

RESEARCH ARTICLE

Electroconvulsive Therapy Use in Youth in the Province of Quebec

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Abstract

Objectives: Electroconvulsive therapy's (ECT) safety and tolerability is well-established in the treatment of severe psychiatric disorders in adults, but has been less studied in youth. The aim of the present study was to describe the use of ECT in youth in Quebec City and obtain Child and Adolescent Psychiatrists' (CAP) perceptions in the province of Quebec.

Methods: The authors reviewed charts of minors who received ECT treatment in the Quebec City metropolitan area between 1995 and 2014 (part 1). Data was also collected on CAP perceptions and experience of ECT use in youth by means of a survey (part 2). **Results:** Part 1 included four girls and two boys, aged between 15 and 17. The main diagnoses were: mood disorders and schizoaffective disorder. Patients received between four and twelve ECT sessions. Five patients responded to treatment, whereas one did not. Treatment and side effects are presented. For part 2, 53 CAP answered the survey. Forty-eight (91%) thought ECT is a good treatment option after failure of other therapeutic modalities and 12 (23%) had prescribed it. All respondents wished to receive additional training regarding ECT use in youth.

Conclusion: Our results are consistent with the notion that ECT use in youth with a refractory and complex disease is a safe and effective treatment, although rarely used. The majority of psychiatrists treating children and adolescents in Quebec favor ECT when all available therapeutic modalities have failed, but wished they had more training regarding its use.

Key Words: *Electroconvulsive therapy, survey, Quebec, perceptions, youth*

Résumé

Objectifs: La sécurité et la tolérabilité de la thérapie électroconvulsive (TEC) sont bien établies dans le traitement de graves troubles psychiatriques chez les adultes, mais elles ont été moins étudiées chez les adolescents. Le but de la présente étude était de décrire l'utilisation de la TEC chez les adolescents de la ville de Québec et d'obtenir les perceptions des pédopsychiatres de la province de Québec. **Méthodes:** Les auteurs ont examiné les dossiers des mineurs qui ont reçu un traitement de TEC dans la région métropolitaine de Québec entre 1995 et 2014 (partie 1). Les données ont aussi été recueillies d'après les perceptions des pédopsychiatres et l'expérience de l'utilisation de la TEC chez les adolescents par voie d'un sondage (partie 2). **Résultats:** La partie 1 comprenait 4 filles et 2 garçons, âgés entre 15 et 17 ans. Les principaux diagnostics étaient: les troubles de l'humeur et le trouble schizo-affectif. Les patients ont reçu entre 4 et 12 séances de TEC. Cinq patients ont répondu au traitement, mais 1 n'y a pas répondu. Le traitement et les effets secondaires sont présentés. Pour la partie 2, 53 pédopsychiatres ont répondu au sondage. Quarante-huit (91 %) estimaient que la TEC est une bonne option de traitement après que les autres modalités thérapeutiques ont échoué, et 12 (23 %) l'avaient prescrite. Tous les répondants souhaitaient recevoir une formation additionnelle en matière d'utilisation de la TEC chez les adolescents.

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Submitted: November 4, 2015; Accepted: December 12, 2016

Conclusion: Nos résultats sont en conformité avec la notion que l'utilisation de la TEC chez les adolescents souffrant d'une maladie réfractaire et complexe est un traitement sûr et efficace, quoique rarement utilisé. La majorité des psychiatres qui traitent des enfants et des adolescents au Québec favorisent la TEC quand toutes les autres modalités thérapeutiques ont échoué, mais tous ont souhaité avoir plus de formation pour l'utiliser.

Mots clés: *thérapie électroconvulsive, sondage, Québec, perceptions, adolescents*

Introduction

Electroconvulsive Therapy (ECT) represents the oldest psychiatric somatic treatment still used today (Lima et al., 2013). Its safety and tolerability is well-established in the treatment of severe psychiatric disorders in adults (Baghai & Möller, 2008). Despite the publication of practice parameters guiding ECT use in youth by the American Academy of Child and Adolescent Psychiatry (AACAP) (Ghaziuddin et al., 2004), the use of ECT has been less studied in this population. Studies include prospective and retrospective data, reviews and surveys. There are no randomized controlled trials (Lima et al., 2013). Nonetheless, literature reviews suggest high remission rates, rare and benign side effects (Lima et al., 2013) and similar efficacy and safety between adults and adolescents (Rey & Walter, 1997).

