



Case Report

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# Dental Local Anaesthetic Complications – A Commentary



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## Summary

The injection of local anaesthetic is a very routine procedure in the practice of dentistry and oral surgery but can be associated with complications. These are usually classified into local and systemic complications. Local complications are those that occur in the region of the injection site while systemic complications are those that involve more complex organ systems in the body and can have profoundly more serious consequences if not identified early and managed efficiently [1].

We classify these complications as follows:

- i. Local anaesthetic solution related complications
- ii. Administration/Injecting technique complications
- iii. Dental needle associated complications

In the following commentary, we will highlight the different local complications and how they can be avoided and managed in brief. We also present an uncommon but potentially problematic complication that was referred to our unit.

**Keywords:** Local anaesthetic; Prilocaine; Articaine; Levobupivacaine's

## Background

Local anaesthetics work by altering the membrane permeability to prevent passage of nerve impulses. Local anaesthetics should be used at their lowest concentrations and warmed to body temperature to decrease pain on injection. Adrenaline can be added to local anaesthetics to decrease rate of absorption and prolong duration of action together with local vasoconstriction [1]. Local anaesthetics are classed into Esters and Amides. Some examples of esters are procaine and cocaine, whilst examples of amides are prilocaine, lignocaine and levobupivacaine. Prilocaine and articaine are contraindicated in inferior alveolar nerve blocks due to their high concentration and increased risk of nerve injury [2]. The most commonly used in dental and Oral & Maxillofacial surgical practise are lidocaine and levobupivacaine. These have recommended safe maximum doses. Lidocaine's safe maximum dose is 3mg/kg which can go up to 7mg/kg if adrenalin is added. Levobupivacaine's safe maximum dose is 2mg/kg which goes up to 4mg/kg when adrenaline is

added [1,2]. As discussed previously, many local and systemic complications of local anaesthetic administration exist. We will be focussing on the local complications based on our above proposed classification.

### Local anaesthetic solution related complications

Local anaesthetic solution can cause local soft tissue damage, tissue oedema, burning on injection, pain on injection, sloughing of tissues as well as prolonged anaesthesia. Prolonged anaesthesia can be due to direct nerve damage during injection, compression by soft tissue oedema or haematoma. Prolonged anaesthesia can be a source of litigation and safe techniques, good knowledge of anatomy and using the correct and safe doses assists in avoiding such problems. These will however be discussed with patients before the procedure and appropriate consent is recommended [1]. Trauma to soft tissues is caused by self-inflicted injury during biting or chewing when the patient is still anaesthetised. This

can lead to further oedema and potential infection. This can be avoided by selecting the appropriate agent with a short duration of action [1]. Burning on injection of the solution is due to the pH of the solution being injected into the tissues. It is a common side effect and is due to the acidity of the local anaesthetic. Storing the anaesthetic at room temperature can help with this as well as a slow rate of infiltration. Buffering the solution with a vasopressor like adrenalin can also be slightly beneficial [1,3,4]. Soft tissue oedema can be due to a reaction of the patient's tissues to the solution as well as from some irritating substances within the local anaesthetics. This is not usually significant enough to cause major problems for the patient. The oedema needs to be managed on the basis of severity. This can also be caused by poor injection technique. Sloughing of tissues can occur when there is prolonged ischaemia due to the injection of local anaesthetics with vasoconstriction. It usually results in desquamation of the epithelium which can predispose the patient to future infection at the injection site. Use vasoconstrictors cautiously and management is supportive with the occasional need for antibiotics [1].

### Administration/Injecting technique complications

Injecting technique is critical in delivering accurate local anaesthesia. Incorrect technique can lead to trismus, haematoma formation, soft tissue injury, infection, worsening pain on injection, isolated cases of facial nerve paralysis and nerve injury as a result of injecting. Trismus or limited mouth opening can become one of the most chronic and difficult post injection complications to manage. Local trauma to muscles or blood vessels is the most common cause of trismus post injection. Injection into muscle can cause necrosis of the exposed muscle fibres. Irritation to these muscles can cause chronic spasm and irritation leading to prolonged trismus. Haemorrhage from blood vessel damage due to poor injection technique can lead to local tissue irritation causing trismus. This can be avoided by using a sharp, sterile, disposable needle with an aseptic injection technique [1,3,4]. Contaminated needles should be changed immediately. The injection technique is of paramount importance and repeat injections should be avoided. Knowledge of anatomy is essential and wherever possible use minimum effective volumes of local anaesthetic. Trismus is not always preventable, and patients should always be informed of it as a risk during the consent process. Haematoma formation can occur due to accidental injury of a blood vessel during administration of local anaesthetic. This can be due to injury of an artery or a vein. Arterial injuries will be more pronounced and require more immediate intervention and are unlikely in the setting of local anaesthetic administration. Injury to a vein may or may not produce a hematoma. Haematomas formed after injection of dental local anaesthetic seldom cause major problems but can lead to significant bruising, trismus and pain. Correct injection technique and knowledge of anatomy can significantly reduce the incidence of this happening. If it were to happen, local pressure is the best option to try and tamponade any bleed and prevent the haematoma from increasing in size [1,3,4].

