Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2018;8:1:169-173.

Intricate Estimation and Comparison of Effects of Adrenaline on Blood Glucose Level in Patients Requiring Dental Extraction Under Local Anesthesia: An In Vivo Study

Kunwar Satish[1*] Priyanka Kumari[2] Mohsin Khan[3]

[1]Reader, Department of Oral and Maxillofacial Surgery, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, UP, India.
[2]Consultant Periodontist, Vedanta Hospital , Varanasi, UP, India
[3]Senior Lecturer, Department of Oral and Maxillofacial Surgery, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, UP, India.

ABSTRACT

Aim: Local anesthetic (LA) solutions are one of the most widely used drugs in dentistry for performing minor as well as major surgical procedures. Adrenaline has come out as an integral component of LA vials and being dispensed mostly in fixed combinations/preparations. Various researchers have shown a variety of effects of Adrenaline on blood glucose levels in diabetic patients. The present study was conducted to compare the LA containing adrenaline and LA without adrenaline on diabetic patients requiring dental extraction.

Materials & Methods: The present study was conducted on 120 patients requiring dental extractions & was divided into 3 groups of 40 each. Group I was kept as reference or control group while group II were diabetic on antidiabetic drugs. Group III patients were diabetic but not on diabetic drugs. In all patients, 2% lignocaine with 1: 50000 adrenaline was used for the study. Blood glucose level was assessed using electronic glucometer first before administrating LA, second after administrating LA and third after extraction of tooth.

Results: Mean blood glucose level in group I before and after administering LA was 102.4 and 108.6 respectively. Mean blood glucose level in group II before and after administering LA was 190.2 and 196.8 respectively. Mean blood glucose level in group III before and after administering LA was 168.2 and 164.4 respectively. Mean blood glucose level in group I before extraction of teeth was 104.2 and after 102.6, in group II was 190.6 and 196.2 before and after extraction of teeth respectively and in group III was 172.8 and 216.4 before and after extraction of teeth respectively.

Conclusion: It has observed that there was alteration in blood glucose level on those diabetic patients who were not on medication.

Keywords: Adrenaline, Glucose, Local anesthetic.

INTRODUCTION

In literal words the anesthesia is reversible loss of sensation in particular region for a particular duration. As we all are aware that Local anesthetic (LA) solutions are widely used in dentistry in performing minor as well as major procedures. In this third millennium it is almost impossible to think of any dental surgical procedure without using LA. Because patients are becoming more concerned for pain day by day, the uses of LA's are become absolute. It's right and rational use makes the treatment positive to the patient as it assists in relieving pain and provides reversible anesthesia for small duration. Some of the surgical dental procedures are pulpectomy, root canal treatment,

Received: Feb. 11, 2018**: Accepted**: Apr. 8, 2018
***Correspondence Dr. Kunwar Satish.**
Department of Oral and Maxillofacial Surgery, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, UP, India.
Email: kunwarsatish@yahoo.co.in

pISSN 2278-0076
eISSN 2321-9270

Table I: Distribution of patients.

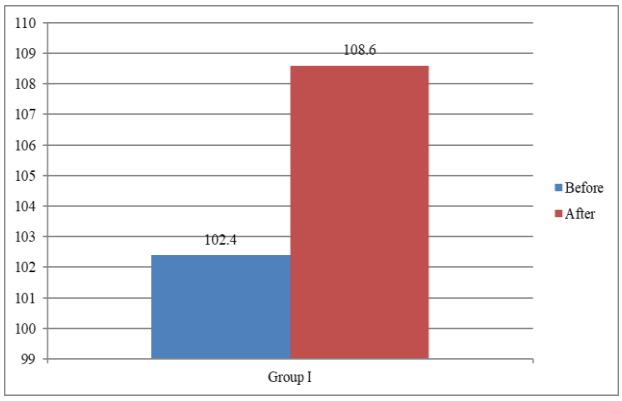
Total- 120			
Group I (Control)	Group II (diabetic on antidiabetic drugs)	Group III (diabetic not on antidiabetic drugs)	P value
40	40	40	1*

*: Non-Significant (**P- value > 0.05**)

