ABSTRACT:
Is there a role of gender in electroconvulsive therapy response?

Objective: Gender difference is a significant determinant of treatment response. As in pharmacological agents, knowledge about this difference is also important for electroconvulsive therapy as an effective treatment modality. The current study aimed to examine the gender differences in terms of indications for electroconvulsive therapy, responses to treatment, and side effects that occur during its application.

Methods: The hospital records of 176 adult patients (39 females and 137 males) having undergone bilateral temporal electroconvulsive therapy under anesthesia between 2007 and 2012 were examined retrospectively.

Results: The mean age of women was higher than that of men, and the duration of hospitalization was longer in men. There was a significant difference between the genders in terms of the indications of electroconvulsive therapy. Major depression as a diagnosis and suicidal thoughts as an indication were more common in women, while catatonia was more common in men. The most frequent side effects were cardiovascular side effects and allergic reactions. No significant difference was determined in the response rates of the patients to electroconvulsive therapy according to their diagnosis and genders.

Conclusion: Our results once again demonstrated that electroconvulsive therapy is a highly effective treatment in both genders. Some gender differences exist in terms of indication and diagnosis, although there was no difference in terms of response to electroconvulsive therapy. There is a need for prospective studies to identify the reasons for these differences.

Keywords: electroconvulsive therapy, gender, treatment response

INTRODUCTION
For a long time, differences in treatment responses according to gender have attracted attention in psychiatry. Plasma concentrations of some psychiatric drugs, such as tricyclic antidepressants (TCAs), vary between the genders, but the clinical significance of this finding is not clear. It was reported that gender was not an important factor in major depression in terms of treatment response. When analyzing gender differences related to antipsychotic treatment, the most dominant opinion is that women require lower doses of antipsychotics than men to obtain an adequate response, which may be due to hormonal factors. There are more uncertainties about electroconvulsive therapy (ECT), which is one of the oldest and most commonly used treatment method in psychiatry, compared to the uncertainty in the field of psychopharmacology when it comes to differences in terms of gender. ECT is a treatment method based on the creation of a generalized convulsion in patients after stimulation of the brain tissue with an electric current. To this day, the
mechanism of action of ECT has not been clearly elucidated. Standards of practice of ECT may differ according to institutes or between countries. Although in the past, the most common indication for ECT was schizophrenia, major depression has recently come to be the most common indication. While the diagnosis of 85% of patients receiving ECT is major depression in the United States, the remainder of the patients are diagnosed with schizoaffective disorder, mania, schizophrenia, and other psychiatric disorders (anxiety disorder, obsessive-compulsive disorder, etc.). There is no clear evidence about gender differences for indications of ECT. The cognitive side effects of ECT (particularly in bilateral applications), such as retrograde amnesia, were reported to be significantly higher in women. The presence of a lower seizure threshold in women was indicated in the literature. More frequent side effects might have been reported in women because the dose adjustment could not be performed each time during ECT, and a higher than threshold dose was given to women. Additionally, there are studies indicating that the response to ECT, regardless of diagnosis and reporting that gender constitutes a determining factor. It was shown that ECT is a more frequently chosen option in the earlier stage of treatment in women compared to men.

In this study, we aimed to examine gender differences in terms of indication for ECT, response to treatment, and side effects occurring during the application.

**METHODS**

**Sample**

In this study, the data of 176 adult patients, 39 women (22.2%) and 137 men (77.8%) admitted as inpatients to the psychiatry clinic of Gülhane Military Medical Faculty between 2007 and 2012 who had received ECT with anesthesia were examined retrospectively. The patients underwent a physical examination, electrocardiogram, chest radiography, computer tomography and laboratory studies (including complete blood count, liver function tests, and electrolytes, HIV and hepatitis markers, sedimentation rate, and prothrombin time) prior to ECT. Each of the patients was consulted by specialists of internal medicine, neurology, and anesthesia, and patients not deemed appropriate for ECT were excluded from the study. Written informed consent was obtained from the patients and their family.

**ECT Procedure**

All patients received bilateral ECT to the temporal region by a Spectrum 5000 Q (Mecta Corporation) device. The seizure threshold was determined in the first application by titration method. From the next session onwards, patients received ECTs with stimuli one and a half times above their seizure threshold.

**Data Collection**

The diagnosis was made by a psychiatrist using a structured clinical interview for DSM-IV axis I disorders (SCID I). Other clinical data of the patients were age, gender, duration of hospitalization, indication of ECT, number of ECTs, history of previous ECTs, side effects, and response to treatment, respectively. As predictors of response to treatment, the Clinical Global Impression Scale (CGI) and daily observation forms of doctors and clinical nurses, which were completed at regular intervals during treatment and included in the files of patients, were evaluated. In this form, the responses to ECT were divided into four groups; namely, “full recovery”, “major improvement”, “minor improvement”, and “no change”. “Full recovery” and “major improvement” were defined as a response to ECT. “Minor improvement” and “no change” were defined as no response to ECT.