The fact that ECT has been less studied in youth may reflect its underuse in this population. Indeed, a rate of ECT treatment use of 0.02 per 100 000 individuals in the general youth population contrasts with much higher adult rates (Duffett, Hill, & Lelliott, 1999). In Quebec, the Agence d'évaluation des technologies et des modes d'intervention en santé (AETMIS) published a report on ECT use: rates per 1000 of ECT sessions (not treatment) in 2001 were: 0 for boys and girls aged 0-14, 0.08 for boys and 0.11 for girls aged 15-19, while rates for men and women aged 20-64 were respectively 0.59 and 1.45, and respectively 1.76 and 3.41 for men and women aged over 65. Rates were comparable to those of certain countries such as England (Banken, 2002).

In a survey conducted in Scotland, CAP who had never prescribed ECT (79% of the sample) identified a perceived lack of evidence-based data and availability of other adequate therapeutic modalities as their main reasons (Parmar, 1993). Another survey conducted in New-Zealand and Australia (Walter, Rey, & Starling, 1997) identified that forty percent of CAP felt that their level of knowledge was inadequate. Having had a patient treated with ECT was the best predictor of possessing knowledge on the matter. Thirty-nine percent of psychiatrists thought ECT was unsafe in children, 17% in adolescents and 3% in adults. The authors conducted the same survey four years later: psychiatrists had greater self-rated levels of knowledge on the subject and were more likely to approve the use of ECT in adolescents due to higher medical education about ECT between the two surveys (Walter & Rey, 2003).

To our knowledge, no study was ever conducted on the use of ECT in youth in Quebec. The first part of the present study describes the cases of patients under 18 who received ECT in the Quebec City metropolitan area between 1995 and 2014. The second part collects CAP perceptions and experience regarding use of ECT in youth.

Material and methods

Part 1 - Retrospective chart review

The inclusion criteria were: age under 18 at time of treatment, at least one ECT session received between January 1st, 1995 and January 1st, 2014 in the Quebec City metropolitan area (this information was gathered from hospitalization summary sheets). Medical records were obtained through archives of the Centre de Pédopsychiatrie de Québec, Centre Hospitalier de l'Université Laval (CHUL), Hôtel-Dieu de Québec and the CSSS Alphonse-Desjardins. Authors systematically collected information on: demographic data, pre-ECT pharmacological and psychotherapy trials, ECT indication, pre-ECT workup, type of consent, ECT technique, medical surveillance following ECT, adverse events, concurrent pharmacologic treatment, ECT clinical response, patient and family satisfaction, maintenance pharmacological treatment and long-term follow-up data when available. Diagnoses were based on clinician reporting according to DSM-IV or DSM-IV-TR (APA, 1994; 2000). Pharmacological trials were considered adequate when antidepressants or antipsychotics were taken for at least four weeks, in accordance with the current guidelines (Taieb et al., 2002). Motor seizures of at least twenty seconds or EEG seizures of at least 25 seconds were considered of adequate duration, while seizures lasting at least 180 seconds were considered prolonged (Mankad, Beyer, Weiner, & Krystal, 2010). Different ECT treatment episodes were analyzed separately. Approval was obtained from CHUL's ethics committee.

Part 2 - Survey

All psychiatrists enlisted in the Quebec association of CAP were asked to fill a short online survey in French. A participation prize (iPad mini) was drawn. The survey was answered anonymously. Figure 1 presents all of the questions asked in the survey.