Pain on injection can be due to poor injection technique. Using correct technique, slow administration of the local anaesthetic, using clean sharp needles and avoiding reinsertion of the needle help to reduce pain on injection. Topical anaesthetics gel can be used to help some patients pain experience and keeping the local at room temperature is also helpful [1,3,4]. The authors like to use a distraction technique to help improve the pain experience by shaking a lip with the dental mirror or focusing on controlled breathing at the same time as injecting. Infection subsequent to local aesthetic administration in dentistry is an extremely rare occurrence since the introduction of single-use sterile needles and glass cartridges. Infection can occur at the injection site and is usually due to contamination of the needle prior to injection. This can all be avoided by using aseptic techniques. In severe cases antibiotics may be required. Facial nerve paralysis can occur when an infraorbital nerve block is given or when maxillary canines are infiltrated. This can lead to paralysis of the terminal branches of the facial nerve.

The duration of the paralysis will be that of the agent duration of action and it is usually transient but can cause some distress to patients. No obvious treatment is available other than allowing the local to wear off and the motor function of the facial nerve returns to normal. The eyelid can be affected, and this leads to the upper lid not being able to close. Lubricating drops can be placed into the affected eye to prevent any drying of the cornea. Correct and careful injection technique with knowledge of anatomy will help prevent this from occurring [1,3,4]. The mechanism of nerve injury due to giving LA is multifactorial. It may be physical due to local injury by the needle itself or compression by haemorrhage around or within the nerve. It may also be chemical due to haemorrhage or local anaesthetic contents [5]. Therefore, the resultant nerve injury may be a combination of peri-, epi- and intra-neural trauma causing subsequent haemorrhage, inflammation and scarring resulting in demyelination (loss of nerve lining) [5]. Again, this can all be prevented with good safe technique and anatomical knowledge as previously described.

### Dental needle associated complications

Although rare, dental needle breakage does occur. When a needle fractures and it is easily viewed it should be removed with caution immediately. Where the needle fragment is lost referral to the specialist centre for more skilled management is a priority and essential [1,3]. To prevent this from happening short needles should be avoided for inferior alveolar nerve blocks, needles should not be bent, never sink the needle to the full length of the hub and then be extra cautious when inserting needles in young restless children and anxious adults who may have sudden movements that can cause needle breakage [1,6-9].

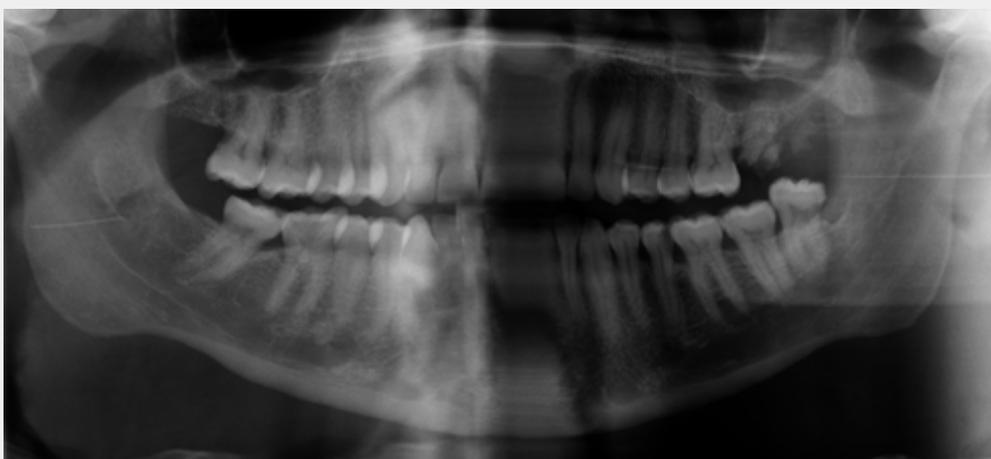
### Case Presentation

A 38-year-old male patient was referred to our maxillofacial emergency clinic regarding a fractured needle following right inferior alveolar nerve (IAN) block and failed extraction of lower

right first molar (LR6). During the IAN-block, the emergency dentist recounts that part of the needle fractured when the patient flinched due to pain and could not be retrieved intra-orally. Over the next 3 days the patient developed pain, swelling of the right side of his face and limitation in mouth opening. He was exceptionally anxious due to the failed extraction and the sensation of a foreign body in his mouth. On examination, the right pterygoid region was extremely tender to palpation and the patient had restricted mouth opening of 13mm. The LR6 had a temporary filling and was very tender to percussion. The needle fragment was not visible and could not be palpated. The patient reported paraesthesia along the distribution of the lingual nerve.