**Statistical Analyses**

As descriptive statistics, frequency and percentages were used for discrete data, and mean±standard deviation were used for...
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Continuous variables. The relationships between the variables were evaluated by the chi-square test. The Mann-Whitney U-test was used for non-parametric data associated with gender. A p value of <0.05 was considered statistically significant.

Ethical Issues

The study protocol was approved by the local ethics committee.

RESULTS

A total of 176 patients, including 137 men and 39 women, received ECT within five years. Mean age, duration of hospitalization, previous ECT history, the number of ECTs, and the number of patients who developed side effects during the implementation of the ECT are shown in Table 1.

The mean age of the women was higher than that of men (p<0.05). Duration of hospitalization was longer in men than in women (p<0.05). Nine women (24%) and 16 men (12%) had comorbid medical disorders: two had diabetes mellitus (DM), three had hypertension (HTN), two had DM+HTN, two women had migraines and three had HTN, and thirteen men were substance abusers.

Although not statistically significant, the side effects occurring during ECT tended to be higher in women. The most frequent side effects were cardiovascular side effects (arrhythmias) and allergic reactions. None of the ECT treatments were terminated because of ECT complications.

The rate of women diagnosed with unipolar depression and treated with ECT was 53.8%. In men, the greatest number of patients treated with ECT were patients with schizophrenia. The distribution of patients according to their diagnosis was shown in Table 2. There was a significant difference between the genders in terms of diagnosis, with a statistically significant high frequency of psychotic disorders in men and a high frequency of depression in women (p=0.003).

The most common indication for ECT in both men and women was suicidal thoughts. The second most common indication was unresponsiveness to treatment. Catatonia was ranked as the third. There was a significant difference between the genders in

<table>
<thead>
<tr>
<th>Variables</th>
<th>Women (n=39)</th>
<th>Men (n=137)</th>
<th>Statistical Analysis</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean±sd* (years)</td>
<td>37.07±11.67</td>
<td>27.41±8.06</td>
<td>z=6.477*</td>
<td>p&lt;0.001</td>
</tr>
<tr>
<td>Duration of hospitalization, mean±sd* (days)</td>
<td>27.12±6.97</td>
<td>30.12±10.26</td>
<td>z=1.694*</td>
<td>p=0.034</td>
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<tr>
<td>Number of ECT, mean±sd*</td>
<td>8.35±3.26</td>
<td>9.07±4.14</td>
<td>z=2.347*</td>
<td>p=0.153</td>
</tr>
<tr>
<td>Patients with side effects of ECT, n (%)</td>
<td>5 (12)</td>
<td>6 (4)</td>
<td>χ²=3.692**</td>
<td>p=0.055</td>
</tr>
<tr>
<td>Patients with history of ECT, n (%)</td>
<td>7 (17)</td>
<td>12 (8)</td>
<td>χ²=2.662**</td>
<td>p=0.103</td>
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*Mann-Whitney U test, **Chi-square test

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<tr>
<td>Diagnosis of patients</td>
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<tr>
<td>Schizophrenia, n (%)</td>
<td>7 (17.9)</td>
<td>65 (47.4)</td>
<td>χ²=11.783*</td>
<td>p=0.003</td>
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<td>Unipolar depression, n (%)</td>
<td>21 (53.8)</td>
<td>41 (29.9)</td>
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<tr>
<td>Bipolar Disorder, n (%)</td>
<td>11 (28.2)</td>
<td>31 (22.2)</td>
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<tr>
<td>Response rates to ECT</td>
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<tr>
<td>Schizophrenia, n (%)</td>
<td>6/7 (86)</td>
<td>56/65 (86)</td>
<td>χ²=0.04*</td>
<td>p=0.951</td>
</tr>
<tr>
<td>Unipolar depression, n (%)</td>
<td>19/21 (90)</td>
<td>33/41(80)</td>
<td>χ²=0.17*</td>
<td>p=0.679</td>
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<tr>
<td>Bipolar Disorder, n (%)</td>
<td>10/11 (91)</td>
<td>29/31(93)</td>
<td>χ²=0.08*</td>
<td>p=0.784</td>
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<tr>
<td>Indication for ECT</td>
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<tr>
<td>Suicidal thoughts, n (%)</td>
<td>25 (64.1)</td>
<td>60 (43.7)</td>
<td>χ²=7.61*</td>
<td>p=0.022</td>
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<tr>
<td>Unresponsiveness to treatment, n (%)</td>
<td>12 (30.7)</td>
<td>46 (33.5)</td>
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<tr>
<td>Catatonia, n (%)</td>
<td>2 (5.1)</td>
<td>31 (22.6)</td>
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*Chi-square test
terms of indication of ECT. Having a high frequency of suicidal thoughts in women and a high frequency of catatonia in men was statistically significant. The indications of ECT in patients according to gender were shown in Table 2.

