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Review Article

A literature review on various complications associated with administration of local anesthesia in dentistry

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ABSTRACT

To perform any surgical procedure, we require administration of safe as well as effective local anesthesia. The prime and the most important step in any clinical oral surgical procedure is the administration of local anesthesia. Almost in most of the clinical steps in dentistry, local anesthesia is used, therefore there are chances of complications that might occur with the administration of the local anesthetic drug. It is advised to take the proper history of the patient, i.e., is there any systemic complication that might get enhanced with the administration of the local anesthetic agent. Ask and verify, whether the patient is allergic to any specific medicine or allergic to the local anesthetic agent, to avoid any sort of complication.

1. Introduction

To eliminate the pain in any clinical oral surgical procedure, local anesthetic agent is required[1] Local anesthetics are the most commonly and in routinely used agent in the dentistry, the clinician should be aware of the possible complications associated with local anesthetic agent. Complications associated with administration of local anesthesia includes, trismus (lock jaw), hypersensitivity reaction, toxicity, allergic reaction, formation of hematoma, paresthesia. Now the complications associated with administration of local anesthesia can be evaluated as local complications and systemic complications.[2] psychogenic reactions, systemic toxicity, methemoglobinemia and allergy falls under the common systemic reactions after administration of local anesthetic agent and under local reactions or complication after administration of local anesthesia are pain at the site of the injection , fracture of the needle in the soft tissue, prolonged parasthesia, trismus, infection at the site of the injection, formation of the hematoma, soft tissue injury, ophthalmic complications.[3]

In a study it was stated that dental local anesthetic agent is one of the essential part of the dentistry and almost 300 million cartridges of local anesthesia were used in the dental treatment in the united sates annually.[4] Albert Niemann developed first anesthetic agent i.e. cocaine from the plant named coca in the year of 1859 and this agent was firstly used by Carl Koller in an ophthalmic procedure in the year of 1884.[5,6] Also the numbing effect of cocaine was seen when used topically by Sigmund Freud.[7,8] firstly the nerve block was administered by Halsted in the mandible for the extraction of the wisdom tooth, and the extraction of the wisdom tooth was totally painless.[9]

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Local anesthesia can also be used to differentiate between the pain associated with the tooth and the pain associated with the temporomandibular joint. Dental local anesthesia is most commonly used to relieve the pain during any dental procedure which ultimately helps in easy going of the treatment to the patient as well as to the dentist also.

Chemically the local anesthesia is of two types i.e. amino ester type and amino amide type. Local anesthetic solutions that have esters are hydrolyzed by pseudocholinesterase into para-aminobenzoic acid in the plasma, on the other side the local anesthetic solutions that contains amide are totally metabolized by the liver. Amide group of local anesthetic agents includes lidocaine, mepivacaine, etidocaine, and bupivacaine, ropivacaine. Articaine is one of the local anesthetic agent that contains both amide and ester and are metabolized in the liver and in the blood. The ester group of local anesthetic agent includes cocaine, benzocaine, procaine, chloroprocaine, tetracaine. The local anesthetic agents of ester group are not available in the dental cartridges, [10–12]

2. Some of The Complications Associated With The Administration of Local Anesthesia Are as Follows

2.1. Psychogenic reaction

These psychogenic reactions some times happen to the patient, due to the anxiety related to the dental treatment or from the fear of injection. Or might be due to the secretion of the adrenaline from the vasoconstrictor agent. This might result in changes in the heart rate, respiration rate of the patient, changes in the mood, and also the altered blood pressure. Patient might shows symptoms of hyperventilation, nausea, vomiting, erythmatic blush over the skin. In this situation the patient is asked to be relaxed, dental procedure need to be stopped, and to avoid these psychogenic reactions oral administration of drug is an efficacious method to manage the dental fears prior to the administration of the local anesthetic solution, for patient with short clinical oral surgical procedure antihistamines can be used. [13,14]

2.2. Systemic toxicity

Systemic toxicity develops in the patient after the administration of sufficient amount of local anesthetic agent reaches the central nervous system as well the cardiovascular system. Symptoms such as hypertension, tachycardia, initially convulsions and latterly loss of consciousness, flicker, tremors in the extremities. To prevent systemic toxicity, patient should be evaluated prior to the administration of the local anesthetic solution, proper history of the patient should be taken, is the patient is allergic to any pharmacological agent or not? should be asked. Proper dosage of drug should be given after calculating the drug dosage with patient age and weight. For the healthy adults accepted maximum safe dose of 2 percent lignocaine is 1:80000 (180 to 198 mg), for 3 percent prilocaine, maximum safe dose is 400 mg. If any symptoms appear of toxicity, initially ongoing dental procedure should be stopped immediately, if convulsion seen, administration of 100 % oxygen should be given, supine position with both the legs bended and elevated should be given if patient becomes unconscious. [15]

