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COMPARING GLYCEMIC RESPONSE TO REGIONAL BLOCK ANESTHESIA IN CONTROLLED DIABETIC PATIENTS

Alexandra Diaconu[1], Octavian Dinca[2], Cristina Padurariu[2] , Mihai Bogdan Bucur[3] Cristina Padurariu[2] ,Cristian Vladan[2] , Alexandru Bucur[4]

[1] PhD student ”Carol Davila" U.M.Ph. - București, Romania, Department of OMF Surgery
[2] “Carol Davila" U.M.Ph. - București, Romania, Department of OMF Surgery
[3] Resident doctor, Carol Davila" U.M.Ph. - București, Romania, Department of OMF Surgery
[4] “Carol Davila" U.M.Ph. - București, Romania, Faculty of Dentistry, Head of Department of OMF Surgery
Corresponding author; *e-mail: alexandru.bucur@umfcd.ro*

ABSTRACT

Aim of the study The aim of this study is to compare glycemic variability of 2% plain lidocaine to 4% articaine with epinephrine 1:200,000 during tooth extraction. **Material and methods** This prospective study was carried out in 60 diabetes melitus patients who presented at the Clinic of Oral and Maxillofacial Surgery, Carol Davila University, OMFS Hospital, Bucharest, from 2019 to 2020 for tooth extraction. Patients were randomly allocated to two groups (30 patients in each group) according to the type of anaesthetic solution employed. Group 1 had tooth extraction done under 4% articaine with 1:200,000 epinephrine while group 2 had tooth extraction done under plain 2% lidocaine. One tooth was extracted from each patient. Blood glucose level was recorded before surgery, after local anaesthetic injection and one hour after the administration of anesthetic agent. **Results** There was no statistically significant difference between the glycemic response in the two groups after administration of regional block anaesthesia. However the highest alteration in parameters was observed one hour after procedure in the two groups. **Conclusions** The glycemic changes induced by injecting 4% articaine with epinephrine in patients with controlled diabetes melitus during tooth extraction is within normal range and is not different from that induced by plain 2% lidocaine. The general preference given to local anesthetics without vasoconstrictor in diabetics is not supported by the present study

Key words diabetes melitus, local anesthetics

INTRODUCTION

The prevalence and severity of dental diseases are greater in individuals with diabetes and these patients must frequently undergo oral surgery procedures [1]. In these cases, oral surgery requires special precautions, such as pain control and the use of a safe and effective anesthetic solution. Endogenous catecholamine secreted during surgical stress can lead to an undesirable increase of the blood glucose level [2,3].

The ideal local anesthetic agent for routine oral surgery should have a large therapeutic index, and a predictable duration of action. The most commonly used local anesthetic agents in dental practice are 2% lidocaine and 4% articaine. Addition of epinephrine to local anesthetic provides vasoconstrictive benefits but carries a disadvantage of having systemic side effects [4].

Patients with diabetes frequently present for ambulatory surgery concomitant with the rise in incidence of the disease. Glucose fluctuations and hypoglycemia may pose greater risks to patients than elevated glucose itself. New medications and insulin regimens make perioperative blood glucose control easier now than in the past [5].

There is no consensus regarding the safety of local anesthetic solutions in diabetic patients. Some authors recommend the use of epinephrine-free local anesthetics for diabetes patients [6]. However, other authors conclude that epinephrine as vasoconstrictor is not contraindicated in patients with diabetes [7].

Therefore, the aim of this study was to investigate variations in blood glucose levels during tooth extraction under regional block anesthesia with 4% articaine with 1:200,000 epinephrine versus plain 2% lidocaine in patients with diabetes melitus.

MATERIAL AND METHODS

We enrolled 60 adult patients with pharmacologically controlled diabetes melitus (via the use of insulin and/or hypoglycemic agents), that had been admitted to the Clinic of Oral and Maxillofacial Surgery, Carol Davila University Bucharest - Hospital of Oral and Maxillofacial Surgery between 2019 and 2020. All patients needed to have at least one tooth extracted according to an oral examination and panoramic radiography. Subjects were randomly divided into 2 groups. The first group consisted of 30 patients, of which 17 (56.67%) were men, with a mean age of 63.27 years (+/- 9.54). Nine patients (30%) came from the rural environment. Regional block anesthesia was performed using 1.8 mL of 4% articaine HCl with 1:200,000 epinephrine. The second group consisted of 30 patients, of which 18 (60%) were men and the mean age was 65.56 years (+/- 8.41). Four patients (13,33%) came from the environment rural, the rest being from the urban environment. Regional block anesthesia was performed using 1.8 mL of plain 2% lidocaine HCl.

The study was approved by the Committee of the Ethics of the Hospital of Oral and Maxillofacial Surgery, Bucharest. Informed consent was obtained from each patient. The exclusion criteria were as follows: systemic conditions in which injection of 4% articaine HCl with 1:200,000 epinephrine and 2% lidocaine is contraindicated, use of medications that could affect anesthetic assessment, allergy to the components of the local anesthetic solutions.

The surgeon and patient were blinded about the type of anesthetic solution administered. Blood glucose levels were measured by means of an automatic digital blood glucose meter, before the injection, 5 min and one hour later.

