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The Effect of Pulse Width on Subjective Memory Impairment and Remission Rate 6 Months After Electroconvulsive Therapy

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Objectives: The aim of this study was to compare the 0.5-millisecond pulse width with broader brief width stimulus and ultrabrief pulse width stimulus in respect to rates of subjective memory impairment and remission 6 months after completion of electroconvulsive therapy (ECT).

Methods: This study used data from the Swedish National Quality Register for ECT. Inclusion criteria were bipolar or unipolar depression with or without psychosis, ECT with unilateral electrode placement, and data on the Montgomery-Åsberg Depression Rating Scale—Self-Assessment and the memory item of the Comprehensive Psychopathological Rating Scale (CPRS-M) before and 6 months after ECT. The primary outcomes were the distributions of patients with a maximum of 10 on the Montgomery-Åsberg Depression Rating Scale—Self-Assessment (remission) and a minimum of 2-step worsening in CPRS-M score according to the ECT pulse widths of <0.5, 0.5, and >0.5 millisecond.

Result: This study included 312 patients. The distributions of patients with remission or a minimum of 2-step worsening on the CPRS-M 6 months after completion of ECT showed no significant differences between the 3 pulse width groups. Older age was associated with a significantly higher rate of remission 6 months after ECT.

Conclusions: In this cohort of patients, no support was found for the previous research finding of lower rates of subjective memory disturbances 6 months after ultrabrief pulse width ECT in comparison with brief pulse width ECT. Older age was associated with higher remission rate 6 months after ECT. Large randomized studies are required to exclude the possibility of long-term differential effects between pulse widths.

Key Words: electroconvulsive therapy, pulse width, memory, remission, depression

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Received for publication October 16, 2019; accepted April 7, 2020.

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The authors report no conflict of interests.

This study was supported by the Region Örebro County. The funding source had no influence on study design; the collection, analysis, and interpretation of data; the writing of the report; or the decision to submit the manuscript for publication.

Supplemental digital contents are available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.ectjournal.com).

DOI: 10.1097/YCT.0000000000000697

(*J ECT* 2020;36: 272–278)

Although electroconvulsive therapy (ECT) is an effective treatment of severe depression,[1] memory impairment is a common side effect. A number of strategies have been tried to minimize this impairment, including unilateral electrode placement rather than bilateral, and shorter pulse widths. However, there is a trade-off between maximal efficacy and minimal memory impairment.[1,2]

Pulse width techniques can be classified as ultrabrief pulse (UBP; 0.3–<0.5 millisecond) and brief pulse (BP; 0.5–1 millisecond).[3] The Sackeim group showed that the cognitive outcomes of the unilateral UBP technique were superior to those of bilateral and BP techniques, whereas the efficacy seemed to be similar to that of the unilateral BP technique.[4] A recent meta-analysis confirmed the superiority of UBP to BP in regard to cognitive outcomes within the first week of ECT, but showed the disadvantage of a lower remission rate.[5] In addition, UBP requires more sessions than BP to achieve a similar treatment effect.[6]

In a randomized trial, UBP showed a favorable difference in long-term memory effects 6 months after treatment in comparison with BP.[4] If these results are confirmed, they would provide evidence for long-term ECT-induced memory deficits that would need to be considered when prescribing ECT. Moreover, they could mean that UBP should be considered as the first-line ECT technique, with the BP technique being reserved for cases that do not respond adequately to the UBP technique. Currently, unilateral electrode placement with a pulse width of 0.5 millisecond is primarily used in Sweden, but there is variation across hospitals regarding the pulse widths used. Therefore, it is possible to analyze the impact of pulse width on the outcomes of ECT.[7]

The aim of this study was to compare the current Swedish standard 0.5-millisecond pulse width with broader BP-width and UBP-width stimuli in respect to rates of subjective memory impairment and remission 6 months after completion of treatment.

