Samuelsson S, Balladin J, Wälinder J, Bengtsson C, Myström E, Andersch B, Lindstedt G, Lundberg PA (1983): Abnormal Dexamethasone Suppression Test in normal females. *Br J Psychiatry* 142:489–497.

Haskett RF, Zis AP, Albala AA, Carroll BJ (1983): DST performance during the first 48 hours of admission. Presented at the 38th Annual Meeting of the Society of Biological Psychiatry, New York.

Holsboer F, Doerr HG, Gerken A, Müller OA, Sippell WG (1984): Cortisol, 11-deoxycortisol and ACTH concentrations after dexamethasone in depressed patients and healthy volunteers. *Psychiatry Res* 11:15–23.

Mellsop GW, Hutton JD, Delahunt JW (1985): Dexamethasone Suppression Test as a simple measure of stress? *Br Med J* 290:1804–1806.

Roy-Bryne P, Gwirtsman H, Steinbach H, Gerner RH (1984): Effects of acute hospitalization on the Dexamethasone Suppression Test and TRH stimulation test. *Biol Psychiatry* 19:607–612.

Rush AJ, Schlesser MA, Giles DE, Crowley GT, Fairchild C, Altschuler KZ (1982): The effect of dosage on the Dexamethasone Suppression Test in normal controls. *Psychiatry Res* 7:277–285.

Sachar EJ (1970): Psychological factors relating to activation and inhibition of the adrenocortical stress response in man: A review. In De Wied C, Van Weijnen JAWM (eds), *Progress in Brain Research*. Amsterdam: Elsevier pp 32–316.

Stokes PE, Stoll PM, Koslow SH, Maas JW, Davis M, Swann AC, Robins E (1983): Pretreatment DST and hypothalamic–pituitary–adrenocortical function in depressed patients and comparison groups. *Arch Gen Psychiatry* 40:1034–1035.