ORIGINAL ARTICLE

SYSTEMIC EFFECTS OF LOCAL ANAESTHESIA IN HYPERTENSIVE PATIENTS

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ABSTRACT

The aim of this study was to review the literature to assess any scientific basis for the limited use of dental anesthesia with a vasoconstrictor agent in hypertensive patients. This stratified randomized control study was carried out at the department of Oral and Maxillofacial Surgery in Baqai Dental College, Karachi from August 2014 to January 2015. The total numbers of patients were 75; age range from 25 to 70 years. The patients were characterized by the JNC-8 report for hypertension patients i.e. normotensive with <120/180mmHg and hypertensive with >140/90mmHg. Patients were clinically evaluated and were divided into three groups, each groups comprises of 25 patients. Group A: Hypertensive patients who were administered 2% lignocaine. Group B: Hypertensive patients administered 2% lignocaine with epinephrine 1:100,000 and Group C: Normotensive patients who were administered 2% lignocaine with epinephrine 1:100,000. The mean age of the study sample was 46.62±13.81. These three groups were further stratified into three categories on the basis of age i.e. young patients' age 25 to 35 years, middle age 36-55 years and old age 56-70 years respectively, to check the relation of hypertension with age. The mean B.P increased in all groups after two minutes of administration, which maintained even after 5 minutes of administration, while after extraction it returned to the observed baseline values in each group. When including age as a co-variable in the multivariate analysis, no statistically significant differences was observed between groups and did not show any adverse effects of epinephrine.

Key Words: *Hypertensive, normotensive, oral surgery, epinephrine, pulse rate.*

INTRODUCTION

The utilization of local anesthesia with vasoconstrictor is a common clinical practice in dentistry. The effects of vasoconstrictor in hypertension vary from patient to patient. According to the literature, it has a potential to cause serious effects in patients who suffer from persistent hypertension and is contraindicated in such patients. As far as routine dental clinical practice is concerned, the treatment protocol for hypertensive patients is not much followed in controlled hypertension.

Vasoconstrictor agents have benefits like delaying the absorption of local anesthesia toxicity; they increase the depth and duration of local anesthesia and provide homeostasis.[1] Despite all these, they have limited dose of systemic absorption and initiate the side effects in hypertensive patients, until used in safe dosage.[2] The frequent increase in the number of patients in OPD with hypertension and the use of local anesthesia with vasoconstrictor agents in patients raise concerns about the elevation of B.P. If a practitioner considers pharmacologic effects of infiltrated substances have, it is obvious that the specialist must know and control the situation thoroughly. This situation may worsen if proper protocols are not followed. Epinephrine reinforces the effect of local anesthetics by increasing the duration and depth of analgesia[3] and is regularly incorporated for infiltration in most commercial preparations because it aids in homeostasis.[4,5] Epitome of vasoconstrictor decreases the systematic toxicity of L.A and after infiltration decreases the release of local

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anesthetics to blood circulation.[6] B.P and heart rate,[7] arrhythmia,[8] myocardial ischemia,[9,10] increase of endogenous catecholamine,[10] and hypokalemia[11] were raised after administration of L.A containing epinephrine noted in previous studies. The morbidity and mortality rate rose with the increase of epinephrine dose.[12] This is important for patients with cardiovascular disease. Recent studies show that epinephrine associated with L.A has a safety range.[13]

According to American Heart Association (AHA) and American Dental Association (ADA) guidelines, there is no contraindication to using a vasoconstrictor agent when administrated carefully and with preliminary aspiration. The maximum dose of epinephrine in local anaesthesia for a healthy subject is 0.2 mg, though this can be lowered to 0.04 mg if patient has severe cardiovascular disease (ASA III and IV).[14] Therefore, the aim of this study was to review the literature to assess any scientific basis for the limited use of dental anaesthesia with a vasoconstrictor agent in hypertensive patients.

