

# Effect of Anesthetics Containing Lidocaine and Epinephrine on Cardiovascular Changes During Dental Surgical Procedure

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## Abstract

The purpose of this study was to evaluate cardiovascular changes during dental surgery using 2% lidocaine with 1:80 000 epinephrine. Eleven normotensive subjects, ranging from 18 to 56 years, were selected to undergo dental surgery in the jaw. They were monitored in the pre-, intra-, and postsurgical periods by continuous noninvasive automatic arterial pressure and cardiac frequency measurements taken every 2 minutes. Parameter scores were obtained for the following phases: P1, 15 minutes during preparation of the patient (control period); P2, before anesthesia; P3, immediately after anesthesia; P4, 2 minutes into anesthesia; P5, during incision and detachment; P6,. Individualized statistical analysis for each group during the pre-, intra-, and postoperative periods were performed by analysis of variance. The greatest variations in systolic pressure were increases of 2.29% during phase P2 and 2.59% in phase P5. Diastolic pressure decreased during phase P6 (2.58%) and increased in P6 (3.27%). The greatest changes in heart rate In normotensive subjects anesthetized with 2% lidocaine with epinephrine 1:80 000.

## Key Words:

Cardiovascular changes, dental surgery, epinephrine, lidocaine, stress

## INTRODUCTION

Many subjects feel anxiety and stress during dental treatment. Professionals are always concerned about not creating stressful conditions during treatment, especially during dental surgery. Although it is believed that pain from dental procedures is controlled through local anesthesia, the psychologic stress originating from the clinical environment, discomfort of injections, and resulting discomfort of oral tissue manipulation, associated with fear, may produce varying levels of cardiocirculatory changes that are not clinically detectable.<sup>1-5</sup> The anxiety experienced during a visit to the dentist may cause a series of symptoms, ranging from parasympathetic activity with bradycardia<sup>6,7</sup> and/or syncope to cardiac arrhythmias.<sup>8</sup> Healthy

subjects are usually able to tolerate the physical responses to stress; however, hypertensive or cardiac patients, those with cerebrovascular diseases, or elderly subjects may suffer changes in their homeostatic mechanisms, and such changes could represent threats to their health.<sup>9</sup> The correct use of anesthetic techniques may greatly aid control of the subject's anxiety; the technique involving a slow injection and certain maneuvers, such as distension and traction of the mucosa at the moment of the injection, may help make the procedure painless. On the other hand, the choice of the local anesthetic and the choice of the most suitable base and vasoconstrictor for a given patient and for a given procedure, such as the anesthetic depth, duration, or hemostasis,

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seems to be a simple task, but it demands that the professional has a sound knowledge of anesthetic properties, indications, and contraindications.

Lidocaine with epinephrine is the most common local anesthetic agent used for dental surgeries. It is known that the greater the concentration of epinephrine, the better will be the hemostatic effect, but the greater will be the risk of cardiocirculatory changes. Several studies have shown that an epinephrine concentration of 1:50 000 is deemed high and demands an accurate indication and thorough control of the dose to limit its beta-adrenergic effects.<sup>4,5</sup> Two percent lidocaine with 1:80 000 epinephrine is currently available on the Brazilian market. This association may be a good option for minor surgery in healthy subjects who require hemostasis control with low doses of anesthetic and vasoconstrictor. Therefore, the purpose of this study was to assess the influence of the use of 2% lidocaine with 1:80 000 epinephrine on cardiocirculatory parameters, systolic and diastolic blood pressure as well as mean arterial pressure and heart rate, through noninvasive monitoring during dental surgery.

#### **MATERIALS AND METHODS**

Subject population were healthy, normotensive, medication-free subjects of both sexes, with ages ranging from 20 to 60 years, who were undergone minor dental surgery in the jaws, were enrolled in this study. All subjects received instructions on the study procedures, contained in the information letter for obtaining informed consent. Diabetic, immunocompromised, hypertensive, pregnant, and nursing subjects and smokers were excluded from this study. Cardiocirculatory parameters, such as arterial blood pressure (systolic and diastolic blood pressures) were assessed by automatic noninvasive blood pressure monitoring by the oscillometric method and heart rate by the photoplethymographic method programmed to record every 2 minutes during the pre-, trans-, and postoperative periods. These parameters were analyzed to assess the degree of stress perceived by the subjects during dental surgery. The aim was to verify the safety of the chosen local anesthetic by checking for cardiocirculatory changes immediately after injection as a consequence of exogenous epinephrine administration and

to assess the magnitude of these changes. The aspiration procedure was used in all subjects to avoid anesthetic injection into the vasculature, and care was taken to inject it as painlessly as possible. At the end of the operation the number of tubes used to complete the surgery was computed. No sedation agents were used in any surgery. Hundred healthy, normotensive, medication-free subject. of both sexes, with ages ranging from 20 to 60 years, who were undergone dental minor surgery were enrolled in this study. The study period is 15month(1<sup>st</sup> January 2012 to 31<sup>st</sup> March 2013) Total number of cases is 100 cases. Study done in the of dept.of OMFS,Nepal medical College & Himal Dental Hospital, Kathmandu.

