

# Complications Of Local Anaesthesia

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**Abstract:** Local anaesthesia is often used in oral and maxillofacial surgery. One of the important attempts in clinical oral surgery is to practice safe and effective local anaesthesia. Practitioners need to be aware of the complications that are often encountered while using local anaesthesia. These complications can be systemic or local. Systemic reactions that are seen include psychogenic reactions, systemic toxicity, allergy and methemoglobinemia. Local complications that are seen are pain on injection, needle fracture, prolongation of anaesthesia, lack of effect, trismus, infection, edema, hematoma, soft tissue injury and ophthalmologic complications.

**Keywords:** Local anaesthesia, complication, systemic complication, local complication.

## Introduction

Local anaesthesia is defined as a loss of sensation in a circumscribed area of the body caused by depression of excitation in nerve endings. Local anaesthetic agents have been used in clinical dentistry to eradicate pain associated with invasive operations. It is also used in oral and maxillofacial surgery. [1]

Composition of local anaesthesia includes a local anaesthetic agent: lignocaine hydrochloride (2%), reducing agent: sodium metabisulphite, preventive agent: methylparaben, diluting agent: distilled water, fungicide: thymol, isotonic solution or ringer's solution: sodium chloride, vasoconstrictor agent: adrenaline.

Various complications of local anaesthetics can be studied under two broad categories being systemic and local. Systemic reactions are reported as psychogenic reactions, systemic toxicity, allergy, and methemoglobinemia. Local complications are given as pain at injection, needle fracture, prolongation of anaesthesia and various sensory disorders, lack of effects, trismus, infection, edema, hematoma, gingival lesions, soft tissue injury, and ophthalmologic complications.[2]

Table 1: Depicting the Systemic and Local complications due to local anaesthesia

<i>Systemic Complications</i>	<i>Local Complications</i>
[A]Psychogenic Reactions	[A]Pain on injection
[B]Systemic Toxicity	[B]Needle fracture
[C]Allergy	[C]Prolongation of anaesthesia
[D]Methemoglobinemia	[D]Lack of effect
	[E]Trismus
	[F]Infection
	[G]Edema
	[H]Hematoma
	[I]Gingival lesions
	[J]Soft tissue injury
	[K]Ophthalmologic complications

## Systemic Complications due to Local Anaesthesia

### [A]Psychogenic Reactions

The patient's body counterbalance to an anxiety-inducing situation or adrenaline secreted by the vasoconstrictor agent are the main factors associated with the psychogenic reactions. Due to psychogenic reactions mood change, respiratory rate, heart rate, blood pressure is also affected. Relaxation of the patient before administering local anaesthetic injections is important for the prevention of psychogenic reactions. Using oral sedatives is an effective method to manage dental fears. Patient's physic such as health, age, weight and duration of operation determine the initial dosage of local anaesthesia.[3]

### [B]Systemic Toxicity

Local anaesthetic systemic toxicity develops when a sufficient (toxic) concentration of anaesthetic drug in the blood level reaches to the central nervous system and cardiovascular systems.

Initial symptoms witnessed are excitation, convulsions, followed by loss of consciousness and respiratory arrest. These symptoms are accompanied by cardiovascular signs such as hypertension, tachycardia, and premature ventricular contractions. The clinical signs and symptoms usually show objective symptoms such as quick talking, flicker, and tremor in the extremities.[4]

### [C]Allergy

Allergy is also known as hypersensitive reactions, initiated by immunological mechanisms acquired through exposure to a specific allergen; re-exposure to which produces a heightened capacity to react. It is predicted that less than 1% of all complications are caused by an allergy. Many of the complications doubt to be allergic are actually anxiety-induced reactions.[5]

Allergic reactions may include mild symptoms, such as urticarial, erythema, and intense itching, as well as severe reactions in the form of angioedema and/ or respiratory distress.[6]

Adverse reactions to local anaesthesia are caused by preservatives (e.g., methyl-p-hydroxybenzoate), antioxidants (e.g., bisulphate), antiseptics (e.g., chlorhexidine), vasoconstrictor (e.g., sulphites), and other antigens such as latex, as well as local anaesthetic drugs themselves.[7]

