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Broken local anesthetic needles

A case series of 16 patients, with recommendations

M. Anthony Pogrel, DDS, MD, FACS, FRCS

The modern disposable hypodermic needle, which dentists use to administer local anesthetic, became available in the 1960s and was a great improvement on the previously available reusable needles that were thicker, had to be sterilized and sharpened and had a habit of breaking. These needles usually were made of carbon steel, although gold and platinum needles also were available. Sizes went from 20-gauge to 27-gauge. Some even had a “stopper” (a ball or disk) attached along the needle so that it could not be inserted too far or become lost in tissue¹ (Figure 1). In fact, when speaking with dentists who have had experience using nondisposable needles, I learned that needle fracture was a common problem and that they always had been advised to avoid burying the needle up to the hub and to avoid indenting the tissues with the hub so that if the needle broke, a portion of it would be visible in the mouth so that it could be retrieved immediately. Instructors also taught dentists

ABSTRACT

Background. Local anesthetic needle fractures occur rarely. Since reports are uncommon, the mechanism and optimal treatment remain controversial.

Methods. The author reviewed 16 cases of needle fracture that were reported during a 25-year period in one academic institution.

Results. Of 16 needle fractures, 15 occurred in connection with an inferior alveolar nerve block, and one occurred in connection with a posterior superior alveolar block. Of the 16 fractures, 13 involved a 30-gauge needle. Five of the patients involved were younger than 10 years. The oldest patient was 28 years old. In all cases, a surgeon retrieved the needle, often with radiological guidance, while the patient was under general anesthesia in an operating room.

Conclusions and Clinical Implications. Most needle fractures occur during the administration of inferior alveolar nerve blocks, often with 30-gauge needles and in children who are reported to have moved suddenly and violently as the dentist gave the injection. Dentists should avoid burying any needle up to the hub (so as to ensure the possibility of immediately retrieving the needle intraorally), avoid using 30-gauge needles to administer inferior alveolar nerve blocks and avoid bending the needle before inserting it.

Key Words. Local anesthetics; nerve block.

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TABLE

Summary of the 16 cases of needle fracture.				
YEAR OF FRACTURE	AGE (YEARS)	SEX	TYPE OF INJECTION	CONTRIBUTING FACTORS
1983	7	Male	Right IAN*	30-gauge needle
1984	11	Male	Right IAN	30-gauge needle that the dentist bent before insertion
1989	21	Male	Right posterior superior alveolar	30-gauge needle
1989	28	Female	Right IAN	30-gauge needle that the dentist bent before insertion
1990	11	Female	Left IAN	30-gauge needle that the dentist bent before insertion
1993	12	Male	Right IAN	30-gauge needle that the dentist bent before insertion
1993	14	Male	Right IAN	27-gauge needle
1994	11	Male	Right IAN	27-gauge needle
1998	13	Male	Left IAN	30-gauge short needle that the dentist bent before insertion and that an oral and maxillofacial surgeon attempted to remove in the office
1999	4	Female	Left IAN	30-gauge short needle that an ear, nose and throat surgeon attempted to remove in the hospital
1999	6	Male	Right IAN	30-gauge short needle that the dentist bent before insertion
2002	7	Male	Left IAN	30-gauge needle
2002	7	Male	Left IAN	30-gauge short needle that the dentist bent before insertion
2003	22	Male	Left IAN	30-gauge needle that an ear, nose and throat surgeon attempted to remove in the hospital
2003	21	Male	Right IAN	27-gauge needle that the dentist bent before insertion; the dentist was removing the patient's third molars
2005	11	Male	Right IAN	30-gauge needle that the dentist bent before insertion

* IAN: Inferior alveolar nerve.



Figure 1. Radiograph of a patient's oral cavity showing a broken nondisposable needle. Note that the ball attached at approximately two-thirds of the length of the needle prevented the needle from becoming buried in the soft tissue. If the needle broke, it would have protruded into the oral cavity, making it relatively easy for the surgeon to remove.

using such needles to keep their eyes on the needle, to keep the soft tissues indented with the fingers and to have a pair of artery forceps within reach (often taped to the examination tray) to facilitate grasping any exposed portion of the needle and retrieving it quickly.

