

**Title:** PH-ADJUSTED LIDOCAINE/BUPIVICAINE MIXTURES ARE SUPERIOR FOR PERIBULBAR ANESTHESIA

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**INTRODUCTION:** Alkalinization of local anesthetics has been shown to improve onset time and spread of anesthesia(1). A mixture of lidocaine (L) and bupivacaine (B) is commonly used for ophthalmic anesthesia. The peribulbar approach has been advocated to reduce the complications of retrobulbar block. A frequent clinical problem is that the peribulbar block requires more time and injections than the retrobulbar (2). We undertook a prospective, double-blinded, randomized study to see if pH-adjusted L/B mixtures had faster onset times and better spread when used for peribulbar anesthesia.

**METHODS:** After IRB approval 80 patients gave written informed consent. All patients were scheduled for elective intraocular surgery with regional anesthesia and MAC. The only exclusion criteria was prior vitreo-retinal surgery. Patients were divided into 4 equal groups of 20 to receive one of four possible L/B mixtures: 1- L = 2% Lidocaine (Elkins-Sinn, Cherry Hill NJ); 2- LPH = 2% L plus 0.4 meq sodium bicarbonate/10ml; 3- LE = 2% L with 1:100000 epinephrine (premixed Elkins-Sinn); 4- LEPH = 2% L with 1:100000 epinephrine plus 0.4 meq sodium bicarbonate/10ml. To 5 ml of each of the preceding 5 ml of 0.75 % B (Astra, Westborough MA) and 150 units of hyaluronidase were added.

Patients were premedicated with 50-100 mcg of fentanyl and 0.5 mg of droperidol IV. All blocks were done by one of the investigators (KZ), who was blinded to the mixture, with 8 to 9 ml of anesthetic. One injection was at 6 o'clock at the inferior orbital rim and the second at the the supratrochlear notch with a 25 ga needle inserted past the equator of the globe. Each patient had digital massage with gauze for 2 min. Extraocular muscle movement was evaluated in each quadrant at 1 min intervals for 20 min. The block was considered satisfactory when akinesia occurred (defined as movement of  $\leq 1$ mm). Supplemental blocks (with the same mixture) were done at 20 min in the case of residual movement. Adequate analgesia was determined by lack of response to incision of the conjunctiva.

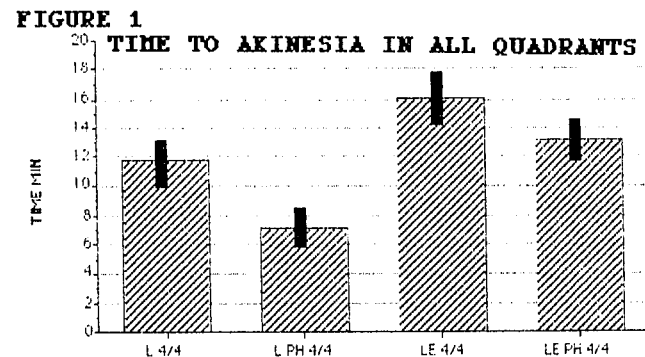
During the course of the study sample vials representative of the lots of local used were selected. The pH of the 4 resulting mixtures were measured by a Beckman model 4500 pH meter.

Differences between onset times of akinesia between groups were evaluated by the ANOVA. Need for supplemental injections was compared among groups by the Fisher exact test. A  $F$  of  $< 0.05$  was used to reject the null hypothesis.

**RESULTS:** Mean pH values ( $\pm$ SEM) and numbers of patients needing supplemental blocks at 20 min are presented in Table I.

	L	LPH	LE	LEPH
pH	6.43 $\pm$ .21	6.97 $\pm$ .12	3.84 $\pm$ .47	6.57 $\pm$ .18
sup.block	4/20	2/20	7/20	4/20

Although the LE group had the highest need for supplementation this was not statistically significant. Mean time to akinesia in all quadrants ( $\pm$ SEM) is presented in Figure 1.



Statistical analysis by ANOVA reveals that the LPH group is faster than the L or LE/LEPH groups. The LEPH group has faster onset than the LE group. All patients had adequate analgesia for surgery.

**DISCUSSION:** Alkalinization of local anesthetic solutions increases the amount of drug available in the non-cation form and presumably this increases nerve penetration to decrease onset time. In this study on peribulbar anesthesia we have demonstrated that alkalinization of L/B and LE/B mixtures improves the onset time and quality of the block. The LE solution used is supplied at a pH of 3.5 to avoid oxidation of the epinephrine. It would be interesting to see if LPH with freshly added epinephrine would work as well as LPH. Alkalinized local anesthetics may be an attractive method to improve the efficacy of peribulbar anesthesia.

#### References:

- Galindo A: pH-adjusted local anesthetics: Clinical Experience. Regional Anesth 8:35, 1986
- Davis DB, Mandel MR: Posterior Pulbulbar Anesthesia: An alternative to retrobulbar anesthesia. Geriatric Ophthalmology 3:27,1984