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Effects of local anesthesia with adrenaline on blood pressure and pulse rate of healthy and hypertensive patients undergoing tooth extraction

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ABSTRACT

Background

Local anesthesia (LA) is the most common form of anesthesia that is used in most dental procedures. It is almost unavoidable in many dental treatments. Lidocaine is usually used with epinephrine in a single cartridge. Epinephrine is added to lidocaine to reduce toxicity, prolong duration of anesthesia and control bleeding. A common belief in medicine, dentistry and even among the patients is that the use of epinephrine is contraindicated in cardiovascular patients as epinephrine suddenly raises the blood pressure (BP) and heart rate (HR).

Objective

The aim of this research is to study the effects of Local Anaesthesia containing adrenaline (vasoconstrictor) on Blood pressure and pulse rate in hypertensive patients and to ascertain the safety of using Local Anaesthesia with adrenaline in such patients.

Design

A prospective cross sectional study to analyze the effects of Local Anaesthesia containing adrenaline (vasoconstrictor) on Blood pressure and pulse rate in hypertensive patients

Duration

October 2016 to December 2017.

Setting

Osmania General Hospital, Hyderabad.

Participants

The study was conducted on 200 patients who underwent dental extraction at Osmania General Hospital, Hyderabad.

Methods

Out of 200 patients, 100 patients were normotensive patients with systolic blood pressure of <120 mm of Hg and diastolic blood pressure of < 80 mm of Hg and remaining 100 patients were Hypertensive patients out of which 50 patients had Stage I Hypertension (SBP 140 – 159 mm of Hg & DBP 90 – 99 mm of Hg) and 50 patients had Stage

II Hypertension (SBP >160 mm Hg & DBP >100 mm Hg). All patients were given Inferior Alveolar Nerve Block followed by Lingual & Long Buccal Nerve Blocks with 2% Lignocaine with 1:2, 00,000 Adrenaline. The Blood pressure and pulse rate were recorded 6 times.

Results

All patients showed a considerable increase in Systolic and Diastolic BP recorded at 2 minutes but gradually showed a reduction until 60 minutes post-operatively. The pulse rate also demonstrated a sudden increase followed by gradual reduction to preoperative level.

Conclusion

All patients demonstrated a considerable increase in blood pressure and pulse rate but not significantly which may be attributed to stress induced due to dental extraction.

Keywords: Local Anesthesia, Adrenaline, Hemodynamic Changes, Blood Pressure, Pulse Rate.

INTRODUCTION

The first important task for a dentist or maxillofacial surgeon is to allow a patient to be comfortable and pain-free during minor surgical procedures and various other dental procedures under local anesthetics is an essential part of the dentistry. The most commonly used block is inferior alveolar nerve block, and a local anesthetic solution is lignocaine with adrenaline for mandibular teeth extraction. Addition of epinephrine to lidocaine reduces the local blood flow, resulting in vasoconstriction, and rapid onset and increased duration of action, by decreasing systemic absorption of lidocaine. The provision of a clear operative field due to reduced bleeding at the operating site is another beneficial effect of using vasoconstrictors. However, unfavorable hemodynamic changes such as tachycardia, increased blood pressure (BP), and cardiac contraction force can be observed due to systemic absorption of exogenous epinephrine in the local anesthetic, especially in subjects with hypertension. Low concentration of epinephrine is preferred in patients for whom it may be desirable to limit the epinephrine burden, such as those with cardiovascular diseases. When lignocaine and adrenaline are used in combination, they prevent pain transmission passing from the area of injection to the brain and so it numbs the surgical area. The numbness will constantly wear off following the surgical procedure under local anesthesia. The objective of this study was to evaluate and compare the changes in blood pressure and pulse rate in normotensive and hypertensive patients undergoing dental extraction using 2% Lignocaine Hydrochloride with 1:2,00,000 Adrenaline.

MATERIALS AND METHODS

The study was conducted on 200 patients who underwent dental extraction at Osmania General Hospital. The patients were divided into three groups based upon their medical history and Blood pressure recordings in the outpatient department: Group I - 50 Normotensive patients (BP < 120/80 mm of Hg); Group II - 25 patients with Stage I Hypertension (BP 140-159/90-99 mm of Hg); Group III - 25 patients with Stage II Hypertension (BP >160/100 mm of Hg). All the patients were explained and written informed consent were obtained. Preoperative antibiotics and analgesics were prescribed and patients were advised to start the night before dental extraction. The procedures were performed in morning sessions without any preoperative anxiolytics. On the day of extraction, the patients were made to sit in a calm waiting room. BP and pulse rate were recorded using a Multi-para Monitor twice: immediately after reporting and after 15 min of reporting; the lowest of both the readings was considered as baseline BP and pulse rate. All the patients were given Inferior Alveolar Nerve Block with Lingual Nerve Block and Long buccal nerve block using 4 ml of 2% Lignocaine Hydrochloride with 1:200000 Adrenaline. The patients were made to sit in dental chair and Blood pressure and pulse rate were recorded immediately before Injection of LA, 2 minutes after Injection, 5 minutes after injection, 30 minutes after injection, 60 minutes after injection.

OBSERVATIONS AND RESULTS

Out of 200 patients, the mean ages for normotensive patients, Stage I Hypertensive and Stage II hypertensive patients was 30 ± 3.33 ; 40.34 ± 4.31 and 53.87 ± 4.00 years respectively.

