

Frequency of Trigeminal Nerve Injuries Following Third Molar Removal

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Purpose: To estimate oral and maxillofacial surgery reporting of the frequency of temporary and permanent inferior alveolar and lingual nerve damage from lower third molar extraction and injury etiology, and to identify factors associated with injury rates.

Materials and Methods: A postal survey was sent to all members of the California Association of Oral and Maxillofacial Surgeons requesting information on known instances of inferior alveolar and lingual nerve damage that had occurred in their practices over a 12-month period and known instances of permanent damage over their entire careers.

Results: Replies were obtained from 535 California Oral and Maxillofacial Surgeons (OMFS) representing 86% of all OMFS in California. Instances of injury to the inferior alveolar nerve in a 12-month period were reported by 94.5% of OMFS; 53% reported instances of lingual nerve injury in a 12-month period. Instances of permanent nerve injury of the inferior alveolar nerve were reported by 78% of OMFS; 46% reported permanent lingual nerve injury occurring during their professional lifetime. The overall estimated self-reported rate of injury was 4 per 1,000 lower third molar extractions for the inferior alveolar nerve and 1 per 1,000 extractions for the lingual nerve for all cases (temporary and permanent). In most cases (80%) of inferior alveolar nerve injury the cause was known, but in a majority of cases of lingual nerve injury (57%) the injury etiology was unknown. Self-reported rates of permanent injury were 1 per 2,500 lower third molar extractions for the inferior alveolar nerve and 1 per 10,000 lower third molar extractions for the lingual nerve. Injury rates were associated with provider experience (ie, extractions per year) and years in practice.

Conclusion: This survey included a high percentage of California OMFS. Injury to the inferior alveolar and lingual nerve was reported by most OMFS in California following lower third molar removal, and many reported cases of permanent nerve injury, frequently with unknown cause.

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Although uncommon, injury to the inferior alveolar and lingual nerve following lower third molar removal has attracted disproportionate attention. It is a clinical issue that involves most oral and maxillofacial sur-

geons (OMFS) and leads to a discussion of issues such as the indications for removal of third molars, prevention of complications, alternative techniques (eg, lingual retraction or coronectomy), and also has medicolegal implications. However, the true frequency of these conditions is unknown and current publications give considerable variation, from 0.5% to 5%¹⁻⁶ of inferior alveolar nerves being involved and 0.6% to 2%⁷⁻¹¹ of lingual nerves being involved when lower third molars are removed. Many papers do not specify whether these injuries are temporary or permanent. The purpose of this article is to present the self-reported frequency of nerve injury after third molar removal with a retrospective postal survey.

Materials and Methods

Using the database of the California Association of Oral and Maxillofacial Surgeons (CALAOMS), an 11-

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Table 1. CALAOMS NERVE INJURY QUESTIONNAIRE

1. How long have you been in practice?
 - A. One to two years
 - B. Three to five years
 - C. Five to ten years
 - D. Ten to 20 years
 - E. Over 20 years
2. What best describes your practice?
 - A. Private practice only
 - B. Academics only
 - C. Private practice with part-time teaching
 - D. Academics with part-time private practice
 - E. Military or other institutional practice
3. How many lower third molars do you remove per year?
 - A. 100 to 200
 - B. 200 to 500
 - C. 500 to 1,000
 - D. 1,000 to 1,500
 - E. Over 1,500
4. How many cases of inferior alveolar nerve damage (temporary or permanent) following lower third molar removal do you think you have on average per year?
 - A. None
 - B. Zero to five
 - C. Five to 10
 - D. 10 to 20
 - E. More than 20
5. In how many of these cases do you think you knew the cause?
 - A. None
 - B. Zero to 25%
 - C. 25% to 50%
 - D. 50% to 100%
 - E. In all cases
6. How many cases of lingual nerve damage (temporary or permanent) following lower third molar removal do you think you have on average per year?
 - A. None
 - B. Zero to two
 - C. Two to five
 - D. Five to 10
 - E. 10 to 20
 - F. More than 20
7. In how many of the cases do you think you knew the cause?
 - A. None
 - B. Zero to 25%
 - C. 25% to 50%
 - D. 50% to 100%
 - E. In all cases
8. Over your practice lifetime, in how many cases are you aware that a patient experienced permanent inferior alveolar nerve damage following third molar removal?
 - A. Zero
 - B. Zero to five
 - C. Five to 10
 - D. 10 to 20
 - E. More than 20
9. In how many of these cases do you think you know the cause?
 - A. None
 - B. Zero to 25%

