Short Term Topical Tetracaine is Highly Efficacious for the Treatment of Pain Caused by Corneal Abrasions: A Double-blind, Randomized Clinical Trial

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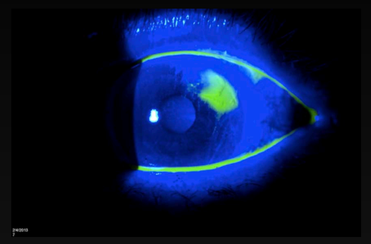
ABSTRACT

Study Objective: The objective of this study was to show that patients with corneal abrasions would experience more pain relief with short term topical tetracaine than placebo.

Methods: The study was a prospective, double-blind, randomized trial of tetracaine versus placebo set in the emergency department (ED). A total of 118 adults who presented with uncomplicated corneal abrasions were included and randomized. The intervention was either topical tetracaine or placebo applied every 30 minutes as needed for 24 hours. The primary outcome was the overall numerical rating scale (NRS) pain score measured at the 24 to 48-hour ED follow-up examination.

Results: 111 patients were included in the final analysis, 56 in the tetracaine group and 55 in the placebo group. At the 24 to 48-hour follow-up, the overall NRS pain score after use of the study drops was significantly lower in the tetracaine group (1) versus placebo group (8) ($\Delta 7$; 95% CI 6,8). Patients in the tetracaine group used less hydrocodone than those in the placebo group. The complication rates between the 2 groups were similar.

Conclusions: Short term topical tetracaine is an efficacious analgesic for acute corneal abrasions, is associated with less hydrocodone use when compared to placebo, and was found to be safe in this sample.



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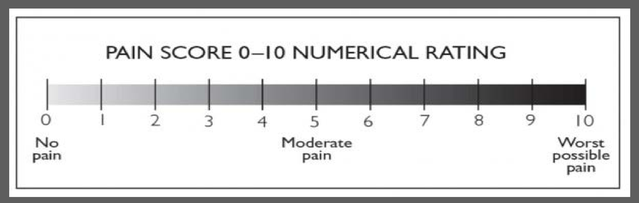
Background

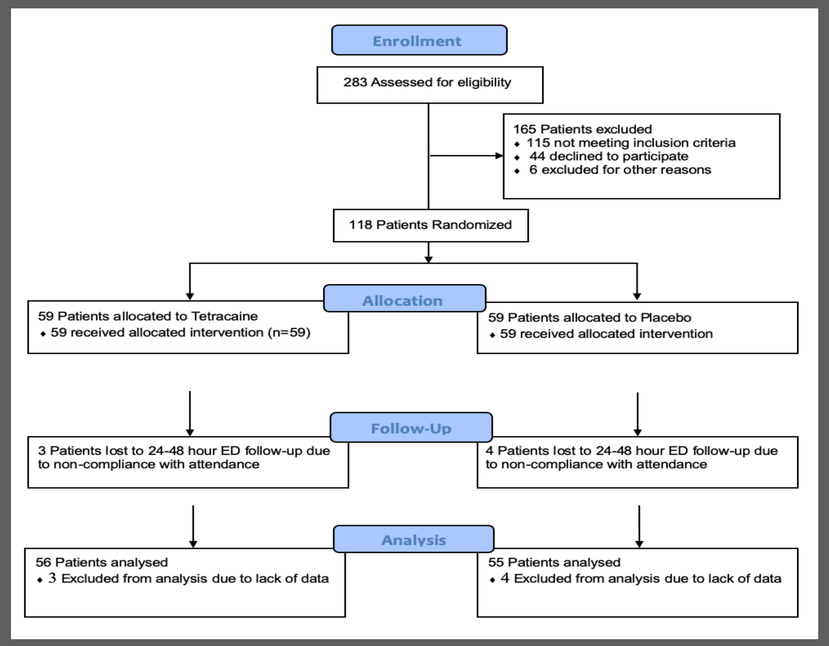
- Corneal abrasions are common Emergency Department complaints.
- Topical anesthetic drops are routinely used as diagnostic therapy but discouraged for outpatient management due reports of rare complications.
- The objective of this study was to compare the effectiveness of topical tetracaine vs placebo in ED patients with corneal abrasions by measuring the Numeric Rating Scale (NRS) pain score at 24 – 48 hour ED follow up.

