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The Incidence of Dental Fracturing in Electroconvulsive Therapy in Sweden

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Objectives: One adverse effect of electroconvulsive therapy (ECT) is dental fracture; thus, a bite guard and muscle relaxants are used to prevent it. Earlier research reported varying rates of dental fracture, but there is no large-scale study on the incidence of dental fracture during ECT. This study aimed to examine the incidence of dental fracture during ECT and to investigate whether the incidence differs between different sexes, age groups, diagnosis groups, electrode placements, or number of treatment sessions.

Methods: This register-based study used data from the Swedish national quality register for ECT. All hospitals offering ECT report to this register, and the coverage ratio is about 90%. All registered patients who started an ECT series between January 2012 and January 2019 were included in this study, with the data representing 16,681 individuals, 38,862 series, and 254,906 sessions.

Results: Forty-six dental fractures were identified, giving an incidence of dental fracture of 0.2% per series, 0.02% per session, and 0.3% per individual. We did not find any significant associations between dental fracture rates and male or female populations, age, or different diagnosis groups, nor was there any significant difference between dental fracture rates and electrode placement. The mean number of treatments was significantly higher in the dental fracture group than in patients without dental fracture.

Conclusions: There is a minimal risk of dental fracture during ECT. Our findings, together with those of other studies, provide further motivation for the use of a bite guard and muscle relaxant.

Key Words: dental fracture, adverse effect, electroconvulsive therapy

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Electroconvulsive therapy (ECT) is an established treatment for severe affective disorders and is used worldwide.¹ In Sweden, the treatment is mainly used for severe episodic depression (with melancholic and/or psychotic character).² The most common adverse effects of ECT are nausea, headache, and muscle ache.³ The most debated adverse effect of ECT is amnesia, which can be of both anterograde and retrograde type.⁴ Electroconvulsive therapy is a safe procedure.^{3,5} Dental fractures are a rare adverse effect, with there being a number of reports of malpractice claims for dental injuries acquired during ECT.^{6–8}

During ECT, the muscles of the jaw can contract and exert high pressure on the teeth.^{9,10} The incisors are particularly at risk because they are normally inclined forwards. An uneven load distribution may result in fracture or loosening of teeth, which may cause more serious complications if they are aspirated.¹¹ To limit muscular contractions, the muscle relaxant succinylcholine is administered together with anesthetics before the electrical stimulus. To further avoid dental injury, a variety of different bite guards have been designed for use during ECT.^{9,10,12} Bite guards can be produced from different materials, including plastic, rubber, or disposable foam,¹² and they must direct the loading pressure on the teeth appropriately to avoid dental trauma.¹⁰ In Sweden, different bite guards are used depending on the policy and guidelines of each hospital. Disposable foam, self-manufactured roll-gauze bite guards, and market-bought rubber protective devices are used,¹³ with no specific bite guard having been found to be more effective for protecting against dental injuries than any other.^{10,13} To avoid discomfort, the bite guard is inserted after the patient loses consciousness.⁹

Before an ECT session, a brief oral inspection is made by the anesthesiologist. A pre-ECT dental evaluation is recommended in some literature, but this is not standard of care in Sweden.^{10,13,14} Thus, it is uncertain if more extensive dental assessment than the current pre-ECT praxis would be appropriate.¹²

Different studies report different incidence rates for dental complications during ECT.^{11,15–17} Because ECT is usually repeated at regular intervals, the cumulative risk of oral trauma and dental injury increases with subsequent ECT therapy.¹² Clinical practitioners need to be able to inform patients undergoing ECT of the risks of the treatment. In addition, more information on the incidence rates of dental fractures could help to determine the need for more extensive evaluations or improvements to routines to limit the risks.

The primary aim of this study was to examine the incidence of dental injury during ECT, whereas secondary aims included investigation of whether this incidence differs between sexes, different age groups, number of sessions, diagnoses, and electrode placements. When electrodes are placed in a unilateral matter, muscle contraction is asymmetric and the right jaw muscles are stimulated more than those of the left jaw. This may cause the patient to bite obliquely. We hypothesized that unilateral electrode placement may increase the risk of tooth fractures.

MATERIALS AND METHODS

Design

This study was a register-based study using data from the Swedish national quality register for ECT (Q-ECT). Since 2012, all 49 Swedish hospital units that offer ECT have reported to the Q-ECT via a Web-based report form. During 2017, the coverage ratio was 90% (varying between 84% and 100% according to the different counties). The Q-ECT is a nonmandatory register, and every patient has the option of declining their participation. The aim of this register is to compile data on ECT-treated patients for research purposes and quality assurance.

To further validate the study, dental fracture insurance claim data from the Swedish governmental patient insurance scheme was compared with the Q-ECT data. However, because of patient anonymity issues, it is not known whether the dental fractures reported to the insurance company are the same ones that were reported to the register.

