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Extent and Impact of Needle Phobia among Dental College Patients- An In-Vivo Prospective Study

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Abstract

Background: The extent of the needle phobia and its effect on the patients in the community is the topic whichstill remains largely unexplored. The presence of needle phobia may influence the future dental treatment by the patient.

Aim: The aim was to evaluate hemodynamic changes in the Blood Pressure, Heart Rate, and Oxygen Saturation (SpO2) of normal patients before and after administration of local anesthesia.

Materials and Methods: A clinical trial was conducted on 110 patients who were requiring injection of local anesthesia before endodontic treatment were selected from the out-patient department of Conservative Dentistry and Endodontics from Narsinhbhai Patel Dental College and Hospital, Visnagar. Patients having history of convulsions, patients that are medically compromised and patients not requiring local anesthesia for the endodontic procedure were excluded from the study. Blood Pressure, Heart Rate, and Oxygen Saturation (SpO2) were evaluated in each patient before and after administration of local anesthesia.

Results: Statistically, significant difference was observed in mean Systolic Blood Pressure and in Heart Rate before and after administration of Local Anesthesia. Whereas, no significant difference was observed in mean Diastolic Blood Pressure and oxygen saturation before and after administration of Local Anesthesia.

Conclusion: The changes in Systolic Blood Pressure and Heart Rate were observed in patients before and after administration of Local Anesthesia which shows that the assessment of Hemodynamic Parameters also plays an

important role in understanding the patient's nature and extent of Needle Phobia.

Keywords: Needle Phobia, Dental Treatment, Heart Rate, Blood Pressure, SpO2, Endodontic Treatment

Introduction

Fear of needles is called trypanophobia, and it is considered as an extreme fear of dental procedures. Fear of injections is one of the most common upsetting aspect for the dental patients in healthcare settings. The viewpoint of dental operator is to carry out the dental treatment without pain and discomfort. The experience of a needle being attached to a syringe and then touching the oral mucosa is dreadful, and it has a detrimental effect on the patients' psychology.[1]

There are many aspects of going to a dentist that might provoke feelings of nervousness, concern, or anxiety in prospective patients. Fear of needles and overcoming that fear has been an important focus of a research in the UK. Fear of dental needle is an important concern of delivery of local anesthesia by injection is the main concern of pain relief techniques in dentistry and dentists as well as patients often avoid tough injections as a consequence, resulting in poor pain control.[1] One in four adults report a clinically significant fear of dental injections, and 1 in 20 reports have been encountered regarding avoidance of dental treatment because of a fear of dental injections.[1]The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition also classifies needle phobia as BII phobia. [1]

High dental fear has been shown to affect approximately one in every six Australian adults, and this prevalence rate is comparable to that of many Western countries around the world. Some subgroups of the population, such as middle-aged women, can have as many as one in three people who are afraid of the dentist. For starters, people with high dental anxiety are more likely to postpone or miss dental visits; these afraid patients often cancel or fail to show up for appointments. Second, these individuals with heightened dental anxiety, whether children or adults, are a little more difficult to handle because they take more time and often present with behavioural issues that can result in a traumatic and unpleasant experience.[2]

The use of local anaesthetics combined with vasoconstrictor agents is justified in dentistry. Doing so counters the local vasodilation effect of local anaesthetic agents and delays its absorption into the cardiovascular system. These effects are helpful in increasing the period of local anesthesia and weakening the risk of toxicity and also provide haemostasis during surgery. Lidocaine is an amide local anaesthetic that is used extensively for pain control since its pharmacokinetic characteristics and low toxicity make it safe for use in dental practice.[3]

Epinephrine is the main vasoconstrictor used in dentistry. The major action of epinephrine is on β receptors; however, it also effects on both α and β receptors. The vasoconstriction action of epinephrine depends on stimulating the α1 receptors in peripheral blood vessels. Stimulating of β 1receptors by epinephrine increases heart rate and blood pressure also. On the other hand, pain during dental treatment can trigger the release of endogenous catecholamines, which, in turn, can arise hemodynamic changes, such as an increase in blood pressure and heart rate, and may even produce arrhythmia. [3]

The primary goal of this research was to determine the prevalence of needle phobia among dental patients. Secondary goals included determining the level of needle phobia by monitoring hemodynamic changes in patients

before and after local anaesthesia administration, such as blood pressure, heart rate, and oxygen saturation.

