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Fracture of a Dental Needle during Administration of an Inferior Alveolar Nerve Block

Abstract: We report a case of a 42-year-old female who was referred to our department for the management of a fractured dental needle following administration of an inferior alveolar nerve block. The fractured needle was successfully removed under general anaesthesia. We also suggest some guidelines for preventing this unfortunate event.

Clinical Relevance: Inferior alveolar nerve blocks are administered on a daily basis, with some practitioners using 30-gauge short (21–25 mm) needles. This article highlights potential risks involved with their use.

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The incidence of dental needle fracture has dramatically reduced since the advent of disposable needles. Nevertheless, fracture still occasionally occurs. Of the reported cases, most needle fractures have occurred during administration of inferior alveolar nerve (ID) blocks.^{1–8} Needle selection is a contentious issue. Many practitioners prefer to use short (21–25 mm), narrow (30-gauge) needles for ID blocks, yet most dental school educators do not recommend their use because of problems with deflection, aspiration and fracture.

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Case report

A 42-year-old female was referred to the department of Oral and Maxillofacial Surgery (OMFS) following fracture of a needle during the administration of an ID block. The dentist had used a short (25 mm), narrow (30-gauge) needle and recalled that, during administration of a second cartridge, the patient suddenly swallowed and, at this moment, the needle had fractured.

Intra-orally, a puncture wound was noted at the site of administration, but the needle could not be seen. Therefore, an immediate referral was made to the OMFS department.

Orthopantomogram (OPG) (Figure 1) and PA mandible (Figure 2) radiographs revealed the fractured fragment.

Following discussion with the patient about the available options, consequences and possible risks, a decision was made to operate as soon as possible to remove the fractured needle fragment. The patient was urgently admitted to hospital for removal of the fragment under endotracheal general anaesthesia.

Procedure

A vertical incision was made along the left anterior border of the ascending ramus of the mandible. Blunt dissection, using 3.5 x magnification with loupes, was carried out medial to the ramus to enter the pterygomandibular space. However, this did not reveal the fractured needle.

Intra-operative radiographs were taken with an image intensifier, with both PA and lateral views obtained. Although the needle was identified, it was still impossible to locate clinically. A marker needle was then introduced at a right angle to the fractured needle and further images obtained. It had migrated superiorly towards the neck of the condyle and skull base. After extended exploration, a 2.5 cm length of fractured needle (Figure 3) was eventually located in the medial pterygoid muscle and retrieved with haemostatic forceps. The surgical site was sutured with resorbable sutures and a steroid (8 mg dexamethasone three times a day for 24 hours) was administered.

It must be emphasized that accurate localization and retrieval of the needle fragment proved extremely arduous and



Figure 1. OPG demonstrating fractured needle (arrow).



Figure 2. PA mandible demonstrating fractured needle (arrow).

resulted in an extended operation time of two and a half hours.

The patient was discharged on co-amoxiclav 625 mg tds for 1 week and analgesics as required. Healing was satisfactory one week post-operatively; the patient had no

anaesthesia or paraesthesia of the ID or lingual nerves, but was suffering from trismus. At four weeks, her inter-incisal opening had improved to 20 mm and further jaw exercises were recommended. Two months post-operatively the inter-incisal opening had increased to

34 mm and the patient was discharged with further conservative advice.

Discussion and recommendations

Factors affecting the risk of needle fracture include:

- Needle dimensions;
- Patient co-operation;
- Operator technique;
- Manufacturing quality.

Needle dimensions

Figure 4 shows two of the most commonly used needles in dental practice: a 30-gauge (narrow), 23 mm length, red needle, commonly used for infiltration injections and a 27-gauge (wide), 35 mm length, yellow needle, used mostly for regional block injections.

Although needle fracture is extremely rare in routine practice, it is our opinion that the use of a short, 30-gauge needle for administering ID blocks increases the risk of this unfortunate event occurring.

It has been suggested that narrower gauge needles are more likely to

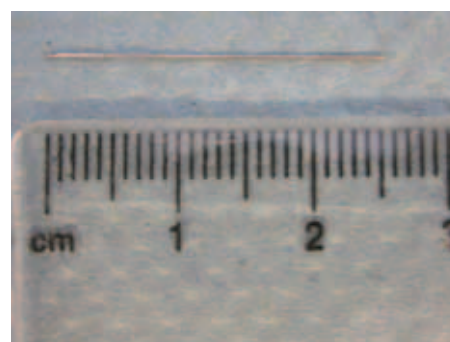


Figure 3. The retrieved segment of fractured needle.

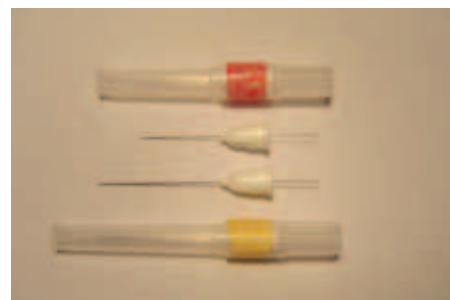


Figure 4. Two commonly used needles: Red: 30-gauge (narrow) 23 mm; Yellow: 27-gauge (wide) 35 mm.

fracture.^{1,2} Additionally, the majority of reported cases of needle fracture during ID block have involved the use of 30-gauge needles.³⁻⁷

Needle fracture usually occurs at the weakest point – the attachment between the thread and the needle itself (the hub). Therefore, total needle insertion must be avoided. Archer⁹ recommended the use of longer needles (minimum 42 mm length). It has also been advised that no more than two-thirds of the needle length should be introduced.⁸

Kronman *et al*¹⁰ performed a study on cadavers in order to determine the average depth of penetration required for successful inferior alveolar nerve blocks. A mean value of 21.96 mm was calculated, with a standard deviation of 1.81 mm. As a result, the authors advocated 'short' needles for ID blocks. However, the 'short' needles used were actually 30 mm in length. In the UK, short needles are 21–25 mm in length. Therefore, if a depth of penetration of 21.96 mm is required, a short needle would have to be inserted perilously close to the hub. This would greatly increase the risk of fracture.⁶

Some operators prefer to use 30-gauge short needles for ID blocks, especially for children. Although this technique does not seem to be taught to undergraduates, it would seem that it is still being adopted by some practitioners. Some of the reasons cited for this are:

- Pain reduction;
- Prevention of facial palsy.

