



Permanent Nerve Damage From Inferior Alveolar Nerve Blocks: A Current Update

m. anthony pogrel, dds, md

abstract Permanent nerve involvement has been reported following inferior alveolar nerve blocks. This study provides an update on cases reported to one unit in the preceding six years. Lidocaine was associated with 25 percent of cases, articaine with 33 percent of cases, and prilocaine with 34 percent of cases. It does appear that inferior alveolar nerve blocks can cause permanent nerve damage with any local anesthetic, but the incidences may vary.

involvement following a local anesthetic injection.

Editor's Note:

Subsequent to the publishing of the article "Permanent Nerve Damage From Inferior Alveolar Nerve Blocks: A Current Update" in the October 2012 issue of the *Journal of the California Dental Association*, the author M. Anthony Pogrel, DDS, MD, reported that he has been a paid expert witness in a number of cases for dentists who have been sued for permanent nerve

author

M. Anthony Pogrel, dds, md, is a professor and chair, Department of Oral and Maxillofacial Surgery, University of California, San Francisco. He also is a fellow of the Royal College of Surgeons, as well as with the American College of Surgeons.

Conflict of Interest Disclosure: None reported.

Permanent involvement of the inferior alveolar and/or lingual nerve following an inferior alveolar nerve block has been reported. There are a relatively small number of studies and the reported incidences vary from a high of 1 in 20,000 blocks to a low of 1 in 850,000 blocks. Several studies do not indicate whether the involvement was temporary or permanent.¹⁻⁷ Studies appear to show that when nerve damage occurs, the lingual nerve is affected twice as frequently as the inferior alveolar nerve and one suggested reason for this may be the fascicular pattern in the region where the injection is given.⁸ It also appears that about half the patients feel an "electric shock sensation" on injection, but approximately half do not.⁷ The phenom-

enon has been noted with every local anesthetic used in dentistry, but it has been suggested there might be a higher incidence

with prilocaine and articaine, possibly since they are in a 4 percent solution whereas other local anesthetics are in lower concentration.⁹⁻¹⁶ The author last reported his findings in 2007, based on information received up to the end of 2005.¹⁷ This study tended to show that although all local anesthetics could cause this problem, it was more or less in proportion to their usage. It was felt that it could be helpful to update these numbers utilizing data obtained from patients seen since the beginning of 2006.

Materials and Methods

The Department of Oral and Maxillo-facial Surgery at the University of California, San Francisco, has become known as a tertiary referral center for injuries to the inferior alveolar and lingual nerves in general, and, in particular, injuries caused by inferior alveolar nerve blocks. Many practitioners are aware of these problems

and will refer patients to UCSF for evaluation. This study covers all patients referred and seen between Jan. 1, 2006, and Dec. 31, 2011. All patients still have neurological symptoms nine months after injection and are considered permanent injuries.

Results

Forty-one patients were referred to the Department of Oral and Maxillofacial Surgery, University of California, San Francisco, with a diagnosis of damage to the inferior alveolar and/or lingual nerve that could only have resulted from an inferior alveolar nerve block, between Jan. 1, 2006, and Dec. 31, 2011. None of these patients underwent surgical or other procedures that could have been responsible for the nerve involvement. The symptoms included paresthesia and dysesthesias, varying from mild to severe, but there were no cases of total anesthesia. In two cases, the type of local anesthetic used was unknown and in one case a carpule of lidocaine was used followed by a carpule of articaine so the causative agent could not be determined.

The distribution of the local anesthetics used in the 38 cases receiving one known local anesthetic is shown in the figure coupled with an approximate percentage of sales of dental local anesthetics nationally and in Northern California.¹⁸

Discussion

In 2001, articaine, after its introduction in the United States, increased its sales until 2003 when it had approximately 25 percent of market share for dental local anesthetics, since which time, its use nationally has risen to about 32 percent (figure). This has resulted in a decrease in the market share of lidocaine, which had more than 60 percent of the market prior to articaine being released in 2001. However, it is known that by 2005 warnings were being given about the use of articaine for inferior alveolar blocks, and its use was