MATERIALS AND METHOD

Study Design

This study is a register-based analysis using information from the Swedish National Quality Register for ECT (Q-ECT). For the years 2012 onward, the Q-ECT contains ECT-related data from all hospitals in Sweden offering ECT.[8] Data from the period January 2017 to June 2018 were retrieved for this study.

Participants

The study population consisted of patients with bipolar and unipolar depression with or without psychosis. The depressive episode could be severe to moderate. The *International Statistical*

Classification of Disease and Related Health Problems, Tenth Revision codes of F33.3, F32.3, F31.5, F33.2, F31.4, F32.2, F33.1, F32.1, and F31.3 were included.[9] The diagnosis providing the indication for ECT was confirmed by the referring psychiatrist. An additional inclusion criterion was initial right unilateral electrode placement. Patients treated with ECT were asked to fill out a follow-up inquiry approximately 6 months after ECT. This follow-up inquiry included the memory item of the Comprehensive Psychopathological Rating Scale (CPRS-M)[10] and the Montgomery Åsberg Depression Rating Scale—self-rated version (MADRS-S).[11] These scales are also routinely used in the register within a week before ECT. Patients who completed the 6-month follow-up inquiry within 4 to 10 months after ECT were included in this study. The patient data required for inclusion in this study were the MADRS-S and CPRS-M score, both before and 6 months after ECT.

ECT Technique

The study population were treated with either Mecta (Mecta Corp, Lake Oswego, Ore) or Thymatron ECT devices (Somatics, Inc., Lake Bluff, Ill). Unilateral electrode placement according to d'Elia was used. Of the total of 312 patients, 46 were treated with a pulse width <0.5 millisecond, 187 with a pulse width of 0.5 millisecond, and 79 with a pulse width >0.5 millisecond. The mean (SD) electrical dosages used in the different pulse width groups were 243.7 (108.2) mC for <0.5 millisecond, 333.9 (119.2) mC for 0.5 millisecond, and 466.2 (150.8) mC for >0.5 millisecond. The mean (SD) numbers of sessions in the different pulse width groups were 8.1 (3.1), 8.1 (3.5), and 8.2 (3.4) for <0.5, 0.5, and >0.5 millisecond, respectively. The standard frequency of sessions in Sweden is 3 times per week. The anesthetics used were propofol, thiopental, remifentanil, or ketamine; the full details of these are given in Table 1. Further details on the ECT techniques including frequency, duration, current, charge, and seizure duration are described in Supplementary Table 1 (Supplemental Digital Content 1, http://links.lww.com/JECT/A103).

Variables

Patients rated their subjective memory impairment in the follow-up inquiry 6 months after completion of ECT, with the question being adapted from the memory question in the CPRS. The questionnaire was sent out to the patients and returned to the hospital by post; this routine is recommended by the register from 2016 onward. The scale for memory impairment was as follows: 0, no experience of memory impairment; 2, experience of temporary memory impairment; 4, experience of socially inconvenient or distressing memory impairment; and 6, experience of complete inability to remember. In a study on subjective memory impairment following ECT, this scale has been compared with the Global Self-Evaluation of Memory and Mood.[12,13]

The pulse width at which ECT was initiated was retrieved from the Q-ECT. Patients were categorized into 3 groups according to the pulse width at which treatment was initiated: <0.5, 0.5, or >0.5 millisecond. The 3 pulse width groups were chosen in this study because 0.5 millisecond is the most commonly used in Sweden but less studied than the 0.3- and 1.0-millisecond pulse widths. The diagnoses were categorized into four groups: unipolar depression with psychosis, unipolar depression without psychosis, bipolar depression with psychosis, and bipolar depression without psychosis. The MADRS-S scores before ECT were categorized into 3 groups: 1–19, 20–34, and ≥35, as were the numbers of sessions: 1–5, 6–9, and ≥10. The anesthetics used during the ECT were categorized into 3 groups: propofol, thiopental, and other. The "other" group included ketamine or a combination of anesthetics including propofol, thiopental, ketamine, and remifentanil. Other medications taken during the period of ECT were categorized into 5 groups: benzodiazepines, lithium, antipsychotics, antidepressants, and antiepileptics. If no medication was noted in the register, it was interpreted to mean that no medication was prescribed during ECT. Follow-up times were categorized into <5, 5–7, and >7 months.

