

Complication & Management of Local Anesthesia: A Systemic Review

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Abstract

Local anesthetics are widely used in the dentistry world for various procedures. The local anesthesia is very much effective and also safe but they have also risks which practitioners should be aware off and this article reviews the different complication regarding the use of local anesthesia. Different complications occur which include systematic and regional complications that can occur with the use of local anesthesia. The various complications include ocular complications, methemoglobinemia, toxicity, and paraesthesia, etc. Knowing the risk factors involved with local anesthesia relatively decreases the adverse outcome and helps the patient by improving health care.

Keywords: *Local Anesthesia, Paraesthesia, systemic and regional complication, Toxicity.*

Introduction

In the year 1860s, the first local anesthesia or anesthetic was isolated from the coca leaves by a German person called as Albert Niemann. Local anesthesia is widely used for dental procedures throughout the globe and lidocaine is currently the widely used local dental anesthetic solution in most of the countries of the world. One can define local anesthesia as the temporary loss of sensation or pain in a single particular part of the human body that has been produced by an injected or topically applied agent without suppressing the level of consciousness.^{1, 2} The dental anesthetics include two classifications, which are described as esters that include procaine and benzocaine, and amides which consist of lidocaine, prilocaine, mepivacaine and articaine. Commercially available local anesthetic agents have a

pH of 3.5- 5.5 and also have a shelf life of 3 to 4 years. This type of pH is very low to the drug pKa which all the vitally all the drugs are present in the more stable, water-soluble and charged form. Generally, the composition of local anesthetics includes lignocaine hydrochloride, a reducing agent that is sodium metabisulfite, a preserving agent that is methylparaben, and a diluting agent which includes distilled water.³

Mechanism of action of local anesthesia:

The steps following the mechanism of action includes the:

- The anesthetic which are ionized by binding to the sodium channel
- The entry of the sodium channel is blocked in these different channels
- Blockage of sodium channels prevents the propagation of the action potential
- As the lack of propagation blocks the sensation as the signal is not transferred to the brain.¹⁻³

Testing the success of Local Anesthesia:

Testing for a successful Local anesthesia should be done by the:

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Subjective testing that includes asking the patient to describe the area that is altered in sensation which is usually positive with the nerve block and mandibular injections and anterior maxillary. Objective testing that includes the use of a probe or pulp testing or percussion. When probe the soft tissue always one should consider the supplementary nerve supply and IA is positive with the onset time for the IA is 2-3 minutes and for the NB is 3-4 minutes usually. Pulpal local anesthesia had a longer onset time as compared to the soft tissue anesthesia.⁴

Local Complications

The local complication included during the use of local anesthesia are:

Needle Breakage: It is one of the common complications that occur due to the bending of the needle, sudden movement of the patient, the entire needle is entered into the soft tissue, or using a smaller needle-like 40 gauge. Prevention includes using large gauge needles, especially in the case of the posterior superior alveolar nerve and inferior alveolar nerve and one should not insert the needles into tissues to its hub and take preventive not to redirect a needle once it's injected into the soft tissue. When a needle breaks and it is visible stay calm and instructs the patient not to move and left his/her mouth open. If the fragment is visible remove it from hemostat or Magill intubation forceps. If the fragment is not visible calmly inform the patient, inform an oral surgeon, and take a radiograph and determine its position whether it is superficial or not or leave it and follow up.⁴⁻⁶

Ocular Complications: There are different complications regarding ocular that includes Mydriasis that is pupillary dilation, Amaurosis which is temporary blindness, ptosis i.e. drooping of eyelid and diplopia which means double vision. The causes for these complications include inadvertent arterial injection with retrograde blood flow and orbital injection that includes inadvertent injection into orbit through the inferior orbital fissure. Prevention includes aspiration before the actual injection and inject slowly. The treatment includes make the patient reassure that is transient; cover the affected eye with gauze dressing. Refer the patient to an ophthalmologist for the evaluation if it lasts for more than 6 months and make follow up.⁴⁻⁶

