Original Article

Analysis Of Local Anesthesia With Adrenaline In Diabetic Patients Undergoing Extractions

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Abstract

Background: To analyse local anesthesia with adrenaline in diabetic patients.
Materials & methods: A total of 40 patients were enrolled. The age group of subjects was 30 to 70 years. The subjects were divided into 2 groups. Group A were healthy individuals and group B were type II diabetes individuals. Lignocaine with adrenaline (1: 80000) was used as local anesthetic agent. Immediately after local anaesthetic administration, peripheral blood glucose estimation using the glucometer was repeated. Further readings were obtained 20 min after local anaesthetic administration. Results were obtained and analysed using SPSS software.
Results: Variations in blood glucose levels for the healthy and diabetic patients when treated under lignocaine with adrenaline. In group A, the mean levels of blood glucose before L.A were 86.52 whereas, in group B the mean glucose levels were 202.36. The mean levels of blood glucose with L.A administration after 20 min. in group A was 102.38 and in group B were 238.38.
Conclusion: Adrenaline containing LA should be used with caution in Type 2 diabetes.

Keywords: local anaesthesia, diabetes, extraction.

Introduction

A local anesthetic (LA) is a medicine that is used to numb a small part of the body temporarily before performing a minor surgery like skin biopsy. Before a dental operation, such as tooth extraction, LA may be given to the patient. LA do not cause humans to fall asleep, unlike general anesthesia. They are usually distinguished by their chemical structure, specifically the linkage between the compound's common components, such as amide and esters. [1] The vast majority of the regularly used dental LA are amides, for example, lidocaine, mepivacaine, bupivacaine, etidocaine, prilocaine, and articaine. [2]

Lidocaine, also known as lignocaine, is a class Ib antidysrhythmic and local amino amide-based anesthetic that has been on the market since 1948. [3,4] Due to its superior safety profile as compared to other LA agents, it was quickly adopted. It can also be used to treat acute and chronic pain as an adjuvant analgesic. [5,6] It is widely used to relieve pain after a minor surgery or invasive procedures like biopsies, minor excisions, or dental surgery. However, as lidocaine can be used in different ways, i.e., by injection, inhalation, or as a topical agent to provide anesthesia to the same patients, it is essential to keep records of the total dose given to avoid its systemic toxicity. Lidocaine should not be used in patients with confirmed allergic hypersensitivity to amide-based LA.

Since lignocaine with or without adrenaline is one of the most commonly used local anaesthetics in our country, we decided to undertake a study to observe its effects on blood glucose concentration in patients undergoing tooth extraction. Most dental treatments are performed under local anaesthesia, and an increase in blood pressure is common even in normotensive patients. This increase is influenced by many factors, such as psychological and physical stress, painful stimuli and the action of catecholamine present in local anaesthetic. [7] There is considerable information available concerning the haemodynamic effect of vasoconstrictors in dental local anaesthetic solutions, in both healthy and medically compromised individuals. Hence, this study was conducted to analyse local anesthesia with adrenaline in diabetic patients.

Materials & methods

A total of 40 patients were enrolled. The age group of subjects was 30 to 70 years. The subjects were divided into 2 groups. Group A were healthy individuals and group B were type II diabetes individuals. Lignocaine with adrenaline (1: 80000) was used as local anesthetic agent. The patients appointment were in the morning and advised to have their normal breakfast before coming for the treatment. The patient was seated comfortably and first reading of blood glucose concentration was taken before administration of local anaesthesia. After that 2 ml local anaesthetic solution was administered to each patient in the form of nerve blocks. Immediately after local anaesthetic administration, peripheral blood glucose estimation using the glucometer was repeated. Further readings were obtained 20 min after local anaesthetic administration. Results were obtained and analysed using SPSS software.

Results

A total of 40 patients with 20 in each group were taken under consideration. Variations in blood glucose levels for the healthy and diabetic patients when treated under lignocaine with adrenaline. In group A, the mean levels of blood glucose before L.A were 86.52 whereas, in group B the mean glucose levels were 202.36. The mean levels of blood glucose with L.A administration after 20 min. in group A was 102.38 and in group B were 238.38. Statistically highly significant difference was observed in the level of blood glucose as measured at intervals (20 min after anaesthetic injection) in both healthy and diabetic patients.