Outcomes

The MADRS-S scores after 6 months were categorized into 2 groups: 0–10 and >10. Patients with a MADRS-S score between 0 and 10 after 6 months were viewed as being in remission, whereas those with a MADRS-S score >10 were viewed as nonremission. Electroconvulsive therapy–induced subjective memory impairment was defined as a minimum 2-step worsening in the CPRS score from before ECT to 6 months after ECT. Examples of a 2-step worsening are change from 0 to 2 or 3 to 5. The primary outcomes were the distributions of remission and subjective memory impairment according to the 3 different pulse width groups.

Statistical Methods

The data collected from the Q-ECT were processed using SAS 9.4 (SAS Institute, Cary, North Carolina) and SPSS 25 (IBM Corp, Armonk, New York). Differences in the distributions of patient characteristics between the different pulse width groups were calculated using χ^2 tests. The associations between a minimum 2-step worsening in the CPRS-M score and the potential cofounding variables of sex, age group, number of sessions, anesthetics, medications during the period of ECT, MADRS-S 6 months after completion of ECT, and pulse width were evaluated in 2 multivariate analyses performed using logistic regression with and without follow-up time. Logistic regression was also used to evaluate the association between nonremission and the potential cofounding variables of sex, age group, number of sessions, anesthetics, other medications during the period of ECT, and pulse width group, with and without follow-up time. Statistical significance was defined as $P < 0.05$.

Ethics

This study is part of the research project "Outcome of Treatment for Severe Affective Disorders," which was approved by the regional ethical vetting board in Uppsala, Sweden (registration no. 2014/174/3). Before a patient's information was entered into the Q-ECT, the patient was informed of the register and the future use of the data for research, and had the option to decline participation. No information about this specific study was given to the participants.

RESULTS

A total of 312 patients were identified, 58% female and 42% male. Of these, 84% were diagnosed with unipolar depression and 16% were diagnosed with bipolar depression. Seventeen percent of the patients had psychotic features before ECT. Of the 312 patients, 71 were treated as outpatients, and 240 were treated as inpatients; the data for one patient was missing. The study population and the different variables were similarly distributed among the different pulse width groups, as they were in the patients in the Q-ECT from the same time period that were not included in this study (reference population). The characteristics of the study population and the reference population are described in Table 1.

The 2 patient characteristic variables of sex and age group showed statistically significant differences in distribution among the different pulse width groups. Men tended to be treated with

