Introduction
The ability to provide painless and effective local anaesthesia is a critical aspect of pain control in dentistry. The success of any practice is at least partly dependent on the reputation of the dentist in terms of delivering painless injections. Mandibular anaesthesia is important for two reasons: anaesthetic failures are most common in this region; and, post-injection complications are more frequently associated with mandibular anaesthesia. In this regard, assessment of the patient should focus in part on identifying previous difficulties with local anaesthesia. Possible problems might include failure to achieve satisfactory local anaesthesia, an unreasonably brief duration of anaesthesia, or significant postoperative pain or stiffness. This short article focuses on the following three areas:

1. Providing a painless injection.
2. Achieving safe and effective local anaesthesia.

Providing a painless injection
Step one – control patient anxiety with good verbal communication.
Almost all patients experience anxiety in the dental setting, while some are ‘needle phobic’. Heightened anxiety increases our responses to potentially painful stimuli. Validation or recognition of the patient’s anxiety by reference to previous uncomfortable or unsuccessful dental visits should be completed during the initial assessment. Time spent on explanation and reassurance will help. During the treatment visit, it is imperative that an anxious patient does not feel rushed.

Step two – position the patient correctly in the dental chair.
For almost all local anaesthetic injections (and particularly inferior dental nerve block injections), it is preferable to place the patient in a semi-supine position with the head slightly extended backwards (Figure 1). The advantages are: (1) we can rapidly deal with vasovagal syncope (a fainting attack) if it occurs; and, (2) the semi-supine position allows the patient to open the mouth comfortably and widely so that we can visualise the position of entry and path of insertion of the needle (Figure 2).

Step three – preparation of equipment to be used and the site of the injection.
Choose the correct needle length and gauge (Figure 3). Most clinicians use a 27-gauge long needle for inferior alveolar nerve block (IANB) anaesthesia. 25-gauge long needles are not often used in dentistry but are extremely effective. Avoid using 30-gauge short needles. The narrow gauge makes aspiration difficult. In addition, the flexible nature of these needles allows them to bend or break too easily.1 The assumption that narrow gauge needles are less painful for the patient is false. Clinical studies show that if the injection technique is good, patients cannot differentiate between the width of the needle bores.

Visually inspect the tip of the needle to ensure that it is not ‘barbed’. When in doubt, the needle tip may be drawn backwards across a piece of gauze to see if it snags. However, with modern manufacturing techniques this rarely occurs. Needles that have been used two or three times previously for the same patient should be discarded. Dentists should ensure that the local anaesthetic syringe (and cartridge) is self aspirating. The local anaesthetic solution should be stored at room temperature. Warming is unnecessary and may result in increased discomfort for the patient. Avoid using local anaesthetic that is close to its expiration date, as oxidation of the vasoconstrictor may occur (Figure 4). This lowers the pH of the solution and increases discomfort on injection.

Delivering painless and effective inferior alveolar nerve block anaesthesia

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Achieving safe and effective local anaesthesia

The objective of IANB injections is to place local anaesthetic solution as close as possible to the nerve on the lingual aspect of the ramus at a point just above the lingula (Figures 5 and 6). It is essential to aspirate to avoid intravascular injection. Only about 60% of dentists aspire routinely, despite the potential dangers to the patient. The rate of injection should be slow, particularly for anxious patients. The recommended rate of injection is about 1ml per minute. Injecting too quickly may cause immediate and/or long-term pain at the site.
Although we use landmarks for needle placement, it is essentially a ‘blind approach’. The natural variation in the position of the mandibular foramen may vary from one individual to another. Most failures occur because we have injected too low (beneath the mandibular foramen) or too far forward (too close to the anterior border of the ramus). These difficulties may be overcome by palpating important landmarks such as the anterior border of the ramus (intraorally) and the posterior border (extraorally), to get a sense of the width of the ramus anteroposteriorly. The height of the ramus may be estimated by palpating the angle of the mandible and the lateral pole of the condyle.

The point of needle insertion is normally medial to the border of the pterygomandibular raphe, about one finger width (6-10mm) above the lower occlusal plane. The traditional approach places the barrel of the syringe across the premolar teeth of the opposite side. The trajectory of needle insertion is upwards, backwards and outwards. This is much easier to achieve if the head is extended backwards and the mouth is open widely. Problems arise when mouth opening is limited due to trismus or infection, or when head position is incorrect and the chin is too close to the chest.

Failure to achieve pulpal anaesthesia may occur for a number of reasons, which include poor placement of the needle and the anaesthetic solution, lowered pH due to infection or inflammation, which limits absorption of the solution, accessory innervation from other branches of the mandibular nerve, and possibly expression of sodium channels, which are resistant to local anaesthesia (triggered by nerve injury or infection). Apparent numbness of the lip and chin does not guarantee pulpal anaesthesia. It has been suggested that large myelinated nerve fibres may be more sensitive to local anaesthetic than small myelinated fibres (which generally serve pain transmission). Another possibility is that local anaesthetic solution may fail to adequately penetrate through the nerve into its core fibres, leaving patients feeling numb but still feeling pain.

**Identifying and managing post-injection complications**

When failure to achieve adequate anaesthesia is attributed to infection or inflammation, the easiest approach is to prescribe antibiotics and/or anti-inflammatories for a period of four or five days. The chances of success with a subsequent inferior nerve block are increased significantly. In situations where the anaesthetic apparently fails due to accessory innervation, options include a complete mandibular division block (aka Gow Gates Block), intraosseous injections or intra ligamentary injections. A popular clinical choice is to add an infiltration injection in the buccal sulcus with articaine (Septanest). The belief is that the articaine is absorbed through tiny foramina in the buccal bone.

Theoretically, there are many potential complications of IANB anaesthesia, but the most common problems are pain with or without limited mouth opening (trismus). Post-injection pain may be due to the development of a small haematoma in the medial pterygoid muscle, and this may also limit mouth opening. As the initial pain experience is quite severe, patients may require non-steroidal anti-inflammatory medications for periods of up to five days. Options include Vimovo (one tablet twice per day), ibuprofen 800-1,200mg per day in divided doses and Keral sachets (25mg per sachet, three times per day). As the haematoma resolves mouth opening generally recovers spontaneously. Once the acute pain phase has passed the patient should be encouraged to stretch the mouth open as frequently as possible.

A less frequent consequence of IANB injections is injury to the inferior dental nerve. This may occur when the tip of the needle inadvertently touches the neurovascular bundle. It may also occur as a result of chemical toxicity. In this regard, there is continued controversy about the use of articaine for IANB injections. However, the evidence regarding the neurotoxicity or otherwise of articaine remains inconclusive. Patients usually experience a sharp ‘shock’ of pain in the face at the time the injection is being given. A variable degree of post-injection pain may be experienced, but it is generally short lived and responsive to anti-inflammatories. In exceptional cases patients may develop neuropathic pain, which is characterised by unrelenting pain in the distribution of the inferior dental nerve. Management of these rare cases is challenging and referral to a specialist clinic should be considered.

**Reference**