Published in final edited form as:
Psychoneuroendocrinology. 2008 June ; 33(5): 654–658.

HPA-Axis Hyperactivity and Mortality in Psychotic Depressive Disorder: Preliminary Findings

William Coryell[1], **Jess Fiedorowicz**[1], **Mark Zimmerman**[2], and **Elizabeth Young**[3]

1 *Department of Psychiatry, Carver College of Medicine, Iowa City, IA, USA*

2 *Department of Psychiatry, Brown University School of Medicine, Providence, RI, USA*

3 *Department of Psychiatry, University of Michigan, Ann Arbor, MI, USA*

Abstract

Background—The excess mortality associated with depressive disorders has been most often attributed to risks for suicide but diverse findings indicate that depressive disorders also increase risks for cardiovascular (CV) mortality. Among the possible mediators is the HPA-axis hyperactivity that characterizes many cases of relatively severe depressive disorder and severity is characteristic of psychotic depressive disorder.

Methods—The following describes a 17-year mortality follow-up of 54 patients with Research Diagnostic Criteria (RDC) psychotic major depression or schizoaffective, mainly affective, depression. All had baseline assessments that included a 1mg dexamethasone suppression test with post-dexamethasone samples at 8 a.m., 4 p.m. and 11 p.m.

Results—Regression analyses showed that both greater age and higher maximum post-dexamethasone cortisol concentrations predicted deaths due to cardiovascular (CV) causes ($t = 4.01$, $p < .001$ and $t = 3.03$, $p = .004$, respectively); the 11 p.m. cortisol concentration predicted death due to suicide ($t = 2.05$, $p = 0.048$). The 4 who died from CV disease had a mean (SD) post-dexamethasone cortisol concentration of 18.0 (6.0) μg/dl while the mean (SD) value for the remaining 50 patients was 7.6 (6.6) μg/dl ($t = 3.03$, $df = 53$, $p = 0.004$). Regression analyses showed the 11 p.m. post-dexamethasone value to be predictive of suicide ($t = 2.05$, $p = 0.048$).

Conclusions—Conclusions should be tentative because an earlier follow-up of a more heterogeneous, but larger, sample did not find a relationship between DST results and CV mortality, and because only 4 CV deaths occurred in the present study. HPA-axis hyperactivity is probably only one of a number of factors that link depressive disorder to CV mortality.

Background

Previous research into the effects of HPA-axis hyperactivity on mortality has focused on its relationship to risks for suicide and there are now at least six reports of a significant association between HPA-axis hyperactivity and completed suicide in groups with mood disorder (Carroll et al., 1980; Coryell and Schlesser, 2001; Coryell and Schlesser, 1981; Norman et al., 1990; Targum et al., 1983; Yerevanian et al., 2004). Another two found the relationship to be confined

Corresponding Author: William Coryell, M.D., University of Iowa Carver College of Medicine, Department of Psychiatry, 2-205 MEB, Iowa City, IA 52242; telephone: 319-353-4434; fax 319-353-3003; e-mail: william-coryell@uiowa.edu.

to depressed patients who had attempted or seriously contemplated suicide (Coryell et al., 2006; Jokinen et al., 2007).

While death by suicide is the best-recognized cause of the excess mortality associated with depressive illness, numerous studies of both clinical (Allgulander, 1994; Norton and Whalley, 1984; Tsuang et al., 1980) and community (Aromaa et al., 1994; Barefoot and Schroll, 1996; Everson et al., 1996; Murphy et al., 1987) samples have also shown that depressive illness increases the likelihood of subsequent cardiovascular (CV) mortality even after statistical control of those risk factors for CV mortality that are more frequent among individuals with depressive disorders (Aromaa et al., 1994; Barefoot and Schroll, 1996; Everson et al., 1996) . Among the mediators proposed to explain this relationship is the increased platelet coagulability that results from high sympathetic tone (Musselman et al., 1998) and the various effects of the hypercortisolemia that result from hypothalamic-pituitary-adrenal (HPA) axis hyperactivity.