TABLE 1. Patient Characteristics According to the Different Pulse Width Groups

	<0.5 ms		0.5 ms		>0.5 ms		Total			Reference†	
	n	%	n	%	n	%	n	%	*P**	n	%
Sex									0.019		
Female	33	71.7	112	59.9	37	46.8	182	58.3		2289	61.6
Male	13	28.3	75	40.1	42	53.2	130	41.7		1427	38.4
Age, y									0.000		
16–39	23	50.0	50	26.7	13	16.5	86	27.6		885	23.8
40–64	13	28.3	85	45.5	32	40.5	130	41.7		1430	38.5
≥65	10	21.7	52	27.8	34	43.0	96	30.8		1400	37.7
Diagnosis									0.706		
Unipolar depression with psychosis	7	15.2	27	14.4	15	19.0	49	15.7		651	17.5
Unipolar depression without psychosis	30	65.2	131	70.1	53	67.1	214	68.6		2350	63.2
Bipolar depression with psychosis	1	2.2	1	0.5	2	2.5	4	1.3		112	3.0
Bipolar depression without psychosis	8	17.4	28	15.0	9	11.4	45	14.4		603	16.2
MADRS-S before ECT									0.959		
0–19	2	4.3	9	4.8	5	6.3	16	5.1		210	8.3
20–34	22	47.8	97	51.9	39	49.4	158	50.6		1150	45.3
≥35	22	47.8	81	43.3	35	44.3	138	44.2		1179	46.4
MADRS-S after 6 mo									0.052		
0–10	12	26.1	78	41.7	38	48.1	128	41.0		119	44.9
>10	34	73.9	109	58.3	41	51.9	184	59.0		146	55.1
No. sessions									0.846		
1–5	6	13.0	26	13.9	7	8.9	39	12.5		801	21.6
6–9	29	63.0	113	60.4	51	64.6	193	61.9		2092	56.3
≥10	11	23.9	48	25.7	21	26.6	80	25.6		823	22.1
Anesthetics									0.000		
Propofol	23	50.0	85	45.5	58	73.4	166	53.2		1383	37.2
Thiopental	23	50.0	66	35.3	11	13.9	100	32.1		2014	54.2
Other‡	0	0.0	36	19.3	10	12.7	46	14.7		319	8.6
Medication during ECT											
Antidepressants											
No	6	13.0	22	11.8	10	12.7	38	12.2	0.961	722	19.4
Yes	40	87.0	165	88.2	69	87.3	274	87.8		2994	80.6
Lithium											
No	38	82.6	164	87.7	65	82.3	267	85.6	0.426	3059	82.3
Yes	8	17.4	23	12.3	14	17.7	45	14.4		657	17.7
Benzodiazepine											
No	18	39.1	120	64.2	44	55.7	182	58.3	0.007	1961	52.8
Yes	28	60.9	67	35.8	35	44.3	130	41.7		1755	47.2
Antiepileptics											
No	33	71.7	162	86.6	71	89.9	266	85.3	0.016	3106	83.6
Yes	13	28.3	25	13.4	8	10.1	46	14.7		610	16.4
Antipsychotics											
No	33	71.7	119	63.6	53	67.1	205	65.7	0.558	1918	51.6
Yes	13	28.3	68	36.4	26	32.9	107	34.3		1798	48.4

*Between pulse width groups. Calculated using Pearson χ^2 test.

†Data from the excluded patients from this study treated for depression in the Q-ECT from the same time period.

‡Other contains ketamine or a combination of the anesthetics including ketamine, remifentanil, propofol, and thiopental.

longer pulse widths compared with women, and increasing age correlated with the use of longer pulse widths. The distributions of diagnosis, MADRS-S before ECT, and number of sessions did not differ significantly between the different pulse width groups (Table 1). Propofol was more often used in the >0.5-millisecond pulse width group, and benzodiazepines and antiepileptics were more prevalent in the <0.5-millisecond pulse width group. The MADRS-S 6 months after ECT displayed a nonsignificant tendency for more participants to be in remission with the longer pulse widths (Table 1).

The CPRS-M scores before and 6 months after ECT showed no significant differences in distribution between the different

pulse width groups. The median CPRS-M score in the total population of participants and in all separate pulse width groups was 2, both before and 6 months after ECT. The upper (Q1) and lower (Q3) quartile pre-ECT CPRS-M values in the different pulse width groups were 1 and 4, 1 and 4, and 0 and 3 for <0.5, 0.5, and >0.5 millisecond, respectively, whereas they were 0.75 and 4, 1 and 4, and 0 and 3, respectively, at 6 months after ECT.

The effects of potential cofounding variables on a minimum 2-step worsening in CPRS-M score were evaluated in a multivariate analysis using logistic regression. This analysis included the variables of sex, age group, pulse width group, MADRS-S score 6 months after completion of ECT, number of sessions, anesthetics, and other medication during the period of ECT.

The results displayed no statistically significant associations between subjective memory worsening 6 months after completion of ECT and sex, age group, pulse width group, number of sessions, anesthetics, or other medications during the period of ECT. However, patients in remission had a significantly lower risk of experiencing subjective memory worsening 6 months after completion of ECT compared with patients not in remission ($P < 0.001$; odds ratio [OR], 0.29; 95% confidence interval [CI], 0.15–0.57; Table 2).