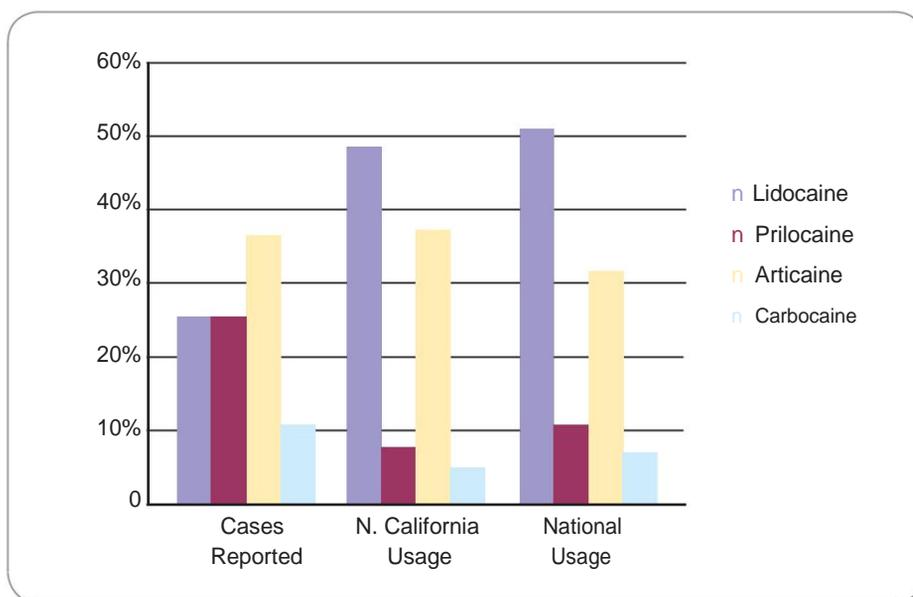


figure. Analysis of the 38 patients who received only one known local anesthetic. Local and national sales figures refer to all manufacturers of these local anesthetics.¹⁸

discontinued in the student clinics of some dental schools.^{3,19,20} Largely because of this, the market share of articaine has stabilized, whereas in other countries where it has been introduced, it has shown a steady increase to a final higher usage. It is also possible that much of the articaine used today is used for infiltration injections and not for inferior alveolar nerve blocks.

The new numbers presented in this article show a number of trends.

The number of patients with this problem referred to the Department of Oral and Maxillofacial Surgery at the University of California, San Francisco, has decreased considerably. In the years 2003 to 2005 over a three-year period, there were 57 patients referred (19 per year). In the six years from 2006 to 2011, there were 41 patients referred (an average of seven patients per year). This decrease in referrals could be due to a true decrease in the number of cases occurring but is probably due to the publicity given to the fact there is isn't any treatment for this condition and, therefore, patients are not being referred in the same numbers that there were, since, from a practical point of view, they know there is little to offer in the way of treatment.

However, of the cases referred, it

would appear that despite the fact that articaine may be used less for inferior alveolar blocks than it was, and used more for infiltrations because of its great penetrating power, it is still causing cases of permanent inferior alveolar and lingual nerve damage, which is proportionate to its market share. The number of cases caused by lidocaine on the other hand appears to be only around 50 percent of its market share. Prilocaine, however, by causing 26 percent of all cases seen since 2005 with a local market share of only 8 percent is somewhat disproportionate to its market share. The numbers with carbocaine (11 percent of cases with a local market share of 5 percent) is of interest since cases caused by carbocaine appear to be very rare and we had only seen one case prior to this study.

It is also apparent that sales figures for Northern California (where all these cases occurred) differ slightly from national sales figures in that less lidocaine is used (49 percent versus 51.6 percent) and less prilocaine (8 percent versus 10.6 percent) but more articaine (38 percent versus 32.3 percent). The carbocaine numbers are interesting since in the past only isolated cases have been reported, but in this study, carbocaine produced 11 percent of the

total number of cases, confirming that this phenomenon can occur with all local anesthetics used in dentistry.

This study differs from many of the other reported studies in that it is based on patients actually seen and examined by a single clinician. Many of the other reports are a result of reports to a malpractice carrier or reports to the FDA. These kinds of reports are known to be susceptible to reporting bias. It is well-known that complications with new medications are much more likely to be reported than those occurring with older medications and also that publicity regarding a complication can result in a short-term increase in reporting such complications.^{21,22} Also, many of the reports to outside agencies do not report whether the paresthesia was temporary or permanent, and since it is known that most of the paresthesias are temporary and do eventually recover, only reports of persistent issues for nine months or longer should be considered permanent.