Since the arrival of flexible disposable needles, dentists have forgotten these lessons. However, it is surprising to read case reports indicating that local anesthetic needles still break, especially considering that these needles are flexible enough to be tied into a thumb knot without fracturing.² These case reports indicated that needle fractures often occurred during procedures involving children who moved violently at the time that the dentist administered an inferior alveolar nerve block.²⁻²⁶ To administer an inferior alveolar nerve block, the dentist must pass the needle between the medial aspect of the ascending ramus of the mandible laterally and

the lateral aspect of the medial pterygoid muscle medially. The dentist must insert the needle into a narrow space bounded by relatively rigid structures, which means that any movement can be deleterious. Additionally, if the dentist inserts the needle too far posteromedially, perforating the medial pterygoid muscle, any movement of the muscle can endanger the needle. The technique of deliberately identifying the internal oblique ridge with the needle initially and then repositioning the needle posteriorly to engage the lingual area

ABBREVIATION KEY. CT: Computed tomographic. IAN: Inferior alveolar nerve. UCSF: University of California, San Francisco.

also may put additional strain on the needle, as can striking the bone with any degree of force.

MATERIALS AND METHODS

For this study, I reviewed all cases of local anesthetic needle fracture referred to the Department of Oral and Maxillofacial Surgery at the University of California, San Francisco (UCSF), in the 25-year period from 1983 through 2008.

RESULTS

During the period studied, dentists—15 from the community, one from the UCSF student clinic—reported having experienced needle breakage while administering local anesthetic to a total of 16 patients, each of whom had a retained fragment of needle (Table). In 15 cases, the needle fractured while the dentist was administering an inferior alveolar nerve block (Figure 2); in one case, the needle fractured as the dentist administered a posterior superior alveolar block to the maxilla (Figure 3). In 13 patients, the needle involved was a 30-gauge (usually short) needle. The patients' ages ranged from four to 28 years; five of the patients were younger than 10 years.

I contacted the dentists who administered the injection in each case to obtain further details. Fifteen cases involved general dental practitioners, and one case involved a dental student at UCSF. Many of the dentists noted that the patient had moved suddenly at the moment that the dentist was administering the injection, and in at least nine cases, the dentists admitted to having bent the needle before inserting it. In no case had the dentist attempted to visualize the needle or extract the fractured portion. In many of the cases, the dentists noted that they first had attempted to position the needle correctly, but that the needle did not make contact with the bone; thus, it was while they were repositioning the needle and attempting to contact bone and make the injection that the patient had moved suddenly and the needle had fractured.

Treatment. In all cases, a clinician had captured a three-dimensional image of the retained needle portion by using both panoramic radiography and computed tomographic (CT) scanning²⁶ (Figure 4). In more recent cases, clinicians had used three-dimensional CT scanning to identify the position of the needle accurately (as recommended by Ethunandan and colleagues¹³) (Figure 5). In all cases, patients were hospitalized and a surgeon removed the needle in the operating



Figure 2. Radiograph of a patient with a broken needle in the oral cavity (arrow), which occurred while the patient received an inferior alveolar nerve block. The needle may have migrated after fracturing.

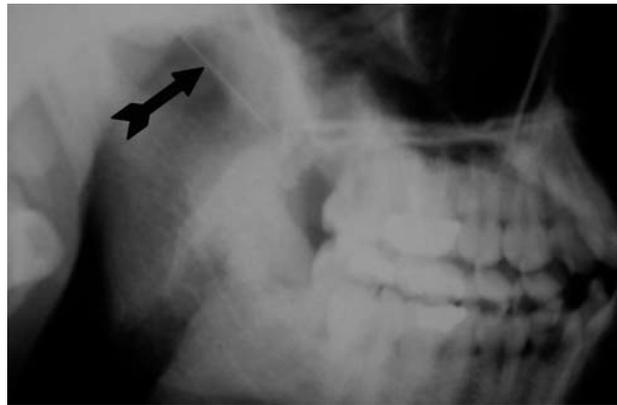


Figure 3. Radiograph of a patient with a broken needle in the oral cavity (arrow), which occurred after the patient received a posterior superior alveolar nerve block. The needle appears to have migrated superiorly.

room while the patient was under general anesthesia. In all cases, the surgeons successfully located and removed the needles (Figure 6); however, some of the procedures took as long as three hours to complete although the surgeons were able to detect the needles' positions. When the surgeon could not locate the needle easily, the most helpful technique was to pass two spinal needles under radiographic control until the two needles appeared to meet at the site of the broken needle (as described by Hai²⁷) (Figure 7). After making a blunt dissection down one or another spinal needle, the surgeon could track down to the site of the buried needle and locate it. Surgeons made attempts to use intraoperative fluoroscopes (also known as "C-arms"); however, although the fluoroscope could help the surgeon identify the spinal needles, its resolution was not good enough to aid in locating the broken needle

