

## Electroconvulsive treatment of a patient with Parkinson's disease and moderate depression

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### Abstract

Depression is a usual comorbidity in patients with Parkinson's disease. It has been known for more than 50 years that electroconvulsive treatment (ECT) has a positive effect on the muscular symptoms of Parkinson's disease. Many countries do not allow giving ECT for this indication. We have recently treated a resident patient in an acute psychiatric facility referred to the hospital with moderate depressive symptoms and strong suicidal ideation. Before and after a series of ECT he filled out the Beck Depression Inventory and the Antonovsky Sense of Coherence test. The scores before ECT were 20 and 2.69, respectively, and after 12 treatments 14 and 3.38. Both test results indicate improvement regarding level of depression and coping in life. The physiotherapists treating him observed that his rigidity was reduced and his gait improved. Muscular tonus was reduced and increased his tendency of falling as he had less tonus in muscles close to joints. Self help efficiency in daily tasks improved. He got cognitive impairment during and in the weeks after ECT. Electroconvulsive treatment should be offered to more patients with Parkinson disease and depression in order to lessen the burden of both depression and Parkinson symptoms.

### Introduction

Treating depression in a country where every fifth inhabitant may develop disease during their life time, and some risk suicide, is a challenge.<sup>1</sup> Recommendations for treatment are renewed frequently and now show a shift from the use of antidepressants prescribed at the GPs office to cross professional rearranging of life circumstances in the community. However, this strategy may not be sufficient for moderate to severe depressions.<sup>2,3</sup> Parkinson's disease is a life long illness that heavily influences the daily life of the patient and the families. The burden on the families is both emotional and financial.<sup>4,5</sup> Some of these patients live for decades with the illness, and

life is changing substantially. It is well known that the depression in Parkinson's disease is helped by electroconvulsive treatment, but it is less appreciated that the motor symptoms of Parkinson is also ameliorated.<sup>6,7</sup> Fromm published in 1959 the first report on the positive electroconvulsive treatment (ECT) on Parkinson's disease.<sup>8</sup> Aarsland et al from Norway published positive results of maintenance ECT in Parkinson.<sup>9</sup> The apathy seen in patients with Parkinson's disease may very well be an expression of undetected depression.<sup>10</sup> Even mania in Parkinson's disease has been successfully treated with ECT.<sup>11</sup> The positive effect on motor symptoms may develop before the effect on the mania using bitemporal stimulation. Delivering ECT is a safe procedure in patients with Parkinson's disease, as reported for an old woman with a deep brain stimulator.<sup>12</sup> A 78-year-old woman had suffered from depression during five years, and her Parkinson symptoms had deteriorated during the last two years. She got a deep brain stimulator operated into her left subthalamic nucleus. Several antidepressants did not restore her mood. She then received seven ECTs with bitemporal stimulation in order to avoid placing the stimulating electrodes close to the brain stimulator. The treatment was given with low energy 201.6 milliCoulomb at 0.9A. Seizures were observed for more than 33 seconds and recorded as more than 45 seconds on the EEG of the stimulation apparatus. Anaesthesia was attained with methohexital 60 mg and succinylcholine 40mg.

One reason for the restricted use of ECT in Parkinson's disease may be the general opposition against ECT in parts of the population and among politicians, as shown in a recent editorial Popeo & Kellner in Medical Hypothesis.<sup>13,14</sup>

Parkinson patients may themselves decide how much dopamine medication they use. Overdosing dopamine ameliorates depressive traits, but is followed by side effects that may be dyskinesias, *on-off* episodes and more choreatic movements. There are reports of confusion, depression, sleep disturbances and psychotic episodes. We recently treated a patient with Parkinson's disease and depressive traits with suicidal ideation. The indication for treatment with ECT was initially solely his severe depression. We used several psychometric tests to evaluate the patient before and after the series ECT. The properties of the Sense of Coherence test of Antonovsky is described elsewhere.<sup>15-17</sup>

### Case Report

The patient was 58 years old at referral with a history of Parkinson's disease over the last

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18 years. The diagnosis of Parkinsons disease was established at his frequent visits to the Neurological department of Akershus University Hospital. He has received Duodopa-treatment with an external pump for the last two years. Regular controls took place at the local neurological policlinic. He lived alone and most activities of daily life he managed on his own. Before the present referral he had not been in contact with psychiatric care or treatment. Half a year before referral his mood deteriorated. The reason for the referral was depression and imminent suicidality. A mini mental status examination at entry was normal, i.e. no cognitive deficiency.