Study Population

The study population included all patients entered into the Q-ECT who started an ECT treatment series between January 2012 and January 2019 and had a Swedish personal identity number. The data represent 16,681 individuals aged from 13 to 99 years (average age, 52 years), 32,862 treatment series, and 254,906 sessions, with 60% of patients being women and 40% men. The indications (grouped) for ECT were as follows: 60%, depressive episodes and recurrent depressive disorder; 15%, bipolar affective disorder and mania; 5%, schizoaffective disorder, schizophrenia, and acute polymorphic psychotic disorder; 1%, postnatal depression and postpartum psychosis; and 19%, other (including missing information). Supplementary Table 1 (Supplemental Digital Content 1, <http://links.lww.com/JECT/A95>) in the appendix provides a full list of diagnoses from the register report forms.²⁵ Unilateral electrode placement was performed in 66% of patients, bilateral placement was performed in 7% of patients, and the data on electrode placement were either missing or other placements were used in 26% of patients.

TABLE 1. Characteristics of the Dental Fracture and No Dental Fracture Groups on a per-Individual Basis

	Dental Fracture	No Dental Fracture	P
F/M			0.130
Women	39 (0.4%)	9926	
Men	17 (0.3%)	6699	
Age, y			0.399
0–25	2 (0.1%)	1577	
26–45	18 (0.4%)	4872	
46–65	22 (0.4%)	5552	
66–99	14 (0.3%)	4624	
Diagnosis (grouped)			0.914
Depressive	35 (0.4%)	9936	
Bipolar and mania	8 (0.3%)	2479	
Schizoaffective and Schizophrenia	2 (0.2%)	896	
Postpartum and postnatal	0 (0.0%)	158	
Other (including missing)	11 (0.3%)	3156	
Mean no. sessions	29.9	15.2	<0.001

TABLE 2. Characteristics of the Dental Fracture and No Dental Fracture Groups on a Serial Basis

	Dental Fracture	No Dental Fracture	P
Electrode placement			0.336
Unilateral	42 (0.2%)	21,809	
Bilateral	2 (0.1%)	2419	
Mixed and other	12 (0.1%)	8578	

Statistics

SPSS Statistics 25 (IBM Corp, Armonk, NY) was used for all statistical analyses. Associations between the presence or absence of dental fracture and the 5 different variables of sex, age group, diagnosis group, electrode placement, and number of treatment sessions were evaluated. The age group and diagnosis information were based on the data from each individual's first session in their first treatment series. Electrode placement information was based on the electrode placement in the first and last session of every ECT series. If the diagnosis or electrode placement was missing, it was considered as *other/missing*. Pearson χ^2 test and Student *t* test were used to test statistical differences between the dental fracture and no dental fracture groups.

Ethics

This study was part of the research project “The outcome of treatment of severe affective disorders.” Ethical permission was given by the Regional Ethical Vetting Board in Uppsala, Sweden, with the registration number 2014/174/3. Patients were not identifiable in the data set used for this study. The included patients were not informed about this particular study but were informed about the quality register and the use of its data for research purposes.

RESULTS

The incidence rate of dental fractures during ECT was 0.2% per series, 0.02% per session, and 0.3% per individual.

Table 1 shows the sex, age, diagnosis, and mean number of sessions in the dental fracture and no dental fracture groups on a per-individual basis. There was no significant difference in the incidence of dental fractures between the sexes, age groups, or diagnosis groups. The cumulative mean number of sessions per individual was significantly higher in the dental fracture group than in patients without dental fracture. None of the dental fractures within our patient cohort led to aspiration or more serious complications.

Table 2 shows the electrode placements in the dental fracture and no dental fracture groups for the first and last sessions on a serial basis. There was no significant difference in dental fracture rates between the electrode placements.

During the years 2011 to 2018, 342 ECT-related malpractice insurance claims were filed to the Swedish public patient insurance company “Landstingens Ömsesidiga Försäkringsbolag — LÖF”. Of these 342 claims, 35 (~10%) concerned dental fracture, and at the time of writing, 7 of these had led to financial payouts (H. Olsson, written communication, May 6, 2019). During the same period, around 280,000 ECT sessions was carried out in Sweden.

DISCUSSION

The results of this study show that the incidence of dental fracture during ECT was 0.2% per ECT series. This indicates a minimal risk of incurring a dental fracture during treatment with ECT for most patients.

It is difficult to find robust data on the incidence of dental fractures during ECT, and the incidence rates may vary between different populations and periods. One study from the United States reported 3 incidences of tooth fracture in 242 patients (a rate of ~1.2%),¹⁵ whereas another US study did not report any fracture in 200,000 ECT sessions.¹⁶ Another American study reported 12 injuries involving the teeth or the mouth in 73,440 sessions performed between 1999 and 2010.¹⁷ Of these 12 injuries, 5 involved an injury to a tooth and 7 involved laceration to the tongue or lips. This would suggest the incidence of tooth injury to be 0.007% per session within the study group in question. In each case, either incorrect bite block placement or failure to use a bite block was cited as the reason for the injury.

