



# Permanent Nerve Damage From Inferior Alveolar Nerve Blocks — An Update to Include Articaine

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**ABSTRACT** Permanent nerve involvement following inferior alveolar nerve block may occur from 1 in 20,000 to 850,000 patients with little information on local anesthetic used. Patients with permanent nerve damage from blocks were recorded. Lidocaine was associated with 35 percent, with articaine causing approximately 30 percent of the cases. Nerve blocks can cause permanent damage to the nerves, independent of the local anesthetic used. Articaine is associated with this phenomenon in proportion to its usage.

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**P**ermanent involvement of the inferior alveolar and/or lingual nerve following an inferior alveolar nerve block has been reported.<sup>1-7</sup> There are a relatively small number of studies, and the reported incidence varies from a high of 1 in 20,000 blocks to a low of 1 in 850,000 blocks.<sup>1,6</sup> Several studies do not indicate whether the involvement was temporary or permanent. Studies appear to show that when nerve damage occurs, the lingual nerve is affected approximately 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.<sup>6,8</sup> It also appears that about half the patients feel an “electric-shock sensation” on injection, but approximately half do not.<sup>6</sup> The phenomenon has been noted with every local anesthetic used in dentistry, but it has been suggested there may be a higher incidence

with prilocaine and articaine.<sup>7,9,10</sup> Although the reason for this is unknown, suggestions have been made that it may be because they are 4 percent solutions, whereas the other local anesthetics are at lower concentrations.<sup>9</sup> With the exception of isolated case reports, the major information on a possibly higher incidence with articaine in particular comes from the studies of Haas, which are from cases reported to the major dental malpractice carrier in Ontario, Canada, from the early 1980s (when articaine was approved in Canada) until the present day.<sup>9,11-14</sup> In order to further elucidate these findings, the following study was carried out.

## Materials and Methods

The Department of Oral and Maxillofacial 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. Most dental practitioners are aware of these problems and refer patients for evaluation. This study covers all patients referred from Jan. 1, 2003, to Dec. 31, 2005. All patients still had neurological symptoms nine months after injection and were considered permanent.

### Results

A total of 57 patients were referred to the Department of Oral and Maxillofacial Surgery at the 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. None of these patients underwent surgical or other procedures that could have been responsible for the nerve involvement. The symptoms included paresthesias and dysesthesias, varying from mild to severe, but there were no cases of total anesthesia. The distribution of local anesthetics used is shown in **TABLE 1**, coupled with an appropriate percentage of U.S. national sales.<sup>15</sup>

Articaine, as the sole local anesthetic, is responsible for about 29.8 percent of the total. One patient received articaine as well as lidocaine, therefore it cannot be determined which agent was associated with the nerve involvement.

### Discussion

In 2001, after its introduction, articaine was felt to have captured around 15 percent of the U.S. dental local anesthetic market. In 2002, it had approximately 22 percent of the market, and in 2003, it reached approximately 25 percent of the market and has stayed around that level since then. Current estimated percentage sales figures for all local anesthetics are shown in **TABLE 1**.<sup>15</sup>

TABLE 1

### Number of Cases of Nerve Damage With Percentage U.S. National Sales Figures

| Anesthetic                | # of cases | Approximate % sales (total 260 million cartridges/year) |
|---------------------------|------------|---|
| Lidocaine alone           | 20 (35%)   | (54%)   |
| Prilocaine alone          | 17 (29.8%) | (6%)  |
| Articaine alone           | 17 (29.8%) | (25%)   |
| Articaine plus lidocaine  | 1 (1.75%)  |   |
| Lidocaine plus prilocaine | 1 (1.75%)  |   |
| Bupivacaine               | 1 (1.75%)  |   |
| Mepivacaine               | 0 (0%)     | (15%)   |

Utilizing figures obtained from dentists in Northern California in previous studies, it is estimated there could be between 4.5 (incidence 1 in 850,000) and 190 (incidence of 1 in 20,000) cases of permanent nerve involvement per year from local anesthetic injections in Northern California with a population of around 10.5 million.<sup>6</sup> It is extrapolated that an incidence of 1 in 20,000 inferior alveolar nerve blocks causing permanent nerve damage may be accurate, and therefore the annual occurrences may be as high as 190 cases per year in Northern California. Over a three-year period we have seen approximately 19 patients per year with this problem, which may be around 10 percent of all the cases occurring in Northern California each year. When these figures are compared with studies such as that of Hass, differences become very apparent.<sup>9,10</sup> In his study, there were virtually no cases caused by lidocaine, whereas in all of our studies, lidocaine has caused the most individual cases. This is extremely difficult to explain, since we have been examining patients, questioning their dentists, and examining medical records, and are comfortable the results are accurate.

We chose not to use data from

2000, 2001, and 2002 since with the introduction of articaine in 2000, usage was variable. For 2003-2005, sales figures and usage appear more constant. We are aware of discussion in dental circles as to the use of articaine for inferior alveolar nerve blocks, and are aware of recommendations suggesting that it not be used for inferior alveolar nerve blocks.<sup>16-18</sup>

This was the predominant reason for submitting this paper at this time, since we did not want to find that although sales figures remained high for articaine, it was not being used for inferior alveolar nerve blocks, since this would obviously distort our numbers. The authors are confident this phenomenon has not taken place to any appreciable extent in Northern California by the end of 2005. Therefore, using our previous assumption that approximately half of all local anesthetic used is for inferior alveolar nerve blocks, then on the figures we have generated from our clinic we do not see disproportionate nerve involvement from articaine.<sup>6</sup> For prilocaine, it does appear to be causing approximately 29.8 percent of cases with sales of about 6 percent of all dental local anesthetics, which may indicate a higher incidence. ■■■■

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