Pain reduction

It is often thought that the use of thinner needles is less painful. Proponents of the 30-gauge needle state that it causes less discomfort when initially piercing the mucosa.⁶ Brownbill *et al*¹¹ used a subjective visual analogue scale to assess the pain experienced by children who had ID blocks. On comparison between 25- and 30-gauge needles, no significant difference was found between the distributions of pain scores. With adult subjects, Fuller *et al*¹² found no significant difference in the pain experienced on penetration of the retromolar fossa with 25-, 27- and 30-gauge needles.

Promoters of the 30-gauge needle may also argue that, owing to the narrow lumen, anaesthetic cannot be injected quickly, causing less distension of tissues and therefore decreasing pain.⁶ However, as resistance in a tube is inversely related to the radius to the

fourth power, greater pressure is required to deliver solution from a narrower lumen. Therefore, using a narrower needle may cause the patient more pain due to increased hydraulic pressure.¹

Although a 30-gauge needle can aspirate blood, the time required for adequate aspiration is not reasonable for block-type injections.⁶ Additionally, a narrow needle is easily deflected by the penetrated tissue.⁶

Facial palsy

Facial nerve palsy is a rare complication of ID blocks. This occurs when the needle is advanced and enters the capsule of the deep lobe of the parotid gland on the medial side of the mandibular ramus. Injection of the local anaesthetic solution within the capsule diffuses to affect nearby branches of the facial nerve as they traverse the gland. This complication is self-limiting and wears off gradually over the same period as the local anaesthetic. Explanation and reassurance is usually all that is needed.

It is important to emphasize that, with a correct technique of ID block, needle length has no bearing on the risk of causing facial palsy. It is only if the needle is advanced too far medially, parallel to the ascending ramus, and the injection made at this point, is there a risk of entering the parotid capsule. Even if this rare complication occurs, it is self-limiting and resolves without further trauma, unlike the consequences of needle fracture.

Patient co-operation

Today, needle fracture is mainly attributed to a sudden movement of the patient or incorrect operator technique.² The procedure must be clearly explained and the patient warned not to make any sudden movements. Unco-operative children or patients without voluntary control of their musculature may require referral to experienced specialists.¹

Operator technique

The technique of ID block injection will not be described, but some of the factors affecting the risk of needle fracture are discussed. Bending prior to injection weakens the needle and repeated attempts using the same needle should be avoided because of the risk of metal fatigue.¹³ Changing the grip on the syringe while the needle is located deep

in the tissue should be avoided. Changing the needle direction is acceptable only if the majority of the needle has been withdrawn and its tip is just beneath the mucosa. To prevent excessive pain (thus preventing spontaneous head movement), the injection should be administered slowly and contact with the periosteum should be gentle.² The needle should be withdrawn without lateral pressure because deviation of the long axis of the needle from the long axis of the syringe may cause fracture.¹

A needle must never be advanced to its hub. It is better to use wider and longer needles to minimize the risk of hub weakness.²

Manufacturing quality

Manufacturers do not prescribe any specific clinical usage for a particular length or gauge of needle, so cannot be liable for any consequences unless a manufacturing defect is found. Nowadays, this is extremely rare as dental needles are manufactured to stringent 'Conformité Européene' (CE) criteria.¹⁴

Management of a fractured needle

A curved haemostat or equivalent must always be immediately available to aid retrieval if fracture occurs. If the needle has not been 'hubbed', a portion of the distal aspect of the fractured needle may be seen. This must be observed continuously and the practitioner's eyes should not leave the operative field. The assistant can then pass a curved haemostat to the practitioner for immediate removal of the needle.^{1,6}

If the needle disappears beneath the mucosa, no attempt should be made to retrieve it, as palpation of the soft tissue may cause migration. The practitioner must emphasize to the patient the importance of avoiding mouth opening and closing manoeuvres to minimize needle migration.¹³ Immediate referral should be made to the nearest OMFS unit for emergency evaluation.^{1,8}

Some authors^{15,16} propose that no attempt should be made to remove the needle unless symptoms develop. Most others advocate immediate removal for several reasons, including the possibility of migration to vital structures.⁶ A fractured needle may reach the lateral pharyngeal space, where the styloglossus muscle, ascending pharyngeal artery and external carotid artery are located.⁸

Another important reason for immediate removal concerns the psychological effect on the patient, knowing that the needle is still there. Considering the incidence of malpractice suits, it is also psychologically traumatic for the practitioner.

Summary

Needle fracture often results in the patient enduring lengthy and traumatic surgery with its inherent risks. Attempts at retrieval also involve further exposure to ionizing radiation.

Longer needles are less likely to be advanced close to the hub and therefore less likely to fracture. If fracture occurs, more of the needle will protrude from the tissue and thus may be removed more easily with artery forceps, avoiding traumatic surgery. Lower gauge (wider) needles are less likely to fracture and easier to locate if fracture occurs.

As discussed, we can find no justification for the use of short (21–25 mm) 30-gauge needles for inferior alveolar nerve

blocks in adults or children. We therefore strongly recommend that they should not be used for this purpose.

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