Table: comparison of blood glucose concentration in groups

	Group A (healthy) Mean	**Group B (diabetes) Mean**
Blood sugar before L.A	86.52	202.36
Blood sugar after L.A	91.35	215.33
20min.after L.A	102.38	238.65

Discussion

Local anesthetic agents are chemicals that reversibly block the transmission of action potential of nerve membrane. [8] An essential pre-requisite to success in dentistry is to achieve good quality local anesthesia (LA). Local anesthetic agents are normally associated with absence of pain during surgical intervention in bone and soft tissue. There are many local anesthetic agents, lignocaine being the gold standard available with the wide selection of vaso-constrictive agents that improve the clinical efficacy and the duration LA. [9]

Vasoconstrictors are used in local anesthetic solutions to retard their systemic absorption. This enhances the local anesthetic effect by localizing it to the site of injection, decreases toxicity by retarding systemic absorption, prolongs the duration of anaesthesia, and may decrease the total dose of the local anaesthetic drug required. Another secondary advantage to the use of vasoconstrictors in local anesthetic solutions is in the control of bleeding or haemostatic effect that the vasoconstrictor provides. [10] In our study, a total of 40 patients with 20 in each group were taken under consideration. Variations in blood glucose levels for the healthy and diabetic patients when treated under lignocaine with adrenaline. In group A, the mean levels of blood glucose before L.A were 86.52 whereas, in group B the mean glucose levels were 202.36.

Study by Meechan JG recorded the rise in blood glucose following the injection of 30 ml of local anesthetic solution containing 1:200,000 adrenaline as crural blocks. [7] However, it has been reported that the hyperglycaemic effect of adrenaline occurs at plasma adrenaline concentration 4–5 time's basal levels, i.e. at values of 150–200

pg/ml. [11] Such concentrations may be obtained shortly after the injection of clinical doses of adrenaline containing local anesthetic. [12]

Local anesthetics have greater affinity for receptors within sodium channels during their activated and inactivated states than when they are in their resting states. [13] Therefore, neural fibers having more rapid firing rates are most susceptible to local anesthetic action. Also, smaller fibers are generally more susceptible, because a given volume of local anesthetic solution can more readily block the requisite number of sodium channels for impulse transmission to be entirely interrupted. For these reasons the tiny, rapid-firing autonomic fibers are most sensitive, followed by sensory fibers and finally somatic motor fibers. [14] The anesthesiologist blocking mixed spinal nerves is acutely aware of these differential sensitivities. As patients recover from spinal anesthesia they first regain voluntary motor function, then sensation returns, and finally they can micturate (autonomic control). The dentist is generally spared this consideration because the trigeminal nerve branches anesthetized for dental procedures are comprised only of small, rapid-firing sensory fibers. However, the many classes of sensory fibers also vary in their diameters and firing rates. For example, pain fibers are more sensitive than those carrying pressure and proprioception. A patient may remain disturbed by a sense of pressure despite complete anesthesia of pain fibers. [15] In our study, the mean levels of blood glucose with L.A administration after 20 min. in group A was 102.38 and in group B were 238.38. Statistically highly significant difference was observed in the level of blood glucose as measured at intervals (20 min after anaesthetic injection) in both healthy and diabetic patients.

Another study by Kalra P et al, was conducted on 120 patients comprising of 60 healthy and 60 diabetic patients. All these patients were in need of multiple extractions. The patients were in the age group of 18–50 years. On their first visit the patients were given plain lignocaine and tooth extraction was carried out. One week later the same patient was given lignocaine with 1:80,000 adrenaline to carry out tooth extraction. The mean blood glucose concentration increased from the base line level of 84.81 to 85.09 mg/dl in healthy patients and from 206.82 to 207.09 mg/dl in diabetic patients 10 min following the injection of 2% plain lignocaine. This increase in blood glucose concentration following the administration of plain lignocaine was statistically not significant ($P > 0.05$). There was statistically significant ($P < 0.005$) increase in the blood glucose concentration from 88.81 to 105.55 mg/dl in healthy, and 208.77 to 242.46 mg/dl in diabetic patients 20 min following the injection of lignocaine with adrenaline. [16]

Conclusion

Adrenaline containing LA should be used with caution in Type 2 diabetes.

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