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Palatal Injection For The Removal of Maxillary Teeth: Current Practice Amongst Oral and Maxillofacial Surgeons

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Abstract

Purpose:

Conventional teaching regarding palatal injection for the removal of maxillary teeth dictates that both a buccal and palatal injection are to be administered. Recently, some authors have questioned the necessity of the palatal injection, suggesting that contemporary local anaesthetics might diffuse sufficiently across the buccal-palatal cortical bone distance. It has been suggested that since the buccal-palatal cortical bone distance increases anteriorly to posteriorly in the maxilla, the success of maxillary extractions with buccal injection only, might be related to anterior-posterior position of the tooth.

Evidence from clinical trials has only relatively recently become available. Since 2006, fifteen clinical trials that examined outcomes of maxillary tooth extractions performed with buccal injection of local anaesthetic only, have been published. However, there is limited data available regarding the clinical practice of surgeons.

Patients and Methods:

An online survey was sent to 276 full members of the Canadian Association of Oral and Maxillofacial Surgeons. Respondents were asked about their use of palatal injection for the removal of maxillary teeth under local anaesthesia, including how often they administer a palatal injection for maxillary extractions in each region of the maxilla.

Results:

92 responses were received (33%). Most practitioners deliver a palatal injection for every maxillary tooth extraction under local anaesthetic. However, there is a significant number who do not always administer a palatal injection (i.e. they give it 'most of the time', 'occasionally' or 'never'). This number decreased in a linear fashion anteriorly to posteriorly in the maxilla:

incisors: 17/89; canines: 16/88; premolars: 13/88; first and second molars: 10/89; third molars: 10/88.

Conclusion:

There are a number of surgeons who do not always administer a palatal injection for extraction of maxillary teeth under local anaesthetics. The number is greater for anterior compared to posterior teeth.

Abbreviations: LA: local anaesthetic; OMS: oral and maxillofacial surgeon; SD: standard deviation; CI: confidence interval

Introduction

Conventional teaching regarding local anaesthesia for the removal of maxillary teeth dictates that both a buccal and palatal injection (block and/or infiltration) are to be administered¹.

Unfortunately, palatal injection is poorly tolerated by patients due to the rich nerve supply of the palatal tissues and firm attachment of palatal mucosa to bone²⁻⁵. Recently, a number of authors have questioned the necessity of administering the palatal injection, suggesting that contemporary local anaesthetics might diffuse sufficiently across the buccal-palatal cortical bone distance. This distance increases anteriorly to posteriorly in the maxilla; therefore, the success of maxillary extractions performed with buccal injection only might be related to anterior-posterior position of the tooth⁶.

In 2007, a survey of Australian and New Zealand OMSs regarding their use of palatal injection was conducted by Badcock and McCullough⁷. The study was limited to extraction of maxillary third molars and the authors found that, in line with conventional teaching, palatal injection was widely used. However, they identified a small number of practitioners who do not always deliver the palatal injection (palatal injection delivered 'always': 77/84, 'most of the time': 4/84, 'occasionally': 2/84, 'never': 1/84).

Fifteen clinical trials (2006-2015) examining outcomes of maxillary tooth extractions performed with buccal injection of LA only, have been published, and were the subject of a recent review by Badenoch-Jones and Lincoln⁸. The included trials varied considerably in their designs and the authors gave the caveat that the results of each trial should be interpreted within the framework of the protocol of the particular study. Nevertheless, it was found that all nine controlled studies that assessed pain during the procedure failed to demonstrate a statistically significant difference between the test (buccal injection only) and control (buccal and palatal injection) groups. Four studies reported results according to region of the maxilla and provided some evidence for better

results for anterior compared to posterior teeth, although none of the studies reported a P value for comparisons between the groups. The review authors made the point that the relevant consideration in clinical practice is the 'cost' versus benefit of the intervention (i.e. the pain of palatal injection versus the pain that it eliminates during the procedure), whereas, the majority of included trials considered only whether there was a benefit from the intervention.

The findings of the 2007 survey⁷ and the review^{7,8}, together, raise the possibility that in some circumstances, the palatal injection might not be required. The purpose of the current study was to examine previously reported estimates for the percentage of practitioners who do not 'always' deliver a palatal injection, and by way of a similar survey improve on the sample size of the 2007 survey. We also aimed to expand on the previous research by collecting data for all regions of the maxilla in order to analyse for variance in results that might be due to the region.