When assessed independently of their diseases, the response rates to ECT were 90% for women and 86% for men. No significant difference was determined between the patients’ response rates to ECT according to diagnoses and gender. Patients’ response rates to ECT according to diagnoses and gender are shown in Table 2.

**DISCUSSION**

Today, there is limited knowledge of ECT, particularly regarding its mechanism of action. Another little known issue is the effect of the gender factor on ECT. The present study’s findings show that there may be gender-based differences in the application and the outcome of the ECT.

Our study sample was relatively younger than in a similar study. Mean age of the participants of this study was 27.41±8.06 in men and 37.07±11.67 in women, while in the study of Bloch et al., the mean age of the participants was 52.1±17.6 in men and 52.2±16.2 in women. There are studies reporting that age is a parameter that affects the response to ECT, although there was a study reporting that it did not make any difference. From a socio-demographic perspective, the age of women was higher than that of men in this study. This result was not a surprise, because our hospital services were provided in an environment predominantly to a young male population.

The duration of hospitalization was shorter in women than in men. Considering that there was no difference in the number of ECT sessions between the genders, at first glance, this finding can be interpreted as a consequence of the decision to apply ECT earlier in women. Previous studies have reported that ECT was implemented primarily in women rather than in men as a treatment option, which could have resulted from the more frequent help-seeking behavior in women. In accordance with the findings in our study, it was reported in the literature that the duration of hospitalization before the application of ECT was longer in men compared to women. However, in our patients, the diagnosis of depression was more frequent in women and the diagnosis of schizophrenia was more frequent in men; therefore, the reason for these findings might be indications of ECT being considered a higher priority in patients with depression.

Consistent with the literature, the most frequent complications during the implementation of ECT were cardiovascular complications (arrhythmias). However, the literature showed no clear findings as to whether there was any difference between the genders in terms of complications. Our findings suggest that the complications of ECT are greater in women than in men. In our study, the age of 60% of the men ranged from 20-30 years, and 35% of women were aged between 40 and 70 years. Although patients underwent a physical and laboratory examination prior to ECT, more cardiovascular problems could be expected in women due to the presence of more elderly patients in this group. Additionally, DM and HTN frequency in women was higher than in men.

Unipolar depression in women and schizophrenia in men were the most common diagnoses. The most common indication for ECT was suicidal thoughts in all disorders. As is known, ECT is performed most commonly in cases of depression.

When the ECT responses were evaluated according to gender and diagnosis, there was no statistically significant differences for all three disorders. Some researchers consider that “response to the ECT is independent of gender factor.” ECT had been found more effective in women diagnosed with schizophrenia than in men in the study by Bloch et al. This finding was attributed to serious symptoms of depression in the women diagnosed with schizophrenia who participated in that study. Consequently, the data about the relationship between gender differences and response to ECT in psychiatric disorders are not conclusive; however, these findings demonstrated the importance of the severity of
depression symptoms in response to ECT.

The retrospective design of our study is an important limitation. The second limitation is not matching the number of male and female groups. Because of the characteristics of our clinic, the patient population mostly consists of young male patients. This situation might have influenced the results. In our clinic, patients receive ECT treatments as outpatients or inpatients. However, only hospitalized patients were enrolled in this study. Therefore, ECT made for some diagnostic groups such as treatment-resistant obsessive-compulsive disorder, might not have been included in this study.

As a result, although the findings of this study did not differ in terms of response to ECT, there were gender-based differences in the application and the outcome of the ECT. There is a need for prospective studies to replicate these findings and to identify the reasons for these differences.

References:


3. Hildebrandt MG, Steyerberg EW, Stage KB, Passchier J. Are gender differences important for the clinical effects of antidepressants? Am J Psychiatry 2003;160(9):1643-50. [CrossRef]


5. Smith S. Gender differences in antipsychotic prescribing. Int Rev Psychiatry 2010;22(5):472-84. [CrossRef]


11. Sackeim H, Decina P, Prohovnik I, Malitz S. Seizure threshold in electroconvulsive therapy. Effects of sex, age, electrode placement, and number of treatments. Arch Gen Psychiatry 1987;44(4):355-60. [CrossRef]


