Death by suicide long after electroconvulsive therapy. Is the sense of coherence test of Antonovsky a predictor of mortality from depression?

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Abstract

Prediction of increased risk of suicide is difficult. We had the opportunity to follow up 20 patients receiving electroconvulsive therapy (ECT) because of severe depression. They filled in the Antonovsky sense of coherence test (SOC) and Beck depression inventory (BDI) before and after a series of ECT treatments. Seventeen surviving patients had a mean observation time of 20.6 months, whereas the three deceased patients had 11.3 months. There was a lower mean age at onset of illness and a longer mean duration of disease in the deceased. Other clinical parameters did not differ. The surviving patients had a significant decrease on the BDI from 35 to 18 (P<0.001) and an increase on the SOC test after ECT from 2.45 to 3.19 (P<0.001), indicating both less depression and better functioning in life. The deceased had a larger change on the BDI from 32 to 13, not attaining significance because of the low number of deceased. The SOC test, however, did not increase to a purported normal level; that is, from 2.43 to 2.87. Although the SOC scale has been shown to predict mortality in substance abusers, the SOC test has not been part of earlier reviews of predictive power. Tentatively, a low pathological score on the SOC test may indicate low sense of coherence in life that might increase the propensity for suicide. These preliminary results need replication in larger studies.

Introduction

There is a need for strong indicators of mortality after the onset of mental illness. Depression, bipolar disorders, schizophrenia, and also severe personality disorders and substance abuse carry an increased risk of premature death.[1-3] The mortality rate from intravenous heroin abuse exceeds 2% per year in some countries.[4] Many patients in the early stage of schizophrenia commit suicide, thus contributing to the increased mortality rate in schizophrenia from cardiovascular diseases later in life. Comorbid schizophrenia and substance abuse is not rare, making the treatment of both illnesses more difficult. In general, electroconvulsive therapy (ECT) seems to reduce the risk of suicide, more so in the short term than over years after a series of ECT treatments.[5] Suicide attempts after six months were not as frequent among 519 depressive patients receiving ECT (0.8%) compared to patients receiving antidepressant medication (4.2%).[6]

Depression inventories categorize the depth of a depression, but as far as we have read in the scientific literature, no single test of depression or anxiety has a distinct ability to predict an increase in mortality, let alone suicide, except for the notion that a more severe degree of illness would indicate an increase in mortality risk. This is documented thoroughly in the now 25-year-old study of Pokorny.[7] The sample for this study was 4800 patients consecutively admitted to a Veterans hospital. On a wide range of tests, including the Beck depression inventory (BDI), attempts to identify specific subjects were unsuccessful. Thus the author concluded that "identification of particular persons who will commit suicide is not currently feasible." Some of his negative conclusions were criticized by others.[8] Contrary to this, we did find such a relationship in a study of 120 substance abusers.[4,9] They filled in the Antonovsky sense of coherence test (SOC) and six years later their fates were sought in the Causes of Death Register of Statistics, Norway. All patients who died during this period, and only one of the surviving abusers, had a low score (<3.0) on the SOC test. The degree of depression may hinge on a combination of social, economic, relational, and possibly genetic factors. We have taken the opportunity to investigate if this test, used more in social sciences than in medicine, could be an indicator of mortality, despite the rather conclusive recommendations of Pokorny.[7]

Materials and Methods

Twenty patients referred to the acute psychiatric department of Lovisenberg Diaconal Hospital in Oslo received ECT treatment for severe uni- or bipolar depression. The hospital is responsible for acute resident care in a catchment area of 100,000 and is obliged to accept all patients referred by a medical doctor outside the hospital. All patients underwent a differential diagnostic assessment according to ICD-10 categories, and comorbid disorders were noted. The presence of significant personality disorders or active substance abuse made patients unfit for ECT. Most patients with depression deemed suitable for ECT were referred to the hospital on a voluntary basis. The age of onset of uni- or bipolar depression was noted, together with the duration of illness before the index stay. The number of previous known suicide attempts, and whether they revealed suicidal ideation during the stay, was also registered. After a series of ECT treatments, described in detail elsewhere, 20 patients were discharged from the hospital,[10] and they were referred to another long-term resident facility, a psychiatric polyclinic, or back to their general practitioner for further follow-up. Before and on the day after finishing a series of ECT treatments, all patients filled in two psychometric tests, the SOC test and the BDI.