Material and Method

The materials of the study include a diagnostic tray with a mouth mirror, probe and a cotton forceps, an anaesthesic syringe needle, local anesthesia (1:1,00,000) (Lustre pharmaceuticals), pulse oximeter (EZ-LIFE) and sphygmomanometer (Diamond apparatus). In our study the patients were selected from the Department of Conservative Dentistry and Endodontics of Narsinhbhai Patel Dental College and Hospital, Visnagar with an age group of 18-55 years and the patients voluntarily participating in the study and sign the written consent.Patients having history of convulsions, that are medically compromised (patients who are hypertensive, hypotensive, having cardiovascular problems), not requiring local anesthesia for the dental procedure the one allergic to local anaesthetic were excluded from the study and pregnant women according to the medical history and the continuing trimester were selected accordingly.

Methodology

A simple random technique was used and 100 patients were selected from the Department of Conservative Dentistry and Endodontics of Narsinhbhai Patel Dental College and Hospital, Visnagar.Patients having history of convulsions, patients that are medically compromised and patients not requiring local anesthesia for the dental procedure were excluded from the study. Then the patients were explained regarding the study and only after signing the written consent, after which the patient's heart rate, SpO_2(oxygen saturation) were measured with pulse oximeter and blood pressure with sphygmomanometer before administration of local anesthesia and the values were recorded.The patients were administered local infiltration anesthesia or inferior alveolar nerve block was given to the patient according to the tooth being treated.Then after the administration of local anesthesia the values were recorded again. Differences in the readings were recorded for each patient and were sent for statistical analysis.

Results

In our study, [Table- 1]the distribution of study subjects based on hemodynamic changes 3 min before administration of LA. Among 110 study subjects, the mean systolic blood pressure before administration of LA was 124.17, mean diastolic blood pressure was 79.66, mean heart rate was 73.27 and mean partial pressure of oxygen was 97.93.

Table 1: Distribution of study subjects based on hemodynamic changes 3 min before administration of local anesthesia.

Hemodynamic changes	N	Mean	SD
Systolic blood pressure	110	124.17	5.04
Diastolic blood pressure	110	79.66	4.17
Heart Rate	110	73.27	3.56
Partial pressure of oxygen	110	97.93	1.02

SD – standard deviation

Table-2 shows distribution of study subjects based on hemodynamic changes 3 min after administration of LA. Among 110 study subjects, the mean systolic blood pressure before administration of LA was 126.56, mean diastolic blood pressure was 79.46, mean heart rate was 75.87 and mean partial pressure of oxygen was 97.10.

Table 2: Distribution of study subjects based on hemodynamic changes 3 min after administration of local anesthesia.

Hemodynamic changes	N	Mean	SD
Systolic blood pressure	110	126.56	5.26
Diastolic blood pressure	110	79.46	3.76
Heart Rate	110	75.87	3.93
Partial pressure of oxygen	110	97.10	8.82

SD- standard deviation

Table-3 shows distribution of study subjects based on hemodynamic changes 3 min before and after administration of LA. Among 110 study subjects, the mean difference in systolic blood pressure before and after administration of LA was -2.39. Statistically, significant difference was observed in mean systolic blood pressure before and after administration of LA. Mean difference in diastolic blood pressure before and after administration of LA was 0.20.

Table 3: Distribution of study subjects based on hemodynamic changes 3 min before and after administration of local anesthesia.

Hemodynamic changes	N	Mean difference	SD	P value
Systolic blood pressure	110	-2.39	2.34	≤0.05*
Diastolic blood pressure	110	0.20	1.42	> 0.05**
Heart Rate	110	-2.60	2.48	≤0.05*
Partial pressure of oxygen	110	0.82	8.62	> 0.05**

Level of significance ≤ 0.05, * significant result, ** Non-Significant result

Statistically, no significant difference was observed in mean diastolic blood pressure before and after administration of LA. Mean difference in heart rate before and after administration of LA was -2.60. Statistically, significant difference was observed in heart rate before and after administration of LA. Mean difference in partial pressure of oxygen before and after administration of LA was 0.82. Statistically, no significant difference was observed in partial pressure of oxygen before and after administration of LA.

Discussion

The aim of this study was to see how epinephrine concentrations affected blood pressure, heart rate, and oxygen saturation in normal patients who needed basic endodontic care. These parameters were measured at 3-minute intervals since epinephrine has the greatest effect 3 minutes after injection.