#### **Study protocol:**

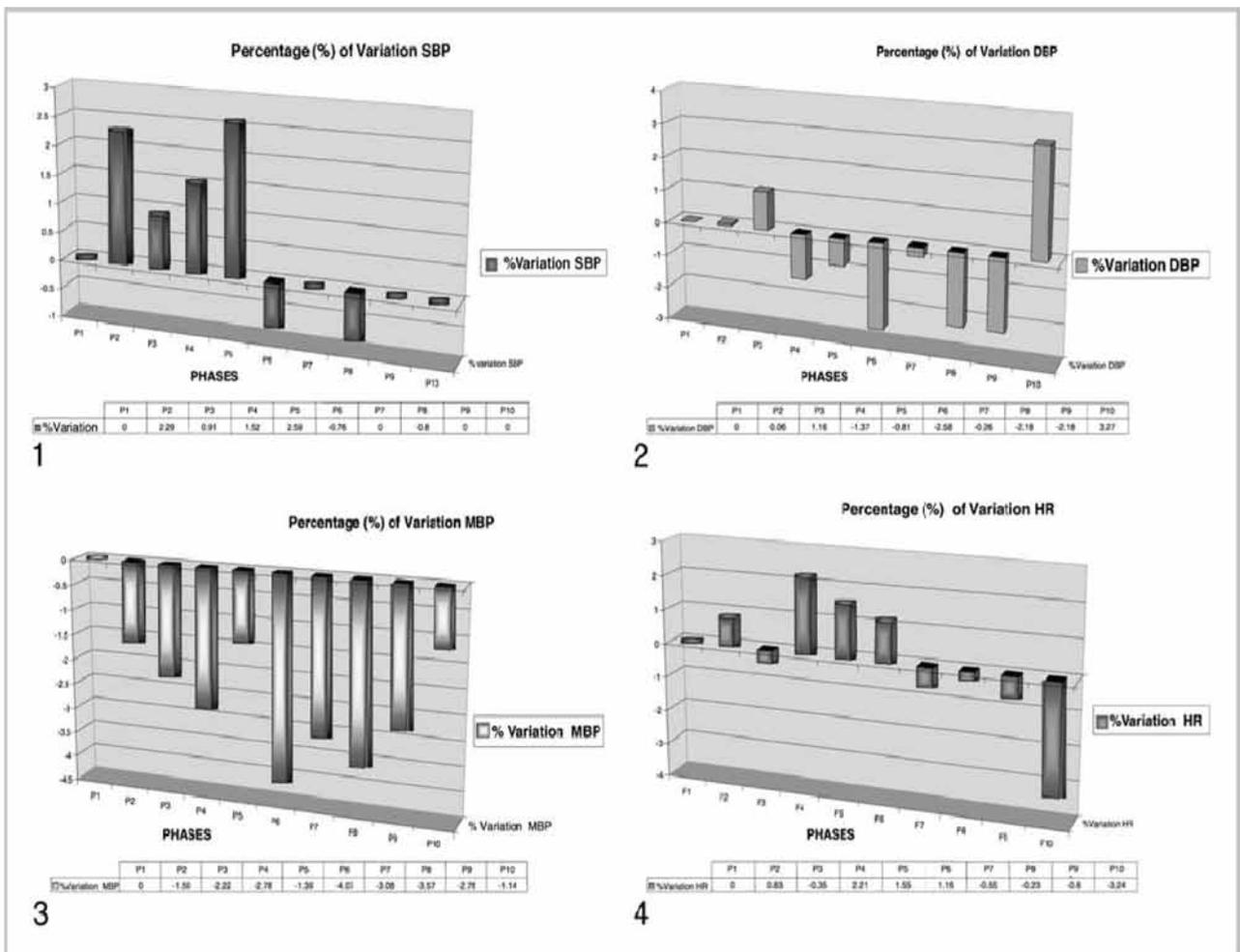
The left arms of the subjects were placed parallel to the body, and the arterial pressure measuring cuff was aligned with the heart so that the noninvasive pressure monitor would work perfectly. The plethysmograph was placed firmly over the index finger of the right hand. After the subject was prepared, the appliance was automatically calibrated by allowing it to record for 15 minutes, a sufficient length of time to stabilize parameters and determine a scale of baseline values (baseline period) for systolic, diastolic, and mean arterial pressures, in mm Hg, and cardiac frequency, in beats per minute, in each subject. The surgeries were carried out with continuous monitoring of arterial pressure, cardiac frequency, and oximetry from the time the subject was being prepared until 10 minutes after the end of the procedure. Cardiovascular parameters were assessed at the following stages: P1, immediately after subject preparation (15 minutes; baseline period); P2, before anesthesia (2 minutes); P3, immediately after anesthesia; P4, 2 minutes after anesthesia; P5, during incision and flap elevation; P6, during surgical site preparation; P7, during implant placement; P8, during suturing; P9, on anesthesia; P5, during incision and flap elevation; P6, during surgical site preparation; P7, during implant placement; P8, during suturing; P9, on completing the procedure; and P10, 10 minutes after the end of the surgery. The data obtained in the first 15 minutes before anesthesia (baseline period) were used as a control in relation to the

