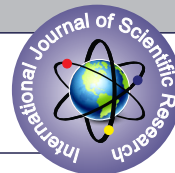


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EPIDEMIOLOGICAL STUDY ON THE INCIDENCE OF MEDICAL EMERGENCIES ENCOUNTERED IN DENTAL OFFICES ASSOCIATED WITH THE ADMINISTRATION OF LOCAL ANAESTHETICS AND THE AWARENESS OF THE DENTIST ABOUT ITS COMPLICATIONS AND MANAGEMENT.



Anesthesiology

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ABSTRACT

Local anaesthetics despite being successfully used for painless dentistry tend to have potential complications when administered incorrectly. Knowledge of these potentially harmful agents and the complications that they are ought to produce and its management should be known to a dentist that may help in avoiding a complication or even aggravating the same.

The objective of this study was to evaluate the incidence of medical emergencies encountered in the dental office associated with the administration of local anaesthetics via a questionnaire based survey, calculating the awareness of the dentist to these rare but potential complications and its management.

By this study we conclude that even today a significant no. of dentists do not adhere to taking a complete medical case history before initiating and dental procedure and thus do not find it of importance to refer patients for a medical check-up. Although a significant no. of them were young practitioners having a significant knowledge about local anaesthetic agents and their administration, a majority of them didn't practise giving a test dose and a significant of them reported not having the required armamentarium and preparedness or even expertise in the advent of a complication.

KEYWORDS

Local anaesthesia, medical emergency, awareness, dentists.

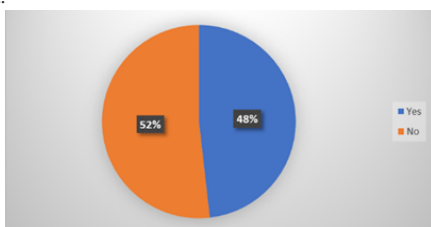
Introduction

Local anaesthesia is any technique to induce the absence of sensation in a specific part of the body, generally for the aim of inducing local analgesia, that is, local insensitivity to pain, although other local senses may be affected as well. It allows patients to undergo surgical and dental procedures with reduced pain and distress. Local anaesthetics are responsible for 5 to 10% of all reported adverse reactions to anaesthetic drugs. Signs and symptoms of CNS toxicity include convulsions, followed by coma and respiratory depression. Convulsions are due to disinhibition of nervous conduction, probably by an action at the gamma-aminobutyric acid (GABA) receptor complex, while depressant effects, which predominate at higher doses, are due to blockade of sodium channels. CNS toxicity is potentiated by hypoxia and hypercapnia, so acute management must minimise these. Cardiovascular toxicity also involves sodium channel blockade, reducing contractility and interfering with conduction. Bupivacaine differs from lidocaine (lignocaine) in the sudden occurrence of dangerous ventricular arrhythmias including fibrillation at sub convulsion doses. Ropivacaine is a newer amide local anaesthetic with toxicity intermediate between these but potency like bupivacaine. Allergic reactions account for only 1% of untoward reactions, but anaphylactoid collapse can be life threatening and requires rapid and effective management.

An evidence based protocol that would cover all the potential complications of administration of local anaesthetics should be followed by all dental practitioners to minimize such risks and complications.

Methodology

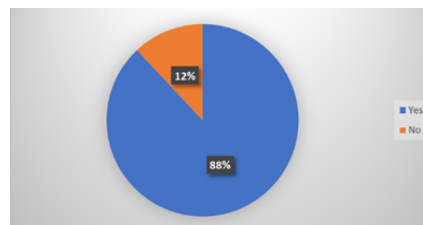
A questionnaire based survey was conducted in the city of Mumbai among random general dental practitioners evaluating their expertise in the field, the incidence they've encountered of patients that experienced adverse reactions on administration of local anaesthetics. Data was collected from a sample of 1000 dentist irrespective of practising experience. The inclusion criteria were subjects having a valid license to practise dentistry, subjects willing to participate in this study. Subjects who were unwilling to participate in the study were excluded.



