



The implications of a broken needle in the pterygomandibular space: clinical guidelines for prevention and retrieval

Rephael Zeltser, DMD, DipOdont (Pretoria) Carlos Cohen, DMD Nardi Casap, MD, DMD

Dr. Zeltser is senior lecturer and program director, Department of Oral and Maxillofacial Surgery; Dr. Cohen is former resident and current OMFS specialist, Caracas, Venezuela; Dr. Casap is lecturer, Department of Oral and Maxillofacial Surgery, the Hebrew University Hadassah Medical Center, Jerusalem, Israel. Correspond with Dr. Zeltser at rzeltser@cc.huji.ac.il

Abstract

The implication of a broken anesthetic injection needle in the posterior part of the oral cavity is described. Needle breakage is preventable if proper preventive measures are used during local anesthesia administration. A broken needle should be removed immediately after a thorough localization and not left in the tissue, as previously believed. Computerized tomography (CT) scan is the proper diagnostic device to locate a broken needle. A careful surgical approach under general anesthesia is recommended to retrieve the needle.

Clinical preventive guidelines are described and presented to the pediatric dentist. (*Pediatr Dent 24:153-156, 2002*)

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The incidence of a broken hypodermic needle in the past was a common occurrence among dentists mainly due to improper technique, reuse of the needle and weakness of the alloy.^{1,2} The transition to single-use disposable stainless steel hypodermic needles reduced the frequency of needle breakage. Today, needle breakage is mainly attributed to a sudden movement of the patient during administration of local anesthetic or an incorrect anesthetic administration technique.^{3,4} Several retrieval modalities were published in the dental literature in which the main concern was the localization of the broken needle. Guided needles with routine radiographs, guided X-rays, TV, metal detector, electromagnet and ultrasonography were among the techniques described to localize a broken needle's exact position.^{4,5}

The task of locating and surgically exploring the needle is difficult and time consuming. Proper injection technique in combination with preventive measures will minimize needle breakage. A technique utilizing the CT scan to locate the exact position of the needle, and its surgical retrieval are described. In addition, clinical preventive guidelines are also presented to the pediatric dentist.

Case report

A five-year-old boy was referred for emergency treatment of a broken needle that remained in the tissue after an inferior

dental nerve block. The referring pediatric dentist stated that the patient experienced pain while an inferior alveolar nerve block was administered and jumped, screamed and forcefully pushed the dentist's hand. The dentist noticed that the needle was fractured and the whole tip was missing.

Examining the oral cavity, he did not disclose the needle. The child arrived at the emergency and critical care unit complaining of pain. On examination, limited mouth opening without any dysphagia was noted. Routine panoramic (distorted due to patient movement) (Fig 1) and posterior-anterior extraoral plain radiographs, exposed by the dentist, revealed a broken needle located medially to the mandibular ramus high above the lingula.

A CT scan was performed with three projections: axial, coronal and three-dimensional (3D). Each projection was performed in hard and soft tissue windows. Fig 2 demonstrates an axial view of the anterior part of the broken needle lodged in the pterygoid muscle beyond the maxillary tuberosity, parallel to the lateral pterygoid plate and medially to the inner mandibular table. The coronal hard tissue window demonstrates a crosscut of the needle located 6 mm lateral to the maxillary tuberosity and horizontally in the same level of the maxillary tuberosity (Fig 3). The rounded radioopaque transverse cut of the needle is located 6 mm medially to the inner table of the mandible and 5mm above the occlusal line.

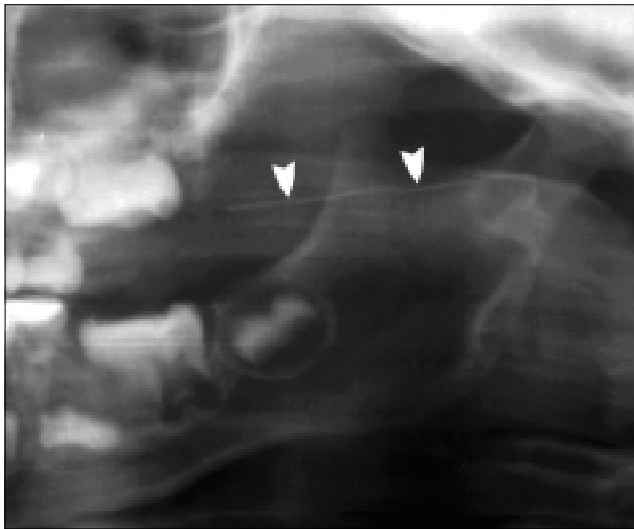


Fig 1. Panoramic radiograph demonstrating the broken needle overlapping the mandible close to the sigmoid notch (arrowheads)

