

## Knowledge, Attitude, and Practice Survey On The Choice Of Local Anesthetic Solution and Methods Used To Anesthetize Dental Pulp By General Dental Practitioners

Research Article

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### Abstract

**Introduction:** Pain is the most common symptom reported to the dentists. Alleviation of pain and discomfort hence becomes the first priority in the management of a patient.

**Aim:** The aim of the study was to assess the various factors that play an important role in the selection of the local anesthetic solution by dentists in general. The knowledge and practical skills of the dentists for administration of local anesthesia were assessed and also their interest to know of the advancements in local anesthesia checked upon.

**Materials and Methods:** A cross sectional survey with a structured questionnaire consisting of 15 questions was performed among general dental practitioners and the responses obtained by 302 general dental practitioners were recorded.

**Results:** It was found that the majority of the dentists chose Lignocaine and their choice depended upon the chemical characteristics and efficacy of the solution. Nerve blocks remain the choice of administration of local anesthetic solution followed by local infiltration and intrapulpal methods.

**Conclusion:** This KAP survey gives us the results that most dentists do follow the protocol for injecting local anesthetic solutions. Sessions and talks educating the practitioners may be necessary to ensure a better and more positive practice of local anesthetic administration and lessen the scope of local anesthetic failures.

**Keywords:** Local Anesthesia; Dental Pulp; Criteria; Dentist; Advances; Protocol.

### Introduction

Pain has been one of the most common symptoms of a diseased state and can be considered as a protective mechanism through which the body notifies of a harmful stimulus [1]. Pain thus becomes the most common symptom that patients present to a dentist. The patient approaching a dentist in most of the scenarios experience pain and discomfort [2]. Although an array of pain management techniques as mentioned by Rosenberg exist which include providing proper information, use of analgesics, pulpotomy, pulpectomy, trephination, etc, [3] the most important and foremost step is the successful administration of anesthetic

solution [4]. The patient must always be informed by the operator of the procedure and risks associated with the administration of local anesthetic agents and must be calmed down. Efforts to build rapport with patients must be taken to ensure maximum support and cooperation by the patient. This also prevents the chances of postponement and rejection of the treatment because of the fear and anxiety induced by poor local anesthetic cover [5]. Hence, pain management forms the basis of any endodontic procedure. Local anesthesia is used for procedures as minor as extraction of teeth, root canal treatment to management of trauma, major surgical interventions and periodontal surgeries. With the administration of local anesthesia, it is commonly noticed that the

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patient calms down and cooperation with the operator increases. The choice of local anesthetic solution must be based on criteria like safety, efficacy and longevity of action [6]. Even though the conventional methods of administration of local anesthesia is used worldwide, advancements in the direction of achieving painless anesthesia and alternatives to the administration of local anesthesia are being commonly experimented upon [7].

Previously our team has a rich experience in working on various research projects across multiple disciplines [8-22] Now the growing trend in this area motivated us to pursue this project. Our aim was to analyze the criteria of the selection of a local anesthetic solution and practice of pulpal anesthesia by dental practitioners.

### Materials and Methodology

A structured questionnaire was prepared and approved by the Faculty of Department of Operative and Conservative Dentistry. An online survey was conducted with these tested questions and multiple answers could be chosen amongst the available choices. The questions were based on the knowledge, and practice of local anesthetic solution administration and choice and the attitude towards learning the newer advances in the local anesthesia. The survey links were forwarded to general dental practitioners (GDPs) only and 302 responses were recorded. There were a total of 15 questions, of which all were obligatory and almost all questions had multiple options to be chosen from. 5 questions tested the knowledge of the respondent, 5 questions assessed the

attitude and 5 questions corresponded to the protocol adopted by the respondent. All the answers were electronically recorded and frequency distribution was done. The respondents were allowed to choose more than one option for certain questions.

### Results

The results obtained are tabulated in tables 1, 2 and 3. It can be seen that pain alleviation is the most common reason reported by the respondents to administer local anesthetic agents. The anesthetic agent of choice is Lidocaine and majority of the respondents follow the proper anesthetic protocol.

