ORIGINAL STUDY

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Electroconvulsive Therapy in Depression
Improvement in Quality of Life Depending on Age and Sex

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Objectives: It is uncertain if there are variations in the improvement of quality in life between sexes and age groups after electroconvulsive therapy (ECT). The aim of this study was to investigate how health-related quality of life changed after treatment and to examine differences in the results between sex and age groups.

Methods: This register-based study used data from the Swedish national quality register for ECT. The study population was patients diagnosed with depression who had received ECT. Health-related quality of life was quantified using the 3-level version the EuroQol 5-dimensional questionnaire (EQ-5D 3 L). Analysis of variance was used to compare change in EQ-5D score from pretreatment to posttreatment between sex and age groups.

Results: There was a statistically significant improvement in EQ-5D index score and EQ visual analog scale (VAS) score in all patient groups after ECT. The mean improvement in EQ-5D index score and EQ-VAS score ranged from 0.31 to 0.46 and 28.29 to 39.79, respectively. Elderly patients had greater improvement in EQ-5D index score and EQ-VAS score than younger patients. There was no significant difference in improvement between the sexes. The mean improvement in EQ-5D index score was 0.40 for male patients and 0.41 for female patients.

Conclusions: Electroconvulsive therapy had a considerable effect on health-related quality of life in patients with depression of both sexes and all age groups. The improvement was greatest in elderly patients, who more often had psychotic features. More studies are needed to investigate the long-term effects of ECT and to further explain the varying treatment results between elderly and younger patients.

Depression is a major health problem. It is associated with increased mortality risk and is a major cause of inability to work.[1] Electroconvulsive therapy (ECT) is used in severe depression with suicidal ideation or psychotic symptoms.[2] Electroconvulsive therapy is an effective treatment, with the remission rates after ECT often reported to exceed 50% for patients with depressive disorder.[3] According to the World Health Organization, quality of life is a state of physical, mental, and social well-being and not merely the absence of disease.[4] Major depressive disorder has a large impact on quality of life.[5] Patients with major depressive disorder report poorer health-related quality of life (HRQoL) than patients with other common medical conditions, such as hypertension, arthritis, and angina. Health-related quality of life is especially low in depressed patients who are referred for ECT.[6]

The majority of patients with depression who receive ECT report improvement in HRQoL.[7] Improvements in HRQoL tend to be greater in ECT recipients than in hospitalized depressed patients treated only with antidepressants.[8] There is heterogeneity regarding the influence of age on treatment results following ECT for depression. Some studies report clinically relevant better results among elderly patients as compared with younger ones, whereas other studies dispute the relevance of age as a predictor for efficacy of ECT.[9–12] More studies are needed to determine the effect of age on HRQoL after ECT in treatment of depression.

The EuroQol 5-dimensional questionnaire (EQ-5D) is a standardized and widely used instrument for measuring health status and is one of the most common instruments used to quantify HRQoL.[13,14] To our knowledge, EQ-5D has not been used to quantify HRQoL after treatment of patients with depressive disorder with ECT in previous studies. Therefore, the aim of this study was to investigate how HRQoL, as measured by EQ-5D, of patients with depressive disorders changed after treatment with ECT and to examine differences in the treatment results between sexes and age groups.

MATERIALS AND METHODS

Study Design

The study was a register-based cohort study based on data from the Swedish National Quality Register for ECT (Q-ECT). The Q-ECT was created in 2008, and since 2012 it has included all hospitals in Sweden that use ECT.[2] The register contains detailed information about patient characteristics, including indications for therapy and rating on EQ-5D. It is a nonmandatory register, and the coverage rate is approximately 90%.[15]

Outcome Measure

Health-related quality of life was estimated using the 3-level version of EQ-5D (EQ-5D-3 L). The instrument is designed as a questionnaire and embodies 2 components: a descriptive system that consists of 5 questions regarding the patient's health and a rating of the health state using a visual analog scale (EQ-VAS). The 5 questions in the descriptive system represent different dimensions of HRQoL: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The patients describe their health status by selecting 1 of 3 response levels for each question: none, moderate, or severe problems (scored 1, 2, and 3, respectively).[16]

To calculate an overall index value based on the 5 questions, a value set from United Kingdom was used to score the responses of each patient. This value set operates on a scale between a minimum value of −0.59 (for health state 33333) and a maximum value 1 (for health state 11111).[17] On the EQ-VAS, the patients rate their health status between 0 (worst imaginable state of health) and 100 (best imaginable state of health).[16] The patients were asked to evaluate their HRQoL within a week before the first ECT session and within a week after the last ECT session.