Figure 1. Survey sent to psychiatrists treating minors in the province of Quebec (translated from French)	
Questions regarding respondents' characteristics	
1. What is your gender?	Female Male
2. How many years have you practiced as a child and adolescent psychiatrist?	Less than 5 years 6-10 years 11-15 years More than 15 years
3. Describe your caseload:	Less than 50% youth 50% and more youth Exclusively youth
4. What is your practice setting?	University Centre Non-university
5. Have you received ECT training (patients of all ages)?	Yes No
Questions regarding respondents' perceptions and experience with ECT	
6. Do you think ECT should be used only after failure of all other therapeutic modalities in minor patients?	Yes No ECT should never be used in minor patients
7. Has one of your minor patients ever received ECT treatment?	Yes No
7.1 If so, please indicate the number of patients per diagnosis category according to ECT indication:	Affective disorder Psychotic disorder Catatonia Other (please precise)
7.2 If one of your minor patients ever received ECT treatment, did he/she present side effects?	Yes No
7.2.1. If so, please indicate the main side effect	
<i>continued</i>	

Figure 1. continued	
8. Did you ever consider prescribing ECT to a minor patient but didn't do it?	Yes No
8.1 If so, please indicate the main reason you didn't prescribe ECT treatment (only one answer):	Improvement in the patient's clinical state Refusal of treatment by patient and/or family Lack of knowledge on the topic Worries regarding safety of the treatment Non availability of the treatment in the clinical setting Other (please specify)
9. Are you interested to receive additional training regarding the use of ECT in child and adolescent psychiatry?	Yes No

Statistical analyses

Hypothesis-generating statistical analyses (Fisher's Exact Test) were conducted on the survey answers to detect a possible influence of respondents' characteristics on their perception and experience with ECT (see Figure 1). Statistical tests were two-tailed with a significance level of 0.05.

Results

Part 1 – Retrospective chart review

Demographic and clinical characteristics of patients

Table 1 describes patients' baseline characteristics. Between 1995 and 2014, six patients received ECT in the Quebec City metropolitan area. The main diagnoses, comorbidities and family histories are listed in Table 1.

Pre-ECT treatment characteristics

Patient 1 had schizoaffective disorder and received family therapy, three atypical antipsychotics trials and one selective serotonin reuptake inhibitor (SSRI) trial before ECT. Patient 2 received a SSRI for a major depressive disorder (MDD) before ECT and diagnosis changed to bipolar disorder (BD) during hospitalization. Patient 3 suffered from BD and received family therapy, lithium, two atypical antipsychotics and one SSRI before ECT. Patient 4 had rapid cycling BD and developed neuroleptic malignant syndrome twice, therefore antipsychotics became contraindicated. Patient 5 presented with MDD and severe suicidality. She had been previously treated with a serotonin-norepinephrine

Table 1. Patients' baseline characteristics

Patient	Sex	Age at ECT initiation	Main diagnosis	Comorbid psychiatric diagnoses	No. previous medication trials	No. previous psychotherapy trials	Family history
1	F	16	Schizoaffective disorder	Intellectual disability	4	1	MDD Schizophrenia
2	M	17	BD	Substance Use Disorder (SUD)	1	0	BD MDD
3	F	17	BD	Obsessive-compulsive personality traits	4	1	BD MDD SUD
4	M	15	BD	Intellectual disability Malignant neuroleptic syndrome	2	Unknown	Schizophrenia Psychotic disorder due to a medical condition Intellectual disability
5	F	17	MDD	Disruptive behavior disorder Borderline personality disorder (BPD) traits	2	1	MDD SUD
6	F	15	MDD	Oppositional defiant disorder Eating disorder ADHD Generalized anxiety disorder BPD traits	2	2	MDD Anxiety disorder Eating disorder

reuptake inhibitor (SNRI), lithium and psychotherapy. Patient 6 received two ECT courses, the first time for refractory MDD (she had SNRI and SSRI trials with augmentation strategies, as well as individual psychotherapy) and the second time 15 months later for severe MDD with psychotic and catatonic features.

ECT parameters

Table 2 gives detailed information on ECT parameters.

A second psychiatric opinion was obtained for all patients prior to ECT. Informed consent was obtained for five patients and families, but one patient received ECT under court order because of severe suicidality. Blood work, urinalysis and a physical exam were performed on all patients. Three patients had brain imaging before ECT (patient 1, 5 and 6) and patients 5 and 6 underwent a neuropsychological assessment before and after their ECT courses.