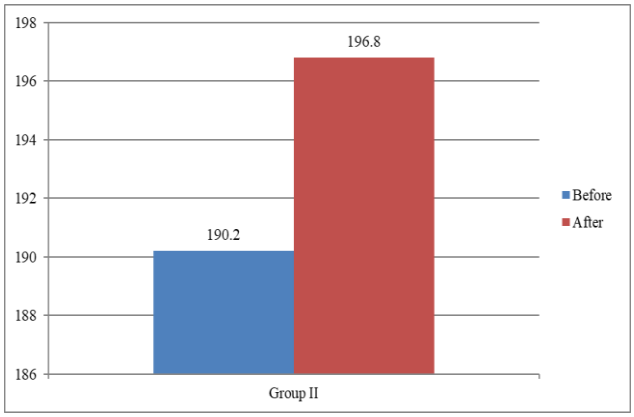
Table II: Comparison of blood glucose level before and after extraction of teeth (Values in gm%).

Groups	Before	After	P value
Group I	104.2	102.6	0.5*
Group II	190.6	196.2	0.1*
Group III	172.8	216.4	0.01*

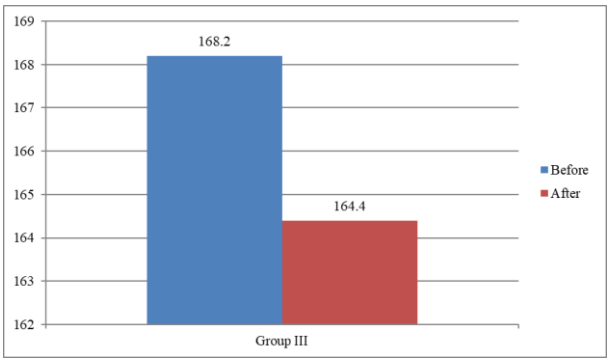
*: Non-Significant (**P- value > 0.05**)



Graph 1: Mean blood glucose level in group I before and after administering LA.



Graph 2: Mean blood glucose level in group II before and after administering LA.



Graph 3: Mean blood glucose level in group III before and after administering LA.

extraction of tooth, flap surgery, gingivectomy, crown lengthening, frenectomy, osteotomy and alveoloplasty. Several local anesthetic solutions with preparation combination, concentrations and of different properties are available in the market.[1] All have different indications, contraindications with few advantages and disadvantages. Among all, lignocaine is the one which is consistently used in dental practice from decades. It has become the choice of LA solution as it offers minimal toxicity with fewer allergies when compared to other local anesthetic solutions.[2] Adrenaline is a vasoconstrictor used in combination with LA solution. The role of vasoconstrictor is to delay the absorption of solution in the body and hence improves the efficacy of LA solution and prolongs the effect of LA. It also makes the surgical site so called 'bloodless'. By using Adrenaline, the doses of LA have shown to be lowered down significantly. This occurs because Adrenaline reduces the absorption of the LA solution from the surgical site thus it is available for a longer time at the site. This also results in the increased half-life period of LA's due to which the solution is maintained at the site for longer time. This is how it provides longer anesthesia for major surgical procedures. Additional practically valuable functions of these agents are that they increase peripheral resistance and thus cause transient alterations of blood vessels. Apart from it redistributes blood to the muscles and affects metabolism of carbohydrates which in turn increase blood glucose level in the brain. Considering all these points and strategies, the present study was performed to compare effects of the LA containing adrenaline on blood glucose levels in diabetic patients requiring dental extraction.[3]

MATERIALS & METHODS

The present study was planned, outlined and conducted in logical and strategic manner which was comprised of 120 patients requiring dental extractions of both genders. All patients were explained in detail about the study design, procedure and time. Written consents were obtained from all the participating patients. Patients with any kind of gross anomaly related to maxillofacial structure, excluded from the study. General demographic details and information such as name, age, gender etc. were recorded and tabulated. Patients were divided into 3 groups of 40 each. Group I was control group, group II were diabetic on antidiabetic drugs and group III were diabetic but not on diabetic drugs. In all patients, 2% lignocaine with 1: 50000 adrenaline was used for the study. Blood glucose level was measured using electronic glucometer first before administrating LA, second after administrating LA and third after extraction of tooth. All obtained observations were tabulated and sent for statistical analysis. Statistical analysis was executed using SPSS 'Statistical Package for the Social Sciences' software version 21 (IBM Incorporation, New York, United States of America). Chi- square test was used for assessment of level of significance. P-value of less than 0.05 was considered as significant.