One potential weakness with the present study is that all the numbers are small and there may well be reporting bias in those cases that are referred to UCSF. Nevertheless, this is felt to be the largest database available of patients actually seen and examined and, therefore, may represent a reasonable source of data. ■■■■

references

- Ehrenfeld M, Cornelius CP, et al, Nerve injuries following nerve blocking in the pterygomandibular space. *Dtsch Zahnärztl Z* 47:36, 1992.
- Harn SD, Durham TM, Incidence of lingual nerve trauma and postinjection complications in conventional mandibular block anesthesia. *J Am Dent Assoc* 121:519, 1990.
- Hillerup S, Jensen R, Nerve injury caused by mandibular block analgesia. *Int J Oral Maxillofac Surg* 35:437, 2006.
- Krafft TC, Hickel R, Clinical investigation into the incidence of direct damage to the lingual nerve caused by local anaesthesia. *J Craniomaxillofac Surg* 22:294, 1994.
- Pogrel MA, Trigeminal nerve chemical neurotrauma from injectable materials. *Oral Maxillofac Surg Clin North Am* 13:247, 2001.
- Pogrel MA, Bryan J, Regezi J, Nerve damage associated with inferior alveolar nerve blocks. *J Am Dent Assoc* 126:1150, 1995.
- Pogrel MA, Thamby S, Permanent nerve involvement resulting from inferior alveolar nerve blocks. *J Am Dent Assoc* 131:901, 2000.
- Pogrel MA, Schmidt BL, et al, Lingual nerve damage due to inferior alveolar nerve blocks: a possible explanation. *J Am Dent Assoc* 134:195, 2003.
- Gaffen AS, Haas DA, Retrospective review of voluntary reports of nonsurgical paresthesia in dentistry. *J Can Dent Assoc* 75:579, 2009.
- Garisto GA, Gaffen AS, et al, Occurrence of paresthesia after dental local anesthetic administration in the United States. *J Am Dent Assoc* 141:836, 2010.
- Haas DA, Lennon D, A 21-year retrospective study of reports of paresthesia following local anesthetic administration. *J Can Dent Assoc* 61:319, 1995.
- Haas DA, Lennon D, Local anesthetic use by dentists in Ontario. *J Can Dent Assoc* 61:297, 1995.
- Meechan JG, Re: prolonged paraesthesia following inferior alveolar nerve block using articaine. *Br J Oral Maxillofac Surg* 41:201, 2003.
- Pedlar J, Prolonged paraesthesia. *Br Dent J* 195:119, 2003.
- Pedlar J, Re: prolonged paraesthesia following inferior alveolar nerve block using articaine. *Br J Oral Maxillofac Surg* 41:202, 2003.
- van Eeden SP, Patel MF, Re: prolonged paraesthesia following inferior alveolar nerve block using articaine. *Br J Oral Maxillofac Surg* 40:519, 2002.
- Pogrel MA, Permanent nerve damage from inferior alveolar nerve blocks — an update to include articaine. *J Calif Dent Assoc* 35:271, 2007.
- Woolon M, Pain control product manager, Septodont. Personal communication, 2011.
- Malamed SF, Nerve injury caused by mandibular block analgesia. *Int J Oral Maxillofac Surg* 35:876, 2006.
- Yagiela JA, Recent developments in local anesthesia and oral sedation. *Compend Contin Educ Dent* 25:697, 2004.
- Agency DM, Adverse reactions from anaesthetics containing articaine (Septanest, Septocaine, Ubistesin, Ubistesin Forte). Reported March 30, 2006.
- Weber JCP, Epidemiology of adverse reactions to nonsteroidal anti-inflammatory drugs, in Rainford KD, Velo GP, et al, eds., *Advances in inflammation research*, volume 6, New York City, Raven Press: 1, 1984.

to request a printed copy of this article, please contact M. Anthony Pogrel, DDS, MD, Department of Oral and Maxillofacial Surgery, University of California, San Francisco, Box 0440, Room C522, 521 Parnassus Ave., San Francisco, Calif., 94143.