METHODOLOGY

The total numbers of patients were 75; age ranged from 25 to 70; the patients were clinically evaluated from August 2014 to January 2015 at the Oral Surgery and Maxillofacial Department of Baqai Dental College, Baqai Medical University, Karachi, Pakistan. The department averagely treats 45 patients per day, complaining of a variety of dental problems. The patients were characterized by the JNC-8 report for hypertension patients i.e. normotensive with <120/80mmHg and hypertensive with >140/90 mmHg.[15] According to the report patients were divided into controlled group (i.e., patients with normal range of B.P: systolic 120 mmHg and diastolic 80 mmHg), hypertensive patients administered lignocaine with epinephrine, and hypertensive patients administered only lignocaine. Both male and female patients of hypertension and normotensive seeking dental department for extraction. Patients who were taking beta blockers were excluded in the study as these are shown to interact with epinephrine.[16] Patients with any other cardiovascular disease or any serious illness were also excluded from study and patients who had not taken their daily prescribed medicine and patients having systolic pressure greater than 150mmHg and diastolic with increased 95mmHg were not treated to prevent any future medical emergencies.[17,18] Firstly, informed consent was taken from the patients. All the subjects were pre-informed about the risks and benefits involved with procedure. Stratified random sampling was done and categorized into three groups, each category comprising 25 subjects:

Group A: Hypertensive patients administered lignocaine,

Group B: Hypertensive patients administered lignocaine with epinephrine 1:100,000,

Group C: Normotensive patients administered lignocaine with epinephrine 1:100,000.

Data was collect under the supervision of an oral and maxillofacial surgeon. All patients went through the same procedure of evaluation; the record sheet and consent were signed before the procedure. The two cartridges of L.A injection containing 2% lignocaine with 1:100,000 epinephrine were used in group B and group C, while group A was evaluated by plain cartridge of 2% lignocaine. B.P and P.R were recorded as risk indicators, which were measured four times for the patient: First at rest position on a dental chair, second immediately after injection, third after 5 minutes of injection, and fourth 15 minutes after extraction. The B.P was measured by a sphygmomanometer, and the P.R was measured by principle method of the manual palpation of the radial artery. The above three groups were further stratified on basis of age to check the relation of hypertension with age, which was group into three categories young patients with age of 25 to 35 years, followed middle age of 36-55 years, and old age 56-70 years respectively. The chart 1 defined the division of patients in relation to age.

RESULTS

For details see Tables 1-4. The mean age of this study sample was group A: 42.96 ± 14.45, group B: 45.20 ± 14.80, and group C: 51.72 ± 10.84. When including age as a co-variable in the multivariate analysis, no statistically significant difference was observed between groups. The mean B.P raised in all three groups after

TABLE 1: GROUP A: HYPERTENSIVE PATIENTS ADMINISTERED ONLY 2% LIGNOCAINE

Group A	At rest	2 minutes after injection	5 minutes after injection	After extraction
Systolic BP	135.40 ±6.44	142.20 ±3.55	141.80 ±6.10	138.20 ±6.59
Diastolic BP	84.80 ±4.89	89.80 ±6.84	88.60 ±6.04	87.40 ±7.23
Pulse rate	84.64 ±8.09	92.08 ±9.11	89.84 ±8.19	88.12 ±7.33

TABLE 2: GROUP B: HYPERTENSIVE PATIENTS ADMINISTERED 2% LIGNOCAINE WITH EPINEPHRINE 1:00,000W

Group B	At rest	2 minutes after injection	5 minutes after injection	After extraction
Systolic BP	141.60±10.67	144.80±8.35	142.20±9.58	136.80±6.27
Diastolic BP	83.60±4.89	89.00±7.21	87.00±4.56	80.40±8.15
Pulse rate	86.72±10.93	95.88±13.48	94.44±11.87	87.40±5.68

TABLE 3: GROUP C: CONTROL GROUP OR NORMOTENSIVE PATIENTS ADMINISTERED 2% LIGNOCAINE WITH EPINEPHRINE 1:100,000

Group C	At rest	2 minutes after injection	5 minutes after injection	After extraction
Systolic BP	112.40±8.30	119.00±3.53	117.00±4.78	115.40±4.06
Diastolic BP	79.00±3.22	86.40±5.86	83.40 ±4.01	81.80±4.30
Pulse rate	81.20±6.62	83.88±6.51	82.56±5.50	81.36±3.62

TABLE 4: DIVISION OF AGE ACCORDING TO STUDY GROUP

Type of study group	Young patients (25-35 years)	Middle age patients (36-55 years)	Old patients (56-70 years)	Total	Mean B.P
Group A	9	16	0	25	131.47± 14.09/83.70±8.49
Group B	0	4	21	25	143.83± 8.57/86.8.10±4.06
Group C	0	7	18	25	136.22± 28.18/84.7.44±1.90

2 minutes of administration, which maintained even after 5 minutes of administration, while after extraction it comes back to baseline degree, which was observed in each group. The mean pulse rate was also increased by 3 to 4 beats after 2 minutes of administration and then decreased after 5 minutes in all groups. As both clinical and statistical results were significant, no risk changes were observed.