RESULTS

Upon compilation of data and statistical references, some very interesting and useful inferences were drawn. Table I shows that group I had 40 control subjects, group II (40) were diabetic on antidiabetic drugs and group III (40) were diabetic not on antidiabetic drugs. The difference was non-significant (P< 0.05). Graph I shows that mean blood glucose level in group I before and after administering LA was 102.4 and 108.6 respectively. Graph II shows that mean blood glucose level in group II before and after administering LA was 190.2 gm% and 196.8 gm% respectively. Graph III shows that mean blood glucose level in group III before and after administering LA was 168.2 gm% and 164.4 gm% respectively. The difference was non- significant (P> 0.05). Table II shows that mean blood glucose level in group I before extraction of teeth was 104.2 gm% and after 102.6 gm%, in group II was 190.6 gm% and 196.2 gm% before and after extraction of teeth respectively and in group III was 172.8 gm% and 216.4 gm% before and after extraction of teeth respectively. The difference was significant in group III (P< 0.05). In group I and II, the recorded blood glucose levels are higher when recorded after procedure. However it was found lower in group III when recorded after procedure. This gives an open inference regarding the effects of LA's on diabetic medications.

DISCUSSION

In this modern era, surgical dental procedures cannot be imagined without usages of LA's. It can be used in a variety of dental procedures. Soon after it's evaluation it was made available as a solution coupled with adrenaline. Adrenaline is well known for its vasoconstricting actions. It is also an overall cardiac stimulant. It is an integral component of anaphylactic shock management emergency kit. In literal terms the exact role of vasoconstrictor is to delay the absorption and hence prolong the action of LA. It also known to modify or alters the level of glucose in diabetic patients. Consequently the use of LA containing adrenaline requires very precise and vigilant evaluation of parameters in diabetic patients as there is alteration of blood glucose level in such patients.[4] The present study was conducted to compare the level of glucose in healthy subjects, diabetic patients on antidiabetic therapy and diabetic patients not on antidiabetic drugs. In the present study, out of 120 patients those requiring dental extraction, group I were control without diabetes, group II were diabetic on antidiabetic drugs and group III were diabetic but not on diabetic drugs. Mean blood glucose level in group I before and after administering LA was noticed as 102.4 gm% and 108.6 gm% respectively. Mean blood glucose level in group II before and after administering LA was 190.2 and 196.8 respectively. Mean blood glucose level in group III before and after administering LA was 168.2 and 164.4 respectively. These finding was quite comparable with the study results of Viana and coworkers.[5] Meechan et al[6] observed significant alterations in blood glucose levels after 20 min of adrenaline administration, they did not mention anything about the antidiabetic therapy status of the patients

in the study. We found that mean blood glucose level in group I before extraction of teeth was 104.2 and after 102.6, in group II was 190.6 and 196.2 before and after extraction of teeth respectively and in group III was 172.8 and 216.4 before and after extraction of teeth respectively. These findings was in agreement with the results of Bolli and collegues.[7] Khawaja et al[8] studied and explored the influence of adrenaline containing local anesthesia (2% Xylocaine) on glycemic level of patients undergoing tooth extraction levels. Their study concluded that the blood glucose level alterations in pre-extraction and post-extraction phase were observed only in those diabetic patients who were not on antidiabetic therapy. These were quite contrasting to the results of ours. The probable reason could be understood on the basis of demographic differences in the studied population. Mohima et al[9] studied and discussed the blood glucose levels in healthy patients, diabetic patients with medication, and diabetic patients without medication. Their study results showed them respectively as 106.51 gm%, 107.55 gm%, 192.19 gm%, 194.22 gm%, 171.28 gm%, and 169.37 gm%. It was recorded before and after administration of LA solution respectively. They found no significant difference in the blood glucose values in studied patients. However, blood sugar levels in healthy patients, diabetic patients with medication, and diabetic patients without medication before and after extraction of teeth were 106.51 gm%, 104.46 gm%, 192.19 gm%, 198.22 gm%, 171.28 gm% and 169.37 respectively. The one and only significant change which were noticed were in the group containing diabetic patients those were not on antidiabetic medication. Literature has well substantiated that any amendment of blood glucose levels by adrenaline might be possibly due to inhibitory effect of adrenaline.[10-14] These inhibitory effects are known to reduce the secretion of insulin by inhibiting beta cells present in the pancreas. However it may possibly be due to decreased glucose consumption by affected peripheral tissues.[15-17]