Methods

Sample Size/Power Calculation

The results of Badcock and McCullough⁷ for the proportion of practitioners who 'always' deliver a palatal injection for extraction of maxillary teeth were used to determine the sample size required for our study. Although the study by Badcock and McCullough⁷ was limited to the extraction of maxillary third molar teeth, given the similarity expected for results across all maxillary teeth, this estimated sample size was used for our study. Our null hypothesis was that the proportion of practitioners who 'always' deliver a palatal injection for the extraction of maxillary teeth, as reported by Badcock and McCullough⁷ is 0.92. Conversely, our alternative hypothesis was that the true population proportion is not 0.92.

According to our calculation, at a power of 80%, a significance level of 5%, and a proportion of interest that differed more than 10% from the null proportion of interest (0.92), 89 respondents were required for our study. The null proportion was obtained from the study by Badcock and McCullough⁷ in which 77 of the 84 respondents 'always' delivered a palatal injection for

extraction of maxillary third molars (compared to practitioners who do not 'always' deliver the palatal injection, i.e. they give it 'most of the time', 'occasionally' or 'never').

We conducted a one-sample proportions test to determine if there was a difference in the proportion of respondents that 'always' delivered a palatal injection for extraction of maxillary third molars in the study by Badcock and McCullough⁷ and the proportion of respondents that 'always' delivered a palatal injection for extraction of third molars in the present study.

Questionnaire

In constructing our survey, we used the survey by Badcock and McCullough⁷ (obtained from the authors) as a reference. Respondents were asked how often they administered a palatal injection for permanent maxillary extractions under local anaesthetic in each region of the maxilla, grouped as: incisors (central and lateral), canines, premolars, first and second molars, and third molars. For this question, the same format as that used by Badcock and McCullough was maintained so that the results of the present study could be pooled with those obtained by Badcock and McCullough (for third molars). For the remainder of the survey, we used similar questions to those of Badcock and McCullough, although we sought more detailed information from respondents for some questions..Respondents were also able to provide general comments at the conclusion of the survey.

Our online survey was distributed via email link by The Canadian Association of Oral and Maxillofacial Surgeons (CAOMS) to all active full members (276), followed by a reminder to non-responders 3 weeks later. Members were advised that participation in the study was voluntary and that their response could not be identified.

Approval for the study was gained from The University of Queensland Dental Sciences Research Ethics Committee.

Results

Ninety-two members responded to the survey (33%), although some respondents did not complete all of the survey components. The respondents had practised as qualified OMSs in Canada or overseas for an average of 19.3 (SD: 11.5) years full time equivalent.

The responses are shown in Tables 1-3.

Table 1

A one-sample proportions test indicated no significant difference ($p=0.52$) between the proportion of respondents that 'always' delivered a palatal injection for third molars in the study by Badcock and McCullough⁷ (77/84, 0.92) and the proportion of respondents that 'always' delivered a palatal injection for third molars in the present study (79/88, 0.90 (95% CI: 0.83-0.96)).

With the addition of intravenous sedation, 16% (15/92) of practitioners administer the palatal injection 'more commonly', 12% (11/92) 'less commonly', while for 72% (66/92) there is no difference.

Table 2

Of the respondents who were influenced by patient anxiety level in the delivery of the palatal injection, 69% (11/16) were 'more likely' to administer the injection for an anxious patient, while 31% (5/16) were 'less likely' to administer the injection for an anxious patient.

None of the respondents indicated that there were any additional factors, not included in the survey, which influence whether or not they administer a palatal injection (aside from tooth eruption status which we consider to fall under our category, pre-operative assessment: tooth/alveolar anatomy). One respondent commented that they administer a high posterior superior alveolar nerve block and that this usually achieves palatal anaesthesia.

Table 3

The gauge of needles used by respondents to reduce the discomfort of palatal injection ranged from 25 to 33 (median: 30).

Other techniques employed to reduce the discomfort of palatal injection that were not included in the survey but which are utilized by respondents were:

- nitrous oxide (1 respondent)

- intraalveolar and/or intrapapillary injection prior to palatal injection (2 respondents)

One respondent provided the comment that the techniques he/she uses to reduce the discomfort of palatal injection are not used for every patient. It is likely that this is the case for other respondents as well.