2.3. Allergy or allergic reaction or hypersensitivity reaction

These hypersensitivity reactions are initiated by specific allergen to which the patient is allergic. It is stated that ester type local anesthetic solution are found to be more allergenic when compared to the amide type of local anesthetic solution. Symptoms like urticarial, itching, sweating, erythema, respiratory distress are seen. Skin prick test should be done in order to check the allergy from anesthetic agent, if allergic reaction occur in the dental office, the first step is to remove the causative agent, pharmacologically it is treated initially with the administration of antihistamines diphenhydramine 25 mg to 50 mg orally or intramuscularly should be given. Ointment containing hydrocortisone should be applied over the skin to relieve the itching from the skin. If the condition still persists, admistration of epinephrine 0.3 – 0.5 mg intramuscularly or subcutanaeiusly should be given and the patient should be transfer to the hospital immediately. [16,17]

2.4. Methemoglobinemia

It is a condition in which the iron which is present in the hemoglobin is totally stabilized in the form of the ferric and is unable to attach oxygen which finally results in hypoxia of the tissue. Methemoglobinemia can be both i.e. it can be inherited or it can be acquired also. When the local anesthetic administration is in excessive doses (most commonly administered local anesthetic solution that leads to methemoglobinemia is prilocaine and benzocaine) may lead to the condition of methaemoglobinemia. Patient gives symptoms of headache, dyspnea, dizziness, restlessness, and tachycardia. Management started with immediately restricting the procedure and administration of 100 percent oxygen to the patient is the first line treatment. In severe cases methylene blue should be administered in the dosage of 0.1 ml per kg of 1 percent solution from the intra venous route over five to ten minutes every hour up to 7mg / kg to the maximum. [17–19]

3. Local Complications Associated With The Administration of Local Anesthetic Solution

3.1. Pain on injection

Pain during injection is from different causes like the velocity of injecting the solution, the temperature of the solution to be administered, barb of the needle, aggressive insertion of the needle, damaged to the soft tissue. In order to prevent these complications, topical anesthetic solution should be applied over the soft tissue to avoid the pain of pricking, injecting the local anesthetic solution with slow speed, use smaller gauge needle, always use fresh needle for pricking multiple times in the same spot of the lesion. It is stated that injecting the solution at the rate of 30 ml per second is recommended.[20,21]

3.2. Needle fracture

fracture of the needle is one of the rarest complication that can happen, but it can happen some time. most commonly the fracture of the needle happened with 30 gauge needle and most commonly in the inferior alveolar nerve block due to in accurate positioning of the needle or making a bend in the needle. If the needle is broken and is placed superficially it should be removed immediately with the help of hemostat and if it is placed deeply computed tomography of the needle to be done to ensure the proper site of the needle. A superficial mucosal incision perpendicular to the trajectory of the needle should be made which is followed by supra periosteal dissection.[22]

3.3. Prolonged paresthesia

In case of prolonged paresthesia, that happens due to a nerve injury, in this case if the nerve is damaged the first line of treatment is to treat the pain with the help of pain killers and usage of multivitamin and vitamin B is prescribed to enhance the healing of the nerve as well as the function of the nerve.[23]

3.4. Other complications like trismus, infection, hematoma, soft tissue injury and ompthmalic complications

Trismus is a condition in which patient is unable to open and close the mouth and there is pain while opening and closing the mouth with limited mandibular movement. Trismus might occurs due to breakage of the needle, multiple insertion of needle in the muscle, wrong insertion of the needle, hematoma formation during multiple pricks of the needle. In the management of the trismus, some patient problem resolved easily and some patient problem take time, in the management patient is advised to take soft diet, occlusal hard splint can be given to the patient to be worn at the night time, heat packs should be advised to the patient, ask the patient to open and close beyond the limits of pain to increase the opening of the jaw, and injection of normal saline mixed with local anesthetic solution can be given to the patient.

Local infection due to trauma at the surgical site, trauma due to multiple pricks of the needle, infection, bad oral hygiene, infection due to breakage of the needle, these should be managed by appropriate injecting techniques, avoiding multiple traumas at the single site, removal of needle if it is broken inside the soft tissue, patient is given antibiotics to reduce the infection. Hematomas and soft tissue injuries might occurs due to multiple pricks or breakage of needle, these are managed by giving ice packs in the initial step followed by antibiotics and painkiller. Opthalmic complications include diplopia, ptosis, mydriasis, they are avoided by numerous aspiration before injecting and the clinician has a good knowledge of anatomy of all the vessels.