Methods

- Prospective, randomized, double-blind, placebo-controlled trial.
- Approved by IRB and registered with ClinicalTrials.gov.
- Data collected from Jan 2015 – Sept 2017 in an urban community ED with 86,000 visits/year.
- Patients were randomized to tetracaine or placebo groups using numbered, sealed opaque envelopes.
- Each envelope contained an antibiotic ophthalmic solution (Polytrim) and either tetracaine or placebo labeled as “study drops.”
- Patients also received hydrocodone/APAP 7.5/325 mg #12 for breakthrough pain and asked record amount of hydrocodone taken.
- The primary outcome was the overall numerical rating scale (NRS) pain score measured at the 24 to 48 hour ED follow-up examination.
- The secondary outcome was the number of hydrocodone taken and adverse events.
- Patient were asked to follow up with study ophthalmologist after one week.
- Electronic medical record searched and follow up via telephone.

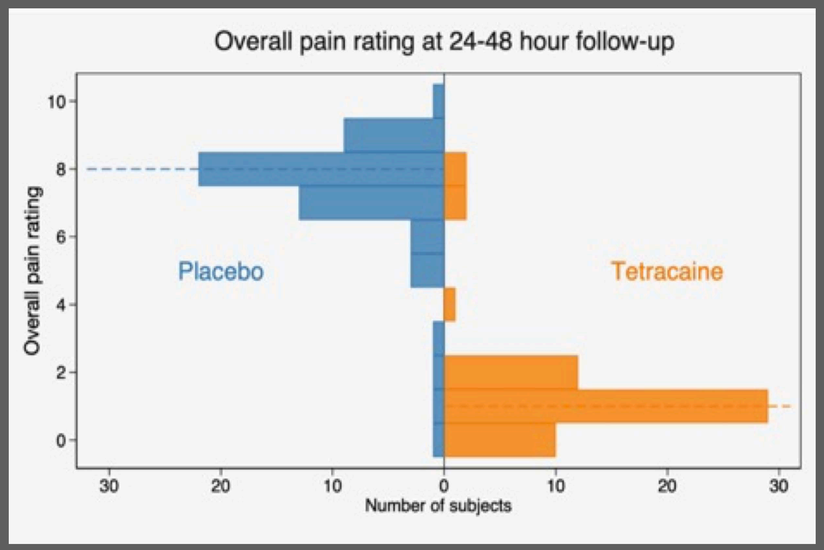


Results



Endpoint	Tetracaine(n=56)	Placebo(n=55)	Difference(95%CI)
Overall NRS at 24-48° follow-up	1(1,2)	8(7,8)	7(6,8)
Secondary endpoint			
Number of hydrocodone tablets recorded	1	7	6(4,9)
Adverse events	3.6%	11%	7.4%(-2.9,18.6)

NRS=Numerical Rating Scale
*Results are expressed median (IQR) unless otherwise indicated.



Conclusions

- Topical tetracaine resulted in significantly lower NRS pain at 24-48 hours as compared to placebo.
- Tetracaine group took less opiates (5.9 tablets) without any increase in complication.
- Tetracaine group recorded use of study drops more.
- This could reduce or eliminate prescription opioid use.
- Our study suggests ED clinicians can safely prescribe patients with uncomplicated corneal abrasions topical anesthesia for 24 hours with close ophthalmology follow up and return precautions.

Limitations

- This study was not powered to establish safety for rare adverse events.
- Burning nature of tetracaine may unintentionally unblinded patients.
- Placebo drops were packaged in 4 ampules vs single bottle of tetracaine.
- Excluded large or complicated cases.
- Single center
- Very few patients in either group attended one week follow up.
- Possibility of missed complications or sought care elsewhere.

References

- [1.] Ahmed F., House RJ, Feldman BH. Corneal abrasions and corneal foreign bodies. *Prim Care*. 2015;42:363-375.
- [2]. Willis WE, Laibson PR. Corneal complications of topical anesthetic abuse. *Can J Opthalmol*. 1970;5:239.
- 3. Henkes HE, Waubke TN. Keratitis from abuse of corneal anesthetics. *Br J Opthalmol.* 1978;62:62-65.
- 4. Rosenwasser GO. Complications of topical ocular anesthetics. *Int Opthalmol Clin.* 1989;29:153-158.
- 5. Rosenwasser GO, Holland S, Pflugfelder SC, et al. Topical anesthetic abuse. *Can J Opthalmol.* 1990;97:967-972.
- 6. Higbee RG, Hazlett LD. Topical ocular anesthetics affect epithelial cytoskeletal proteins of wounded cornea. *J Ocul Pharmacol.* 1989;5:241-253.
- 7. Bisla K, Tanelian DL. Concentration-dependent effects of lidocaine on corneal epithelial wound healing. *Invest Opthalmol Vis Sci.* 1992;33:3029-3033.
- 8. Grant RL, Acosta D. Comparative toxicity of tetracaine, proparacaine, and cocaine evaluated with primary cultures of rabbit corneal epithelial cells. *Exp Eye Res.* 1994;58:469-478.