CONCLUSION

It has observed that there was a significant alteration in blood glucose level on those diabetic patients who were not on medication. These findings may be applied clinically when deciding the doses concentrations in a particularly conditioned patient. Moreover, our study results could be treated as suggestive for predicting the said effects. However we expect other large scale long term studies to be conducted that could further establish certain concrete guidelines in this context.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Rayner CK, Samsom M, Jones KL, Horowitz M. Relationships of upper gastrointestinal motor and sensory function with glycemic control. Diabetes Care 2001;24(2):371-81.

2. Rizza R, Haymond M, Cryer P, Gerich J. Differential effects of epinephrine on glucose production and disposal in man. Am J Physiol 1979;237(4):356-62.

3. Clarke RS. Clinical studies of induction agents. The influence of anaesthesia with thiopentone and propanidid on the blood sugar level. Br J Anaesth 1968;40(1):46-52.

4. Clarke RS, Bali IM, Issac M, Dundee JW, Sheridan B. Plasma cortisol and blood sugar following minor surgery under intravenous anaesthetics. Anaesthesia 1974;29(5):545-50.

5. Viana AM, Campos AC, Morlin MT, Chin VK. Plasma catecholamine concentrations and hemodynamic responses to vasoconstrictor during conventional or Gow- Gates mandibular anesthesia. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005;100:415-9.

6. Meechan JG. Epinephrine, magnesium, and dental local anesthetic solutions. Anesth Prog 1996;43(4):99-102.

7. Bolli G, de Feo P, Compagnucci P, Cartechini MG, Angeletti G, Santeusanio F. Important role of adrenergic mechanisms in acute glucose counter regulation following insulin-induced hypoglycemia in type I diabetes. Evidence for an effect mediated by beta-adrenoreceptors. Diabetes 1982;31(7):641-7.

8. Khawaja NA, Khalil H, Parveen K, Alghamdi AM, Alzahrani RA, Alherbi SM. An influence of adrenaline (1:80,000) containing local anesthesia (2% Xylocaine) on glycemic level of patients undergoing tooth extraction in Riyadh. Saudi Pharm J 2014;22(6):545-9.

9. Mohima, Knoll-Köhler E, Frie A, Becker J, Ohlendorf D. Changes in plasma epinephrine concentration after dental infiltration anesthesia with different doses of epinephrine. J Dent Res 1989;68(6):1098-101.

10. Dionne RA, Goldstein DS, Wirdzek PR. Effects of diazepam premedication and epinephrine-containing local anesthetic on cardiovascular and plasma catecholamine responses to oral surgery. Anesth Analg 1984;63(7):640-6.

11. Kotagal M, Symons RG, Hirsch IB, Umpierrez GE, Dellinger EP, Farrokhi ET, Flum DR; SCOAP-CERTAIN Collaborative: Perioperative hyperglycemia and risk of adverse events among patients with and without diabetes. Ann Surg 2015; 261:97–103.

12. Soldevila B, Lucas AM, Zavala R. Perioperative management of the diabetic patient. In: Stuart-Smith K, editor. Perioperative medicine - current controversies. Switzerland: Springer; 2016. p. 165-92.

13. Khan NA, Ghali WA, Cagliero E. Perioperative management of blood glucose in adults with diabetes mellitus; 2016, Available from; www.UpToDate.com

14. NICE Guideline. Preoperative tests (update): routine preoperative tests for elective surgery. London: National Institute for Health and Care Excellence (UK); 2016, nice.org.uk/guidance/ng45.

15. Pontes JPJ, Mendes FFB, Vasconcelos MMA, Batista NR. Evaluation and perioperative management of patients with diabetes mellitus. A challenge for the anesthesiologist. Rev Bras Anestesiol 2018;68(1):75-86

16. Cornelius BW. Patients with Type 2 Diabetes: Anesthetic Management in the Ambulatory Setting: Part 2: Pharmacology and Guidelines for Perioperative Management. Anesth Prog 2017;64(1):39–4

17. Hoope TW, Looije M, Lirk P. Regional anesthesia in diabetic peripheral neuropathy. Curr Opin Anaesthesiol 2017;30(5):627-31.