Data regarding ECT technique was not available for all treatment courses. For one patient (patient 2), only the anesthesia sheets were available in the medical chart for the ECT treatment course. For four treatment courses, ECT was performed using the Thymatron® System IV instrument,

with a peak current set at 900 mA and pulse width at 0.5 msec. Seizure thresholds were established with the patient's age taken into consideration. One treatment course was performed with the MECTA SR-2 device, with the peak current set at 800 mA, frequency at 90 Hz and pulse width at 1 msec. Both devices used a bidirectional pulse stimulus and a brief pulse. The remaining treatment course (patient 4) was conducted with a Siemens Konvulsator 2077S device, but further information regarding ECT technique was unavailable in the medical chart, except for the peak current which was set at 700 mA for three sessions and 800 mA for the subsequent sessions.

Seizure durations were considered adequate, except for one patient who had one ECT session with seizure duration of eight seconds. The patient received a second stimulus after being hyperventilated and the seizure lasted fifteen seconds. All of the other ECT sessions for this patient lasted between forty-two and 88 seconds.

The anesthetic agent used was thiopental in all patients. Nevertheless, two patients also received propofol, one of which was subsequently switched to thiopental to increase seizure duration.

Table 2 - ECT parameters

Patient	Electrode placement	No. ECT sessions (Mean No. ECT sessions per week)	Minimal EEG Seizure Duration s	Maximal EEG Seizure Duration s	Mean EEG Seizure Duration s
1	Bitemporal	8 (2.7)	8	88	44.2
2	Unknown	4 (2)	Unknown	Unknown	Unknown
3	Bitemporal	6 (3)	46	88	67.3
4	Bitemporal	12 (2.4)	20*	50*	32.9*
5	Unknown	10 (2)	20	40	35.4
6 Course 1	Bitemporal	9 (2.25)	30	115	57.4
Course 2	Bitemporal	12 (2.4)	30	116	76.5

* Motor seizures

Safety

No patient discontinued treatment due to side effects. The most frequent side effects were: headache (four patients), expansive mood (three patients) and nausea (two patients). One patient experienced transient and benign cardiac arrhythmia and high blood pressure while under sedation and another presented bradycardia right after the first session.

Two patients reported post-treatment memory loss (patients 3 and 5), which consisted of short-term memory loss that lasted less than a week for patient 3 and of subjective impaired thinking for patient 5, but information is missing regarding duration; nevertheless, she was still symptomatic upon hospital discharge, three weeks after her last ECT session.

The results of the neuropsychological assessment for patient 1 before ECT treatment showed a mild intellectual disability, difficulties with sustained attention and a slow processing speed. The results revealed improved processing speed after ECT treatment, while the other parameters remained stable. The neuropsychological assessment results for patient 6 did not change before and after the first ECT course, but showed significant drops in verbal memory and sustained attention after the second ECT course.

Efficacy

Overall, efficacy was determined based on subjective reports from the treating psychiatrist. Six treatment courses out of seven resulted in clinical improvement. For example, one psychiatrist mentioned that the patient presented a “favorable evolution, was less concerned with suicide and started to talk about future projects”. Patient 1, who had schizoaffective disorder, showed improvement after six sessions, but psychotic symptoms re-emerged despite two additional ECT sessions and persisted upon discharge.

Post-ECT treatment characteristics

All patients were prescribed post-ECT pharmacotherapy. They had between two and five psychotropic drugs. The five patients with a mood disorder received lithium, one

as monotherapy and three as combination treatment with an antidepressant, an antipsychotic or both and one patient with prior medication-induced seizures received lithium combined with carbamazepine. The patient with schizoaffective disorder received post-ECT antipsychotic treatment.

Long-term follow-up

Information was available for three patients. Patient 3, who had obsessive-compulsive personality traits prior to ECT treatment, was given a borderline personality disorder (BPD) in her adulthood and remained stable for years, but then developed a post-partum psychotic episode. The other two patients (patients 5 and 6) had BPD traits prior to ECT treatment and were subsequently re-hospitalized and diagnosed with BPD, presenting high-risk behaviors, including suicide attempts.

Part 2 - Survey

The survey was sent to 179 psychiatrists treating minors in the province of Quebec in order to obtain their perceptions and experience regarding the use of ECT in youth. Fifty-three (30%) responded. Table 3 presents the respondents' characteristics.