HPA-axis hyperactivity, as measured by 24-hour urinary-free cortisol (UFC) determination, the dexamethasone suppression test (DST) or, more recently, the combined dexamethasone/corticotropin releasing hormone test (Holsboer et al., 1995; Holsboer et al., 1987) is widely thought to be a state phenomena, an abnormality present during, but not between, depressive episodes. There is, though, considerable evidence that some degree of hypercortisolemia persists between episodes (Goodyer et al., 2000; Harris et al., 2000; Kathol, 1985; Ribeiro et al., 1993; Weber-Hamann et al., 2006; Young et al., 2000).

Persistently elevated levels of cortisol, or even high levels present intermittently, would promote CV morbidity in several ways. Glucocorticoids have anabolic effects on fat metabolism and intra-abdominal adipocytes have substantially higher concentrations of corticosteroid receptors than do peripheral adipocytes (Rebuffe-Scrive et al., 1990). Elevated glucocorticoid concentrations thus lead to central obesity, a key feature of the metabolic syndrome. Other glucocorticoid effects that promote this syndrome are decreased insulin sensitivity (Weber-Hamann et al., 2002; Weber et al., 2000) and increases in salt retention leading to increased blood pressure (Wang, 2005). Indeed, depression scores and UFC concentrations were synergistically associated with the likelihood of the metabolic syndrome in a community sample (Vogelzangs et al., 2007). Among patients with major depressive disorder (MDD), hypercortisolemia has also been positively correlated with visceral fat quantity (Thakore et al., 1997; Weber-Hamann et al., 2002) and the inhibition of cortisol production by metyrapone has been shown to ameliorate deficits in flow-mediated dilation measured in the brachial artery (Broadley et al., 2006).

Despite a long-recognized link between depressive disorders and CV mortality, and the role HPA-axis hyperactivity is likely to play in it, we know of only one effort to assess relationships between HPA-axis activity in depressed patients and subsequent CV mortality (Coryell et al., 2006). To do this the following uses data from a study designed over two decades ago to assess the diagnostic and prognostic value of HPA-axis hyperactivity in a consecutive series of inpatients with non-manic psychosis (Coryell et al., 1988; Coryell and Zimmerman, 1989). In addition, we wished to use this new cohort to again test the relationship between HPA-axis hyperactivity and suicide risk.

Methods

Participants

Between 1982 and 1984 consecutive admissions to the adult psychiatric units at the University of Iowa were screened to select those who 1) had delusions and/or hallucinations, 2) were 18 years of age or older, 3) did not have a manic syndrome or a mixed state, 4) were not taking

lithium, 5) were not mentally retarded, delirious or demented and 6) were not in medical or pharmacological circumstances that would invalidate either a dexamethasone suppression test or a thyroid-releasing-hormone stimulation test.

The analyses described here are limited to those subjects who met RDC for psychotic MDD, or for schizoaffective depression other than the mainly schizophrenic subtype. The mainly schizophrenic subtype is equivalent to DSM-IV schizoaffective disorder whereas the other RDC schizoaffective subtypes are equivalent to DSM-IV affective disorder with mood-incongruent psychotic features.

Procedures

Informed consent was obtained prior to all study procedures. Baseline assessment included an interview with the Schedule for Affective Disorders and Schizophrenia (Endicott and Spitzer, 1978) and a 1mg. DST within the first week of hospitalization. Samples were drawn the following day for plasma cortisol determinations at 8 a.m., 4 p.m. and, after the study had been underway, 11 p.m. All of the 54 patients described here had a 0800 sample, 53 had a 1600 sample and 35 a 2300 sample; 34 had all three. Concentrations were determined by radioimmunoassay using a specific cortisol antiserum produced in rabbits against cortisol-3-carboxymethyloxine, conjugated to bovine serum albumin. The intra-assay and inter-assay coefficients of variation were 12.2% and 11.1%, respectively.