parameter in subsequent phases. Individualized analyses of each anesthesia; P5, during incision and flap elevation; P6, during surgical site preparation; P7, during implant placement; P8, during suturing; P9, on completing the procedure; and P10, 10 minutes after the end of the surgery. The data obtained in the first 15 minutes before anesthesia (baseline period) were used as a control in relation to the parameter in subsequent phases. Individualized analyses of each group in the pre-, intra-, and postoperative periods were conducted using analysis of variance. If the differences among means were significant, Tukey's test would be applied to evaluate the results. The level of significance was set at 5%.

**Results:**

In hundred surgeries performed, 2.2 tubules of 2% lidocaine, 1:80 000 epinephrine were used. Therefore, the mean lidocaine dose used was

79.2 mg and the mean epinephrine dosage was 49.5 lg. Figure 1 shows that the highest systolic pressure variations were 2.29% during phase P2 and 2.59% in phase P5 (P . .05). Figure 2 and the Table show the greatest changes in diastolic blood pressure which occurred during phase P6 (-2.58%) and phase P10 (3.27%); however, no statistical significance was observed (P . .05). Mean blood pressure is presented in Figure 3, and the Table shows that the greatest changes occurred during phases P6 (-4.07%) and P8 (-3.57%). The statistical test showed no differences in mean arterial pressure. Figure 4 shows the percentage of variation in heart rate. There were no significant changes according to statistical analysis. In Figure 4 and the Table, it can also be observed that the greatest changes occurred in phase P10 (-3.24%).



## Discussion:

Cardiocirculatory monitoring has been increasingly used by dentists in surgical procedures, as well as in clinical studies, with the aim of assessing possible changes in these parameters in normoreactive patients and in those with cardiovascular involvement.<sup>6,10-14</sup> A therapeutic proposal to use tranquilizers and anxiolytics, such as benzodiazepines or nitrous oxide, can often minimize these possible cardiocirculatory changes.<sup>8,9</sup> The possible changes in cardiovascular parameters observed in the present experiment are shown in the and the percentages of variation in Figures 1 to 4, taking phase P1 as a percentage with zero variation. These cardiovascular changes that bear out the authors' observation have no clinical significance, which is in agreement with previous studies.<sup>1,6,9,11,12,15-17</sup> Analyses of the changes in the assessed parameters (systolic, diastolic, and mean arterial blood pressures and heart rate) in phases P1 to P10 agree with earlier investigations,<sup>18,19</sup> although the authors believe that the epinephrine concentrations used in previous studies were high. The maximum recommended dose of lidocaine in normoreactive patients is 400 mg; in the present study, only 79.2 mg was used. The maximum dose of epinephrine recommended for cardiac patients is 40 mg, in accordance with a previous study.<sup>20</sup> The mean dose of epinephrine used in the present experiments was 49.5 mg. In these patients, this dosage is very high and could produce cardiovascular alterations that are not clinically visible. Finally, it should be emphasized that no cardiovascular changes were observed in normotensive patients. These findings, however, may not be repeatable in hypertensive and cardiac patients or those taking antihypertensives, who are extremely unstable and sensitive to the action of catecholamines. In these patients, the cardiocirculatory changes may be greater and could offer higher risks during dental procedures.

## Conclusions:

In normotensive subjects, 2% lidocaine with epinephrine 1:80 000 resulted in no changes in the analyzed cardiocirculatory parameters (systolic, diastolic, and mean arterial blood pressures and

heart rate) during dental surgery.

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