Discussion and Conclusion

Discussion of Results

In order to maximize the response rate, the authors aimed to keep the survey concise, and therefore collected only the data most relevant to answering the research question. As such, there was no aim to assess the independent effect of covariates such as geographical location, age, and gender, etc. Further, as the survey was completed on the basis of self-report and only given once, it was not possible to evaluate reliability metrics such as intra-rater and inter-rater reliability.

Limitations of the study include the possibility of non-response bias (difference in the estimate provided by the respondents vs the population estimate). No comparison between responders and non-responders was possible, as the research team was unable to collect covariate

information from the non-responders. We note that surveys of professionals (especially health professionals) generally have low response rates, with rates less than 33% not uncommon. Further, a low response rate does not necessarily impart substantial bias(es), as the survey was not of the general population but rather of a specific target population that is more homogenous.⁹

There is also the possibility of response bias, which occurs when respondents do not provide accurate responses. The particular type of survey and the population of respondents do not make this survey vulnerable to this type of bias, and further, we avoided yes/no answers, instead using the following options: 'always', 'most of the time', 'occasionally' and 'never'.

It is the view of this research team that the utilized one-page questionnaire has face validity (i.e. according to the responders, the survey measures what it intends to) and content validity (i.e. that the survey actually measures what it intends to).

The number of practitioners who did not 'always' administer a palatal injection for the removal of maxillary teeth (i.e. they give it 'most of the time', 'occasionally' or 'never') decreased in a broadly linear fashion anteriorly to posteriorly in the maxilla (incisors: 17/89; canines: 16/88; premolars: 13/88; first and second molars: 10/89; third molars: 10/88). It may be that a greater number of practitioners 'always' administer the palatal injection further posteriorly in the maxilla because of the increased buccal-palatal cortical bone distance, or because of clinical experience reflecting this fact.

It is interesting to note the inconsistency in use of palatal injection for patients whom the practitioner judges to be anxious. Presumably, the practitioners who are 'more likely' to administer the palatal injection for these patients do so to reduce pain during the procedure, while those practitioners who are 'less likely' to administer the palatal injection for these patients do so to avoid the pain of injection. At the crux of this inconsistency appears to be uncertainty over the relative cost (i.e. pain of palatal injection) and benefit (i.e. pain that it eliminates during the procedure) of the intervention (i.e. palatal injection). The former group of practitioners must believe that the benefit outweighs the cost, while the latter group must

believe that the cost outweighs the benefit. As mentioned earlier, the authors of the aforementioned systematic review⁸ highlighted that the majority of clinical trials on the topic addressed only the benefit of the intervention, and not the cost; therefore, available evidence for cost versus benefit is sparse (the two trials where cost versus benefit was reported or could be calculated found that cost outweighed the benefit).

The results suggest that the factors which influence whether or not a palatal injection is administered by a surgeon vary according to the individual practitioner (only 14-40% are influenced by each factor). By contrast, there is greater consistency among practitioners in the techniques employed to reduce the discomfort of palatal injection (either uncommonly used (0-3%) or relatively commonly used (62-72%)).

Notwithstanding the nine-year difference in the dates of data collection (and the possibility of changing practice with time), the concordance of the results for third molars reported by Badcock and McCullough⁷, and in the present study ($p=0.52$), indicates similar practice in Australia/New Zealand and Canada. This is likely to be the case for other western countries as well.

While the results of this survey provide some additional evidence regarding the use of palatal injection for maxillary tooth extractions, data are still limited. Building on the current evidence with appropriately designed and executed trials will be necessary. Points to be addressed include the cost of the intervention, and trends in results according to region of the maxilla (to date, no trial has presented results according to region of the maxilla appropriately, i.e. with P values comparing groups).

Ideal Study Design

The following are our suggestions for further trials to address the identified gaps in knowledge:

- Double blinded randomised controlled trials with large cohorts using saline palatal injection as the control.
- Inclusion of all maxillary teeth, grouped as: incisors (central and lateral), canine, premolars, first and second molars, third molars. Results of groups compared with appropriate statistics.
- Lignocaine hydrochloride or articaine hydrochloride standard dose for both buccal injection/s and palatal injection/s.
- Procedure 5 minutes after delivery of LA. For cases of failed initial anaesthesia, supplemental buccal injection, and if unsuccessful after 5 minutes, supplemental palatal injection.
- Unsuccessful anaesthesia determined by pain during the procedure, rather than by probing of the mucosa (the former directly addresses the research question).