Graph 1: Percentage of dentists documenting case history

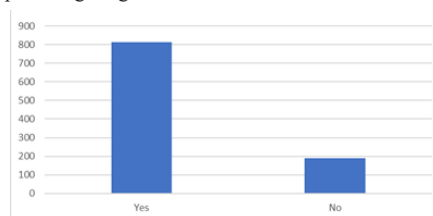
Result

1000 dentists were approached for the survey and there was 100% response. Most of the dentists, 56% were found to be young practitioners that had an average of 5 years of practising experience and the least no. of them, 11%, fell in the above 30 years' experience group. Pertaining to the documentation of the case history of patients presenting to their clinic a maximum no, 52%, of dentists documented a case history before the initiation of any dental procedure, though the difference being not significant as the no. of dentists not recording was 48% (Graph 1). A significant 94% of dentists accepted recording vital parameters before any dental procedure. 91% confirmed of being aware of a procedural informed consent and 88% confirmed taking the same before the commencement of any dental procedure (Graph 2). With respect to the incidences of encountering patients with medical co morbidities, 81% of dentists accepted the same (Graph 3) and also confirmed that a significant 73% of patients ($p < 0.05$)



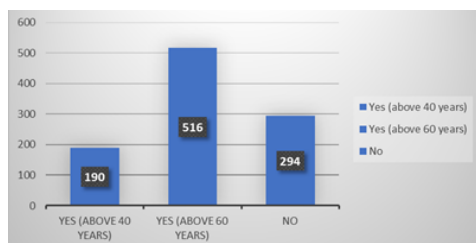
Graph 2: Percentage of dentists taking procedural consent

did reveal their systemic illnesses at the 1st instance of being asked. A significant 52 % found it necessary to take a physician's consent above the age of 60years, irrespective of the presence or absence of medical co morbidities (Graph 4). Advising an ECG before any dental procedure was not taken as of any importance with 94% disapproving of the same (Graph 5). With respect to the knowledge and practise of giving a test dose 83% denied giving a test dose but a significant 94% knew the correct method of the administration. Of the meagre 17% who did practise giving

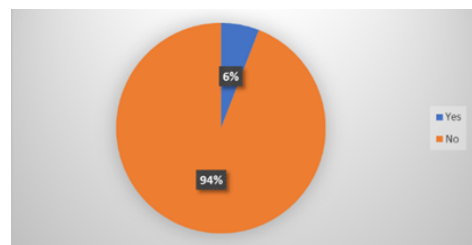


Graph 3: Number of dentists encountering patients with medical comorbidities.

a test dose a significant 53% had a waiting time of 10 minutes before initiating any procedure with 94% noticed redness at the area of injection. A maximum 78% of dentists had the least no. of patients who actually encountered an adverse reaction after the administration of a LA agent and 90% confirmed syncope as the only complication they have encountered. There were no reported fatalities among any of the 1000 dentists reviewed. With regards to the armementaria available with the dentists, Only 32 among the 1000 had a functioning Oxygen Cylinder and an ambu bag, only among these there were 25 of them who had a laryngoscope. All of the 25 dentists who had a laryngoscope also had endotracheal tubes and oropharyngeal airways. Around 61% of dentists had a pulseoximeter. 35% had I.V cannulas. Inj Adrenaline was available with 92% of the dentists. Around 65% confirmed keeping a first aid kit with Inj Avil, Inj Hydrocort and Inj Atropine.



