

Comparison of Patient Comfort in Alcohol Assisted Versus Mechanical Debridement in Photorefractive Keratectomy (PRK)

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ABSTRACT

Aims: To compare patient comfort in alcohol-assisted versus mechanical debridement in photorefractive keratectomy (PRK).

Method: This study was performed on 44 eyes of 22 patients. All patients were above 18 years old and had no ocular and systemic problems apart from refractive error. Detailed evaluation was done for refractive surgery. The method of epithelial removal was randomly assigned. Patients were postoperatively evaluated for comfort in terms of pain, watering, foreign body sensation (FB) and photophobia with the help of questionnaire based Performa on day 0, 5, 15 and 60.

Results: A total of 44 eyes of 22 patients were evaluated. Mean scores were higher in mechanical debridement eyes than alcohol-assisted eyes in day 0 and day 5. Pain and FB sensation had a significant difference on day 5 whereas watering and photophobia had a significant difference on day 0.

Conclusion: In terms of patient's comfort (pain, FB sensation, watering and photophobia) alcohol-assisted removal seems to be a better option.

Keywords

Photorefractive keratectomy, Mechanical and Alcohol-assisted debridement, Patient comfort.

Introduction

Modern excimer laser treatment has dramatically altered the landscape of elective surgery to eliminate one's refractive error and

patients worldwide are having laser assisted in situ keratomileuses (LASIK), photorefractive keratectomy (PRK), or other refractive surgeries [1]. Out of all refractive surgeries, PRK is a popular choice among surgeons over the world. In photorefractive keratectomy (PRK), the epithelium is removed and ablation is done on the stromal bed. To remove the epithelial layer several techniques are used including manual scraping, Amoils brush, alcohol (20%), and

excimer laser [2].

The aim of epithelial debridement is to create a uniform bed for ablation and prevent hydration of stroma. The most commonly used techniques are mechanical scrapping and alcohol-assisted removal. Mechanical debridement is a straightforward and effective method, drawbacks of which include irregular margins, remnants of epithelium and nicks or scratches in Bowman's membrane [3]. Alcohol debridement is easier and faster with a probably more uniform bed at the end [4]. Either way problems of epithelial debridement include moderate to severe pain, a relatively long period of visual recovery and corneal haze [5,6].

Former studies have compared the patient epithelial healing, postoperative pain, and other parameters [3-5]. The degree of refractive error and the resulting amount of ablation would not affect the epithelial healing process. We have studied exclusively patient's comfort level in terms of pain, watering, foreign body sensation, and photophobia. Interpersonal differences between individuals were negated by one eye subjected randomly to one method and other eye automatically to another method.

Methods

This study was performed on 44 eyes of 22 patients. All patients who were above 18 years with normal ocular examination and no systemic illness underwent the procedure. Patients with corneal or anterior segment pathology, keratoconus, eyelid disease, uncontrolled glaucoma, untreated retinal abnormalities, progressive or unstable myopia, or previous intraocular or corneal surgery were excluded. The risks and benefits of PRK were discussed before enrollment. Informed consent was obtained from all patients prior to entering the study. The procedures were randomly assigned to the patient's eye using a random number table. In each group, epithelial removal was performed after application of alcohol or mechanically scrapped using a hockey blade.

All operations were performed by a single surgeon and the same excimer laser machine (Allegretto WaveLight® Allegretto Wave® Eye-Q Laser). After installation of proparacaine 0.5% eye drops (Paracain, Sunways, Mumbai, India) twice within a 10-minute interval, the eyes were exposed using adjustable eyelid speculum. In the mechanical group, the epithelium was removed manually in a centripetal fashion using a blunt hockey blade. In the alcohol group, the cornea was exposed to 20% ethyl alcohol for 25 seconds with the aid of a well. The diameter of epithelial removal was 8 mm. After epithelial removal, excimer laser ablation was performed. Following laser ablation, 0.02% mitomycin C (Zydus, Ahmedabad, India) was applied to the ablated stroma in eyes depending on the refractive error. The Eyes were irrigated with balanced salt solution and a bandage contact lens was placed on the cornea. Moxifloxacin 0.5% w/v eye drops (Vigamox, Alcon Laboratory, Bangalore, India) were instilled. At the time of discharge patients were started on Nepafenac 0.1 % w/v (Nevanac, Alcon laboratory, Bangalore, India), Moxifloxacin 0.5 % w/v (Vigamox, Alcon, Bangalore, India) and Carboxymethylcellulose 0.1 % w/v (Allergan Inc, Irvine, CA, USA). Questionnaire-Based

complaints of patients in terms of pain, watering, foreign body sensation and photophobia were noted according to the grading defined from 0 to 4 for both eyes separately on day 0. Similar feedback was obtained on day 5, day 15 and day 60.

Statistical analysis was performed using SPSS 11.0 software (SPSS Inc., Chicago, IL, USA). Mean and standard deviation of complaints in both eyes at different follow-ups was calculated. P value was calculated using mean and standard deviation. P-values less than 0.05 were considered as statistically significant.

