

THE EFFECTS OF OPTO-FLUOROCAINE ON THE HUMAN CORNEA

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ABSTRACT

Our study was to analyze the possible toxic effects of the drug Opto-fluorocaine, which is used to perform applanation tonometry, on the human cornea. The active ingredients in Opto-fluorocaine are proparacaine hydrochloride 0.5% and fluorescein sodium 0.25%. Thimerosal 0.01% is used as the preservative. The experiment was conducted by taking a random sample of 155 patients. Prior to tonometry, we instilled one drop of Opto-fluorocaine into the left eye, while one drop of proparacaine HCL 0.5% and a fluorescein strip was used in the right eye as a control. The corneal integrity was evaluated for any adverse reactions. Any asymmetrical response was assumed to be the result of a thimerosal hypersensitivity. Bilateral responses were assumed to be related to the proparacaine HCL.

INTRODUCTION

Allergic hypersensitivity is an adverse side effect that may occur through the use of ocular anesthetics. It is not uncommon for these topically applied agents to cause stinging or burning upon initial instillation. Allergic reactions to proparacaine include epithelial stippling, mild stromal edema, conjunctival injection and edema, eyelid edema, and lacrimation.

Present experiments have shown that proparacaine induces structural changes in the membrane-associated, actin cytoskeleton of epithelial cells. These changes are ultimately associated with alterations in cell surface morphology, cessation of cell motility, and detachment of cells from the substratum adhesions (1). Most allergic reactions are not clinically significant due to the spontaneous regeneration of the corneal epithelium. Occasionally the reaction may be severe resulting in visual acuities ranging from 20/80 - 20/200. In some patients, especially those over age fifty years, a localized or diffuse desquamation of the corneal epithelium becomes evident (2). This reaction usually occurs within two to five minutes after instillation of the anesthetic, but sometimes it may not develop for thirty minutes. The characteristics include a diffuse necrotizing keratitis with edema and the formation of epithelial filaments (See Figure 1).

The thimerosal found in Opto-fluorocaine can also cause a hypersensitivity reaction resulting in ocular irritation. These findings can closely resemble a positive reaction to topical anesthetics.

The goals of this study were to determine the frequency of

allergic hypersensitivity reactions found among the population, following the use of topical agents for applanation tonometry. Our focus was on Opto-fluorocaine because of the possible additional risk caused by the presence of thimerosal.

METHODS

This experiment was conducted on a random sample of the patients we encountered during our clinical rotations. Data was collected from a total of 155 patients. The ages of our subjects ranged from eleven to ninety-one years, with a mean of forty-two.

The chemical composition and concentrations in each trial were the same except for a significantly high concentration of thimerosal 0.01% in the Opto-fluorocaine. Therefore we concluded that any unilateral reactions were the result of a hypersensitivity to thimerosal, while a bilateral response would be due to the proparacaine.

Each patient had one drop of proparacaine 0.5% and sodium fluorescein placed into their right eye, while one drop of Opto-fluorocaine was used in their left eye. Following instillation of these topical agents we evaluated the corneal integrity for any type of adverse reaction. A total of thirty minutes was allowed for detecting a positive allergic response.

We recorded whether the positive reactions were unilateral or bilateral. If a reaction occurred the keratitis was graded using a 0-4+ scale (Table 1).

RESULTS

Out of the 155 subjects tested, five developed a keratitis in the left eye only, while eight developed one bilaterally. This suggests a positive reaction to either agent 8.4% of the time. Positive reactions ranged from a grade of 1+ to 4+. The calculated risk ratio comparing the incidence of an Opto-fluorocaine reaction to one caused by using proparacaine alone was 1.625. A 95% confidence interval regarding this value was generated and ranged from .628 to 4.594. The p-value was 0.25.