Graph 4: Number of dentist referring patients for a physician's consent according to age



Graph 5: Percentage of dentists advising patients for ECG

Discussion

The results of this study show that a large no. of practising dentists do not document a detailed case history before starting any dental procedure. Nevertheless, it has been demonstrated that taking an adequate medical history is by far the simplest and most efficient method for detection of risk factors.¹ According to a study performed by Jakobs² only 12.9% of 541 dentists surveyed always get a medical history prior to treatment, and 14.5% stated that they had never taken a patient's medical history. In our study 52% of the 1000 dentists surveyed did not take a prior medical history. Thus, it is essential for dentists to take a medical history in order to reduce or even prevent side effects associated with dental anaesthesia, because this enables the dentist to apply a differentiated anaesthesia that meets the special requirements of the patient. A staggering 94% of dentists did not seem it of importance of prescribing the patient to an ECG. In a study, Allen Hasse³ in 1986 demonstrated that the effects of dental treatment performed with patients under local anaesthesia on HR, BP, and ST segment depression were studied in 19 male cardiac patients and 18 male noncardiac patients. The incidence of ST segment depression was significantly higher in the cardiac patients than it was in the noncardiac patients, indicating that cardiac patients frequently experience myocardial ischemia during dental treatment. The almost equivalent incidence of ST segment depression in the anaesthesia and surgery phases suggests that, for this patient group, the administration of a local anaesthetic is as stressful as the extraction of teeth. The findings also suggest that patients with suspected or known cardiac disease, especially those with angina or hypertension, may benefit from medical consultation before dental treatment. Use of stress-reduction techniques may also be indicated. Our results show that 78% of the dentists that were surveyed had encountered an average of 5 patients with adverse reactions after LA was injected and the most common complication that 90% reported was syncope. A study done by Lustig et al⁴ in 1999 confirmed that LA injections that are properly carried out appear to be safer today than in the past. In 2,528 injections to 1,007 patients in an oral and maxillofacial practice, the most severe immediate complication—syncope—occurred in only one case. In 63 cases (2.5 percent), the dentist touched the nerve, and the patient reported feeling an electric current sensation (40 instances with inferior alveolar nerve blocks, 18 with lingual nerve blocks, four with

mental nerve blocks and one time with a second injection to the same site) without any further complications. In 1966, Freitag⁵ reported the incidence of complications related to dental anaesthesia to be 7% (21 cases out of 299), and in 1969, Persson⁶ found the incidence of side effects associated with dental anaesthesia to be 2.5% after having reviewed 2960 cases.

The American Society of Regional Anaesthesia Pain Medicines⁷ have in 2010 put out recommendations for diagnosing and treatment of Local Anaesthetic Systemic Toxicity (LAST). These are summarised in Tables 1 & 2. In our survey, we found that from the 94% of dentists who were aware of the procedural informed consent 88% did record the same before initiating any dental procedure. Moles, Simper and Bedi⁸ were of the opinion that many professionals think that the correct way to obtain consent is verbally, and they forget to obtain written consent. Doyal and Cannell⁹ were of the view that the practical implications of the doctrine of informed consent are sometimes unclear in clinical work. In the study carried out by Ozdemir et al.¹⁰ in Turkey, dentists were found faulty in two cases out of eight not because of the treatment they performed but because of the lack of their patients' consent. In a retrospective study conducted by Lopez-Nicolas et al¹¹ in 2007 there was a total lack of information about the therapeutic process in three cases, and there were information failures during the treatment process in 26 cases and observed an absence of relevant information in the dental records in 36 cases, which should be emphasised because, as underlined by Komensky¹² and Keeling and Martin¹³, such a lack of information causes problems for dentists during their defence in malpractice cases. For Palat¹⁴, dental records are the backbone of the dentist's defence in any malpractice. Further on, in the study it was found that only 18% of the dentists were certified BLS practitioners.

Table 1: Recommendation for Treatment of LAST

- If signs and symptoms of LAST occur, prompt and effective airway management is crucial to preventing hypoxia and acidosis, which are known to potentiate LAST.
- If seizures occur, they should be rapidly halted with benzodiazepines. If benzodiazepines are not readily available, small doses of propofol or thiopental are acceptable. Future data may support the early use of lipid emulsion for treating seizures.
- Although propofol can stop seizures, large doses further depress cardiac function; propofol should be avoided when there are signs of CV compromise. If seizures persist despite benzodiazepines, small doses of succinylcholine or similar neuromuscular blocker should be considered to minimize acidosis and hypoxemia.
- If cardiac arrest occurs, we recommend standard Advanced

Cardiac Life Support with the following modifications:

1. If epinephrine is used, small initial doses (10Y 100 Kg boluses in the adult) are preferred
2. Vasopressin is not recommended
3. Avoid calcium channel blockers and A-adrenergic receptor blockers
4. If ventricular arrhythmias develop, amiodarone is preferred; treatment with local anaesthetics (lidocaine or procainamide) is not recommended.