TABLE 2. The Impact of Potential Cofounding Variables on Subjective Memory worsening

			Multivariate Analysis*	
	Worsening, n (%)	**No Worsening, n (%)**	**OR (95% CI)**	***P***
Sex				
Female	48 (26.4)	134 (73.6)	1.349 (0.742–2.451)	0.326
Male	27 (20.8)	103 (79.2)	Reference category	
Age, y				
16–39	29 (33.7)	57 (66.3)	1.926 (0.868–4.275)	0.107
40–64	30 (23.1)	100 (76.9)	1.266 (0.603–2.655)	0.533
≥65	16 (16.7)	80 (83.3)	Reference category	
Pulse width				
<0.5 ms	12 (26.1)	34 (73.9)	0.471 (0.180–1.237)	0.127
0.5 ms	41 (21.9)	146 (78.1)	0.575 (0.292–1.133)	0.110
>0.5 ms	22 (27.8)	57 (72.2)	Reference category	
MADRS-S after 6 mo				
0–10	15 (11.7)	113 (88.3)	0.293 (0.151–0.568)	0.000
>10	60 (32.6)	124 (67.4)	Reference category	
No. sessions				
1–5	9 (23.1)	30 (76.9)	1.114 (0.464–2.678)	0.809
6–9	45 (23.3)	148 (76.7	Reference category	
≥10	21 (26.3)	59 (73.8)	0.930 (0.483–1.790)	0.828
Anesthetics				
Propofol	45 (27.1)	121 (72.9)	2.063 (0.822–5.174)	0.123
Thiopental	22 (22.0)	78 (78.0)	1.778 (0.657–4.811)	0.257
Other†	8 (17.4)	38 (82.6)	Reference category	
Medication during ECT				
Antidepressants				
No	11 (28.9)	27 (71.1)	Reference category	0.751
Yes	64 (23.4)	210 (76.6)	0.873 (0.377–2.020)	
Lithium				
No	63 (23.6)	204 (76.4)	Reference category	0.621
Yes	12 (26.7)	33 (73.3)	0.819 (0.371–1.808)	
Benzodiazepine				
No	46 (25.3)	136 (74.7)	Reference category	0.358
Yes	29 (22.3)	101 (77.7)	0.750 (0.406–1.386)	
Antiepileptics				
No	60 (22.6)	206 (77.4)	Reference category	0.169
Yes	15 (32.6)	31 (67.4)	1.699 (0.798–3.619)	
Antipsychotics				
No	51 (24.9)	154 (75.1)	Reference category	0.388
Yes	24 (22.4)	83 (77.6)	0.768 (0.423–1.397)	

Worsening is defined as a minimum of 2-step worsening of the CPRS-M score.

*Calculated using logistic regression.

†Other contains ketamine or a combination of anesthetics including ketamine, remifentanil, propofol, and thiopental.

The relationships between remission and the variables of sex, age group, pulse width group, number of sessions, anesthetics, and other medication during the period of ECT were evaluated using multivariate logistic regression. The results showed no statistically significant associations between remission and sex, pulse width, number of sessions, anesthetics, or other medication during the period of ECT. However, the remission rate showed a statistically significant association with age group, with nonremission 6 months after completion of ECT being more likely in the age group of 16 to 39 years and nearly significantly more likely for the age group of 40–64 years ($P < 0.001$ [OR, 5.02; 95% CI, 2.46–10.28] and $P = 0.061$ [OR, 1.71; 95% CI, 0.98–3.02], respectively) than in patients older than 65 years (Table 3). The proportion of patients achieving remission in the youngest age group was 18.6%, whereas 62.2% achieved remission in the oldest age group (Fig. 1). In comparison with a follow-up time of >7 months (reference), a follow-up time of <5 or 5–7 months did not significantly affect nonremission ($P = 0.228$ [OR, 2.038; 95% CI, 0.640–6.494] and $P = 0.425$ [OR, 1.256; 95% CI, 0.718–2.196], respectively) or memory worsening ($P = 0.229$ [OR, 0.426; 95% CI, 0.106–1.713] and $P = 0.657$ [OR, 0.355; 95% CI, 0.355–1.214]).