In 2003 the National Death Index was used to identify all subjects who had died in the U.S. and their causes of death. This produced a mean (SD) mortality follow-up length of 17.0 (4.6) years. Causes of death were grouped under “cardiovascular disease”, “suicide” and “all other causes” for the following analyses.

Data Analysis

The large majority of reports concerning the DST in depressive disorders have used a threshold of >5μg/dl for the highest post-dexamethasone cortisol value to designate nonsuppression. This threshold was developed to optimize the separation of melancholic from non-melancholic depression. Thresholds of 10μg/dl or above, however, appear to better separate patients with psychotic depression from comparison groups (Brown et al., 1988; Coryell et al., 1984; Evans and Nemeroff, 1987; Levy and Stern, 1987; Rothschild et al., 1982). Relationships between baseline DST results and subsequent suicide or cardiovascular death were therefore tested with alternative thresholds of both >5μg/dl and ≥10μg/dl. Unless otherwise stated DST results are based on the maximum post-dexamethasone value.

We used Cox regression analyses to compare groups falling on either side of these thresholds by cumulative risks for death from CV disease, for death from suicide, and for death from all other causes. All regressions included baseline age in the model.

Because the use of either threshold to define HPA-axis hyperactivity was to some degree arbitrary, we also conducted regression analyses with the independent variables of age and post-dexamethasone cortisol as a continuous measure.

Results

Cardiovascular deaths

Table 1 displays the baseline demographics, RDC diagnostic composition and DST results for the 54 individuals with psychotic depressive disorder. There were thirteen deaths during a mean (SD) follow-up period of 17.1 (4.6) years, of which 4 (30.8%) were from CV causes. All four of these cases, and 22 (44.0%) of the remaining subjects, had post-dexamethasone cortisol

concentrations exceeding 5 μg/dl (p = .047, Fisher's exact test). Three of the 4 CV deaths also had values exceeding 10 μg/dl in contrast to 12 (23.5%) of the remaining subjects (p = 0.060, Fisher's exact test). A Cox regression analyses using the 10 μg/dl threshold yielded a hazard ratio (HR) of 35.7 (CI = 1.4 – 889, p = 0.029). Those who later died of CV causes had a mean (SD) post-dexamethasone cortisol concentration of 18.0 (6.0) μg/dl and the remaining patients a mean (SD) of 7.4 (6.6) μg/dl (t = −3.104, df = 52, p = 0.003).). In the logistic regression analysis both age and post-dexamethasone cortisol concentration were independently predictive of CV death (Table 2). Sex was entered in an additional analysis but did not add significantly to the model (t = 1.66, p = 0.102) and did not substantially reduce the effects of age and cortisol concentration.

We also determined whether the predictive relationships between post-dexamethasone cortisol values and cardiovascular mortality varied by sampling time. Logistic regression results for 8 a.m. samples t = 2.14, p = 0.037; for 4 p.m. samples t = 3.68, p = 0.001 and for 11 p.m. samples t = 3.39, p = 0.002.

Suicide

Of the four deaths that were ruled suicides, three (75.0%) had a maximum post-dexamethasone cortisol exceeding 5 μg/dl; 23 (46.0%) of the remaining subjects were non-suppressors (p=0.342, Fisher's exact test). Corresponding numbers with values exceeding 10 μg/dl were 3 (75.0%) and 12 (24.0%) (p=0.06, Fisher's exact test). A Cox regression showed post-dexamethasone cortisol values exceeding 10 μg/dl to be a nearly significant predictor of death by suicide with HR = 9.4 (CI = 0.969–90.27, p = 0.053). A 5 μg/dl threshold yielded an HR of 3.8 (CI = 0.385– 36.84, p = 0.254).

Logistic regression results differed by sample time. For 8 a.m. samples t = −0.158, p = 0.875; 4 p.m. samples t = 1.34, p = 0.185 and for 11 p.m. samples t = 2.05, p = 0.048.