### Electro stimulating procedure at Blakstad hospital

Electroconvulsive treatment (ECT) is given on Monday, Wednesday and Friday every week of the year. A psychiatrist, a doctor in training in psychiatry, an anaesthesiologist and a specially trained nurse are present at the treatment sessions. This is one of several set-ups in use around the world.<sup>18</sup> Nurses from the referring wards and policlinics accompany the patients. A treatment course is from 6 to 12 sessions depending on the clinical judgment of the treating psychiatrist. The treatment is performed in a dedicated room adjacent to the geronto-psychiatric department using a Thymatron™ System IV device (Somatics, LLC, Lake Bluff, IL 60044 USA). Pre-treatment investigations include general somatic, electrocardiogram, and blood tests and in most patients a CT scan of the head. A written consent from the patient is compulsory and the

patient may at any time during the sessions withdraw his consent. Our clinic monitors two EEG leads and one for electromyography if appropriate and also employs a pulse oxymeter. Stimulation is by right unilateral, bifrontal or bitemporal electrode placement. Pulse duration is individually set from 0.25 msec to 1.0 msec and the device is set up to 1008 mCoulomb. Modified treatment is given with either thiopentalnatrium or propofol followed by suxametoniumchloride. Atropine is also given before anaesthesia. The patient is hyper-ventilated with 100% O<sub>2</sub> before the stimulation. Stimulation level follows the age based method as noted in Petrides & Fink p. 453.<sup>19,20</sup>

Treatment procedure and observations in present case

The patient received 12 sessions of ECT according to our standard procedure as described above, see Table 1 for details. He was stimulated with right unilateral position of the electrodes, thiopental and suxametoniumchloride as anaesthesia.

All sessions gave generalised tonic-clonic seizures (GTC) observed for more than 15 seconds, which is a threshold for effective GTCs in some recommendations.<sup>21</sup> Post-ictal suppression of the EEG leads was observed on the transcript in all treatment sessions, and the post-ictal suppression index was > 70%. Visible motor seizures varied between 22 and 43 seconds. On the EEG the seizures lasted from 20 to 72 seconds, whereas the electromyogram (EMG) registration varied from 19 to 31 seconds. The stimulus level was increased from 70% to 80% (of 512mCoulomb) after the third treatment. Seizure threshold usually increases somewhat during a series of ECTs. After the eighth treatment the stimulus level was reduced because of unnecessary lively seizures increasing the risk of post-ictal muscle pain or fractures, Table 1.

## Results

A marked improvement in mood was observed after 4-5 treatments. The patient related more to others and his sentences were longer and not so cumbersome. His speech was more comprehensible and involuntary movements were markedly reduced. During the period with thrice weekly ECT he had problems remembering appointments and was also confused. Soon after the end of the ECT series he regained his cognitive capacity. He was increasingly better able to cope with activities of daily life and was also good-humoured.

## Psychometric tests

Beck depression inventory sum-score was 20 before ECT, i.e. a moderate depression. Sense of Coherence test of Antonovsky mean

**Table 1. Details of registered items at 12 electroconvulsive treatments in a patient with depression and Parkinson's disease with Thymatron L 0.5 standard program and thus 0.5 msec pulse width.**

Session no.	1	2	3	4	5	6	7	8	9	10	11	12
Stimulus strength	70%	70%	70%	80%	90%	100%	100%	100%	90%	80%	80%	80%
Pulse frequency	50	50	50	60	60	70	70	70	70	70	60	60
Duration of motoric seizure, seconds	43	33	36	28	38	35	30	22	27	20	30	28
Length of EEG registered seizures, sec	72	47	37	28	39	37	46	33	35	20	37	46
EMG, sec.	40	31	30	19	28	29	28	16	22	19	26	26

score was 2.69 indicating severe problems in managing, comprehend and cope with life.<sup>15,22</sup> After the ECT series both tests were improved. Beck sum-score was 14 indicating a slight or mild depression. Sense of Coherence test mean score was 3,38 indicating better handling and comprehension of life. General Assessment of Function and Symptoms score (GAF-F and GAF-S) was before ECT 65 and 60 and after ECT 75 and 78, respectively.