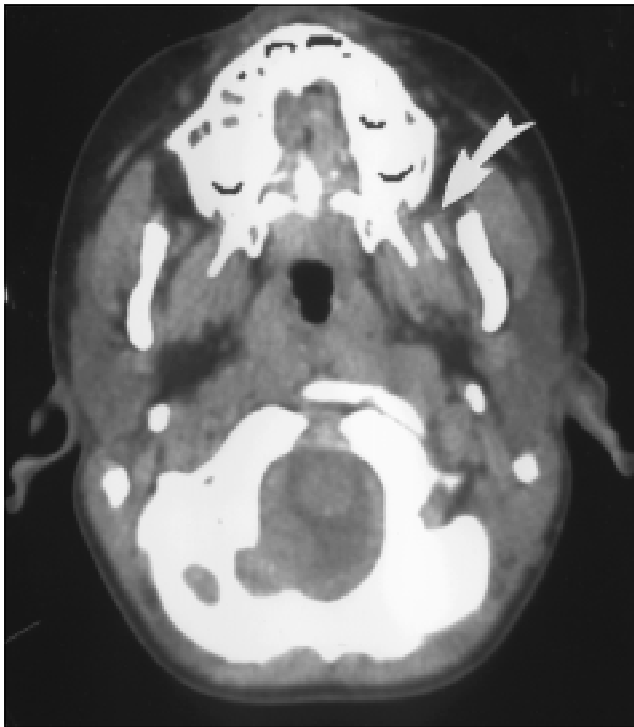


Fig 2. Axial CT scan view demonstrating the proximal part of the needle in relation to the hard tissues and located inside the medial pterygoid muscle (arrowhead)

Coronal data accumulation indicated that the needle is pointing up toward the condylar head. Three-dimensional CT reconstruction demonstrated the needle's position in the pterygomandibular area parallel to the inner table of the mandibular ramus (Fig 4). Under general anesthesia administered through nasal intubation the mouth was kept open by a mouth-prop. The CT scan measurements were copied to the surgical field marked by a 23-gauge needle soaked in Methylene blue and the estimated needle location was marked out. Small amounts of local anesthetics infiltration were administered to prevent tissue distortion. The surface mucosa was incised by an Electrocut pointed needle, thus



Fig 3. Coronal CT scan view illustrates the broken needle's crosscut section in a vertical and horizontal relationship to the surrounding hard tissues (arrowhead)

enabling clear and direct visual accessibility to the inner tissues. Bearing in mind that the needle was located high above the expected inferior alveolar injection sight, the surgical cut of the oral mucosa was performed just beyond the maxillary tuberosity down and laterally towards the mandibular external oblique line. In a prudent exploration locating the lingual nerve below and exploring the pterygoid muscle, the needle was easily found and removed. The rest of the child's hospitalization was uneventful and the limited mouth opening improved with time.

Discussion

Despite significant improvements in the manufacturing of spiral, double-ended injection needles, breakage still occurs. A review of the dental literature of the past 35 years revealed more than 40 publications dealing with the perplexity of detecting and removing a broken needle. Thirteen articles appeared between the years 1965-1975, none for almost the whole next decade, 10 for the next decade until 1995 and six thereafter.

Numerous articles dealing with a specific clinical complication may represent a prevalent phenomenon. In the 1960s, the International Organization for Standardization established standards for hypodermic dental needle specifications. Since the establishment of standards, there is a noticeable reduction in published cases that may imply that there are fewer instances in which needles break.⁶

The majority of the dentists use 27-gauge (long) needles.⁷ Pediatric dentists utilize 27- to 30-gauge, 20-25 mm length



Fig 4. Three-dimensional CT of the submandibular region illustrating the broken needle location and position medial to the mandible (arrowhead)

needles for inferior alveolar nerve block. The use of a 30-gauge needle is thought to be less painful. It has been shown that there is a minimal difference in needle penetration pain between 27- and 30-gauge needles; furthermore, smaller gauge needles are more prone to fracture.^{8,9} Injection pressure severely increases as the needle gauge reduces. Hence, the pain sensation increases while injecting anesthetics with a small diameter (gauge) needle.

