
Proceedings

Cardiorespiratory changes following injection of local anesthetics with different concentrations of adrenaline during simple tooth extraction: Preliminary report of a prospective clinical trial

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Abstract

Purpose: To evaluate some of the cardio-respiratory effects of the commonly used LAAs in dental patients.

Methods: This was prospective clinical trial. Patients were divided randomly into 4 cohorts: L-200 cohort, L-100 cohort, A-200 cohort and A-100 cohort. There were 25 patients in L-200, L-100 cohort and A-200 cohorts each, while A-100 cohort had 26 patients. L-200 cohort was given 1.8 mls of lidocaine 2% with adrenaline 1:200,000. L-100 cohort was given 1.8 mls of 2% lidocaine with adrenaline 1:100,000, A-200 cohort was given 1.8 mls of articaine 4% with adrenaline 1:200,000. A-100 cohort was given 1.8 mls of articaine 4% with adrenaline 1:100,000. One hundred and one patients were included in the study. There were 60 (59.4%) females and 41 (40.6%) males.

Results: Mean respiratory rate decreased following the injection of the LAAs: A-100, A-200, L-100 and L-200 to the respective cohorts, and maintained a steady decrease throughout the study period; T₀ through T₃. The heart rate, systolic blood pressure and diastolic blood pressure increased following injection of LAAs being investigated but no statistically significant increase was noted.

Conclusion: The A-200 cohort, was a source of the statistically significantly low oxygen concentrations, with mean (SD) of 91.2 (11.4) % (P=0.000) at T₀ and 92.8 (11.4) % (P=0.001) at T₁.

Keywords: Cardiorespiratory changes, articaine, lidocaine, local anaesthetics, adrenaline

Indexing: Index Copernicus, African Index Medicus

Background

Effective and safe pain control is essential for today's dental practice and local anesthetic agents (LAAs) play fundamental role for pain-free surgeries. LAAs are the most commonly used drugs in dentistry. Plain LAAs supplied in dental cartridges are rarely used as they are relatively ineffective and have short durations of action. Introduction of adrenaline into the solution produces reliable and profound anesthesia¹. Adrenaline is one of the most widely used vasoconstrictor in association with LAAs in the dental clinic. The vasoconstrictor effect

counteracts the local vasodilation effect of the LAAs and delays their absorption into the cardiovascular system. Vasoconstriction is beneficial in increasing the duration of local anesthesia and diminishing the risk of toxicity. It also improves hemostasis during surgery². However, binding to the β ₁-adrenergic receptors can provoke increase in heart rate and blood pressure, while its binding to β ₂-adrenergic receptors can cause vasodilation in muscles and internal organs[1,2].

Aim/Objectives

This study aims to evaluate some of the cardio-respiratory effects of the commonly used LAAs in dental patients.

Materials and Methods

This prospective clinical trial was carried out in the Department of Oral and Maxillofacial Surgery, University of Benin Teaching Hospital, Benin City from July, 2017 to December 29, 2017. Dental extractions were performed by qualified junior residents under close supervision of a consultant maxillofacial surgeon.

Inclusion criteria: patients who gave informed consent, were not diagnosed as hypertensive and their blood pressure <140/90 mm Hg. Exclusion criteria: hypertension, cardiovascular disease, sickle cell anemia, congenital methemoglobinemia, hyperthyroidism, pregnancy, breast feeding, allergy to local anaesthesia, jaundice and extraction requiring more than one local anesthetic cartridge or if the duration exceeds 30 minutes.

Patients were divided randomly into 4 cohorts (by selecting from marked papers in an envelope): L-200 cohort, L-100 cohort, A-200 cohort and A-100 cohort. There were 25 patients in L-200, L-100 cohort and A-200 cohorts each, while A-100 cohort had 26 patients. L-200 cohort was given 1.8 mls of lidocaine 2% with adrenaline 1:200,000. L-100 cohort was given 1.8 mls of 2% lidocaine with adrenaline 1:100,000, A-200 cohort was given 1.8 mls of articaine 4% with adrenaline 1:200,000. A-100 cohort was given 1.8 mls of articaine 4% with adrenaline 1:100,000.

Measurements were taken as follows: time, T₀ (basal), with patients comfortably seated in the dental chair; T₁, immediately after the injection of the LAA, T₂, 3 minutes after the extraction and T₃, 30 minutes after the extraction. All procedures in the study were performed in morning sessions with relaxed atmosphere and no preoperative anxiolytic medications were prescribed. The LAAs were injected by the infiltration technique. Data of interest were patients' demographics, respiratory rate, heart rate, blood pressure and arterial oxygen concentration. Seated on the dental chair, a pulse oximeter (MASiMO SET® Radical-7 Pulse Oximeter) was applied to the left index finger of the patient then heart rate and oxygen saturation were recorded.

Blood pressure was measured by an electronic sphygmomanometer (OMRON® MX3 Plus automatic blood pressure monitor) and the respiratory rates were counted by a trained research assistant by observing chest movements. The study was approved by the research ethics committee of UBTH (Ref: ADM/E 22/A/VOL. II/1486 of May 2017) and all participants gave informed consent before recruitment into the study. The data was analyzed with SPSS statistical software.

Results

One hundred and one patients were included in the study. There were 60 (59.4%) females and 41 (40.6%) males. Among the study population, 23 (22.8%) volunteered that they occasionally took alcohol while 78 (77.2%) were non-takers of alcohol. Only 1 (1.0%) had previous exposure to LAAs. The mean age (SD) for all patients was 41.6 (14.8) years. The mean ages (SD) for L-200, L-100, A-200 and A-100 cohorts were 41.6 (15.6) years, 43.4 (17.8) years, 40.3 (14.1) years and 41.4 (11.6) years respectively.

Mean respiratory rate decreased following the injection of the LAAs: A-100, A-200, L-100 and L-200 to the respective cohorts, and maintained a steady decrease throughout the study period; T₀ through T₃. This decrease was not statistically significant at any point. Mean (SD) respiratory rates at the times T₀, T₁, T₂ and T₃ for all cohorts combined were 21.7 (1.4) cycles per minute, 19.7 (1.9) cycles per minute, 18.7 (1.5) cycles per minute and 18.0 (1.4) cycles per minute respectively.

The heart rate, systolic blood pressure and diastolic blood pressure increased following injection of LAAs being investigated but no statistically significant increase was noted. Whereas the heart rate, systolic blood pressure and diastolic blood pressure in other cohorts decreased further following surgery, the heart rate in the A-200 cohort increased from a mean (SD) value of 80.3 (13.3) beats per minute to 83.5 (11.5) beats per minute at T₂ and 84.6 (15.3) beats per minute at T₃. The mean (SD) arterial oxygen concentration was globally between 91.2 (11.4) % and 99.3 (1.0) %. The A-200 cohort, was a source of the statistically significantly low oxygen concentrations, with mean (SD) of 91.2 (11.4) % (P=0.000) at T₀ and 92.8 (11.4) % (P=0.001) at T₁.

Conclusion

These four commonly used LAAs are safe in normotensive individuals. Findings from evaluation of efficacy and surgeons preference may be the determinant of preparation of choice in practice.

References

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