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Table 1. CONT'D

- C. 25% to 50%
- D. 50% to 100%
- E. Every case
10. Over your practice lifetime, in how many cases are you aware that a patient experienced permanent lingual nerve damage following third molar removal?
 - A. None
 - B. One to two
 - C. Two to five
 - D. Five to 10
 - E. 10 to 20
 - F. More than 20
11. In how many of these cases do you think you know the cause?
 - A. None
 - B. Zero to 5%
 - C. 5% to 25%
 - D. 25% to 50%
 - E. 50% to 100%
 - F. In all cases

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questionnaire was sent to all active members (N = 564) (Table 1). Those not replying within 6 weeks were sent a second mailing, and if no reply was received after another 6 weeks a third mailing was sent. The questionnaire asks demographic information regarding the type of practice in which the practitioner is involved and the number of years they have been in practice. Subsequent questions relate to recall of cases of inferior alveolar and lingual nerve injury including those that were temporary and those that were permanent. They were also asked if they were aware of any possible cause of this. Details were not asked with regard to the actual cause.

Numerical scores were assigned to each response in Table 1. For each respondent, the rate of injury was estimated as the number of cases (question 4 for inferior alveolar, question 6 for lingual) divided by the total number of extractions from question 3. In addition, an overall rate was calculated by adding cases over all respondents and dividing this by the sum of extractions over all respondents. For rates of permanent injuries, the denominator was calculated as the number of extractions in a 12-month period times the number of years in practice. Associations of rates with practice characteristics were calculated as Spearman rank correlations, and rates in different settings were compared by the Kruskal-Wallis test. Responses for the 2 different nerves were compared using McNemar's test.

The influence of surgeon experience on the incidence of nerve injuries was examined by correlating the incidence of nerve injuries with the number of years in practice as well the incidence of nerve inju-

Table 2. SPEARMAN CORRELATION OF NUMBER OF EXTRACTIONS IN AN AVERAGE YEAR AND YEARS OF EXPERIENCE WITH INJURY RATES

Type of injury	n	Rank	95% CI	P Value
Correlations with years of experience				
Alveolar	522	-.07	-.16 to +.01	.092
Lingual	524	-.02	-.11 to +.06	.61
Permanent alveolar	526	-.16	-.24 to -.08	.0002
Permanent lingual	524	-.03	-.11 to +.06	.53
Correlations with extractions per year				
Alveolar	522	.55	-.60 to -.48	<.0001
Lingual	524	.17	-.25 to -.09	.0001
Permanent alveolar	526	.27	-.35 to -.19	<.0001
Permanent lingual	524	.08	-.17 to +.00	.056

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ries correlated with the surgeon's volume of third molar extractions.

Results

Replies were received from 535 out of 564 active OMFS contacted (a 95% response rate). Nearly all (94.5%) of OMFS reported some cases of inferior alveolar nerve injury, and 53% reported cases of lingual nerve injury over a 12-month period; 78% reported cases of permanent inferior alveolar nerve injury, and 46% reported cases of permanent lingual nerve injury over their practicing lifetimes. The median rate for injury to the inferior alveolar involvement was 4 per 1,000 lower third molar extractions; this was also the overall average rate. The highest calculated rate for any respondent was 93 per 1,000 lower third molar extractions. For lingual nerve injury, the median rate was 1 per 1,000 lower third molar extractions; this was also equal to the overall average rate. The highest calculated rate for any respondent was 23 per 1,000 lower third molar extractions.

The mean permanent injury rate to the inferior alveolar nerve was 0.4 per 1,000 lower third molars removed (1 permanent nerve injury per 2,500 lower third molars removed). The permanent injury rate for the lingual nerve was 0.1 per 1,000 lower third molars removed (1 permanent lingual nerve injury per 10,000 lower third molars removed). Because virtually no OMFS removed more than 2,000 lower third molars per year,

this corresponds to 1 case of permanent lingual nerve injury on average every 5 years for the busiest practitioners. Practitioners with the greater numbers of extractions per year report lower injury rates and rates decrease with years of experience (Table 2).