The sense of coherence scale of Antonovsky

This scale was developed to unravel the factors preventing people from developing illnesses despite enormous strain, in concentration camps for instance.[11] More specifically, the test covers items on manageability, comprehensibility, and meaning in life. There are several versions of the test, and we have used the 13-questions version (see appendix). Although not used much in psychiatry, and not among the tests reviewed by Pokorny, the SOC test has been employed on different populations of patients and non-patients.[7,12-16] In the version used here, each question is rated from one to five, five being the answer deemed normal. A mean was calculated. Values <3.0 were considered pathological, and values between 3.0 and 3.5 were as would be found in students still on their way to establish themselves in work and life. Values >3.5 were considered normal; that is, the person has the ability to manage and comprehend a meaningful life. The Cronbach-α value of the 13-question version used here ranged from 0.74 to 0.91 in 16 studies.[11] Test-

retest stability was measured at 0.54 over a two-year period. Hopelessness and self-esteem have been compared to the sense of coherence concept connected to suicide attempts, and ECT has been shown to prevent imminent suicide in depressed patients.[17,18]

Beck depression inventory

The BDI was developed by Aaron Beck more than 40 years ago, and is one of the most used and well established tests of depression.[19,20] Lack of improvement on this test after ECT would indicate continued depressive symptoms. Many patients continue to have a slightly elevated sum score after treatment, indicating continued depressive traits at a more manageable level. There are many alternative depression scales available for general populations with depression (e.g. Hamilton depression rating scale) or specifically for groups with comorbid schizophrenia (e.g. Calgary depression scale for schizophrenia).[21,22] The BDI was chosen for its ease of use and good psychometric properties.

Results

The 20 patients, who all were diagnosed with severe depression according to ICD-10, were observed until December 1, 2008. They all received a series of ECT treatments during a stay in the acute psychiatry department (see Berg and Kononova[10]). A series of ECT treatments with six to 13 sessions were given thrice weekly. Right unilateral electrode placement was used under general anesthesia with pentothal and succinylcholine. After the index treatment period the patients were referred to either long-term resident treatment in another hospital or to ambulatory treatment within the realm of psychiatric polyclinics.

Mean age was 40.3 years (SD=10.0) for the whole group, 43.4 years and 37.1 years for men and women, respectively (Table 1). The mean age of the three patients who committed suicide was 43.0 years, and was 39.8 years for the 17 surviving patients. None were working prior to ECT and four patients, including one of the deceased, had an invalidity pension. Nine of the 17 surviving patients and one of the three deceased started working again after ECT. All three deceased patients lived alone, whereas six of the 17 surviving patients did not.

The 17 surviving patients had a mean observation time of 20.6 months, whereas the three deceased had a mean time of 11.3 months, which was truncated at death. Mean age at onset of illness for the surviving patients was 29.6 years, and was 22.3 years in the deceased (t=2.8, P=0.03; Table 2). Mean duration of illness prior to the index stay was 10.2 and 20.7 years, respectively (t=2.2, P=0.04). The mean number of previous suicide attempts did not differ, and was measured as 2.8 and 2.7, respectively. No significant difference was found in suicidal ideation during the resident stay or in the kind of treatment received after the treatment sessions. Of the surviving patients, 35.3% had substance abuse comorbidity, whereas two out of three of the deceased had this comorbidity. The mean change in score on the BDI for the 17 surviving patients was from 34.9 to 18.2 (t=5.3, P<0.001) and on the SOC test was from 2.45 to 3.19 (t=-4.3, P=0.001). The mean changes for the three patients who died in the follow-up period were from 32.3 to 12.7 (t=2.2, P=0.16) for the BDI and from 2.43 to 2.87 (t=-1.5, P=0.27) for the SOC test. The changes in mean scores were not significant. Mean number of ECT treatments received were 10.8 and 9.3 for the surviving and deceased, respectively, which was not significantly different (2-tailed t-test, P=0.3).