DISCUSSION

The main aim of this study was to assess the changes in the B.P and P.R of diagnosed hypertensive patients before, during, and after dental extraction under local anesthesia containing epinephrine in comparison with the control group; the mean B.P raised in all groups after 2 minutes of administration, which maintained even after 5 minutes of administration, while after extraction it returned to the baseline value, which was observed in each group. All the procedure was carried out with the permission of the Ethical Committee of the university. Therefore, we concluded that statistically no notable changes were seen clinically in this study while decrease in blood pressure in group B was not associated with any adverse effects of epinephrine. The local anesthetic containing adrenaline is most widely used in dental practice. Epinephrine stimulates the constriction of the blood vessels in the mucosa and skin, which favors latent period and reduces the dissemination of the local anesthetic due to the action of alpha-adrenergic receptors, but the beta 1-adrenergic receptors of adrenaline, will raise the heart rate and the beta 2-adrenergic receptors will cause vasodilation of internal organs and muscles. There are few reports that relate the use of major hypertensive and nonselective beta-adrenergic blocking agents may interact with administered epinephrine infusions.[19] Yoshito Nakumara et al found that a patient with hypertension undergoing tooth extractions has a risk of increased B.P than normotensive patients after injecting the 2% lidocaine with 1:80,000 epinephrine. It has also been observed that mean systolic B.P showed changes throughout the procedure on other hand mean diastolic B.P remains constant in comparison with preoperative readings.[20]

In Nigerian study, no hemodynamic changes has been observed in hypertensive patients on administration of L.A with epinephrine and without epinephrine.[21] hypertensive patients are considered more prone to risk when administering dental local anesthesia containing a vasoconstrictor because of the possible sudden increase in B.P could lead to life-threatening situation.[22] The limited outcome parameters and small sample size are

the limitation of this clinical study; however to the best of our knowledge, this is one of the very few clinical trials conducted on the local population in Pakistan to observe the effects of local anesthesia on controlled hypertensive patients. In this study, there were no significant changes in the systolic blood pressure and the diastolic blood pressure in hypertensive patients from rest till 5 minutes after administering lignocaine. As compared to the study research undertaken in the Lahore local population, there was a significant fall observed in the systolic blood pressure and diastolic blood pressure before injecting lignocaine till 5 minutes after the administration of lignocaine.[23] The results were statically significant. From 2002 to till the all relevant studies reported an increased systolic blood pressure of average 4 mmHg in hypertensive patients which received dental surgery under L.A with 1:100,000 epinephrine.

There was no significant difference in the controlled group of this study from rest till the extraction of the tooth except for the pulse rate, which fell 6 ppm after extraction. The study group in which the hypertensive patients were given lignocaine without epinephrine also showed no difference in the systolic blood pressure, diastolic blood pressure, and pulse rate from rest till after extraction of the tooth. Noticeable fall in systolic blood pressure has also been observed after dental local anesthesia in normal individuals.

A West Indian study reported 20% decrement in systolic blood pressure after injecting lignocaine along with 0.06 mg epinephrine during periodontal surgery.[24]

Undesirable effects of epinephrine on cardiovascular system are minimal as compared to their benefits. Painful dental extraction can result in increased stress in hypertensive patients, which in turn can lead to overproduction of adrenaline by the body. This could prove far more dangerous for such patients. The existing investigation provides evidence that the test dose (2 cartridges) of 2% lignocaine with 1:100,000 epinephrine as a dental local anesthetic solution is not likely to decreases or increase systolic/diastolic blood pressure in hypertensive patients.

CONCLUSIONS

We conclude that no significant changes were observed clinically and statistically in our study, as results did not bring any changes in controlled hypertensive patients who were administered only 2% lignocaine for tooth extraction, with group of controlled hypertensive patients administered 2% lignocaine with epinephrine. However, no hemodynamic changes were found in the blood pressure and pulse rate of patients of both groups, which shows that no harmful effect on blood pressure and pulse rate occurred with the use of two cartridges of local anesthesia with epinephrine. There were no significant changes between normotensive and hypertensive patients using two cartridges of local anesthesia conjugation with epinephrine. Whether there was slight decrease in blood pressure in group B after extraction is not associated with any adverse effects of epinephrine.

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4 Aqib Muhammad Shafi:	Formulation of tables and interpretation of data.
5 Umaima Heyat:	Compilation of write up drafting of data and provided substantial help in various aspects.
6 Muhammad Imran Khan:	Analysis and interpretation of data.