Paraesthesia: This type of complication arises due to trauma of nerve, insertion of the needle to inside the foramen can also lead to the paraesthesia. Local

anesthesia solution which is contaminated by sterilizing solution and the alcohol can produce irritation that results in the edema and increased pressure in the region of nerves which leads to paraesthesia. Also, the hemorrhage leads to an increase in the pressure paraesthesia. One can prevent this complication by proper care and handling of the injection and also the cartridge. In most of the cases having paraesthesia, it resolves within 8 weeks without treatment. A sequence followed for this complication includes-Reassuring the patient party; properly examine the patient and regular follow up for at least 2 months; If the sensory problem persists, consult a neurologist and an oral surgeon.⁴⁻⁶

Facial Nerve Paralysis: It occurs due to the when anesthesia is introduced into the deep lobe of the parotid gland. The cause for this local complication includes transient FNP that is due to the local anesthesia into the capsule of the parotid gland that is present in the posterior border of the mandibular ramus. It is usually occurring during the Vazirani alkiosi injection nerve block or alveolar nerve block. Prevention can be done by proper care to the needle while inserting and cartridge. The management includes reassuring the patient, contact lenses should be removed and eye patches should be applied to the affected eye or one can manually close the lower part of the eyelid periodically that will keep the cornea lubricated.⁴⁻⁶

Trismus: It can be defined as the pain and difficulty in the opening of the mouth that often occurs after the inferior alveolar nerve block and superior nerve block. The onset period is 1-6 days post-treatment. It is caused by the trauma to blood vessels or muscles area in the infratemporal fossa. It also occurs due to the local anesthesia solution contaminated by alcohol or cold sterilizing solutions that gives or produces the irritation of the muscles. Low-grade infection can often lead to Trismus. The prevention measure includes using the sterile, sharp, and disposable needle. Proper handling and care to the injection and cartridge. Avoiding repeating off the atraumatic injection. Management includes the heat therapy, warm saline rinse, Using of the analgesic like aspirin 325mg, If necessary then muscle relaxation, diazepam 10mg BID. Physiotherapy for 5 min each in every 3-4 hours. If the infection occurs then antibiotic is prescribed for 7 days. Surgical intervention can be done in some cases. The recovery range is between 4-20 days.⁴⁻⁶

Soft-Tissue Injury: It is trauma to the lips or the tongue that is produced by the biting or chewing of these tissues while anesthetized, especially occurs in the case of children. In Prevention A cotton roll can be placed between the lips and teeth & warn the patient with a self-adherent warning sticker. It can be managed by analgesic for pain, antibiotics if there is infection, warm saline rinse to decrease the swelling. Petroleum jelly should be used to control the lesion and minimize the irritation.⁴⁻⁶

Hematoma: It occurs due to the effusion of the blood into the extravascular spaces and results from inadvertently a blood vessel. It is caused by the nicking to the vein or artery. It mostly occurs with the IANB and PSA nerve. The practitioner should have a proper knowledge of anatomy, using the shorter needle for PSA nerve block. One should minimize the number of needle penetration. The Management includes the direct pressure applied in the site of bleeding. Applying cold moist towels to the affected area for 20 minutes every hour. Make sure to advise the patient regarding the limitation and soreness of mouth opening possibility.⁴⁻⁶

Pain on Injection: It mostly occurs due to the carelessness of the practitioners and mostly the palatal injection hurts. Dull of needle due to multiple injections. It can also be due to the rapid deposition of the local anesthetic solution. Prevention is Adhere to the proper technique of the insertion process including both the physiological and anatomical. Sharp needles should be used and topical anesthetic should be applied with injecting the needle slowly.⁴⁻⁶

Infection: It is caused due to the contamination of needle but in this modern world, it has become rare due to the introduction of sterile disposable needle and the glass cartridge. The managing includes the antibiotic, penicillin 250 mg QID.⁴⁻⁶

Edema: The cause for this local complication includes trauma, infection, allergy hemorrhage, or injection of the irritating solution like alcohol and cold solution. Management includes a minimal degree of edema – by giving analgesic for pain and will disappear in several days. If the edema occurs in severe form then antibiotics should be prescribed.⁷⁻⁹

Systemic Complications: The systemic complications include the overdose factor and the Allergy factor.