Other causes of death

Regression analyses showed neither age nor maximum post-dexamethasone cortisol to be predictive of death from other causes (Table 2).

Conclusions

If HPA-axis hyperactivity accounts, at least in part, for the association between depressive disorder and an increased likelihood for CV death, and if a cortisolemia dose-effect operates in this mediation, then the association should be more apparent among patients who have depressive disorder with psychotic features. Not all patients with psychotic depressive disorder manifest HPA-axis hyperactivity but they are more likely to do so than depressed patients without psychotic features (Nelson and Davis, 1997), and many of those that do have particularly high post-dexamethasone cortisol concentrations (Brown et al., 1988; Coryell et al., 1984; Evans and Nemeroff, 1987; Rothschild et al., 1982). Moreover, in comparison to patients with non-psychotic MDD, those with psychotic MDD have longer episode durations and shorter intervals between episodes (Coryell et al., 1990). They would therefore have greater within-episode exposure to high cortisol concentrations.

While our findings that patients with psychotic depressive disorder who died from cardiovascular disease had significantly higher post-dexamethasone cortisol concentrations lend support to these suppositions, several important caveats apply. Because the data included only four deaths from CV disease, and high post-dexamethasone cortisol concentrations predicted these deaths with very wide confidence intervals, the possibility that this is a chance finding is substantial. In addition, the current results do not concur with two earlier studies of

DST results and mortality. Vythilingam et al (Vythilingam et al., 2003) followed an older MDD group with psychotic MDD and found that they had elevated all-cause mortality compared to a group with non-psychotic MDD, but also that DST results were not predictive of mortality. They included a separate analysis of suicides but not of CV deaths.

Coryell et al (Coryell et al., 2006) followed a mixed sample of inpatients and outpatients with MDD. This was a substantially larger sample of 334 of whom 32 (9.6%) died of CV disease; 7 (21.9%) of these patients had had 4:00 p.m. post-dexamethasone cortisol concentrations >10 μg/dl while 41 (12.5%) of the other patients had values in this range. Thus, the increase in risk for CV death associated with a value above 10 μg/dl was 1.6, lower than the increase in risk of 2.4 reported in the current sample. The analyses did not separate those who had psychotic features and, not surprisingly, the proportion with values >10 μg/dl (48 of 334 or 14.4%) was substantially lower than the 19 of 55 (34.5%) in the current series ($t = 13.4$, 1 df, $p < .001$). It is thus possible that the values exceeding 10 μg/dl did so by a narrower margin.

A post-dexamethasone cortisol threshold of 10 μg/dl was also more predictive of suicide than was one of 5 μg/dl. Notably, though, the conventional threshold of 5ug/dl yielded a hazard ratio of 3.8, a value approaching the four-fold risk described in a recent meta-analysis of the DST and completed suicide (Mann et al., 2006).

The above study also described a relationship between DST nonsuppression and eventual suicide but this applied only to those with recent suicidal ideation or behaviors. Ratings of suicidality were obtained for subjects in the current study but these data are, unfortunately, no longer available and it is not possible to test whether an interaction between suicidality and DST results on eventual suicide existed in this cohort as well.

To our knowledge only two of the previous studies concerning DST results and suicide tested 8 a.m., 4 p.m. and 11 p.m. post-dexamethasone results separately (Coryell et al., 2006; Jokinen et al., 2008). Those two found that 4 p.m. results were the most predictive of suicide while, in the current study, 11 p.m. sample values produced the only significant results in logistic regression analyses. On the other hand, the relationship between post-dexamethasone cortisol values and cardiovascular death was strongest for the 4 p.m. sample. Reasons for differences by sampling time are not obvious.