The orthopantomogram (OPG) X-ray revealed a needle fragment in the region of the right ramus of the mandible (Figure 1). To locate the needle fragment in three-dimensions and exclude

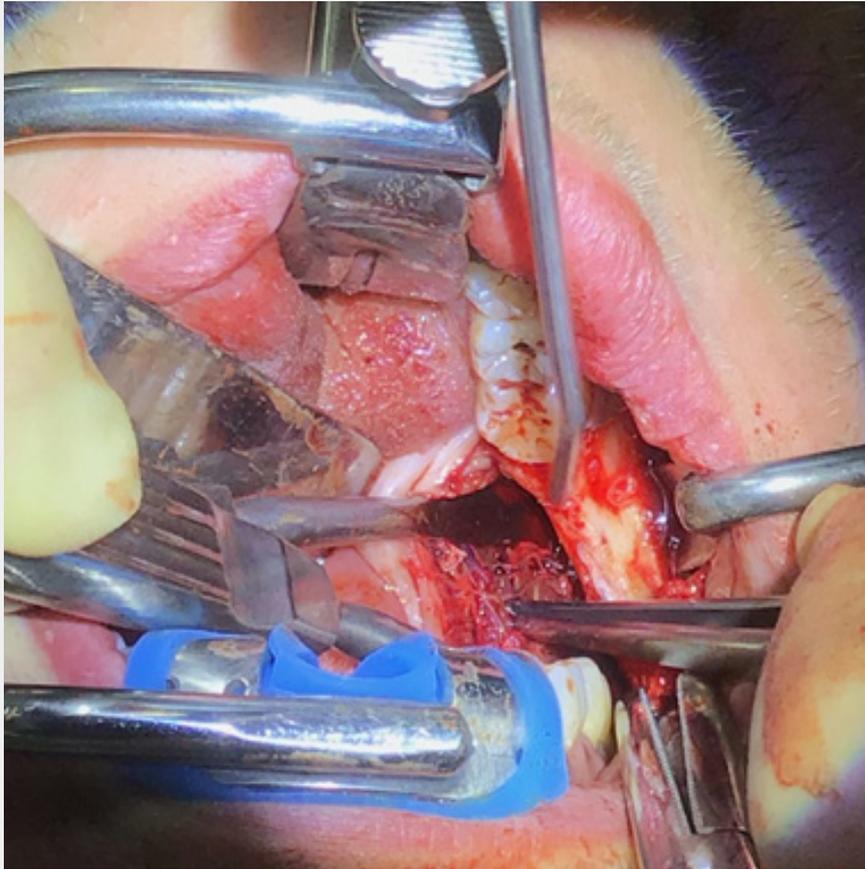
any other pathology, a CT head was done. The CT scan revealed a 2.1cm linear foreign body in keeping with a broken needle within the right medial pterygoid muscle at the level of the mylohyoid groove (Figure 2). Following discussion with the patient, we agreed to proceed with exploration and removal of the foreign body along with extraction of the LR6 under general anaesthesia. A mucoperiosteal flap was raised from the distal aspect of the lower right second molar extending approximately 20mm distally along the alveolar ridge. Mesial and distal relieving incisions were made buccally to create a broad-based flap to allow adequate direct vision down toward the medial pterygoid muscle (Figure 3). The lingula, lingual nerve and inferior alveolar nerve bundles were identified and protected with careful instrumentation and retraction. Adequate mouth opening and retraction was possible using a tonsillar gag retractor.



**Figure 1:** Pre-op OPG.



**Figure 2:** CT Head (pre-op).



**Figure 3:** Surgical field.



**Figure 4:** Retrieved needle fragment.

Throughout the procedure, good illumination and magnification was maintained with loupes and a headlight. Intraoperative imaging with a C-arm image intensifier (OEC Elie MiniView<sup>®</sup>) was used to assist in locating the exact site for blunt dissection to retrieve the fractured dental needle. The needle was located within the medial pterygoid muscle, 1cm inferior to the lingula (Figure 4). On removal of the needle there was immediate bleeding arising superior to the inferior alveolar nerve bundle. This was controlled with diathermy, surgical haemostat dressing and direct pressure. The lingual nerve and inferior alveolar nerve were monitored throughout the procedure and ultimately, preserved with no complications. The LR6 was extracted atraumatically with extraction forceps. The patient made a swift recovery and was discharged the next day. At his one-month review, we noted improvement in his mouth opening and decreased sensation in the distribution of the lingual nerve which appeared to slowly be improving.

### Conclusion

Administration of dental local anaesthesia is a routine procedure and valuable aid in all settings of dentistry and oral & maxillofacial surgery. Correct injection technique, experience and knowledge of anatomy aid to avoid and prevent complications during the administration of dental local anaesthetic. Knowledge of available local anaesthetic solutions, their safety and a sound injection technique is paramount in minimizing complications.

The need to recognize complications related to local anaesthesia and their management including onward referral to the local specialist service when required is also essential for the dental practitioner and allied dental professionals.

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