The Clinical Global Impression–Improvement (CGI-I) scale was performed within a week after the last ECT session. This scale ranges from 1 to 7 (very much improved, much improved, minimally improved, not improved, minimally worse, much worse, and very much worse). A CGI-I score of 1 or 2 was considered improved, and a CGI-I score of 3 or greater was considered not improved.[12]

Subjects

The patients included in the study had to fulfill the following criteria: (1) diagnosed with a depressive episode or major recurrent depressive disorder, F32 or F33 in the World Health Organization International Classification of Diseases, 10th Revision[18]; (2)

received index ECT in Sweden between 2014 and 2016; and (3) have available data for EQ-5D index score and EQ-VAS score in the Q-ECT. The patients were divided into 4 age groups: 15 to 39, 40 to 60, 61 to 80, and 81 to 99 years based on age at the time of treatment.

Statistical Methods

Cohen *d* effect sizes were calculated to evaluate the magnitude of change in EQ-5D index score after ECT in male and female patients and in the 4 age groups. Paired *t* tests were used to compare HRQoL before and after ECT as measured using the EQ-5D index score and EQ-VAS score in the 4 age groups and in both sexes. Analysis of variance was used to compare the change in EQ-5D index score and EQ-VAS score from pre- to post-ECT between the sexes and among the 4 age groups. SPSS version 22 (SPSS Inc, Chicago, Ill) was used for all statistical analyses. A χ^2 test was used to compare the proportion of patients reporting no anxiety or depression after ECT according to EQ-5D between the youngest age group and the other age groups. McNemar test was used to compare the proportion of patients reporting extreme anxiety or depression before ECT and after ECT.

Ethical Considerations

This study is part of the research project Outcome of Treatment for Affective Disorders, which has been approved by the Regional Ethical Vetting Board in Uppsala (2014-174). All patients in the register have been informed of the register and that their data could be used for research. The individuals may ask to have their information removed from the register whenever they want. All data have been anonymized in this study.

TABLE 1. Characteristics of Study Population (n = 1066)

Characteristic	Patients	Age Group, y			
		15–39	40–60	61–80	81–99
Total	1066 (100.0)	283 (26.5)	323 (30.3)	386 (36.2)	74 (6.9)
Sex					
Female	642 (60.0)	173 (61.1)	169 (52.3)	251 (65.0)	49 (66.2)
Male	424 (40.0)	110 (38.9)	154 (47.7)	135 (35.0)	25 (33.8)
No. ECT treatments	7.8 ± 3.0	8.1 ± 3.3	7.9 ± 3.2	7.8 ± 2.8	6.7 ± 2.0
Electrode placement					
Unilateral	986 (92.5)	266 (94.0)	293 (90.7)	357 (92.5)	70 (94.6)
Bitemporal	64 (6.0)	14 (4.9)	22 (6.8)	24 (6.2)	4 (5.4)
Bifrontal	7 (0.7)	1 (0.4)	4 (1.2)	2 (0.5)	0 (0.0)
Other	1 (0.1)	0 (0.0)	0 (0.0)	1 (0.3)	0 (0.0)
Information missing	8 (0.8)	2 (0.7)	4 (1.2)	2 (0.5)	0 (0.0)
Anxiety disorder					
Yes	358 (33.6)	107 (37.8)	107 (33.1)	120 (31.1)	24 (32.4)
No	708 (66.4)	176 (62.2)	216 (66.9)	266 (68.9)	50 (67.6)
Depression with psychotic features					
Yes	204 (19.1)	28 (9.9)	58 (18.0)	95 (24.6)	23 (31.1)
No	862 (80.9)	255 (90.1)	265 (82.0)	291 (75.4)	51 (68.9)
Responder					
Yes	795 (74.6)	176 (62.2)	232 (71.8)	327 (84.7)	60 (81.1)
No	192 (18.0)	88 (31.1)	56 (17.3)	41 (10.6)	7 (9.5)
Information missing	79 (7.4)	19 (6.7)	35 (10.8)	18 (4.7)	7 (9.5)

All values are n (%) or mean ± SD.