Cases

Case #1

Woman, aged 38 years, admitted to the acute psychiatric ward with severe depression and despair. In part, her despair was related to interpersonal difficulties with an abusive boyfriend. At the initial talks with her she gave the impression of an offended and disappointed person. It was difficult to establish a good patient–therapist relationship, which had been the case before entry, and also after the index stay in our facility. She was on sickness leave from education as a rehabilitative activity. After a course of ECT she was given the possibility of a further stay in another facility accommodating patients for some months after a shorter resident stay in the acute wards. After she left that resident facility she received further psychotherapy at a psychiatric polyclinic. Her living arrangements were not satisfactory and she did not manage to restart her studies. She committed suicide two months after the end of that stay (Table 3).

Case #2

A 47-year-old man, with bipolar disorder and a comorbid excessive drinking habit during depressive episodes, was admitted for ECT. He was working full time as a senior advisor in the municipality during his stable periods. His work was done to the satisfaction of him and his employer. Emotional expressions were strong, both as a depressive person, and even more so after the course of ECT. He maintained that he would write articles in the newspapers on the immense success of ECT treat-

Table 1. Diagnosis (1 = primary reason for ECT, and 2 = secondary diagnosis of relevance for mental functioning) and socio-economic status in patients receiving electroconvulsive therapy treatment in an acute care department.

Case no. (deceased†)	Age/ Gender	Diagnosis 1 and 2 given	Number of ECTs given	In Work prior to ECT	In work after ECT	Living alone
1	33/F	F31.3	11	N	N	Y
2	24/F	F32.3/F40.1	11	N	N	N
3	32/M	F32.2	8	N	Y	Y
4	33/M	F31.4	11	N	Y	Y
5	30/F	F32.2/F40.1	8	N	Y	N
6†	47/M	F31.4/F10.2	9	N	Y	Y
7†	44/M	F33.2/F60.3	13	N	N	Y
8	45/M	F33.2/F48.0	11	N	Y	Y
9	38/M	F20.4/F20.0	12	N	Y	Y
10	59/M	F33.2/F41.1	15	N	Y	N
11	59/F	F32.2	10	N	N	Y
12†	38/F	F33.2/F60.3	6	NP	N	Y
13	47/F	F32.2/F13.2	12	NP	N	Y
14	43/M	F31.4/B23.0	11	NP	N	Y
15	36/F	F33.2/F42.0	10	N	Y	N
16	37/F	F33.3/F21.0	9	N	N	N
17	34/M	F31.4/F12.1	11	N	Y	Y
18	59/M	F31.4	12	NP	N	Y
19	31/F	F33.2/F19.1	11	N	N	Y
20	36/F	F32.2/F61.0/F12.1	10	N	Y	N

N, no; Y, yes.

ment, which it turned out he did not do. After the course of ECT he resumed his work, initially on a part-time basis. He was followed up at an alcohol clinic, and we were utterly surprised on reading the announcement of his death in the paper (Table 3).

Case #3

A 44-year-old former heroin abuser was admitted for a recurrent depressive episode and a personality disorder. Diagnostically he was clearly severely depressed at entry and did not use any substances of abuse at that time. His appearance was somewhat worn-out, with heavily colored hair, many tattoos, and a sluggish way of walking. In talks with him, he did not produce analytical material and seemed unmotivated and unable to change his way of life. He was on rehabilitation benefit and thus not working. After ECT he was living in an assisted-living home and had psychotherapy sessions at a psychiatric polyclinic. As far as we know, he still had some contact with an abusing milieu (Table 3).