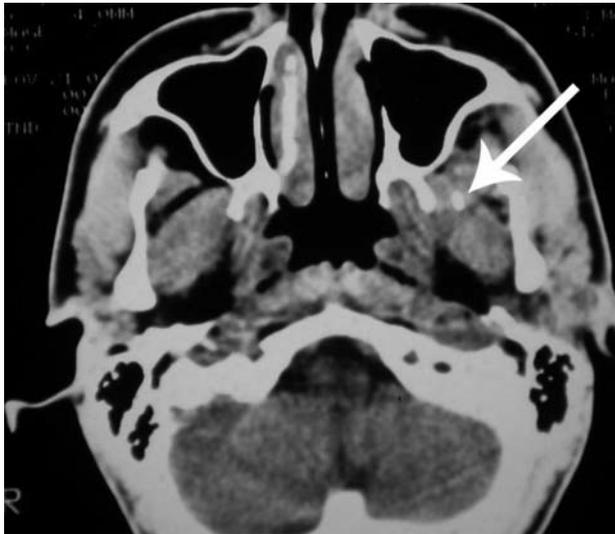


Figure 4. Axial computed tomographic scan of a patient with a broken needle in the oral cavity (arrow). Note that this needle appears to be within the medial pterygoid muscle, which placement may be a risk factor for needle fracture.



Figure 5. Three-dimensional computed tomographic scan that helped accurately locate a broken needle in a patient's oral cavity.

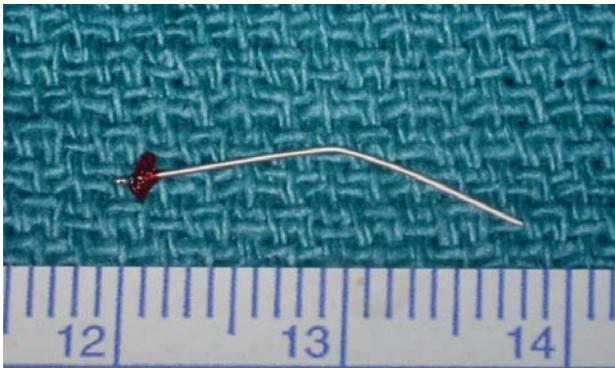


Figure 6. Photograph of a broken needle after the surgeon removed it from the patient's oral tissues. Note that this 30-gauge needle is bent. The bend was not put in deliberately by the dentist but apparently was caused by rapid patient movement.



Figure 7. Intraoperative radiograph showing two spinal needles (black arrows) used for triangulation to identify the position of a broken needle (white arrow). The relatively poor resolution shows the problems associated with most forms of intraoperative imaging.

accurately. However, other clinicians have reported that they have used this technique successfully.²⁸ (My own method of locating broken needles involved the use of intraoperative plain film radiography—a combination of anteroposterior and lateral radiographs.) Recovery was good in all 16 patients, although a number of them had long-term difficulty in opening their mouths as wide as they had preoperatively.

In all of these cases, needle separation had occurred at the hub and not along the shaft of the needle. A common feature of the preoperative radiographs was that the fractured portion of needle appeared to be in a position that was not compatible with administration of a normal inferior alveolar nerve block (Figures 8 and 9). In most cases, I could not discern with certainty

whether the original dentist had administered the inferior alveolar nerve block in an abnormal site, or whether the needle had migrated to the site at which I discovered it radiographically. In some cases, I found the needle's position to be so aberrant that I had to assume that the needle had migrated to that position.

DISCUSSION

Reports of needle fracture usually are single-case reports or small case series.¹⁴ The present article appears to cover the largest series published. Despite the excellent safety record of dental local anesthetic needles, dentists always must bear in mind the possibility of needle fracture or separation. Although needle fractures occasionally may be due to faulty manufacture, in most cases I