## Observations by the physiotherapist

The patient got special training with the hospital staff of physiotherapists almost daily. He was tested before, during and after the series of ECTs by the same test procedure. He would be scored at 4-5 on the Hoehn & Jahr scale before treatment.<sup>23</sup> Involuntary movements and tremor were reduced after 4-5 treatments. Muscular tonus and spasticity in the extremities were reduced to a score of 2. This scale does not, however, take the psychic symptoms into account. There was also a significant reduction in annoying muscle cramps and locking of muscles/joints. He asked for less pain reducing medication. Cogwheel rigidity was less prominent after the series of ECT. His gait improved. He tiptoed less and with fewer problems initiating movements. On the other hand, his motoric precision diminished measured as less finger tapping and supination movements. His balancing capability and falling tendency increased. The physiotherapists interpreted this after extensive testing as loss of muscular tonus in muscles close to joints. The patient was referred from the acute psychiatry department to a rehabilitation facility to regain his tonus with his depression at a sustainable level.

## Discussion

The comorbid condition in the present patient, depression and Parkinson's disease, was much improved by the use of a series of electroconvulsive treatments. Beck depression inventory and the Sense of Coherence tests both corroborate the change, as well as the

impression of the patient. Complete remission of the depression in such a long-standing case of Parkinson disease is in our experience not common. Global functioning improved as shown by the GAF test. Depression may be a side effect when treating Parkinson patients with too much dopamine, but this was not the case in the present patient. In a comparative study from the Mayo Clinic it was shown that the effect on depressive symptoms of ECT was the same regardless of the patient having Parkinson's disease or not.<sup>24</sup> Fourteen of 25 patients improved in motoric function, at least for some time. Controlling for sex and age, both groups got the same number of treatments. Confusion was more frequent between treatments among the patients with Parkinson's disease. The authors also found the cognitive status of the patients with Parkinson's disease to be decreased before ECT compared to the control patients. They did not find a deterioration of cognitive functioning in the Parkinson patients. The authors recommended a small reduction in the dose of levodopa before ECT. This was not done in our patient after consulting his neurologist. The observed reduction in cognitive function in our patient may thus hinge on the fact that we continued to treat him with the same dose of levodopa.

Invigorating of the dopamine transmission and increased sensitivity of dopamine receptors seems to be the mechanism of action of ECT in Parkinson's disease.<sup>14,24</sup> Zwil & Pelchat indicated that several neurological diseases may improve after ECT.<sup>25</sup> They pointed out that rigidity, bradykinesia and *on-off* phenomena improved, but that the muscular tremor did not to the same degree in their patients, somewhat at odds with our experience. The positive effects lasted for days or months. Intractable, medication refractory Parkinson's disease may thus be kept in a better state with ECT, where neurosurgical operations are the only other option. Improving psychological symptoms were also observed. The use of ECT in Parkinson patients without affective disorders has been studied.<sup>26</sup> The mobility in patients who got real ECT and not sham ECT improved. Patients with severe disease, high age and

long standing treatment with levodopa had the best outcome, as demonstrated in a case of maintenance ECT in medication refractory illness from Balke & Varma.<sup>27</sup>

Continuation and maintenance treatment with ECT may overcome the shorter duration of response in many patients with long standing disease. Resource expenditure with ECT would be cost effective compared to the otherwise longer need of resident treatment in hospitals or nursing homes. Even psychotic symptoms, which are not uncommon with delusions and hallucinations, improves after ECT in Parkinson's disease.<sup>28,29</sup> The probable anti-Parkinson drug induced psychosis improved markedly in five elderly patients.

It is a medico-ethical dilemma that patients with Parkinson's disease may not, in many countries, receive continued ECT after a successful treatment series for depression, even more so because the neurological disease would improve over time.

## Conclusion

Parkinson disease is often complicated with depression. Both illnesses improved in the present case report after a series of electroconvulsive treatments (ECT). He filled out the Beck Depression Inventory and the Antonovsky Sense of Coherence test. The scores before ECT were 20 and 2.69, respectively, and after 12 treatments 14 and 3.38. Both test results indicate improvement regarding level of depression and coping in life. The physiotherapists treating him observed that his rigidity was reduced and his gait improved. Hoehn & Yahr scale score improved from 5 to 2. Self help efficiency in daily tasks improved. He got cognitive impairment during and in the weeks after ECT. Electroconvulsive treatment should be offered to more patients with Parkinson disease and depression in order to lessen the burden of both depression and Parkinson symptoms.

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