Discussion

Although prediction of suicide by tests or qualified interviews has been criticized fiercely by Pokorny[7] and others, the observations made after using the SOC scale should still be of interest. This scale was not available to Pokorny and other early critics of prediction of suicide, and has not been used extensively in psychiatry. On the other hand, the other test used in the present study, the BDI, was available to Pokorny. Suggesting an ability to foresee suicidal intent and fulfillment by using the SOC test has, to our knowledge, been shown earlier only in studies of substance abusers.[4,9] The SOC test was compared to traditional locus of control and social support predictor measures,[23] and it emerged as a useful measure implicated in personal reactions to distressing life events. In a U.S. study, 1000 students were given a battery of tests before and after a controlled stressful situation.[24] This study indicated that subjects with low SOC scores showed more distress, and appraised and coped with stressful situations in ways less likely to resolve or eliminate their stress. Thus it may be argued that the SOC test discloses lack of ability to cope with stress, and that this in turn would increase the future risk of a successful suicide attempt.

In our study, 20 depressed patients were followed up after a course of ECT in an acute psychiatric clinic. Three patients died by suicide a long time after the index series of ECT treatments. They all had a low value on the SOC test. Neither they nor the surviving patients had a mean BDI score within the normal range

Table 2. Treatment characteristics of 20 patients undergoing electroconvulsive therapy treatment for depression.

Case no. (deceased†)	Age at onset of illness (years)	Duration of illness (years)	Previous suicide attempts	Current suicidal ideation	Kind of treatment after ECT*
1	25	8	5	Yes	R
2	21	3	1	No	P and M
3	30	2	1	No	P and M
4	26	7	3	No	P and M
5	18	12	6	No	P
6†	21	26	0	No	P and M
7†	20	24	4	No	R
8	42	3	0	No	R
9	26	12	0	No	M
10	45	15	0	No	P
11	39	20	6	No	P and M
12†	26	12	4	Yes	R
13	30	17	0	No	P
14	22	21	5	Yes	P and M
15	33	3	1	Yes	P
16	31	6	7	No	R
17	25	9	0	No	P
18	31	28	0	No	P and M
19	26	5	8	No	P and M
20	33	3	1	Yes	P

*P, psychotherapeutic treatment in a polyclinic setting; M, medication with neuroleptics in a polyclinic setting; R, resident treatment with P and M.

Table 3. Scores on the Antonovsky sense of coherence test and the Beck depression inventory for three patients who committed suicide more than eight months after a series of electroconvulsive therapy treatments.

Case number, gender and age	Months after ECT	SOC before ECT	SOC after ECT	BDI before ECT	BDI after ECT
1, female, 38 years	8	2.92	3.23	29	27
2, male, 47 years	12	3.38	3.39	34	3
3, male, 44 years	9	1.77	2.85	34	8

after ECT, albeit with a reduction being seemingly greater for the deceased. Two of the deceased patients attained normal levels on the BDI. The mean age at onset of illness was lower in the deceased, and they also had a longer mean duration of illness. This information would, however, not be of relevance in identifying the patients at increased risk of future suicide as some of the surviving patients had comparable duration times. There was no difference in the number of previous suicide attempts and in suicidal ideation during the hospital stay. Because of the design of our study, we were unable to give information on suicide attempts after the index ECT stay.

Earlier studies of drug addicts have shown that the SOC test may predict mortality, espe-

cially if counteracting precautions are not taken.[4,9] The majority of them died within the first 1.5 years after filling in the test form. Whether the time elapsed after treatment influences the predictive power of the SOC test has not been studied. However, the stability of the SOC test over time has been demonstrated.[11] In all three of our cases from the acute psychiatric facility, a mean of 11.3 months elapsed before suicide, whereas in the case of substance abusers, few of the cases died before one year after the index event. A low level of well-being has been shown to be associated with a high level of suicidal intent, depression, and hopelessness as measured by the World Health Organization well-being index, a short five-item scale.[25] This scale has

only one item in common with the SOC scale.