RESULTS

Study Population

The study population comprised 1066 patients who fulfilled all criteria to participate in the study. Patient characteristics are provided in Table 1. The age of the patients ranged from 15 to 99 years, and the female-to-male ratio was 3:2. The mean number of ECT treatments was 7.83 for the whole study population. Of 1059 patients, 772 (72.4%) received treatment with pulse width 0.05 millisecond, 103 (9.7%) with pulse width greater than 0.5 millisecond, and 108 (17.3%) with pulse width less than 0.5 millisecond. The most common electrode placement during ECT was unilateral placement throughout the treatment series, but 57 patients (5.8%) who received unilateral treatment in the first ECT session were switched to bitemporal treatment in subsequent sessions. A minority of the patients had comorbid anxiety disorder and/or psychotic features. Of 987 patients, 972 (80.5%) responded to ECT.

HRQoL Before and After ECT

Health-related quality of life improved in both male and female patients and in all age groups after ECT. There were statistically significant improvements in EQ-5D index scores and EQ-VAS scores after ECT in all patient groups (Table 2). The mean improvement in EQ-5D index score and EQ-VAS score ranged from 0.31 to 0.46 and 28.29 to 39.79, respectively (Table 3). There was no significant difference between male and female patients in the mean improvement in EQ-5D index score or EQ-VAS score after ECT (Table 3). However, there was a statistically significant difference between age groups. The 2 oldest age groups had greater improvement in EQ-5D index score, as well as in EQ-VAS score, after ECT than the younger patients (Table 3).

The effect size of change in EQ-5D index score was large for male and female patients, and Cohen d's were 1.43 and 1.55, respectively. Large effect sizes were shown in all age groups, and the effect size increased with older age; for age groups 15 to 39, 40 to 60, 61 to 80, and 81 to 99 years, Cohen d's were 1.13, 1.46, 1.58, and 1.61, respectively.

Details of responses on each item of the EQ-5D in each of the 4 age groups separated by sex are presented in Supplementary Table 1 (Supplemental Digital Content 1, http://links.lww.com/JECT/A99) and Supplementary Table 2 (Supplemental Digital Content 2, http://links.lww.com/JECT/A100). There was an improvement in the ability to perform usual activities and self-care in all age groups. Before ECT, elderly patients reported more problems with mobility than did younger patients. After ECT,

elderly patients reported a larger improvement in mobility than did younger patients.

After ECT, the proportion of patients reporting no anxiety or depression according to the EQ-5D was lowest in the youngest age group ($P < 0.001$; Supplementary Table 1, Supplemental Digital Content 1, http://links.lww.com/JECT/A99; and Supplementary Table 2, Supplemental Digital Content 2, http://links.lww.com/JECT/A100). In all age groups, the proportion of patients reporting extreme anxiety or depression was lower after ECT than before ECT (Supplementary Table 1, Supplemental Digital Content 1, http://links.lww.com/JECT/A99; and Supplementary Table 2, Supplemental Digital Content 2, http://links.lww.com/JECT/A100; $P < 0.001$). However, more than half of all patients still reported "some symptoms" of depression or anxiety after ECT according to the EQ-5D.

DISCUSSION

The primary focus of this study was to investigate how self-rated HRQoL, according to age and sex, changed after treatment with ECT. The results showed an improvement in HRQoL after treatment with ECT for male and female patients with depression in all age groups. There were no significant differences in results between males and females. These results support ECT as an effective treatment method for both sexes. However, there were statistically significant differences in treatment results between age groups, as indicated by the EQ-5D index scores as well as EQ-VAS scores, with greater improvements in elderly patients.

A driver of the difference between age groups was that problems with mobility were more common among elderly patients before ECT and that elderly patients experienced a greater improvement in mobility after ECT than younger patients. Another contributing factor to the difference between age groups was that severe pretreatment anxiety and depression were more common in elderly patients.

Our results support previous studies showing a higher efficacy of ECT among elderly patients than younger patients. These results are in line with Brus et al,[19] who also used the Q-ECT and found an association between older age and higher remission rate after ECT for depression. In addition, Gálvez et al[20] reported a greater improvement in the HRQoL of elderly patients with depression than in that of younger patients after ECT. The Quality of Life Enjoyment and Satisfaction Questionnaire–Short Form was used in the study to measure HRQoL, and a large effect size of change in total HRQoL was reported (Cohen $d = 1.43$). Moreover, McCall et al[6] reported a significantly greater improvement in mental health and social functioning after ECT in elderly patients compared with younger patients.