DISCUSSION

No statistically significant differences in the distribution of subjective memory worsening or remission rate 6 months after completion of ECT were found between the different pulse width groups, and this study therefore provides no support for the hypothesis that BP ECT (>0.5 millisecond) results in higher rates of 6-month subjective memory impairment and remission in comparison with UBP ECT.

The age group had a large effect on the remission rate 6 months post-ECT. Previous research has shown that older age

TABLE 3. Associations Between Nonremission and the Variables of Sex, Age Group, and Pulse Width

	Remission, n (%)	Not in Remission, n (%)	Multivariate Analysis*	
Sex				
Female	68 (37.4)	114 (62.6)	1.356 (0.813–2.262)	0.243
Male	60 (46.2)	70 (53.8)	Reference category	
Age, y				
16–39	16 (18.6)	70 (81.4)	5.024 (2.456–10.277)	0.000
40–64	56 (43.1)	74 (56.9)	1.711 (0.975–3.022)	0.061
≥65	56 (62.2)	40 (41.7)	Reference category	
Pulse width				
<0.5 ms	12 (26.1)	34 (73.9)	1.749 (0.706–4.330)	0.227
0.5 ms	78 (41.7)	109 (58.3)	1.129 (0.624–2.045)	0.688
>0.5 ms	38 (48.1)	41 (51.9)	Reference category	
No. sessions				
1–5	21 (53.8)	18 (46.2)	0.565 (0.267–1.194)	0.135
6–9	83 (43.0)	110 (57.0)	Reference category	
≥10	24 (30.0)	56 (70.0)	1.479 (0.806–2.714)	0.207
Anesthetics				
Propofol	66 (39.8)	100 (60.2)	1.208 (0.575–2.536)	0.618
Thiopental	42 (42.0)	58 (58.0)	1.154 (0.522–2.549)	0.724
Other†	20 (43.5)	26 (56.5)	Reference category	
Medication during ECT				
Antidepressants				
No	14 (36.8)	24 (63.2)	Reference category	0.485
Yes	114 (41.6)	160 (58.4)	0.758 (0.349–1.648)	
Lithium				
No	113 (42.3)	154 (57.7)	Reference category	0.491
Yes	15 (33.3)	30 (66.7)	1.297 (0.619–2.718)	
Benzodiazepine				
No	75 (41.2)	107 (58.8)	Reference category	0.818
Yes	53 (40.8)	77 (59.2)	1.066 (0.622–1.827)	
Antiepileptics				
No	112 (42.1)	154 (57.9)	Reference category	0.974
Yes	16 (34.8)	30 (65.2)	1.012 (0.486–2.109)	
Antipsychotics				
No	88 (42.9)	117 (57.1)	Reference category	0.417
Yes	40 (37.4)	67 (62.6)	1.241 (0.737–2.090)	

Remission is defined as a MADRS-S score of 0–10 at six months after completion of ECT. Non-remission is defined as a MADRS-S score of >10.

*Calculated using logistic regression.

†Other contains ketamine or a combination of anesthetics including ketamine, remifentanil, propofol, and thiopental.

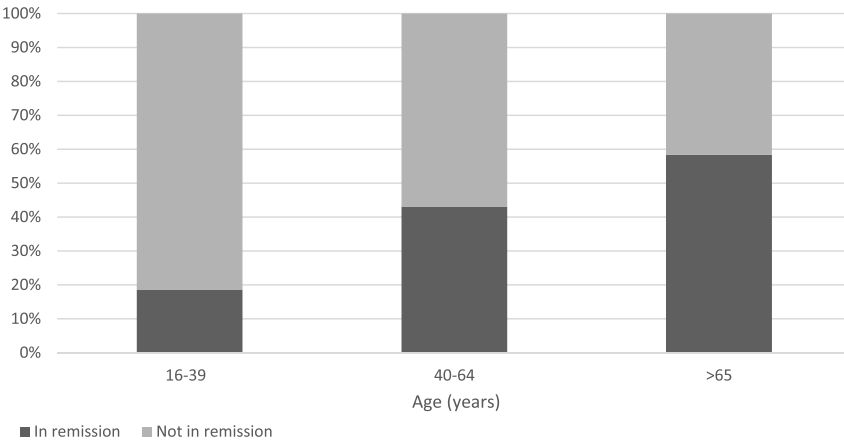

FIGURE 1. Distribution of patients in remission according to the different age groups.