4. Conclusion

Local anesthetic solution is one of the ,most commonly used anesthetic agent in the dentistry, one should have a thorough knowledge of all the complications that might occur during the administration and have a thorough knowledge of managing the complications and must be having all the basic emergency drugs in the clinic.

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6. Conflict of Interest

None.

References

1. Christopher A. Local anesthesia- An insight. *Int Oral Health Med Res*. 2016;3(3):83–6.
2. Cummings DR, Yamashita DD, Mcandrews JP. Complications of local anesthesia used in oral and maxillofacial surgery. *Oral and Maxillofac Surg Clin North Am*. 2011;23(3):369–77.
3. Haas DA. An update on local anesthetics in dentistry. *J Can Dent Assoc*. 2002;68(9):546–51.
4. Malamed SF. Allergy and toxic reactions to local anesthetics. *Dent Today*. 2003;22(4):114–20.
5. Fink BR. Leaves and needles: the introduction of surgical local anesthesia. *Bull Anesth Hist*. 2001;19(1):7–11.
6. Redman M. Cocaine: what is the Crack? a brief history of the use of cocaine as an anesthetic. *Anesth Pain Med*. 2011;1(2):95–102.
7. Hall M. Coca koller". The beginning of local anesthesia. *Anesth Prog*. 1972;19(3):65–72.
8. Valverde AL, De Vicente J, Domínguez LM, De Diego RG. Local anaesthesia through the action of cocaine, the oral mucosa and the Vienna group. *Br DentJ*. 2014;217:41–4.
9. Singh P. The surgeons Halsted and Hall, cocaine and the discovery of dental anaesthesia by nerve blocking. *Dent Res J*. 2011;9:485–92.
10. Berberoglu K, Kasapoglu B, Koseoglu G. Dis Hekimliginde local anestezi. Istanbul: Quintessence; 2007. Available from: https://www.quintessence.com.tr/Dis-Hekimliginde-Lokal-Anestezi,PR-10.html.

11. Giovannitti J, Rosenberg MB, Phero JC. Pharmacology of local anesthetics used in oral surgery. *Oral and Maxillofac Surg Clin North Am*. 2013;25(3):453–65.
12. Becker DE, Reed KL. Essentials of local anesthetic pharmacology. *Anesth Prog*. 2006;53(3):98–108.
13. Donaldson M, Gizzarelli G, Chanpong B. Oral sedation: A primer on anxiolysis for the adult patient. *Anesth Prog*. 2007;54(3):118–28.
14. Appukuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. *Clin Cosmet Investig Dent*. 2016;8:35–50.
15. Appukuttan DP. Safety Committee of Japanese Society of Anesthesiologists. Practical guide for the management of systemic toxicity caused by local anesthetics. *J Anesth*. 2019;33:1–8.
16. Batinac T, Tokmadzic S, Peharda V, Brajac V. Adverse reactions and alleged allergy to local anesthetics: Analysis of 331 patients. *J Dermatol*. 2013;40(7):522–7.
17. Lee J, Lee JY, Kim HJ, Seo KS. Dental anesthesia for patients with allergic reactions to lidocaine: Two case reports. *J Dent Anesth Pain Med*. 2016;16(3):209–12.
18. Barash M, Reich KA, Rademaker D. Guay J. Methemoglobinemia related to local anesthetics: A summary of 242 episodes. *J Am Osteopath Assoc*. 2009;115(2):94–8.
19. Chowdhary S, Bukoye B, Bhansali AM, Carbo AR, Adra M, Barnett S. Risk of topical anesthetic-induced methemoglobinemia: A 10-year retrospective case-control study. *JAMA Int Med*. 2013;173(9):771–6.
20. Säkkinen J, Huppunen M, Suuronen R. Complications following local anaesthesia. *Den Norske Tannlaegeforenings Tidende*. 2005;115:48–52.
21. Kudo M. Initial injection pressure for dental local anesthesia: Effects on pain and anxiety. *Anesthesia Progress*. 2005;52(3):95–101.
22. Brand HS, Bekker W, Baart JA. Complications of local anaesthesia. An observational study. *International Journal of Dental Hygiene*. 2009;7(4):270–272.
23. Vasconcelos BC, Nogueira RVB, Maurette PE, Carneiro SC. Facial nerve paralysis after impacted lower third molar surgery: A literature review and case report. *Patología Oral y Cirugía Bucal*. 2006;11(2):178.

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