Our study is limited in having small numbers in the two groups, those surviving and those deceased months after an ECT series. Notwithstanding, it was possible to show that the SOC test scores remained in the purported pathological range after ECT, thus mimicking the findings in substance abusers.[4,9] With such numbers the power of the results on other demographic and clinical variables would be low. Lack of diagnostic accuracy may also have contributed to illuminate other factors relevant for suicidal intent and action. A comparison with other patients with depression, not given ECT, could have been a wise augmentation of our study. As our facility does not screen all patients with the SOC test or other scales, it is not possible to do this post-hoc.[26]

In a Danish register-based cohort study (N=5781) of all causes of mortality in patients with psychiatric morbidity, the patients receiving ECT (N=783) had a lower overall mortality rate from natural causes (RR=0.82, CI=0.74-0.90) but a slightly higher suicide rate (RR=1.20, but with a 95% CI=0.99-1.47), compared to all other resident psychiatric patients.[27] Suicides (N=149) occurred in less than a third of all deceased (N=783) former ECT patients. There seemed to be a higher risk of suicide in the first weeks after discharge, contrary to the findings of our study. This could be a coincidence, as our sample is very small compared to that of the register-based study.

The review by Prudic and Sackeim contends that ECT exerts a profound short-term beneficial effect on suicidality, but little effect on long-term rates of suicide.[5] This may also be the interpretation of our study.

Predictions of rare events such as suicides are arduous and still a great challenge for clinicians in psychiatry. Even if a prediction of who might commit suicide is impossible, the availability of a test that might identify persons under special risk would be of interest. The SOC test might be a candidate for such a test. Results of prediction in substance abusers and the preliminary results of our study should encourage further research.

Appendix. The sense of coherence test of Antonovsky, 13 questions version

1) **Has it happened in the past that you were surprised by the behavior of people whom you ought to know?**
Never happened – always happened

2) **Do you have the feeling that you are in an unfamiliar situation and don't know what to do?**
Very often – very seldom or never

3) **Do you have very mixed-up feelings and ideas?**
Very seldom or never – very often

4) **Do you have the feeling that you're being treated unfairly?**
Very often – very seldom or never

5) **Many people – even those with a strong character – sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?**
Very seldom or never – very often

6) **Has it happened that people whom you counted on disappointed you?**
Never happened – always happened

7) **How often do you have the feeling that there's little meaning in the things you do in your daily life?**
Very often – very seldom or never

8) **Until now, your life has had:**
No clear goal or purpose at all – very clear goals and purpose

9) **Doing the things you do every day is:**
A source of deep pleasure and satisfaction – a source of pain and boredom

10) **Does it happen that you have feelings inside you would rather not feel?**
Very seldom or never – very often

11) **Do you have the feeling that you don't really care about what is going on around you?**
Very seldom or never – very often

12) **How often do you have feelings that you're not sure you can keep under control?**
Very often – very seldom or never

13) **When something happened, have you generally found that:**
You overestimated or underestimated its importance – you saw things in the right proportion

All items are scored from 1 to 5. There is also a version of SOC – 13 scored from 1 to 7. The former was used in the present study.