is associated with higher remission rates immediately after ECT[14] and lower relapse rates. Thus, this finding is in line with previous research showing superior outcomes for ECT in patients of older age.

A few studies have shown that BP ECT required a lower number of sessions than UBP ECT,[6,15] and that a high number of sessions increases the risk of cognitive side effects.[4] However, no such patterns were found in this study.

Seventeen percent of the study population showed psychotic features, and this relatively low proportion may have been influenced by the inclusion criterion stating that patients needed to have completed the MADRS-S and CPRS-M forms before ECT. Severely catatonic or psychotic patients may have difficulty in completing these forms. This may have limited the remission rate in the study because patients with psychotic features tend to have better outcomes after ECT than do patients without psychotic features.[16] It could be expected that more severely symptomatic patients receive a more intensive stimulus; however, we found that the proportions of patients with psychotic features were evenly distributed among the different pulse width groups. This suggests that any indication bias due to symptom severity was limited.

The anesthetics used differed significantly between the different pulse widths. These differences may be explained by different routines in the different hospitals. However, the choice of anesthetics did not affect either remission or subjective memory worsening at 6 months.

One of the inclusion criteria in this study was unilateral electrode placement, with all other electrode placements being excluded. Different electrode placements result in different remission rates and cognitive side effects.[2,4,17] Considering that previous research indicates that electrode placement could affect memory impairment, this restriction was used to minimize the variation and potential risk for bias. However, our results may only be generalized to the unilateral electrode placement technique.

Limitations

This study has some limitations. The first of these is the reliance on subjective memory rather than objective impairment, which was because of a lack of objective data in the register. Therefore, it is unclear whether patients' experiences of memory disturbance represent objective impairments or not. Second, the restrictive inclusion criteria increased the statistical uncertainty because they limited the size of the study population and may have affected the estimated rates of remission and subjective memory disturbances. However, they are unlikely to have influenced the relative effects between pulse widths or patient groups. Despite being one of the largest studies to date on the long-term effects of different pulse widths during ECT, this study was not large enough to exclude clinically relevant differences in subjective memory impairment between the pulse width groups. The study population was limited to 312 patients, which is not large enough to rule out the possibility of differences in the rate of subjective memory impairment between the treatments with different pulse widths. The point estimate of the odds of nonremission was 1.7 in the <0.5-millisecond pulse width group as compared with the >0.5-millisecond pulse width group, but the difference was not statistically significantly different. However, if this result was confirmed as statistically significant in a larger study population, it would have been clinically relevant. A third limitation is that there may have been an indication bias in respect to the choice of pulse width for treatment initiation. Patients perceived to be at risk of developing memory disturbances may have been treated with shorter pulse widths to lower this risk; if so, this indication bias might have attenuated any association between shorter pulse width and lower risk of subjective memory disturbances. Furthermore, the current dosing strategy in Sweden is related to age and sex but not titrated seizure threshold. Thus, it is unclear if the results are generalizable to dosing strategies using seizure threshold titration.

CONCLUSIONS

In this cohort of patients treated with unilateral electrode placement, no support was found for the previous research finding of a lower rate of subjective 6-month memory disturbances with UBP ECT compared with BP ECT, but older age was associated with a higher remission rate 6 months after ECT. Large randomized studies are required to exclude the possibility of long-term differential effects between pulse widths.

ACKNOWLEDGMENTS

We would like to thank the patients, nurses, and doctors who provided data to the Swedish National Quality Register for ECT.

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