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Competing Interests

No conflicts of interest.

References:

1. Malamed SF. Handbook of local anesthesia. 5th edn. St. Louis: Mosby, 2004: 277.
2. Malamed S. Handbook of local anesthesia. 5th edn. St. Louis: Mosby, 2004: 202.
3. Meechan JG, Wilson NHF. Practical dental local anaesthesia. Chicago; London: Quintessence, 2002:43.
4. Sekhar GR, Nagaraju T, KolliGiri, Nandagopal V, Sudheer R, Sravan. Is palatal injection mandatory prior to extraction of permanent maxillary tooth: A preliminary study. Indian J Dent Res 2011; 22: 100-102.
5. Yadav S, Verma A, Sachdeva A. Buccal Injection of 2% Lidocaine With Epinephrine for the Removal of Maxillary Third Molars. Anesth Prog 2013; 60: 95-98.
6. Kumaresan R, Srinivasan B, Pendayala S. Comparison of the Effectiveness of Lidocaine in Permanent Maxillary Teeth Removal Performed with Single Buccal Infiltration Versus Routine Buccal and Palatal Injection. J Maxillofac Oral Surg 2015; 14: 252-257.
7. Badcock ME, McCullough MJ. Palatal anaesthesia for the removal of maxillary third molars as practised by oral and maxillofacial surgeons in Australia and New Zealand. Aust Dent J 2007; 52: 329-332.
8. Badenoch-Jones EK, Lincoln T. Palatal Injection For Removal of Maxillary Teeth Is It Required: A Systematic Review. Int J Oral Maxillofac Surg 2016 (in press) doi: 10.1016/j.ijom.2016.05.005.
9. VanGeest JB, Johnson TP, Welch VL. Methodologies for improving response rates in surveys of physicians: a systematic review. Eval Health Prof 2007; 30(4): 303-321

Table 1. Number (%) of respondents: how often a palatal injection is administered for maxillary tooth extractions under LA according to region of the maxilla.

Region of Maxilla	Always	Most of the time	Occasionally	Never	Total
Maxillary incisors (central and lateral incisors)	73 (82)	12 (13)	2 (2)	2 (2)	89
Maxillary canines	74 (84)	12 (14)	1 (1)	1 (1)	88
Maxillary premolars	76 (86)	10 (11)	1 (1)	1 (1)	88
Maxillary first and second molars	80 (90)	7 (8)	1 (1)	1 (1)	89
Maxillary third molars	79 (90)	3 (3)	5 (6)	1 (1)	88
Results of Badcock and McCullough⁷					
Maxillary third molars	77 (92)	4 (5)	2 (2)	1 (1)	84
Total: present study and Badcock and McCullough⁷					
Maxillary third molars	156 (91)	7 (4)	7 (4)	2 (1)	172

Table 2. Number (%) of respondents: factors which influence whether or not a palatal injection is administered.

	Yes	No	Total
Indication for tooth extraction (such as caries, apical lesion, pericoronitis, orthodontic treatment plan, prophylactic extraction)	17 (25)	51 (75)	68
Pre-operative assessment: tooth/alveolar anatomy	15 (21)	55 (79)	70
Pre-operative assessment: likelihood of simple versus surgical extraction	13 (19)	57 (81)	70
Patient anxiety level	16 (23)	54 (77)	70
Pain during extraction	28 (40)	42 (60)	70
Type of LA used for buccal (vestibular) infiltration or buccal nerve block (eg lignocaine, articaine, mepivacaine)	10 (14)	59 (86)	69

Table 3. Number (%) of respondents: techniques employed to reduce the discomfort of palatal injection

	Yes	No	Total
Pressure applied to the area of needle penetration	63 (72)	25 (28)	88
Conventional topical anaesthetics	63 (72)	24 (28)	87
Eutectic mixture of local anaesthetic (EMLA) cream	2 (3)	72 (97)	74
Topical cooling of the palate (eg topical ice)	1 (1)	74 (99)	75
Fine gauge needle	52 (62)	32 (38)	84
Computerised delivery system	1 (1)	75 (99)	76
Transcutaneous electronic nerve stimulation (TENS)	0 (0)	75 (100)	75