In summary, HPA axis hyperactivity predicted mortality from cardiovascular causes and, to a limited extent, from suicide. Though negative studies of DST results and suicide exists (Black et al., 2002), it can be argued that the current number of positive studies justify the use of DST results as a tool for estimating suicide risk in conjunction with other clinical measures. The findings regarding risks for cardiovascular death should be considered preliminary given the small numbers available for analysis. As noted earlier, though, there are numerous reasons to expect such a relationship. The prevalence of MDD, and its recurrent nature, gives considerable public health importance to further investigation into the physiological links between it and cardiovascular morbidity.

References

Allgulander C. Suicide and mortality patterns in anxiety neurosis and depressive neurosis. Arch Gen Psychiatry 1994;51:708–712. [PubMed: 8080347]

Aromaa A, Raitasalo R, Reunanen A, Impivaara O, Heliovaara M, Knekt P, Lehtinen V, Joukamaa M, Maatela J. Depression and cardiovascular diseases. Acta Psychiatr Scand 1994;377(Suppl):77–82.

Barefoot JC, Schroll M. Symptoms of depression, acute myocardial infarction, and total mortality in a community sample. Circulation 1996;93:1976–1980. [PubMed: 8640971]

Black DW, Monahan PO, Winokur G. The relationship between DST results and suicidal behavior. Ann Clin Psychiatry 2002;14:83–88. [PubMed: 12238738]

Broadley AJ, Korszun A, Abdelaal E, Moskvina V, Deanfield J, Jones CJ, Frenneaux MP. Metyrapone improves endothelial dysfunction in patients with treated depression. J Am Coll Cardiol 2006;48:170–175. [PubMed: 16814663]

Brown RP, Stoll PM, Stokes PE, Frances A, Sweeney J, Kocsis JH, Mann JJ. Adrenocortical hyperactivity in depression: effects of agitation, delusions, melancholia, and other illness variables. Psychiatry Res 1988;23:167–178. [PubMed: 3363026]

Carroll, BJ.; Greden, JF.; Feinberg, M. Suicide, Neuroendocrine Dysfunction and CSF 5-HIAA Concentrations in Depression. In: Angrist, editor. Recent Advances in Neuropsychopharmacology. Pergoman Press; Oxford: 1980. p. 307-313.

Coryell W, Keller M, Lavori P, Endicott J. Affective syndromes, psychotic features, and prognosis. I. Depression. Arch Gen Psychiatry 1990;47:651–657. [PubMed: 2360858]

Coryell W, Pfohl B, Zimmerman M. The clinical and neuroendocrine features of psychotic depression. J Nerv Ment Dis 1984;172:521–528. [PubMed: 6470694]

Coryell W, Schlesser M. The dexamethasone suppression test and suicide prediction. Am J Psychiatry 2001;158:748–753. [PubMed: 11329397]

Coryell W, Schlesser MA. Suicide and the dexamethasone suppression test in unipolar depression. Am J Psychiatry 1981;138:1120–1121. [PubMed: 7258395]

Coryell W, Young E, Carroll B. Hyperactivity of the hypothalamic-pituitary-adrenal axis and mortality in major depressive disorder. Psychiatry Res 2006;142:99–104. [PubMed: 16631257]

Coryell W, Zimmermann M, Winokur G, Cadoret R. Baseline neuroendocrine function and diagnostic stability among patients with a non-manic psychosis. Eur Arch Psychiatry Neurol Sci 1988;237:197–199. [PubMed: 3203699]

Coryell WH, Zimmerman M. HPA axis hyperactivity and recovery from functional psychoses. Am J Psychiatry 1989;146:473–477. [PubMed: 2929747]

Endicott J, Spitzer RL. A diagnostic interview: the Schedule for Affective Disorders and Schizophrenia. Arch Gen Psychiatry 1978;35:837–844. [PubMed: 678037]

Evans DL, Nemeroff CB. The clinical use of the dexamethasone suppression test in DSM-III affective disorders: correlation with the severe depressive subtypes of melancholia and psychosis. J Psychiatr Res 1987;21:185–194. [PubMed: 3585807]