Reports for inferior alveolar and lingual nerves differed substantially. Rates were higher for inferior alveolar: only 10 respondents reported more lingual than inferior alveolar injuries, while 310 reported more inferior alveolar than lingual injuries ($P < .0001$). Similarly, for permanent injuries, 18 reported more lingual than alveolar, while 256 reported more inferior alveolar than lingual ($P < .0001$). Also, knowing the cause was reported more often for inferior alveolar than lingual, with 31 respondents reporting knowing the cause more often for lingual and 261 more often for alveolar ($P < .0001$). For permanent injuries, 29 reported knowing the cause more often for lingual versus 243 more often for alveolar (Table 3).

Discussion

The total number of active OMFS in California is estimated to be 624 (60 non-members of CALAOMS as calculated from national figures and holders of California General Anesthesia Permits), so this study represents 86% of all OMFS in California. The shortcomings of a survey such as this are well known.¹ It is retrospective and relies on the self-report of the practitioners involved. A common shortcoming of this

Table 3. COMPARISON OF RESPONSES FOR INFERIOR ALVEOLAR VERSUS LINGUAL NERVES

Response	No. of Respondents (%)			P*
	Lingual More than Alveolar	Equal	Alveolar More than Lingual	
All injuries	10 (2%)	203 (39%)	310 (59%)	<.0001
Known cause	31	168	261	<.0001
Permanent injuries	18	255	256	<.0001
Known cause	29	176	243	<.0001

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type of survey is a relatively low response rate, but this did not occur here. Most practitioners were motivated to answer this questionnaire, and by using 3 consecutive mailings a response rate of over 95% from the database of CALAOMS (564 active OMFS) was obtained. The authors were conscious of the dilemma that asking too many questions would lower the response rate, while asking too few questions may not elicit the required information. The 11-question survey was believed to be appropriate.

It appears that 78% of OMFS are aware of cases of permanent inferior alveolar nerve injury in their patients undergoing third molar removal, and the estimated rate is 0.4 per 1,000 lower third molars removed. Forty-six percent of OMFS are aware of cases of permanent lingual nerve injury in their patients undergoing third molar removal, and the estimated rate is 0.1 per 1,000. Operator experience may play a role because more experienced and higher volume practitioners tend to report lower occurrence rates. There are a number of studies reporting better outcomes related to higher surgeon and/or hospital volume in cardiac surgery,¹² cancer surgery,¹³ cataract surgery,¹⁴ orthopedic surgery,¹⁵ and management of myocardial infarction,¹⁶ among others. Similar studies have not been reported for oral and maxillofacial surgery procedures. This issue is, of course, controversial because if lower volume or less experienced surgeons consistently have worse outcomes, how can they ever get started?

In most cases of inferior alveolar nerve injury, the practitioner was aware of a possible cause and, although not stated, it may well refer to the radiologic relationship of the inferior alveolar nerve to the tooth. In contrast, in most cases of lingual nerve injury the practitioner was not aware of a possible cause.

There is considerable interest in "evidence based" and "outcomes" studies and the hope is that factors influencing outcomes can be identified, thus leading to improvement in outcomes. As such, this study on the outcome of lower third molar removal relating to inferior alveolar and lingual nerve damage may be of value. The authors are not aware of any other recent studies to which these results can be compared. It is important that these numbers be supported by other similar studies. Self-reported incidence of complications likely under-reports subtle injuries, patients who did not seek follow-up, patients who seek care elsewhere, and incomplete recollection of the surgeon. Nevertheless, the fact that nerve damage following wisdom tooth removal appears to be widely distributed, though rare, does have implications. It could impact on the indications for tooth removal, the informed consent process, the surgical technique itself (with consideration for variables such as coronectomy¹⁷ or lingual retraction¹⁸), and in standardization in referral patterns for microneurosurgical consultation.¹⁹

Nearly all OMFS in California are aware of injuries to the inferior alveolar nerve related to lower third molar extraction, and over 50% are aware of injury to the lingual nerve following lower third molar removal. Nearly 80% of OMFS are aware of patients who have permanent injury to the inferior alveolar nerve, and almost a half are aware of patients with permanent injury to the lingual nerve following lower third molar removal. This is despite the high recovery rates noted for nerve injury following these extractions.¹ This information should be reflected in both the evaluation of the indications for removal of third molars and in the informed consent process.

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