

Comparison between lidocaine and 50/50 mixture of lidocaine with bupivacaine when used in inferior alveolar nerve and lingual nerve block for patients undergoing third molar surgery

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Abstract

Aim: The purpose of this study was to compare and evaluate the onset of action, duration of action and analgesia of a 50/50 mixture of lidocaine and bupivacaine when injected for surgical extraction of mandibular third molar.

Materials and Method: 50 patients between the age group of 18 to 40 years undergoing bilateral mandibular third molar extractions, reporting to the Department of Oral and Maxillofacial Surgery were chosen for this study. Patients underwent extractions of bilateral mandibular third molars with inferior alveolar nerve and lingual nerve block. Extraction of the mandibular third molar on one side was done using 2.5 cc of 2% Lidocaine (with 1: 80,000 adrenaline) and the contralateral third molar was extracted using a mixture of 1.25cc of 2% Lidocaine (with 1: 80,000 adrenaline) + 1.25cc of 0.5% Bupivacaine(50/50 mixture). Onset of action, duration of action was recorded based on EPT (Electronic pulp tester) response. Post operative analgesics (NSAIDs) taken was recorded at the end of 5th day.

Results: Independent sample t-test was used for statistical analysis. There was a statistical significant difference between two solutions in terms of both onset and duration of action. The combination of Lidocaine + Bupivacaine offered a prolonged duration of action in the patients undergoing third molar surgery. There was no difference in number of analgesics taken in both the groups.

Conclusion: Prolonged duration of action of mixture of local anesthetic agent was not desirable in most minor surgical procedures performed by oral and maxillofacial surgeon. Consumption of NSAIDs noted to be same in both the groups makes no advantage of bupivacaine in terms of analgesia. There was no clinical advantage of mixing two anesthetic solutions even though Statistical differences noted in two parameters studied.

Keywords: Lidocaine, Bupivacaine, 50/50 mixture, Third Molar Surgery.

Introduction

Pain and dental procedures are often synonymous in the minds of patients, especially those seeking surgical dental treatment. Many of the patients perceive a good dentist as a practitioner who causes little or no discomfort. In turn, dentists identify a ideal local anesthetic as one that allows them to focus on operative procedures without distractions from patient movements which may be pain-induced. The everyday practice of dentistry is therefore based upon achieving adequate local anesthesia. Several local anesthetic agents have been studied and documented. Mixture of these local anesthetics are not discussed much and their use in dentistry not reported vigorously. Lidocaine and bupivacaine are widely used agents mostly in different clinical requirements. Lidocaine HCL was the first amide local anesthetic to be marketed. Bupivacaine is a long acting anesthetic agent not commonly practiced for regular dental treatment but used mostly for post operative pain management. The patients requirement for postoperative opioid analgesics is considerably lessened when Bupivacaine is administered for post operative pain control.¹ It is said that Bupivacaine may be administered at the start of the procedure, however, for post operative pain control after lengthy surgical procedure, it might be reasonable to administer Bupivacaine at the conclusion of the procedure.²

Third molar surgery is the most common procedure performed by Oral and maxillofacial surgeon. Prophylactic removal of the third molar still a debatable topic but most commonly symptomatic wisdom teeth are the once encountered in the Maxillofacial OPD. Duration of the surgery may vary while performing surgical extraction of the third molar depending on multiple factors. Patient co operation, mouth opening, chubby cheeks, excessive salivation, extent of decay etc are examples of factors which are not included while scoring the difficulty of impaction on the conventional charts. Inadvertent fracture of the teeth/root may prolong the duration of the surgery making the surgeon to make difficult decision on choice of local anesthesia required. However there is no Ideal local anesthetic agent for a any particular surgery, careful choice of anesthetic agent may avoid requirement of additional prick. On the other hand first post operatively day pain perception is understandably high. A study demonstrated, reported pain levels of patients who underwent mandibular third molar extractions was significantly higher on first day when compared to second day and third day.³ Hence first day pain management is the key to surgeons success. Long acting Bupivacaine which is mostly used for post operative pain management injected along with Lidocaine in this study in 50/50 mixture to evaluate advantages if any, on the first operative day in terms of onset of action, duration of action and analgesia.

Materials and Method

A total of 50 patients selected randomly from both genders in the age group of 18 years to 40 years who were requiring extraction of bilateral mandibular third molars were selected for the study. Case selection was done carefully to choose patients with bilateral radiographically mesioangular impacted mandibular third molar. Patients with infection, medically compromised status and who required additional nerve block were excluded from the study. Before administering the inferior alveolar nerve block and lingual nerve block, written consent was obtained, and appropriate measures were taken to reduce the anxiety. 2.5 ml disposable syringes were used to inject the anesthetic agents. 2% Lidocaine with adrenaline 1:80,000 (LIGNOX 2% A), 0.5% bupivacaine hydrochloride (ANAWIN) were the local anesthetic agents used.

All the patients underwent extractions using inferior alveolar nerve and lingual nerve block in three week

period on either side. One side, extraction of mandibular third molar was performed by using 2.5 cc of lidocaine, whereas the contralateral side third molar was extracted using a mixture of 1.25 cc of lidocaine and 1.25cc of Bupivacaine. Both extractions were performed by placing standard wards incision, followed by distobuccal bone guttering and splitting of the teeth. Standard aseptic condition was maintained throughout the procedure and all measures to avoid infections taken. EPT (Electric Pulp Tester) was used on Canines on respective sides for evaluating the onset and duration of action. NSAIDs (Tab. Diclofenac Na 50mg + Paracetamol 500mg) were prescribed along with prophylactic antibiotics and patients were asked to consume in case of pain and the same was recorded. Corticosteroids avoided in all the cases with no injectable NSAIDs used immediately after the surgery, which was explained to the patient preoperatively while obtaining the written consent. Clearance from internal Ethical committee of the institution was obtained for this study well in advance.