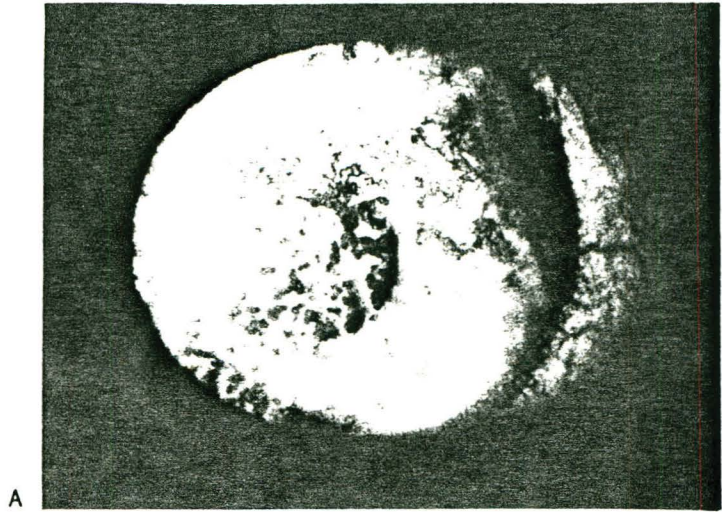
DISCUSSION

Based on our statistical analysis, we found that by instilling Opto-fluorocaine, the likelihood of inducing a keratitis was 1.625 times or 62% greater than when using proparacaine and a fluorescein strip. Overall, the chance of inducing a corneal reaction with topical anesthetics was 5.2%. This increased to 8.4% when Opto-fluorocaine was used to anesthetize the cornea. However, our results did not achieve statistical significance at the 0.05 level. The p-value of 0.25 suggests that the probability that the positive relationship found with Opto-fluorocaine was due to chance was 25% or less.

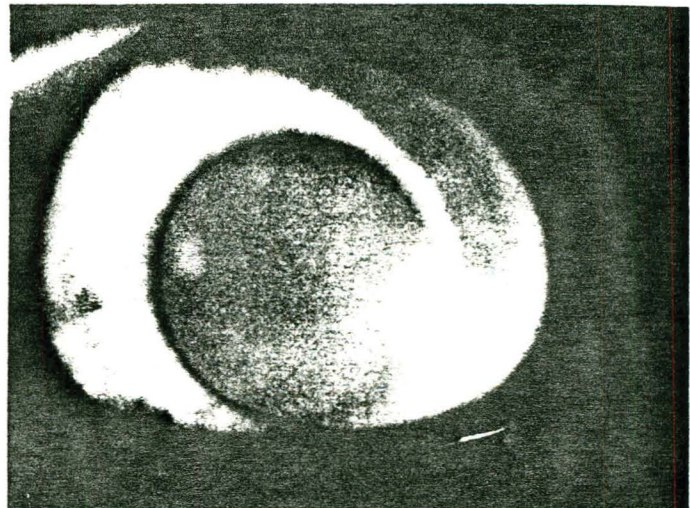
Our believe is that a larger sample size would have increased our

statistical signifigance. We are concluding that a weak positive association exists between instilling Opto-fluorocaine and producing more corneal sensitivity reactions than proparacaine alone. This supports the use of an NCT as a screening device. Based on our study, the use of Opti-fluorocaine is not supported

for applanation tonometry.



A



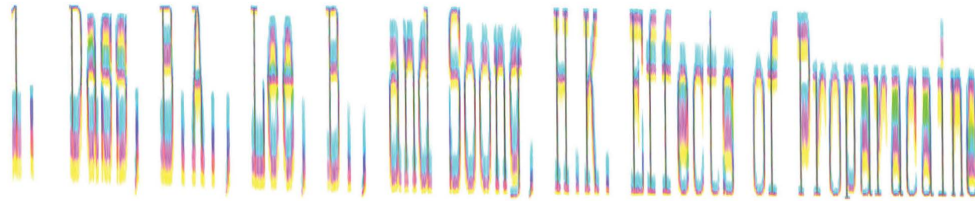
B

Figure 1 (A) Severe toxic corneal epithelial desquamation following instillation of proparacaine 0.5%. (B) Same cornea 24 hours later, demonstrating the rapidity with which healing occurs.

Table 1

<u>PUNCTATE EPITHELIAL EROSIONS</u>	
Grade	Findings
0	None present
1+	< 10 erosions
2+	10-50 erosions
3+	> 50 erosions
4+	Abrasion

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