### Discussion

Our institution is passionate about high quality evidence based research and has excelled in various fields [23-33].

Local anesthesia may be described as the transient loss of sensation in a circumscribed area of the body that is caused by the depression of the excitation of nerve endings or by the inhibition of conduction process occurring in the peripheral nerves [34]. Local anesthetics' mechanism of action is by the interruption of the neural conduction [35].

Some of the ideal properties of a good local anesthetic solution include reversible and specific action, good biocompatibility, suitable duration with a rapid onset of action, with high therapeutic

**Table 1. Responses Obtained by the respondents for questions based on knowledge.**

No	Questions	Options	% of respondents n (%)
1	Reason for injecting Local Anaesthetic	Pain Alleviation	258 (55.4%)
		Allaying anxiety	21 (7%)
		Preparation for surgery	71 (23.5%)
2	Does the choice of LA administered depend upon the general health of the patient	Yes	279 (92.7%)
		No	7 (2.3%)
		Maybe	18 (6%)
3	Does the purpose of administration of LA determine the method of administration?	Yes	237 (78.5%)
		No	12 (5.6%)
		Sometimes	52 (17.2%)
4	Does the presence or absence of infection influence your choice of Local anesthetic solution?	Yes	217 (70.5%)
		No	38 (12.6%)
		Sometimes	51 (16.9%)
5	Do you know about the advances in the administration of LA like WAND and Intraosseous Injection ?	Yes	209 (69.2%)
		No	70 (23.2%)
		Maybe. But unsure	24 (7.9%)

**Figure 1. Bar chart denotes the reason for which respondents provide local anesthesia. It can be seen that pain alleviation forms the most common cause for providing local anesthesia. Very few GDPs use anesthesia to allay anxiety.**

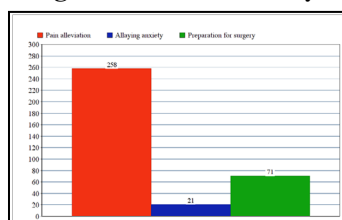


Table 2. Responses Obtained by the respondents for questions based on attitude.

6	Anaesthetic solution selection criteria	Price	28 (9.3%)
		Efficacy	200 (66.2%)
		Chemical characteristics	116 (38.4%)
		Procedure	73 (24.2%)
		Availability	48 (15.9%)
		Shelf life	59 (19.5%)
		Others	4 (1.3%)
7	Anaesthetic solution choices	Lidocaine	265 (87.7%)
		Prilocaine	37 (12.3%)
		Mepivacaine	7 (2.3%)
		Articaine	32 (10.6%)
		Bupivacaine	33 (10.9%)
		Others	19 (6.3%)
8	Do you enquire the patient regarding the symptoms of anesthesia prior to the starting of the procedure?	Yes, Always	267 (88.4%)
		No, Never	8 (2.6%)
		Sometimes	29 (9.6%)
9	Do you ask the patient about a previous allergic reaction to LA or perform a patch test to check for the LA sensitivity?	Yes, Always	224 (73.8%)
		No, Never	18 (6%)
		Sometimes	81 (20.2%)
10	Would you like to venture more on the new and various other methods to administer LA?	Yes	278 (91.7%)
		No	4 (1.3%)
		Maybe	21 (7%)

Figure 2. Bar chart denotes the knowledge of the respondents on the recent advances in the delivery of local anesthetic agents. It can be seen that the majority of respondents knew about the advances and their use to provide local anesthesia.

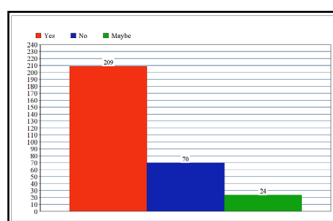
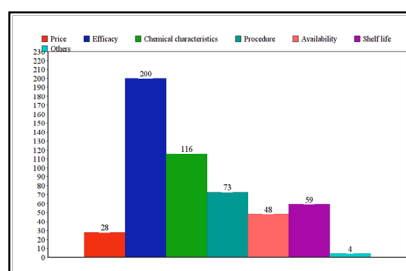


Figure 3. Bar graph denotes the criteria based on which respondents selected a local anesthetic agent. It can be inferred that Efficacy of the anesthetic agent followed by its chemical characteristics form the bases of the selection criteria.



ratio, no systemic toxicity and chemical stability and good shelf life [36].