Data distributions were expressed in the form of means, standard deviations, and intervals percentages, depending on the situation. Comparative analyzes for continuous variables were made using the t-Student test. In the case of categorical or ordinal variables, possible associations were tested using the Pearson chi-square test or the Fisher's exact test. Test two way ANOVA was used to construct factorial prediction models. Data were processed using the Stata / IC 16 program (StataCorp). P-value was set at 0.05.

RESULTS AND DISCUSSIONS

The glucose levels were evaluated for each patient during, 5 min and one hour after the injection. Table 1 an Table 2 shows the values of the parameters.

The mean blood glucose value decreased after regional block anesthesia with 4% articaine HCl with 1:200,000 epinephrine, registering statistically significant differences ($p = 0.002$; t test for 2 dependent samples). There is also a slight increase in post-extraction glycemic values without significant effects ($p = 0.38$; t test for 2 dependent samples, Fig. 1.).

The mean blood glucose level decreased slightly after regional block anesthesia; no statistically significant differences were recorded ($p = 0.63$; t test for 2 samples dependent). There is also a slight increase in post-operatory glycemic values, with no significant clinical effect ($p = 0.51$; t test for 2 dependent samples; Fig. 2.).

We observed lower glucose blood levels when epinephrine was included in the anesthetic solution right after regional block anesthesia. The increase in the blood glucose level in both groups of patients one hour after regional block anaesthesia with 4% articaine HCl with 1:200,000 epinephrine and 2% lidocaine can not be contributed to the vasocontrictor present in the local anaesthetic. Pain from injection can stimulate endogenous epinephrine release, which might increase the

blood glucose level. Dionne et al. [8] studied the circulating epinephrine levels in sedated and non sedated patients having oral surgery under local anesthesia without adrenaline and found that epinephrine increased the adrenal response to surgical stress.

The results observed in our study allow us to conclude that tooth extraction performed on patients with diabetes using regional block anesthesia at the assessed volume (1.8 mL) is safe, regardless of whether 4% articaine HCl with 1:200,000 epinephrine or 2% lidocaine is used.

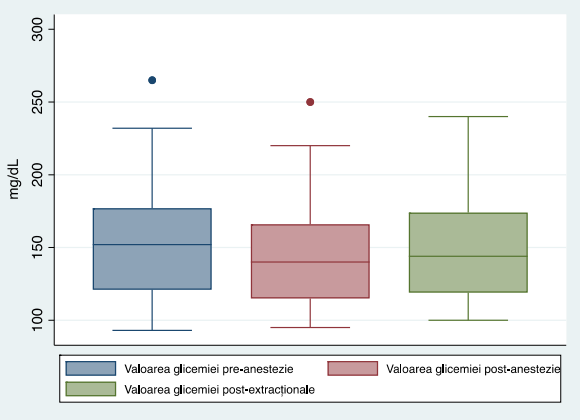

Figure 1. Means of blood glucose levels in the first group

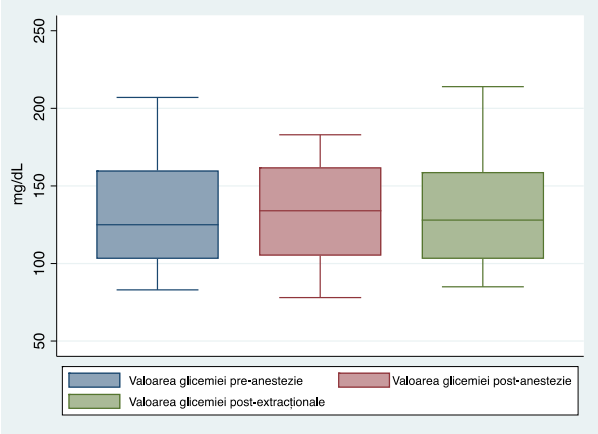

Figure 2. Means of blood glucose levels in the first group

Table 1. The glucose level changes - 4% articaine with 1:200,000 epinephrine

Variable	Mean	Standard Deviation	Interval
Glucose level during injection	152.53	37.93	93-265
Glucose level 5 min after the injection	146.96	35.88	95-250
Glucose level one hour after the injection	148.4	34.65	100-240

Table 2. The glucose level changes - 3% mepivacaine

Variable	Mean	Standard Deviation	Interval
Glucose level during injection	132.36	31.37	83-207
Glucose level 5 min after the injection	131.2	29.65	78-183
Glucose level one hour after the injection	133.3	31.52	85-214

CONCLUSIONS

1. In patients receiving 4% articaine with 1:200,000 epinephrine, there was a significant preoperatory decrease in blood glucose concentration
2. Mild hyperglycemia was observed after injection in diabetic patients in the 4% articaine with 1:200,000 epinephrine anaesthesia group. The levels of blood glucose were found to be comparatively with 2% lidocaine after regional block anesthesia.
3. Mild increase in blood glucose concentration after the operative procedures under regional block anaesthesia could be attributed to the endogenous catecholamine release which results in transient elevation of the blood glucose.

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All authors have contributed equally.

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