A study performed at a British psychiatric hospital during a 4-week period in 1998 found a tooth fracture rate of 1.5% of 68 sessions and a significantly higher frequency of soft tissue trauma.¹¹ Based on these previous studies, it is difficult to draw firm conclusions on the incidence of dental fractures during ECT. However, the results of previous studies, together with our data, clearly demonstrate that dental fracturing exists, but that the incidence rate is low.^{11,15,16}

We did not find a significant difference in the rate of dental fractures between male and female populations, between the different diagnosis groups, or between the different age groups. There was also no significant difference in the rate of dental fractures between different electrode placements. Thus, we did not find any support for the hypothesis of a higher incidence of dental fracture with unilateral electrode placement. However, the mean number of sessions was significantly higher in the dental fracture group, which goes hand in hand with the accumulated risk over repeated sessions described in other literature.¹² We considered the possibility that the association was biased by poorer dental status among patients with the most serious mental disorders that also require a greater number of ECT sessions. If that was the case, higher rates of dental fractures would have been expected among patients with schizophrenia as compared with patients with depressive disorders. Because this was not observed, the association is most likely related to the number of sessions per se.

Over time, oral health has improved in all age groups in Sweden and is now considered to have reached a good level.¹⁸ Dental services are to a large extent publicly funded for children and younger and older adults.¹⁹ Approximately 95% of all children and adolescents and about 75% of individuals aged 20 years and older attend a dental clinic on a regular basis.²⁰ Because the patient's previous oral status matters during a seizure, the general dental health of the population could affect the outcome of dental fractures in ECT and could be a factor contributing to the minimal risk in this Swedish cohort. Generally, patients with severe mental disorders have poorer oral health than the general adult population.²¹ This higher rate of dental pathology has been attributed to both psychological and physiological aspects of psychiatric diseases and treatments.²² As an example, saliva is important for preventing accumulation of decay-promoting bacteria, but its secretion is decreased during episodes of severe depression.²³ Antidepressants and antipsychotics can give anticholinergic adverse effects and hyposalivation.²⁴ Patients with a healthy oral status and teeth with full natural dentition have the least risk of incurring dental injuries during seizures.²²

A strength of this study is the size of the study population: it was possible to analyze over 16,000 treated patients. The register also has a consistently high coverage ratio for the years covered in this study.

This study is also subject to a number of limitations. The register information relied on hospital staff reporting adverse effects at the time of every series, and it is possible that dental injuries

may have occurred without them being reported to the register. Other literature also states that it is likely that ECT-associated oral trauma is underreported.¹² A dental fracture can evolve to a more serious problem if the broken tooth is aspirated; however, this type of serious adverse effect, which was not recorded within our study population, is more likely to be reported than a less serious one.

In this study using register information, it was not possible to distinguish between a chipped tooth and several lost teeth. The register information did not allow a closer assessment of patient histories or their relevant oral health status. Furthermore, preventative actions that may have been undertaken, such as examination of dental status and adjustment of any tooth problems before treatment, are not reported in the register. On the basis of other studies, we suspect that the use of a bite guard may have been missed in some of the cases. However, any accidental neglect in the use of a bite guard was not reported.

It is reasonable to believe that patients with poor dental status are at increased risk of having fractures during ECT. Some patients may therefore have a considerable risk of dental fractures, if not adequate safety measures are undertaken. We suggest that the psychiatrist who intends to treat a patient with ECT should make an overall dental assessment and determine the need for a formal dental health examination, to evaluate if there are any loose or unstable teeth that need to be extracted before ECT. Our findings and those of former studies indicate the need for continued use of a bite guard and muscle relaxants. Therefore, the treating psychiatrist or a dedicated nurse should ensure that the bite block is properly placed at every ECT session.

Further studies could address whether checklists in the form of simple steps to be followed to ensure the use of bite guards would provide any benefit. Such checklists have been applied in the United Kingdom.¹¹ Other safety measures worthy of investigation include the choice of bite guard and the amount of muscle relaxant used.

To the best of our knowledge, this is the largest study on the incidence of dental fracturing to date. Our data show that the incidence of dental fracture during ECT was 0.2% per series, and the risk is therefore minimal. We did not find significant differences in the rate of dental fracture between the sexes or different age groups, nor did we find significant differences associated with different diagnoses or electrode placements. Our findings, together with those of other studies, provide further motivation for the use of a bite guard and muscle relaxant. In individual cases, formal dental evaluations may be justified. However, for the majority of patients, the current standard oral inspection is sufficient.

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