Results

Table 1

	Lidocaine (m=Mean + SD)	Lidocaine+Bupivacaine (Mean+SD)	P value
Onset of Action (Minutes)	3.30 ± 51	3.75 ± 0.48	<0.001
Duration of action (Minutes)	73.78 ± 7.39	80.31 ± 6.37	<0.001
Analgesic Taken	8.05 ± 1.13	8.58 ± 0.98	0.054

There was a statistically significant difference between the two solutions in terms of onset and duration of action. The combination of Lidocaine + Bupivacaine offered a prolonged duration of action in the patients. (P value <0.001). There was no difference in analgesics taken.

An "Independent sample t test" was used for finding out the statistical significance of the results. P value <0.05 was considered statistically significant.

Discussion

Local anesthetic agents are widely used in the field of surgery and dentistry for the purpose of anesthesia and analgesia. Most plastic surgeons and ophthalmologists use Bupivacaine mostly for the purpose of post operative pain management. In the field of maxillofacial surgery bupivacaine infiltration has greater success rate as analgesia in post operative pain management of cleft lip and cleft palate surgery patients.⁴ On the other hand lidocaine is considered to be a gold standard due to its desired duration of action and less toxicity.⁵ Majority of dental procedures which require a local anesthetic can be performed using Lidocaine. For many patients receiving Bupivacaine the onset of anesthesia is delayed from 6 to 10min, this might be due to Bupivacaine's pKa of 8.1. (pKa or the dissociation constant is a measure of a molecules affinity for hydrogen ions(H⁺)). A local

anesthetic with high pKa has very few molecules available in the RN form at a tissue pH of 7.4. The onset of anesthetic action of this drug is slow because too few base molecules are available to diffuse through the nerve membrane. A local anesthetic with a lower pKa has a very large number of lipidophilic free base molecules that are able to diffuse through the nerve sheath. But the anesthetic action of this drug is also inadequate because of the intracellular pH of 7.4. Only a very small number of base molecule dissociate back to the cationic form necessary for binding at the receptor site.

Many clinical studies of lignocaine and bupivacaine combination have been tried. However effect of combining two agents may vary considerably.^{6,7} The action of combined local anesthetics has been suggested to be affected by interaction at drug receptor sites on the nerve membrane.⁸ Average onset of time of anesthetic effect did not vary in comparison of Lidocaine with and without Bupivacaine for local dental anesthesia in a study.⁹ Null Hypothesis – The use of a 50/50 mixture of lidocaine and bupivacaine for peripheral nerve blockade would result in the same onset and duration of anesthesia as the use of the products independently¹⁰ (Bret M Ribotsky et al, Journal of the American Podiatric Medical Association). In our study onset showed statistical difference between two groups. Onset of action was lesser in bupivacaine and lidocaine mixture

when compared to bupivacaine. Ozgur ÖZMEN et al, states Lidocaine addition to bupivacaine significantly lowered the block onset time and extended the postoperative analgesia requirement time compared to bupivacaine alone.¹¹ Clinically no advantage noted by authors of this study by having shorter onset of time, since patient compliance did not differ across both the groups.

In a study by Ribotsky BM et al has concluded that no significant difference in duration of action when lidocaine and bupivacaine used in a 50/50 mixture.¹⁰ In contrary, Corliss a Best et al wrote Buffered lidocaine and bupivacaine mixture as an ideal local anesthetic agent in terms of duration of anesthesia and analgesia.¹² Another study showed significant prolonged duration of action in mixture of lidocaine and bupivacaine when compared to lidocaine alone when administered intradermally with no difference in onset of action.¹³

Statistically significant longer duration of action noted in our study. Our results may be advantageous for a dental surgeon when planning for a lengthy procedures like multiple root canals, pre prosthetic surgeries, Augmentation procedures, multiple implants etc. Few studies have been performed in this regard in dentistry and many research have been published in journals of anesthesia, plastic surgery, General Surgery and pediatric surgery.

One more criteria evaluated in this study was analgesic effect of Bupivacaine. In a study conducted by Reza Khorshidi Khiavi et al, Irrigation of third molar surgery site with bupivacaine post operatively showed significant reduction in pain on first day of surgery.¹⁴ Prolonged duration of action may delay the beginning of consumption of analgesic but overall consumption not altered in any way. Important factor of pain management on first post operative day was successful without any clinical advantage over total number of NSAIDs used.

Conclusion

This study showed prolonged duration of action in Lidocaine and Bupivacaine mixture in inferior alveolar nerve block which is similar to few studies. Faster onset of action is not desirable since mixture contains long acting Bupivacaine. Shorter onset of action is required only in pediatric practice where duration of action also should be optimal. Duration of action may be prolonged, but if that is the requirement of the surgeon, there is no requirement of Lidocaine anyway. Hence it's safer to conclude that 50/50 Mixture of Lidocaine and Bupivacaine has narrow clinical significance even if there was statistical difference in parameters studied.

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