Table 1. Mean Blood Pressure (\pm SD) and Pulse Rate of Normotensive Subjects Before And After Extraction Using 2% Lidocaine With 1:2, 00, 000 Adrenaline

Parameter	Baseline BP and Pulse Rate	Before Injection of LA with Adrenaline	2 Minutes After Injection	5 Minutes After Injection	10 Minutes After Injection	30 Minutes After Injection
Systolic BP	106.22 \pm 2.99	109.22 \pm 4.11	114.07 \pm 3.31	114.07 \pm 3.31	110.67 \pm 3.98	107.88 \pm 3.09
Diastolic BP	71.98 \pm 3.77	74.66 \pm 3.33	76.82 \pm 2.89	75.49 \pm 3.06	75.49 \pm 3.23	71.44 \pm 3.85
Pulse Rate	70.54 \pm 5.87	71.87 \pm 5.34	73.22 \pm 5.00	74.98 \pm 4.77	74.09 \pm 4.32	69.32 \pm 5.99

Table 2. Mean Blood Pressure (\pm SD) And Pulse Rate Of Stage – I Hypertensive Subjects Before And After Extraction Using 2% Lidocaine With 1:2, 00, 000 Adrenaline

Parameter	Baseline BP and Pulse Rate	Before Injection of LA with Adrenaline	2 Minutes After Injection	5 Minutes After Injection	10 Minutes After Injection	30 Minutes After Injection
Systolic BP	147.67 \pm 5.67	149.57 \pm 5.34	152.88 \pm 6.11	152.88 \pm 6.11	151.78 \pm 5.00	148.32 \pm 5.91
Diastolic BP	90.76 \pm 1.99	92.06 \pm 1.13	93.67 \pm 2.39	93.67 \pm 2.39	93.04 \pm 2.76	91.55 \pm 1.78
Pulse Rate	88.01 \pm 3.87	89.03 \pm 3.66	92.43 \pm 2.09	92.78 \pm 2.56	92.78 \pm 2.56	88.39 \pm 3.88

Table 3. Mean Blood Pressure (\pm SD) And Pulse Rate Of Stage – II Hypertensive Subjects Before And After Extraction Using 2% Lidocaine With 1:2, 00, 000 Adrenaline

Parameter	Baseline BP and Pulse Rate	Before Injection of LA with Adrenaline	2 Minutes After Injection	5 Minutes After Injection	10 Minutes After Injection	30 Minutes After Injection
Systolic BP	163.91 \pm 4.00	164.68 \pm 3.65	166.87 \pm 3.21	167.39 \pm 4.06	167.03 \pm 3.50	165.99 \pm 4.77
Diastolic BP	95.55 \pm 2.78	102.77 \pm 1.01	95.61 \pm 2.88	95.61 \pm 2.88	95.69 \pm 2.97	95.89 \pm 2.99
Pulse Rate	84.79 \pm 4.09	86.76 \pm 3.98	90.80 \pm 2.98	89.56 \pm 3.91	88.34 \pm 3.09	84.37 \pm 4.05

All the patients showed an elevation in blood pressure by 3-4 mm of Hg and mean pulse rate of 1-2 beats from baseline to immediately before injection, followed by elevation 4-5 mm of Hg 2 min after injection and 5 min after injection and gradually shown a fall after 30 min and 60 min after injection.

DISCUSSION

The aim of this research is to study the effects of Local Anaesthesia containing adrenaline (vasoconstrictor) on Blood pressure and pulse rate in hypertensive patients and to ascertain the safety of using Local Anaesthesia with adrenaline in such patients. 200 patients were included in the study, out of which, 100 patients were normotensive patients with systolic blood pressure of <120 mm of Hg and diastolic blood pressure of < 80 mm of Hg and remaining 100 patients were Hypertensive patients out of which 50 patients had Stage I Hypertension (SBP 140 – 159 mm of Hg & DBP 90 – 99 mm of Hg) and 50 patients had Stage II Hypertension (SBP

>160 mm Hg & DBP >100 mm Hg). All patients were given Inferior Alveolar Nerve Block followed by Lingual & Long Buccal Nerve Blocks with 2% Lignocaine with 1:2, 00,000 Adrenaline. The Blood pressure and pulse rate were recorded 6 times. All patients showed a considerable increase in Systolic and Diastolic BP recorded at 2 minutes but gradually showed a reduction until 60 minutes post-operatively. The pulse rate also demonstrated a sudden increase followed by gradual reduction to preoperative level. In a similar study, it was concluded that dental surgery using local anaesthesia caused significant increases in systolic blood pressure and pulse rate, and the increase in systolic blood pressure was greater in the middle-aged and the older patients. Factors other than the sympathetic input to the heart contribute to the increase in blood pressure during dental surgery. In a similar study, it was concluded that within the limitations of the study, a decrease in SBP was observed with use of two 1.8ml cartridges of lignocaine with 1:100000 epinephrine in patients

suffering from stage 2 hypertension. This decrease was not associated with adverse effects when observed changes in BP and PR noted among the patients of this study. Cardiovascular disadvantages attributed to the use of epinephrine in hypertensive patients are negligible compared to their benefits. Painful extraction in a hypertensive patient can result in increased stress which in turn can lead to over production of endogenous epinephrine by the body which could be dangerous for the patients.

CONCLUSIONS

All patients demonstrated a considerable increase in blood pressure and pulse rate but not significantly which may be attributed to stress induced due to dental extraction. To conclude, local anaesthesia containing vasoconstrictor can be safely used in both normotensive and hypertensive patients.

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