The treatment that the tooth requires is a factor that influences the effectiveness of local anaesthesia. It has been documented that providing pain-free pulp extraction is more difficult than tooth extraction. A research conducted by Mohammad D. Kana 19 supports the finding because the extirpation community endured more discomfort during treatment. One thing to keep in mind is that all patients who chose tooth extraction received an additional palatal infiltration of lidocaine. Supplemental techniques, such as the administration of various local anaesthetic solutions or medications, can improve efficacy in patients with irreversible pulpitis. [4]

Aspiration is needed prior to injection of local anaesthesia to prevent intravascular injection, which is responsible for significant differences in hemodynamic changes. Positive aspiration occurs as a strong stream of blood rises through the cartridge and mixes with the anaesthetic solution. Aspiration was performed prior to the injection of the local anaesthesia in this study.[5]

Epinephrine is usually released at a basal rate of 2.5 to 7.5 ng/kg per minute from the adrenal medulla. During times

of extreme stress, however, the rate of release will increase by a factor of 20 to 40. According to the researchers, plasma epinephrine concentrations associated with the exogenous administration of 20 Kg of epinephrine (2 mL of 4 percent articaine with epinephrine 1:100,000) will increase as much as 3-fold above baseline levels within 7 minutes of administration. Exogenous epinephrine in approximately 1 or 2 dental cartridges of a dental anaesthetic containing epinephrine 1:100,000 (18Y36 Kg) has been shown to raise plasma epinephrine levels to the physiological activities of public speaking and exercises. Researchers discovered that by administering the maximum dose of local anaesthetic (approximately 18 mL of 1:100,000 epinephrine), plasma epinephrine will reach levels comparable to those observed during strenuous exercise, which is not suitable for medically impaired subjects. Furthermore, unintentional intravascular injection can result in even higher plasma epinephrine concentrations.According to some writers, this suggests that an important aspect of patient stress causes the release of a significant amount of endogenous catecholamines, which may be responsible for the minor hemodynamic variations found rather than the epinephrine commonly associated with the local anaesthetic solution used. [6]

Multiple studies have tested the impact of local anaesthetics on hemodynamic parameters, according to a review of the literature. After injection, there was a substantial rise in systolic blood pressure, according to our findings. Furthermore, we found that diastolic blood pressure dropped after the local anaesthetic injection. Three minutes after a local anaesthetic injection, the mean heart rate increased dramatically. The heart rates decreased 3 minutes after injection. Whereas, the mean oxygen saturation (SpO2) decreased 3 minutes after local anaesthetic injection.[7]

Small therapeutic amounts of epinephrine-containing dental local anaesthetics seem to have acute cardiovascular effects in healthy people. A 1.8 mL injection of 2% lidocaine plus 1:100,000 epinephrine (0.018 mg epinephrine) increased heart rate by around two beats per minute for two minutes in healthy volunteers. A single cartridge of lidocaine plus 1:100,000 epinephrine (0.018 mg epinephrine) has been shown to increase heart rate slightly, by around five beats per minute, but only for 10 minutes in patients undergoing restorative dental procedures. 33 Similarly, in healthy volunteers, 3.6 mL of 2% lidocaine plus 1:80,000 epinephrine (0.045 mg epin) was administered.[7]

The discrepancy between the studies may be due to the varying quantities of local anaesthetics used. We used 3.6 mL of local anaesthesia and L80, which contained 0.045 mg of epinephrine. In the other trials, 2.7 ml of local anaesthesia containing 0.027 mg or 0.0135 mg of epinephrine was used. Kämmerer PW et al. have used just 1.7 ml of local anaesthesia. Small amounts of epinephrine seem to have acute cardiovascular effects in healthy people. However, the epinephrine quantities used in our study, or greater volumes used by Hersh EV et al., which provided (0.119 mg or 0.0595) mg of epinephrine, most likely caused further enhancement of alpha and beta1-adrenergic receptors, which led to the difference in hemodynamic changes.[8]

According to our findings, there was no substantial difference in diastolic blood pressure, heart rate, or oxygen saturation before and after anaesthesia or extraction. However, there was some evidence of a rise in systolic blood pressure.

Conclusion

This study highlighted the importance of understanding the magnitude of patients' fear of injection for dentists to broaden their awareness of the relationship of fear of dental needles for the effect on treatment results and patients' reluctance to intervene. The evaluation of hemodynamic parameters is also critical in understanding the essence and degree of the patient's needle phobia.

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