#### **[D]Methemoglobinemia**

Methemoglobinemia is a unique dose-dependent reaction where the iron in haemoglobin is stabilized in the ferric (Fe<sup>3+</sup>) form then is unable to attach oxygen, leading to tissue hypoxia and causing a varying degree of cyanosis. Methemoglobinemia can be either inherited or acquired. [8]

The risk of methemoglobinemia is increased in infants and the elderly. Patients with underlying health problems such as liver cirrhosis, with underdeveloped hepatic and renal function; heart disease; and pulmonary disease are under the risk of methemoglobinemia. When administered in excessive doses, the local anaesthetics mostly prilocaine and benzocaine (90% of reported cases) and barely lidocaine and articaine may also lead to methemoglobinemia. [9]

Symptoms of cyanosis will be observed in nail beds and mucous membranes. In more severe cases, headache, dizziness, fatigue, dyspnoea, and tachycardia are seen.

#### **Local Complications associated with Local Anaesthesia**

##### **[A]Pain on injection**

Pain on injection can be due to specific circumstances such as:

- temperate of the solution
- velocity of injection
- dull needles
- needles with barbs
- aggressive insertion of the needle, damaging soft tissues, blood vessels, nerves, or the periosteum.

The burning is dependent on the rate of injection and the acidity of the solution. Lidocaine causes an intense burning sensation when injected locally. When the needle penetrates a nerve, the patient may also feel a sudden “electric” shock, suddenly moving the head, with the risk of self-inflicted damage. [10]

##### **[B]Needle fracture**

Needle breakage in the oral cavity after local anaesthesia is a rare complication, since the establishment of non-reusable, stainless steel dental local anaesthetic needles. In most cases, needle fracture happened with 30-gauge needles and during inferior alveolar nerve block. This may happen as a result of either

- injection technique
- improper choice of hypodermic needle magnitude
- unexpected motion of the patient or assistants. [11]

In order to prevent needle fracture, first the injection needles should be checked; 30-gauge and short needles should not be used for inferior alveolar nerve block in adults or children (25–27 should be chosen). Needles should not bend while inserting them into soft tissue. [12]

##### **[C]Prolongation of anaesthesia and various sensory disorders**

Prolonged anaesthesia, paraesthesia, or neuralgia may occur following dental local anaesthetic blocks. This may be temporary, where after a few days, weeks, or months, sensation returns or it may be permanent. [13]

The nerve may be damaged during injection by direct injury, or the needle may damage the intraneural blood supply, resulting in a hematoma, or the needle may traumatize the medial pterygoid muscle which results in trismus. Neurotoxicity of the local anaesthetic is another theory for nerve damage.[14]

Procaine and tetracaine cause more damage than bupivacaine or lidocaine. [15]

Due to a numb feeling, the patient may have discomfort such as tongue biting, drooling, loss of taste, and speech impediment. Sullivan et al. conducted a randomized, double-blind, placebo-controlled trial on 496 patients with Bell’s palsy.

Piccinni et al. conducted an analysis and concluded that the use of prilocaine, articaine, or both drugs have a higher risk of paraesthesia.[16]

##### **[D]Lack of effect**

Reasons for unsuccess in obtaining local anaesthesia can be dependent on:

- anatomical variants
- pathological and psychological factors
- choice of technique and solution
- poor technique.[17]

Anatomical factors comprise accessory nerve supply, alteration in foramen location, atypical development of the nerves (bifid mandibular canals), and bone density.[18]

Pathological reasons for the failure of anaesthesia are trismus, infection, inflammation, and previous surgery or trauma. Inflammatory diseases alter the pharmacokinetics and pharmacodynamics of local anaesthetics.[19]

Local anaesthetic failure or difficulty to obtain satisfactory analgesia commonly occurs in the situations with inflammations such as pulpitis and apical periodontitis acute periodontal abscess or pericoronitis.[20] Psychological determinants such as angst and anxiety can also cause local anaesthesia failure.[21]

Poor technique failure mostly occurs to obtain mandibular anaesthesia. If the needle is inserted and advanced too deeply and too far dorsally, the terminal branches of the facial nerve within the deep lobe of the parotid gland are affected.