TABLE 2. EQ-5D Index Score and EQ-VAS Score Before and After Treatment According to Sex and Age Groups (n = 1066)

	EQ-5D Index Score			EQ-VAS Score		
	Before ECT	After ECT	*P*	Before ECT	After ECT	*P*
Sex						
Male	0.33 ± 0.29	0.73 ± 0.27	<0.01	28.16 ± 19.59	62.67 ± 22.92	<0.01
Female	0.28 ± 0.29	0.70 ± 0.28	<0.01	24.53 ± 19.28	60.12 ± 24.04	<0.01
Age, y						
15–39	0.32 ± 0.26	0.63 ± 0.29	<0.01	23.15 ± 16.72	51.80 ± 24.10	<0.01
40–60	0.30 ± 0.28	0.71 ± 0.28	<0.01	26.05 ± 20.27	61.04 ± 22.76	<0.01
61–80	0.30 ± 0.32	0.76 ± 0.26	<0.01	27.22 ± 20.25	67.06 ± 22.77	<0.01
81–99	0.27 ± 0.34	0.72 ± 0.20	<0.01	29.83 ± 20.62	65.93 ± 18.34	<0.01

Values are mean ± SD.

TABLE 3. Mean Change in EQ-5D Index Score and EQ-VAS Score After ECT (n = 1066)

	EQ-5D Index Score	EQ-VAS Score
Sex		
Male	0.40 ± 0.31	34.33 ± 25.60
Female	0.41 ± 0.33	35.52 ± 27.07
P	0.510	0.475
Age, y		
15–39	0.31 ± 0.30	28.29 ± 24.32
40–60	0.41 ± 0.32	35.03 ± 25.92
61–80	0.46 ± 0.33	39.79 ± 27.71
81–99	0.46 ± 0.31	35.99 ± 25.25
P	<0.01	<0.01

Values are mean ± SD.

Age also affects the HRQoL deficit patterns. According to McCall et al,[21] younger patients with depression typically report relationship problems, whereas older patients report problems in daily living. Cognitive impairment is an important adverse effect of ECT and has been described as a major concern for elderly ECT recipients.[21] On the other hand, subjective memory worsening after ECT is more common in younger patients than in older patients and is more common among females than males.[19] However, improvements in HRQoL after ECT are explained in previous studies by a reduction of depressive symptoms, with little or no relation to cognitive adverse effects.[21]

The results of our study suggest that elderly patients considered the positive impact of improvements in mobility and reduction in depressive symptoms and anxiousness on HRQoL to be more important than any negative impact on cognitive functioning.

Heijnen et al[11] described psychotic features and psychomotor retardation as strong predictors for ECT efficacy in patients with depression. In the current study, the proportion of patients who had depression with psychotic features was higher among elderly patients than younger patients. Also, the higher proportion of patients with impaired mobility among the elderly indicates more catatonic features. This could have contributed to the larger improvement in HRQoL observed among the elderly. Sjöberg et al[22] described an association between dementia and higher prevalence of depression. Some of the elderly patients in this study presumably had comorbid dementia, minimal cognitive impairment, or other comorbid diagnoses.[22] It is uncertain how this might have affected the treatment outcome after ECT.

The strengths of this study include the large, population-based sample. Limitations include lack of a control group not treated with ECT for comparison. Health-related quality of life was only examined immediately following the last ECT session, with no follow-up assessments. The most severally ill patients are likely to more often be unable to complete self-assessment forms and therefore were not included in the study. These patients tend to have the most benefit from ECT, and the effect of ECT could therefore be underestimated. Only a small minority of patients who were not responsive to treatment with unilateral ECT were switched to bitemporal ECT. Better outcomes may have been achieved if bilateral treatment had been used more regularly.

CONCLUSIONS

The HRQoL of patients with depression improved significantly after treatment with ECT for both sexes and all age groups.

The improvement was greatest in elderly patients, who more often than younger patients had psychotic features. More studies are needed to investigate the long-term effects of ECT and to further explain the varying treatment results between elderly and younger patients.

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