Table 4 presents respondents' perceptions and experience with ECT. Fourteen (26%) respondents considered ECT, but finally did not prescribe it. Given explanations were: clinical improvement (n=7, 50%), non-availability (n=2, 14%), treatment refusal (n=2, 14%), safety issues (n=1, 7%) and referral to another psychiatrist (n=2, 14%). One respondent also added a lack of knowledge. Twelve (23%) respondents have prescribed at least one ECT treatment in a minor. The indications were: mood disorders (nine psychiatrists, 15 patients), catatonia (four psychiatrists, five patients) and psychotic disorders (four psychiatrists, four patients). Four respondents (33%) reported their patients experienced significant cognitive adverse effects.

All respondents were interested in receiving additional training about ECT. The influence of practice setting, ECT

Table 3. Respondents' characteristics (n=53)		
		Frequency (%)
Gender	Female	36 (68)
	Male	17 (32)
Years of practice	≤5	7 (13)
	6-10	11 (21)
	11-15	9 (17)
	>15	26 (49)
Caseload	Less than 50% youth	4 (8)
	50% and more youth	5 (9)
	Exclusively youth	44 (83)
Practice setting	University Centre	37 (70)
	Non-university	16 (30)

Table 4. Respondents' perceptions and experience with ECT (n=53)	
	Frequency (%)
ECT training	40 (75)
In favor of ECT in treatment-resistant youth	48 (91)
Considered ECT for a youth but never prescribed it	14 (26)
Ever prescribed ECT for a youth	12 (23)
Presence of significant adverse effects when ECT was administered in youth	4 (33)
Interested in receiving additional training about ECT	53 (100)

training, gender, years of practice or caseload on the respondents' opinion and prescription of ECT did not reach statistical significance. Nevertheless, a greater proportion of respondents in university centres were more favorable to the use of ECT in treatment-resistant youth (95% vs 81%; $p=0.1550$); as did those who had more ECT training (95% vs 77%; $p=0.0882$).

Discussion

ECT indications in youth are: severe, persistent major depression or mania with or without psychotic features, schizoaffective disorder, schizophrenia, catatonia, neuroleptic malignant syndrome and severe self-injury (Ghaziuddin et al., 2004; Ghaziuddin & Walter, 2013). Pre-ECT assessment comprises: a psychiatric evaluation; a second opinion from an independent psychiatrist; review of past treatments; physical examination and laboratory investigation (complete blood count, thyroid and liver function tests, urinalysis and toxicology screen, electrocardiogram, electroencephalogram, and brain imaging); and, memory assessment before treatment, at treatment termination, and at 3-6 months post treatment. Informed consent is necessary (Ghaziuddin et al., 2004). Electrical parameters should be adjusted based on age or by titration. Electrode placement is decided on a case-by-case basis. ECT should be given

two to three times per week and clinical response dictates the number of treatments. No specific anesthetic is recommended (Ghaziuddin et al., 2004; Ghaziuddin & Walter, 2013). Our sample followed the guidelines with regards to ECT indication, informed consent (with the exception of the patient who was under court order), second opinion, adjustment of electrical parameters (when information was available) and frequency of ECT sessions. However, only two patients had brain imaging and a neuropsychological assessment and one patient had brain imaging only. This could be explained by the fact that most patients in our sample received ECT prior to guidelines publication in 2004.

In our sample, ECT was associated with response in five out of six patients, based on subjective reports. The patient who did not improve with ECT had a diagnosis of schizoaffective disorder. These findings are consistent with the literature suggesting ECT is effective in adolescents with refractory mood (Ghaziuddin et al., 1996) and psychotic disorders (Baeza et al., 2010), although less effective for psychotic disorders (Cohen, Paillere-Martinot, & Basquin, 1997).

The most frequent side effects were headache, expansive mood, nausea and memory and attention deficits, which are similar to side effects reported in the literature (Ghaziuddin et al., 2004; Lima et al., 2013). Two patients from our

sample had cognitive testing and one showed memory and attention deficits after her second course of ECT; she had received a total of 21 sessions in 15 months, which could contribute to the cognitive side effect burden.