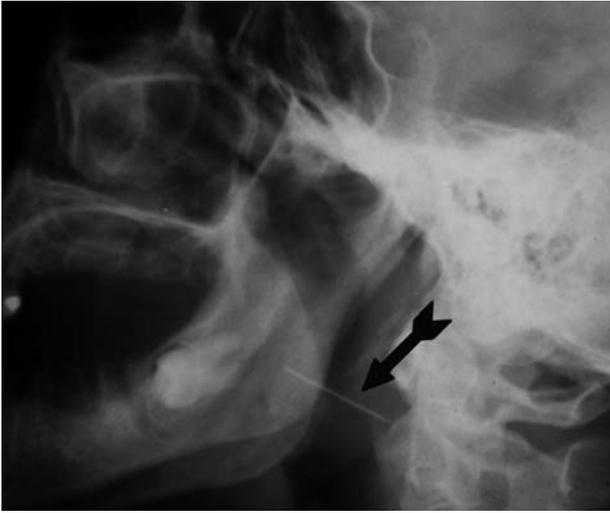


Figure 8. Aberrant position of a broken needle (arrow) after the administration of an inferior alveolar nerve block. Because of the position of the needle, one can assume that migration occurred after fracture.

reviewed for this article, they appear to have been caused by operator-related issues.

Incidence of needle fracture. One can only estimate the incidence of needle breakage. However, in a previous study²⁹ carried out with San Francisco dentists, a colleague and I ascertained that the average practicing dentist administers between eight and 12 inferior alveolar block injections per day. In northern California, there are approximately 11,200 dentists.³⁰ If one estimates that each of these dentists administers a mean of five inferior alveolar block injections per day (which probably is a low estimate), this means that dentists in northern California alone administer approximately 56,000 inferior alveolar blocks per day, or approximately 14 million inferior alveolar blocks per year. In the UCSF Department of Oral and Maxillofacial Surgery, we recorded treating 16 patients who received referrals to the department for needle fractures during a 25-year period. Although the department is the major tertiary referral dental center in northern California, one cannot rule out the fact that some private practitioners may remove broken needles in community hospitals. In fact, three of the cases described here had involved attempts by surgeons to remove the needles under those circumstances. If one were to estimate that another nine needles were removed under these circumstances, this would mean that there is one needle fracture per year, giving an estimate in northern California of one needle fracture per 14 million inferior alveolar nerve blocks. This is only a rough estimate, but it



Figure 9. Position of a needle (arrow) fractured during the administration of an inferior alveolar nerve block. This is the same needle as the one pictured in Figure 6. The patient is a child. The treating dentist stated that he had attempted to administer the inferior alveolar nerve block conventionally (in other words, not through the use of the more rarely used Gow-Gates technique). One can assume that the needle migrated to this site after it fractured.



Figure 10. The broken end of a needle recovered from a patient. It is placed beside the hub of the needle (supplied by the dentist involved) and a new needle (above). Note that the needle used is a short 30-gauge needle. The needle broke at the hub.

does suggest that needle fractures occur rarely.

Avoiding needle fracture. Dentists should consider the following important points in attempting to prevent needle breakage.

- Avoid using 30-gauge needles to administer inferior alveolar blocks. The sharpness of the needle, not its diameter, determines the degree of discomfort that a patient might feel while receiving an injection.
- Avoid using a short needle to administer an inferior alveolar nerve block, as it is likely to be inserted up to the hub.

- Avoid bending the needle before inserting it into the tissue.
- Avoid burying the needle in the tissue to the extent that the hub indents the mucosa (an occurrence known as “hubbing”). If this occurs and the needle fractures as a result, the needle inevitably will be buried under the mucosa (Figure 10).
- Be especially vigilant when repositioning a needle in a child who appears to be nervous.
- If needle separation occurs, prescribe a regimen of antibiotic agents for the patient, obtain a panoramic radiograph if possible, tell the patient not to open his or her mouth widely so as to limit the needle’s movement and promptly refer the patient to an appropriate specialist. In general, the specialist will recommend that the broken needle be removed. If a broken needle is left in situ, there is a risk, across time, of the needle’s moving and entering or damaging vital structures of the head and neck. Since young patients may engage in contact sports, oral and maxillofacial surgeons generally believe that the risk of leaving the needle in situ is greater than the risks associated with removing it, considering that the needle could remain in the tissues for as long as 70 to 80 years.

CONCLUSION

Needle fracture in conjunction with a local anesthetic injection in dentistry is rare, but when it does happen, location and removal of the retained needle fragment often requires that the patient be under general anesthesia in a hospital setting. With a few simple precautions—including not using a 30-gauge needle, not inserting the needle up to the hub, not deliberately bending the needle and displaying additional care when administering an inferior alveolar nerve block to an anxious child—clinicians could reduce the incidence of this problem even more. ■

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