The patient is unable to wrinkle the forehead, raise the eyebrow, close the upper eyelid, retract the commissure of the lips to smile, and turn down the lower lip on the affected side. The removal of contact lenses and closing of the eye on the affected side in Bell’s palsy prevent corneal abrasion or drying.[22]

In most cases, paralysis occurs immediately after mandibular anaesthesia injection, but there are also some cases in which paralysis starts lately. Cakarar et al. have a case report for late paralyses.[23]

If the needle is inserted too high and deep, auriculotemporalis will be affected, and the feeling of “numbness” will occur. There has been a report of sudden unilateral deafness following inferior dental nerve anaesthesia.

#### [E]Trismus

Trismus is defined as a painful circumstance with inability to open the mouth normally. Several factors cause trismus such as multiple injections in a short period of time in the same area, intramuscular injections inside the muscle or trauma to muscles (either the lateral pterygoid muscle or the temporal muscle) which cause hematoma formation and fibrosis, needle fracture in the muscles inserting to styloid process, inaccurate positioning of the needle when giving the inferior nerve block or maxillary posterior injections or inflammation of the masseter and other masticatory muscles, a low-grade infection, and excessive volumes of local anaesthetic solution deposited into a bounded region which cause expansion of tissues. In the acute phase, pain from haemorrhage leads to muscle contraction and limitation of motion.[24]

Intraorally the Vazirani-Akinosi technique, the closed-mouth mandibular nerve block technique, or extraoral techniques can provide anaesthesia to trismus patients.[25]

#### [F]Infection

Infection complication is rare since the usage of disposable needles and glass cartridges. Infection may extend to tissues by penetration of the needle through a contaminated tissue, because of the needle being contaminated before an operation or improper preparation of local anaesthetic diluted solutions.[26]

The area to be penetrated should be cleaned with a topical antiseptic prior to insertion of the needle. Antiseptic mouthwash solutions such as chlorhexidine gluconate should be considered for all regional techniques. The local anaesthesia should not be injected through the infected area.[27]

#### [G]Edema

Swelling of tissues can be due to:

- trauma during injection
- infection
- allergy
- haemorrhage
- injection of irritating solutions.[28]

#### [H]Hematoma

Hematoma formation is the result of a venous or arterial laceration; intra-arterial blood pressure increases causes effusion of blood into the surrounding soft tissues. While injecting, if there is a high pressure, it may be a warning injecting against the bloodstream. Discoloration on the area, a bruise may accompany hematoma.[29]

From the anatomical point of view, different nerve effects cause hematoma on specific regions such as anterior superior alveolar (infraorbital) nerve block below the lower eyelid, incisive (mental) nerve block at the chin area, buccal nerve block or any palatal injection within the mouth, and posterior superior alveolar nerve block extraoral in the lower buccal region of the mandible, intraoral distal to maxillary tuberosity. [30]

#### [I]Gingival lesions

Gingival lesions consist of recurrent aphthous stomatitis, and herpes simplex can occur intraorally after a local anaesthetic injection or after any trauma to the intraoral tissues. The exact mechanism is unknown, but any trauma to tissues by a needle may activate the latent form of the disease process that was present in the tissues with previous injection.[31]

#### [J]Soft tissue injury

Lip or tongue biting or chewing can occur on children with special needs or disabled patients, following dental local anaesthesia with the unfamiliar sensation of being numb [32].

#### [K]Ophthalmologic complications

The most common complications include diplopia (dual vision), ophthalmoplegia (paralysis or weakening of eye muscles), ptosis, and mydriasis (dilatation of pupil). In extremely rare instances, amaurosis (partial/total blindness) can be seen. All these complications are transient and disappear on interruption of the anaesthetic effects.[33]

#### Conclusion

Complications from local anaesthesia are often due to overdosage. Predisposing factors, such as the patient's age, weight, state of health, and other medications that the patient may be taking may cause increased free local anaesthetic blood levels due to a lack of plasma proteins available for binding. During administration, both the rate of injection and the route of administration can also have an impact on the dosage effect, as rapid injection can lead to increased plasma levels of local anaesthetic. Drug factors may also be related to overdosage. While administering anaesthesia, the painless injection should be performed, avoiding intravascular or intramuscular or direct trauma to the nerve. The best way to avoid nearly complications relating to the administration of local anaesthetics is to use the right technique and to have a good knowledge of the anatomy of the trigeminal nerve and the adjacent anatomical structure. New developments should be followed by the practitioners to reduce possible complications associated with the local anaesthesia.

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