Everson SA, Goldberg DE, Kaplan GA, Cohen RD, Pukkala E, Tuomilehto J, Salonen JT. Hopelessness and risk of mortality and incidence of myocardial infarction and cancer. Psychosom Med 1996;58:113–121. [PubMed: 8849626]

Goodyer IM, Herbert J, Tamplin A, Altham PM. Recent life events, cortisol, dehydroepiandrosterone and the onset of major depression in high-risk adolescents. Br J Psychiatry 2000;177:499–504. [PubMed: 11102323]

Harris TO, Borsanyi S, Messari S, Stanford K, Cleary SE, Shiers HM, Brown GW, Herbert J. Morning cortisol as a risk factor for subsequent major depressive disorder in adult women. Br J Psychiatry 2000;177:505–510. [PubMed: 11102324]

Holsboer F, Lauer CJ, Schreiber W, Krieg JC. Altered hypothalamic-pituitary-adrenocortical regulation in healthy subjects at high familial risk for affective disorders. J Neuroendocrinol 1995;62:340–347.

Holsboer F, von Bardeleben U, Wiedemann K, Muller OA, Stalla GK. Serial assessment of corticotropin-releasing hormone response after dexamethasone in depression. Implications for pathophysiology of DST nonsuppression. Biol Psychiatry 1987;22:228–234. [PubMed: 3028512]

Jokinen J, Carlborg A, Martensson B, Forslund K, Nordstrom AL, Nordstrom P. DST non-suppression predicts suicide after attempted suicide. Psychiatry Res 2007;150:297–303. [PubMed: 17316825]

Jokinen J, Nordstrom AL, Nordstrom P. ROC analysis of dexamethasone suppression test threshold in suicide prediction after attempted suicide. J Affect Disord 2008;106:145–152. [PubMed: 17662471]

Kathol RG. Persistent elevation of urinary free cortisol and loss of circannual periodicity in recovered depressive patients. A trait finding. J Affect Disord 1985;8:137–145. [PubMed: 3157722]

Levy AB, Stern SL. DST and TRH stimulation test in mood disorder subtypes. Am J Psychiatry 1987;144:472–475. [PubMed: 3105335]

Mann JJ, Currier D, Stanley B, Oquendo MA, Amsel LV, Ellis SP. Can biological tests assist prediction of suicide in mood disorders? Int J Neuropsychopharmacol 2006;9:465–474. [PubMed: 15967058]

Murphy JM, Monson RR, Olivier DC, Sobol AM, Leighton AH. Affective disorders and mortality. A general population study. Arch Gen Psychiatry 1987;44:473–480. [PubMed: 3555383]

Musselman DL, Evans DL, Nemeroff CB. The relationship of depression to cardiovascular disease: epidemiology, biology, and treatment. Arch Gen Psychiatry 1998;55:580–592. [PubMed: 9672048]

Nelson JC, Davis JM. DST studies in psychotic depression: a meta-analysis. Am J Psychiatry 1997;154:1497–1503. [PubMed: 9356556]

Norman WH, Brown WA, Miller IW, Keitner GI, Overholser JC. The dexamethasone suppression test and completed suicide. Acta Psychiatr Scand 1990;81:120–125. [PubMed: 2327273]

Norton B, Whalley LJ. Mortality of a lithium-treated population. Br J Psychiatry 1984;145:277–282. [PubMed: 6478121]

Rebuffe-Scrive M, Bronnegard M, Nilsson A, Eldh J, Gustafsson JA, Bjorntorp P. Steroid hormone receptors in human adipose tissues. J Clin Endocrinol Metab 1990;71:1215–1219. [PubMed: 2229280]

Ribeiro SC, Tandon R, Grunhaus L, Greden JF. The DST as a predictor of outcome in depression: a meta-analysis. Am J Psychiatry 1993;150:1618–1629. [PubMed: 8214170]