After completion of an ECT course, maintenance treatment is indicated in adolescents. There are no specific pharmacotherapy recommendations in the AACAP's practice parameters (Ghaziuddin et al., 2004) regarding the choice of pharmacotherapy. Psychotherapy may be used and data concerning maintenance ECT in adolescents is limited (Ghaziuddin & Walter, 2013). All of our patients received maintenance pharmacotherapy. It is interesting that five patients received post-ECT lithium. Indeed, the relapse rate following termination of ECT for adult patients with mood disorders is high (greater than 84%), while nortriptyline reduces this risk to 60% and the combination of nortriptyline-lithium seems even more protective, reducing relapse rate to 32-40% (Sackeim et al., 2001). This may be the reason why psychiatrists chose lithium. No patients received tricyclic antidepressants, probably as tricyclics are not recommended in youth because of side effects and lack of efficacy (Birmaher et al., 2007). Even though venlafaxine appears effective in preventing relapses after ECT (Prudic et al., 2013), the patient who received lithium-venlafaxine relapsed and received a second ECT course within 15 months.

Few studies document post-ECT follow-up for adolescents. Bloch and al. (2001) documented a 33% rehospitalization rate at one year (Bloch, Levcovitch, Bloch, Mendlovic, & Ratzoni, 2001). No post-ECT follow-up studies have reported BPD as an outcome, whereas three of our patients had a BPD trajectory. It is possible that early psychiatric symptoms represented emerging symptoms of BPD. Nonetheless, this finding would require more investigation.

Regarding the survey, responses were obtained from 53 out of 179 (30%) CAP in the province of Quebec. This response rate was comparable to rates found when surveys are sent to residents and doctors in different specialties (Ng, Burke, & Narula, 2013). In our sample, 23% of psychiatrists had prescribed ECT to a minor, which is similar to other studies (Ghaziuddin et al., 2001; Parmar, 1993; Walter & Rey, 2003; Walter et al., 1997). Only 9% of psychiatrists were against ECT in youth after failure of usual therapeutic modalities. This result differs from Walter et al's (1997) first survey in which respondents disapproved ECT in children by 71% and in adolescents by 32%. However, more respondents supported its use in adolescents in a second survey (76% vs 63%), suggesting that psychiatrists' opinion regarding ECT can evolve over time and after receiving medical education (Walter & Rey, 2003). Approval of ECT in youth is higher in respondents with advanced knowledge on ECT (Ghaziuddin et al., 2001). Seventy-five percent of our sample received ECT training and only one respondent mentioned refraining from prescribing ECT because of a lack of knowledge. In contrast to other studies,

the majority of respondents practiced in academic settings and 83% worked exclusively with youth. Even though not reaching statistical significance, respondents in academic centres and with ECT training were more likely to be favourable to the use of ECT in treatment-resistant youth. Finally, the fact our survey was conducted after the publication of AACAP guidelines might have contributed to wider acceptance of ECT.

In the Quebec City Metropolitan Area, ECT was used only seven times between 1995 and 2014, which is a rare occurrence. One of the strengths of this study is that it combined retrospective chart reviews with a survey to CAP, which may allow a better understanding of the use of ECT in youth. Since the authors practiced in Quebec City, survey respondents from this area might be overrepresented (potential selection bias). Because the survey was anonymous, this cannot be verified. Practitioners approving ECT were possibly more likely to respond to our survey, which represents another potential source of bias. The descriptive nature of the study is a limitation, because no proof of causality can be established. Finally, there are several limitations associated with retrospective clinical chart reviews: missing data, subjective reports, lack of standardized scales, etc. Unfortunately, the family's and the patient's satisfaction were not documented, which could have been interesting given patients' views of ECT are substantially more positive than general population views (Ghaziuddin & Walter, 2013).

Despite its limitations, this study can lead to hypotheses for future research. Clearly, more research is needed to gather data on safety and efficacy of post-ECT pharmacological treatments and other post-ECT treatment options (psychotherapy, maintenance ECT). Since all CAP in our survey were interested in receiving additional training, it would be useful to determine what type of training they prefer and how specific training modifies their skills and perception of ECT. It is our dearest hope that future research leads to more effective, evidence-based and compassionate treatment for children and adolescents with severe mental health disorders.

Acknowledgments / Conflicts of Interest

The authors would like to thank Martin Lafleur, Dre Nathalie Gingras and Dr Richard Bélanger for their help through all the study. The authors have no conflicts of interest to declare.

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