The local anesthetic solution to be used depends much on the general health condition of the patient. The operator must invest some time in recording the general health status of a patient and questions regarding past medical and dental history so as to avoid any mishaps. For instance, a systematic review implied towards the usage of lidocaine with adrenaline in patients with cardiovas-

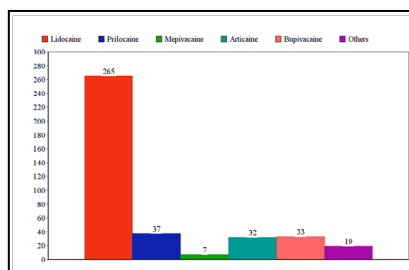
cular disease dangerous as arrhythmias can be seen as a result of the addition of vasopressor [37].

The local anesthetic agents are basically either of the amide or the ester forms. The amide type include Articaine, Lignocaine, Bupivacaine, Etidocaine while the ester type include Procaine, Based on their action, they can be classified as short acting, intermediate acting or long acting agents. The most commonly used local anesthetic solution even in the UK is 2% Lignocaine with adrenaline

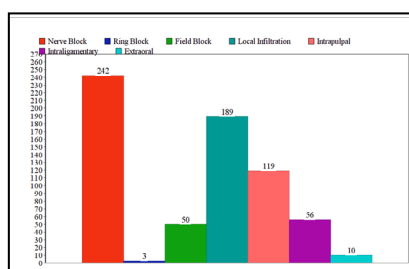
**Table 3. Responses Obtained by the respondents for questions based on practice.**

11	Do you note the Intraoral and extraoral landmarks carefully before and during LA administration?	Yes, Always	264 (87.4%)
		No, Never	1 (0.2%)
		Sometimes	38 (12.6%)
12	Do you utilize topical anaesthesia before performing the anesthetic procedure?	Yes, Always	156 (51.7%)
		No, Never	12 (4%)
		Sometimes	135 (44.7%)
13	What are the methods of LA administration commonly used by you?	Nerve Block	242 (80.1%)
		Ring Block	3 (1%)
		Field Block	50 (16.6%)
		Local infiltration	189 (62.6%)
		Intrapulpal	119 (39.4%)
		Intraligamentary	56 (18.5%)
14	Do you enquire the patient regarding the symptoms of anesthesia prior to the starting of the procedure?	Yes, Always	267 (86.4%)
		No, Never	8 (2.6%)
		Sometimes	29 (9.6%)
15	What is the needle length commonly used by you for the administration of LA?	Long (32mm)	144 (47.7%)
		Short (20mm)	186 (61%)
		Ultrashort (10mm)	6 (2%)

**Figure 4. Bar chart denotes the local anesthetic agent of choice as reported by the respondents. It can be inferred that the majority of respondents use Lignocaine followed by Prilocaine to provide local anesthesia.**



**Figure 5. Bar chart denotes the method of LA administration as reported by the GDPs. It can be inferred that most respondents use the nerve block technique followed by local infiltration of the anesthetic solution.**



[38]. Other than Lidocaine, Articaine, Bupivacaine, Etidocaine, Mepivacaine, Prilocaine and Tetracaine can be used as the local agents for anesthesia [6]. Articaine is found to be more effective, lasting longer and providing better results when compared to lignocaine as it diffuses more and has better lipid solubility [39] while no significant difference in the effectiveness of various local anesthetic agents have been reported [40].