The velocity that the dentist exerts while administering the material also influences injection pressure. Any excessive painful stimulus may cause an unexpected spontaneous head movement and needle breakage.⁹

Needle breakage occurs more frequently with an inferior alveolar nerve block. Increase of needle breakage in an inferior alveolar nerve block is attributed to the length of the needle (usually 35 mm) and any painful stimulus. A sharp, painful sensation happens while the needle accidentally stimulates directly the lingual or inferior alveolar nerves. The same unpleasant sensation occurs by aggressive periosteal pricking. Occasionally, dentists tend to push the needle far beyond the necessary anatomic landmarks, thus pressing the needle hub toward the tissue. The hub-needle junction is rigid and has a limited flexibility. It is considered as the weakest point of the needle and there it will tend to break.

Clinical preventive measures (Table 1)

Prevention measures should be taken in order to minimize the risk of needle breakage. Assure patient awareness prior to injection to prevent sudden unexpected jumping.

Inspection of needle irregularities should always be performed prior to any usage. Never insert the needle up to its hub. It is better to use larger gauge and longer needles to

Table 1. Clinical Preventive Measures

Patient awareness prior to injection
Inspect needle irregularities
Never insert the needle up to its hub
Never bend the needle prior to injection
Avoid needle deflection or change needle's direction while administrating anesthetics
Injection should be given slowly
Avoid aggressive contact with periosteum and hard tissue

Table 2. Emergency Treatment

Visible tip of needle
Retrieve immediately by grasping it with a hemostat
Non-visible needle
Calm the patient and prevent jaw movements
Never attempt to palpate or surgically explore the retromolar region
Refer to an oral and maxillofacial surgeon's attention

prevent needle hub weakness. The recommended needles are 25- or 27-gauge "long" 35mm or 25mm lengths respectively. The 27-gauge, 25mm "short" needle is suitable in most pediatric patients.

It is not recommended to bend the needle prior to injection, as it weakens the needle.⁸ Changing the grip on the syringe, needle deflection and changing needle direction while the needle is located deep in the tissue should be avoided. Changing the needle direction while injecting is possible only if the majority of the needle has been withdrawn out of the tissue and the tip location is just beneath the mucosa. To prevent excessive pain (thus preventing spontaneous head jerking) the injection should be given slowly and contact with the periosteum should be done gently.

Avoid aggressive contact with hard tissue to prevent tip of the needle breakage or bending and tissue tearing.^{8,10}

A controversy appears in the literature whether a broken needle should be left in the tissue or retrieved. The obvious argument for removal are local symptoms (ie, pain, dysphagia, trismus and possible needle migration). Psychologically, patients will not suffice leaving the needle. If a needle fragment is located deep in the tissue and surgical exploration may leave neurological or any tissue damage, leaving the needle is advocated. Neither medico-legal nor dentist's consideration should stand in favor over the patient's well being.^{3,7}

Emergency treatment (Table 2)

If needle breakage occurs, it may present two clinical situations: a visible fragment or an embedded fragment. In a case of a visible end, the dentist should immediately grasp it by a hemostat and pull it out. If the entire broken needle is not

visible in the oral cavity, attempts to palpate the mucosa to locate the needle may drive it further and complicate its retrieval.¹¹ An attempt to remove the needle by an untrained general practitioner tends to fail or cause further complications. In case of an embedded needle fragment, calming the patient and immobilizing the jaw is essential. An immediate referral to Oral and Maxillofacial surgeon is necessary.

Removal of a foreign object out of the hard tissue is easier than out of the soft tissue, as any exploration in the soft tissues may deflect or drive the object further ahead. Apart from the routine clinical evaluation, a CT scan should be performed. Axial and coronal hard tissue windows are necessary to intersect the exact location and the general direction of the fragment. The CT scan enables the measuring of the exact location of the most superficial tip of the needle and thus planning of the surgical procedure. The surgical planning is executed by marking on the oral mucosa the points of reference attributed from the CT. A thorough understanding of the anatomical sight and its contents should always support the surgical exploration.

Therefore, the cut of the oral mucosa should be done medially, parallel and close to the external oblique line and almost perpendicular to the needle. Incision close to the penetrating needle in the lingual aspect is contraindicated. An electro-cut knife may be used to reduce bleeding of the most superficial layer of the oral mucosa. A thorough exploration along the lingual nerve direction may minimize the risk of neurogenic damage. In case of some difficulties, guided needle video X-ray radiographs should be added.

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