Rothschild AJ, Schatzberg AF, Rosenbaum AH, Stahl JB, Cole JO. The dexamethasone suppression test as a discriminator among subtypes of psychotic patients. Br J Psychiatry 1982;141:471–474. [PubMed: 7150883]

Targum SD, Rosen L, Capodanno AE. The dexamethasone suppression test in suicidal patients with unipolar depression. Am J Psychiatry 1983;140:877–879. [PubMed: 6859303]

Thakore JH, Richards PJ, Reznek RH, Martin A, Dinan TG. Increased intra-abdominal fat deposition in patients with major depressive illness as measured by computed tomography. Biol Psychiatry 1997;41:1140–1142. [PubMed: 9146826]

Tsuang MT, Woolson RF, Fleming JA. Premature deaths in schizophrenia and affective disorders. An analysis of survival curves and variables affecting the shortened survival. Arch Gen Psychiatry 1980;37:979–983. [PubMed: 7416910]

Vogelzangs N, Suthers K, Ferrucci L, Simonsick EM, Ble A, Schrager M, Bandinelli S, Lauretani F, Giannelli SV, Penninx BW. Hypercortisolemic depression is associated with the metabolic syndrome in late-life. Psychoneuroendocrinology 2007;32:151–159. [PubMed: 17224244]

Vythilingam M, Chen J, Bremner JD, Mazure CM, Maciejewski PK, Nelson JC. Psychotic depression and mortality. Am J Psychiatry 2003;160:574–576. [PubMed: 12611843]

Wang M. The role of glucocorticoid action in the pathophysiology of the Metabolic Syndrome. Nutr Metab (Lond) 2005;2:3. [PubMed: 15689240]

Weber-Hamann B, Hentschel F, Kniest A, Deuschle M, Colla M, Lederbogen F, Heuser I. Hypercortisolemic depression is associated with increased intra-abdominal fat. Psychosom Med 2002;64:274–277. [PubMed: 11914443]

Weber-Hamann B, Werner M, Hentschel F, Bindeballe N, Lederbogen F, Deuschle M, Heuser I. Metabolic changes in elderly patients with major depression: evidence for increased accumulation of visceral fat at follow-up. Psychoneuroendocrinology 2006;31:347–354. [PubMed: 16213663]

Weber B, Schweiger U, Deuschle M, Heuser I. Major depression and impaired glucose tolerance. Exp Clin Endocrinol Diabetes 2000;108:187–190. [PubMed: 10926314]

Yerevanian BI, Feusner JD, Koek RJ, Mintz J. The dexamethasone suppression test as a predictor of suicidal behavior in unipolar depression. J Affect Disord 2004;83:103–108. [PubMed: 15555702]

Young EA, Aggen SH, Prescott CA, Kendler KS. Similarity in saliva cortisol measures in monozygotic twins and the influence of past major depression. Biol Psychiatry 2000;48:70–74. [PubMed: 10913510]

Table 1

Baseline Description

n	54
age, mean (SD)	39.6 (15.2)
range	(18–76)
# (%) female	34 (63.0)
# (%) with RDC	
– psychotic MDD	28 (51.9)
– schizoaffective, mainly affective	26 (48.1)
maximum post-dexamethasone cortisol	
– mean (SD)	8.1 (7.1)
– # (%) > 5 μg/dl	26 (48.2)
– # (%)≥10 μg/dl	15 (27.8)
deaths during follow-up, n	13
– suicide	4 (30.8)
– cardiovascular	4 (30.8)
– neoplasm	2 (15.4)
– unknown/other	3 (23.1)

Table 2

Baseline Post-Dexamethasone Cortisol and Later Death: Logistic Regression

	t	p
cardiovascular		
– age	3.90	.000
– maximum cortisol	3.11	.003
suicide		
– age	−1.26	.212
– maximum cortisol	.583	.562
other causes		
– age	.999	.322
– maximum cortisol	.019	.985