References

1. Allgulander C, Fisher LD. Clinical predictors of completed suicide and repeated self-poisoning in 8895 self-poisoning patients. Eur Arch Psychiatr Neurol Sci 1990;239:270-6.
2. Brådvik L, Berglund M. Suicide in severe depression related to treatment. Depressive characteristics and rate of antidepressant overdose. Eur Arch Psychiatry Clin Neurosci 2005;255:245-50.
3. Dhossche DM, Meloukheia AM, Chakravorty S. The association of suicide attempts and comorbid depression and substance abuse in psychiatric consultation patients. Gen Hosp Psychiatry 2000;22:281-8.
4. Berg JE, Andersen S. Mortality 5 years after detoxification and counselling as indicated by psychometric tests. Subst Abuse 2001;23:1-10.
5. Prudic J, Sackeim HA. Electroconvulsive therapy and suicide risk. J Clin Psychiatr 1999;60:104-10.
6. Avery D, Winokur G. Suicide, attempted suicide, and relapse rates in depression. Arch Gen Psychatr 1978;35:749-53.
7. Pokorny AD. Prediction of suicide in psychiatric patients. Report of a prospective study. Arch Gen Psychiatr 1984;40:249-57.
8. Cull JG, Roid GH, Dancer S. Suicide risk prevention (letter). Arch Gen Psychiatr 1984;41:309-10.
9. Andersen S, Berg JE. The use of a sense of coherence test to predict drop-out and mortality after residential treatment of substance abuse. Addiction Res Theor 2001;9:239-51.
10. Berg JE, Kononova N. Sense of coherence in patients treated for depression with ECT. Int J Psychiatr Med 2009;39:101-12.
11. Antonovsky A. The structure and properties of the sense of coherence scale. Soc Sci Med 1993;36:725-33.
12. Bengtsson-Tops A, Hansson L. The validity of Antonovsky's sense of coherence measure in a sample of schizophrenic patients living in the community. J Adv Nurs 2001; 33:432-8.
13. Dahlin L, Cederblad M, Antonovsky A, et al. Childhood vulnerability and adult invincibility. Acta Psychiatr Scand 1990;82:228-32.
14. DeWolfe DJ. Stress and coping: a study of HIV positive men and women. Uni Oregon: Div Counsel Ed Psychol, 1989.
15. Gottberg K, Einarsson U, Fredrikson S, et al. A population-based study of depressive symptoms in multiple sclerosis in Stockholm County. Association with functioning and sense of coherence. J Neurol Neurosurg Psychiatry 2007;78:60-5.
16. Langius A, Björvell H, Antonovsky A. The sense of coherence concept and its relation to personality traits in Swedish samples. Scand J Caring Sci 1992;6:165-71.
17. Petrie K, Brook R. Sense of coherence, self-esteem, depression and hopelessness as correlates of reattempting suicide. Br J Clin Psychol 1992;31:293-300.
18. Kellner CH, Fink M, Knapp R, et al. Relief of expressed suicidal intent by ECT: A consortium for research in ECT Study. Am J Psychiatr 2005;162:977-82.
19. Beck A, Ward M, Mendelson J, et al. An inventory for measuring depression. Arch Gen Psychatr 1961;4:53-63.
20. Rounsaville B, Weissman MM, Rosenberger PH, et al. Detecting depressive disorders in drug abusers. A comparison of screening instruments. J Affective

Disorders 1979;1:255-67.

21. Hamilton M. A rating scale for depression. J Neurol Neurosurg Psychiatr 1960;23:56-62.

22. Addington D, Addington J, Schissel B. A depression rating scale for schizophrenics. Schizophr Res 1990;3:247-51.

23. Flannery RB Jr, Perry JC, Penk WE, et al. Validating Antonovsky's sense of coherence scale. J Clin Psychol 1994;50:575-7.

24. McSherry WC, Holm JE. Sense of coherence: its effects on psychological processes prior to, during, and after a stressful situation. J Clin Psychol 1994;50:476-87.

25. Sisask M, Värnik A, Kölves K, et al. Subjective psychological well-being (WHO-5) in assessment of the severity of suicide attempt. Nordic J Psychiatr 2008;62:431-5.

26. Berg JE, Iversen VC. Use of psychometric tests in an acute psychiatric department according to ethnicity. J Psychiatr Intens Care 2009;5:99-107.

27. Munk-Olsen T, Laursen TM, Videbech PB, et al. All-cause mortality among recipients of electroconvulsive therapy. Register-based cohort study. Br J Psychiatr 2007; 190:435-9.