• Lipid emulsion therapy (IIa; B):

1. Consider administering at the first signs of LAST, after airway management

2. Dosing:

- 1.5 mL/kg 20% lipid emulsion bolus
- 0.25 mL/kg per minute of infusion, continued for at least 10 mins after circulatory stability is attained
- If circulatory stability is not attained, consider rebolus and increasing infusion to 0.5 mL/kg per minute
- Approximately 10 mL/kg lipid emulsion for 30 mins is recommended as the upper limit for initial dosing
- Propofol is not a substitute for lipid emulsion (III; C).
- Failure to respond to lipid emulsion and vasopressor

therapy should prompt institution of cardiopulmonary bypass (CPB). Because there can be considerable lag in beginning CPB, it is reasonable to notify the closest facility capable of providing it when CV compromise is first identified during an episode of LAST.

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Table 2: Recommendation for Diagnosing LAST

- Classic descriptions of LAST depict a progression of subjective symptoms of CNS excitement (agitation, auditory changes, metallic taste or abrupt onset of psychiatric symptoms), followed by seizures then CNS depression (drowsiness, coma, or respiratory arrest). Near the end of this continuum, initial signs of cardiac toxicity (hypertension, tachycardia, or ventricular arrhythmias) are supplanted by cardiac depression (bradycardia, conduction block, asystole, decreased contractility). However, there is substantial variation in this classic description, including:
 1. Simultaneous presentation of CNS and cardiac toxicity
 2. Cardiac toxicity without prodromal signs and symptoms of CNS toxicity
 3. Thus, the practitioner must be vigilant for atypical or unexpected presentation of LAST (I; B).
- The timing of LAST presentation is variable. Immediate (G60 s) presentation suggests intravascular injection of local anesthetic with direct access to the brain, whereas presentation that is delayed 1Y5 mins suggests intermittent intravascular injection, lower extremity injection, or delayed tissue absorption. Because LAST can present 915 mins after injection, patients that receive potentially toxic doses of local anesthetic should be closely monitored for at least 30 mins after injection (I; B).
- Case reports associate LAST with underlying cardiac, neurologic, pulmonary, renal, hepatic, or metabolic disease. Heightened vigilance may be warranted in these patients, particularly if they are at the extremes of age (IIa; B).
- The overall variability of LAST signs and symptoms, timing of onset, and association with various disease states suggests that practitioners should maintain a low threshold for considering the diagnosis of LAST in patients with atypical or unexpected presentation of CNS or cardiac signs and symptoms after receiving more than a minimal dose of local anesthetic (IIa; B).

Conclusion

We conclude that among the surveyed dentists, there was a very low incidence of medical emergencies associated with local anaesthetic administration. With a majority of them who actually encountered one mentioning syncope as the only emergency. It was found that even today a significant no. of dentists do not adhere to taking a complete medical case history before initiating a dental procedure and thus do not find it of importance to refer patients for a medical check-up. Although a significant no. of them were young practitioners having a significant knowledge about local anaesthetic agents and their administration, a majority of them didn't practise giving a test dose and around 60% reported not having the required armamentarium and preparedness or even expertise in the advent of a complication. Thus, it becomes very clear from the findings of this study that a standardised protocol be implemented among the general dental practitioners, a list of armamentaria be made mandatory before setting up a dental clinic, the required qualifications of the dentist scrutinised thoroughly with inclusion of BLS/ACLS training, that would not only help reduce the incidence of complications but also save the dentist from any potential legal issues that he/she ought to face some day.

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