Overdose: The overdose reaction occurs when the drug access to the circulatory system. There is a constant absorption of drugs from the sites of the admission into the circulatory system and a steady removal by the liver of the blood.⁷⁻⁹

There are various predisposing factors which includes generally 2 factors:

- Patient Factors- This includes age, weight, medications that is an important one, gender, genetics, etc.
- Drug Factors- it includes concentration, dose, rate of injection, presence of the vasoconstrictors, and route of administration.

The preventive measures include using an aspiration syringe, using the needle which should not be smaller than 25 gauge. The aspiration should be done at least two planes before insertion. The anesthesia should be given very slowly and calmly.

Clinical Manifestation: The surgeon should notice the slurred speech, apprehension, talkativeness, excitability, and stutter. It also includes the sweating, vomiting, failure in following commands. Blood pressure is elevated with heart rate and respiratory rate. One can also notice the CNS depression and myocardial depression.⁷⁻⁹

Management: The basic emergency management includes–Position; Circulation; Breathing; Airway; Definitive Care. The sequence can be followed as P-C-A-B-D. The management in the case of mild overdose includes reassure the patient and administrate oxygen via the nasal canal and then monitor the record the vital signs. The anticonvulsants via IV should be administrated i.e. diazepam 5mg/min and the emergency medical assistance should be done before the discharge of the patient. In the case of severe overdose when the patient is unconscious then the following steps to be followed– Protect the patient, immediately call the emergency medical assistance, and most important continuing the Basic life support (BLS). Administration of anticonvulsants that is diazepam 5mg/min, if the seizure protract more than 5 minutes.⁷⁻⁹

Allergy: It is a type of systemic complication. It occurs due to the hypersensitive state that is acquired through the exposure of a particular allergen. The allergic reactions cover a broad spectrum of OD

clinically manifestations that range from the mild to the delayed response in the occurring as long as 48 hours after the exposure of the allergen to a mark of immediate and dangerous reaction that develops within seconds of the exposure. The predisposing factors include sodium bisulfate, Epinephrine, Latex, and topical anesthesia. The clinical manifestation includes: Generalized Anaphylaxis; Different Dermatological reactions; Respiratory Reactions.¹⁶

The clinical manifestation for the dermatological reaction includes urticaria and angioedema and the clinical manifestation of respiratory reactions includes bronchospasm that includes dyspnea, wheezing, cyanosis, Tachycardia which is life-threatening, anxiety, respiratory distress, and the laryngeal edema includes extension of edema and life endangering emergency. The clinical manifestations of generalized anaphylaxis include different skin reactions, smooth muscle spasm of gastrointestinal and the genitourinary tracts with bronchospasm and respiratory distress and sometimes cardiovascular collapse can persist or occurs.¹⁰

The management process in the skin reaction includes giving oral histamine blocker 50mg diphenhydramine with observation for at least 1 hour and medical consultation should be done. The management of respiratory reaction includes the administration of the oxygen at flow 5-5 liters per minute. If needed epinephrine 0.3 via IM with repeated 10-20 minutes. IM histamine blocker 50mg diphenhydramine should be given. Medical consultation should be taken and an oral histamine blocker should be prescribed for 3 days. The management of generalized anaphylaxis includes the medical assistance in the very first form with the epinephrine dose of the 0.3 IM for 10-20 minutes repeated. Administer of oxygen should be given with an Intramuscular histamine blocker or one can give the corticosteroid IM or IV. Monitoring of the vital signs should be recorded every 5 minutes in case of the unconscious patient.¹⁰

Conclusion

Today in the world of medicines and advancement new uses of the drugs and local anesthetic agents are been used and with the advancement in medical science, the complication of the drugs are increasing. The various ways should always be understood by the surgeon and the professionals to avoid the life-threatening risks for a patient. One should have skillful knowledge and

a good mind set up to acquire or know the various hazards or complications from using local anesthesia. However in countries like India where numerous quacks are frequently practicing, which is challenging for our society as it produces a maximum risk of life treatment for the patient. The people should be aware and the mass awareness should be created to tackle this problem and a patient should always check the original practitioner's license followed by its different treatment. However, it's very challenging in our country due to the expensive dental procedures. A professional should always keep in mind that what are the risk factors and its consequence followed by simplicity and transparency in the treatment. A careful and proper treatment will lead to happiness and put forward a bright smile on the patient's face that will enhance the quality and prospective life in the society.

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