The requirement of local anesthetic agents include an important factor where in the onset of action should be fast and longevity of action must be long. To make this happen, the local anesthetic

agents are commonly acidic and might cause irritation and burning sensation in some patients [41]. The pH is commonly adjusted to increase the shelf life of the local anesthetic solution and is seen to provide better anesthesia with faster onset in some cases [42]. However, research has indicated that the pain during injection cannot be reduced by altering the pH of the anesthetic agent by adding sodium bicarbonate to the solution just prior to injecting [41]. Another crucial factor is the pH of surrounding tissues. It plays an important role in the onset and duration of anesthesia. It is seen that in severely inflamed tissues, the action of anesthetic agents is prolonged. This can be attributed to the low pH with in

the infected tissues hampering the dissociation of the local anesthetic agent and difficulty in the maintenance of the ionized, non lipid soluble anesthetic state. Another risk includes the spreading of infection along the fascial planes and worsening of condition [36].

Another crucial factor for the success of anesthesia is following the correct procedure. Failure of local anesthesia to achieve analgesia can be attributed to failing of deposition of local anesthetic agent at the correct location, inadequate amount of local anesthetic agent deposition, injecting into inflamed tissues, usage of outdated and expired or improperly stored anesthetic agents and not allowing the solution to diffuse within the tissues to provide profound anesthesia [43]. The failure of anesthesia caused as a result of misjudging the anatomical landmarks intraorally can be considered as one of the most common factors. Complications like hematoma, facial nerve paralysis, total body hemiparesis, paresthesia and sudden deafness have been reported in cases where the clinicians failed to assess the intraoral anatomy of their subjects [44]. To avoid complications, it is suggested to enhance curriculum, help in identification of the correct anatomical landmarks and train professionals with the correct protocol of local anesthesia administration [45]. Also, if protocol of administration of local anesthesia is taken seriously, each and every patient who needs to be administered local anesthesia must be asked for a previous allergic reaction related to local anesthetic agents. If the patient has approached for an invasive treatment for the first time and does not present with any history to anesthetic agents, a patch test to check for allergic reaction must be performed. The allergy to local anesthesia is fairly common but the cause of this allergy is rarely because of the anesthetic agent. It is commonly associated with methylparaben, which is an additive for being a preservative in the local anesthetic cartridge [43]. Most of the time, the allergic reaction is due to psychogenic causes and very rarely due to the local anesthetic agent [46].

Most commonly used local anesthetic agents for the purpose of topical anesthesia are eutectic mixture of local anesthetics (EMLA) Lidocaine, ELA-max, epinephrine, tetracaine, bupivacaine, Topicaine, local anesthetic peel, 4% tetracaine, benzocaine, proparacaine, Betacaine-LA, lidoderm and S-caine patch™. However, the choice of topical agent must rely on the age, area and duration of application, possible interactions with surrounding tissues and allergy occurrence in the past [47].

Commonly used technique of anesthesia is the nerve block which anesthesia a large area that is supplied by the same branch of the sensory nerve [38]. Nerve blocks. Profound anesthesia for long durations can be experienced if nerve blocks are given efficiently. Other methods commonly used by dentists like intrapulpal, intraligamentary and intraosseous methods depend largely upon the purpose of inducing anesthesia. For instance, in cases where nerve blocks have failed to produce profound anesthesia, secondary methods to induce anesthesia which include acted as supplementary [48, 49].

Although the conventional methods of delivering local anesthetic agents are effective and have proven their worth over time, advancements in dental anesthesia techniques and devices to improve the efficiency is required. Devices like vibrotactile devices that include VibraJet, Dental Vibe and Accupul are designed to provide painless anesthesia. Computer-controlled local anesthesia

delivery (CCLAD) devices like WAND, Comfort control syringe are designed in such a way that the computers aid in delivering local anesthetic agents almost painlessly and instantly [50].

## Conclusion

According to the results of the present survey most commonly used local anesthetic agents are Lignocaine and Prilocaine amongst the dental practitioners. Efficacy and chemical characteristics of local anesthetic agents act as the deciding factor for the choice of the solution. Most of the dental practitioners believe in following the protocol for local anesthesia administration. Even though many methods of delivering anesthetic agents have been advocated, the tradition Nerve blocks still remain the most extensively used. The advancements in local anesthesia need to be ventured on however.

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