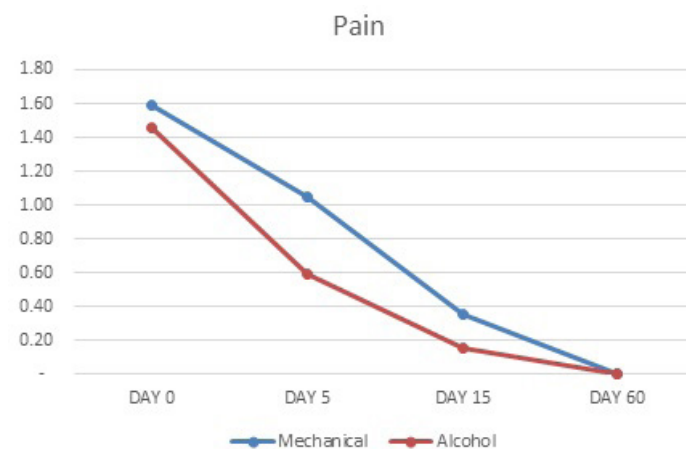
Results

A total of 44 eyes of 22 patients were studied. Each patient's eye was randomly allocated mechanical debridement or alcohol-assisted during PRK. The other eye underwent second method of debridement automatically. None of the patients had any complication intra-operatively and post-operatively and all patients were followed up for 2 months post procedure.

Pain- Mean score for postoperative pain on day 0 in eyes who had mechanical debridement was higher (1.59) as compared to alcohol-assisted removal (1.45). But the P-value (0.4052) was insignificant. Conversely, on day 5, we found a significant difference in pain for mechanical and alcohol-assisted debridement method. Mechanical debridement group had a higher (1.05) pain score than alcohol (0.59) and this difference came out statistically significant with a P-value of 0.0126. On day 15 and Day 60 follow-up, the mean pain scores were comparable and showed no significant difference (P-values >0.05) (Table 1) (Graph 1).

Day	0		5	
Method of epithelial removal	Mechanical	Alcohol	Mechanical	Alcohol
Mean	1.59	1.45	1.05	0.59
Standard Deviation	0.50	0.60	0.58	0.59
P Value	0.4052		0.0126	

Table 1: Mean, Standard deviation and P-value on day 0 and day 5 for pain.



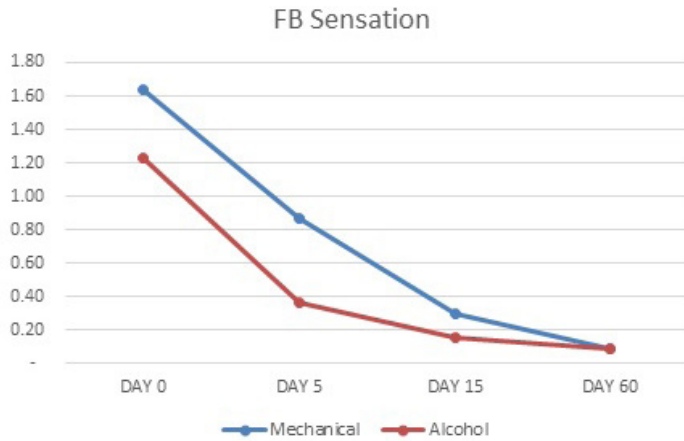
Graph 1: Graph showing the comparison of mean scores for Pain and subsequent follow-up.

Foreign Body sensation

The FB sensation mean score was found to be higher in mechanical debridement eyes (1.64) as compared with alcohol-assisted eyes (1.23) but the P-value was insignificant (0.1214). On day 5 we got higher mean scores for mechanical debridement eyes (0.86) in comparison to alcohol-assisted eyes (0.36). Also, the P-value came out significant (0.0142). As with the pain scores on day 15 and 60, there was no statistical difference between the two groups in FB sensation as well (P-value= 0.7686) (Table 2) (Graph 2).

Day	0		5	
	Mechanical	Alcohol	Mechanical	Alcohol
Method of epithelial removal				
Mean	1.64	1.23	0.86	0.36
Standard Deviation	0.85	0.87	0.71	0.58
P Value	0.1214		0.0142	

Table 2: Mean, Standard deviation and P-value on day 0 and day 5 for FB sensation.



Graph 2: Graph showing the comparison of mean scores for watering and subsequent follow-up.

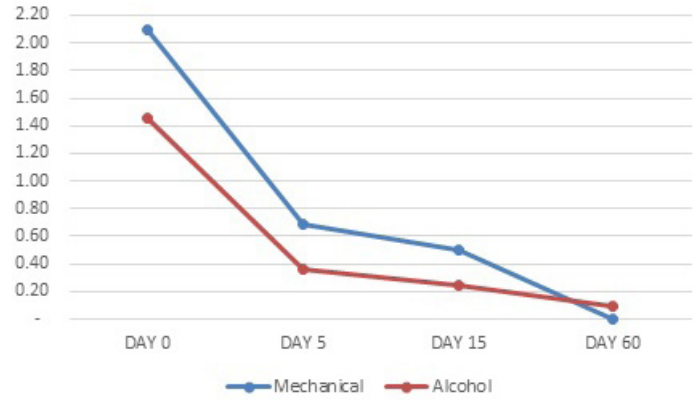
Watering

On the day of procedure, eyes who underwent mechanical debridement experienced more watering with the mean score of 2.09 as compared to alcohol-assisted eyes who had a mean score of 1.45 and also this difference was significant with a P-value of 0.0299. On day 5, both eye groups had a drop in the complaint as mean scores decreased, although mechanical debridement eyes (0.68) were still on a higher side compared to alcohol assisted eyes (0.36). But this difference was insignificant (P-value- 0.069). On day 15 and 60, we found no difference in complaints of watering between the two eye groups (P-value>0.05) (Table 3) (Graph 3).

Day	0		5	
	Mechanical	Alcohol	Mechanical	Alcohol
Method of epithelial removal				
Mean	2.09	1.45	0.68	0.36
Standard Deviation	0.86	0.91	0.64	0.49
P Value	0.0299		0.069	

Table 3: Mean, Standard deviation and P-value on day 0 and day 5 for watering.

Watering



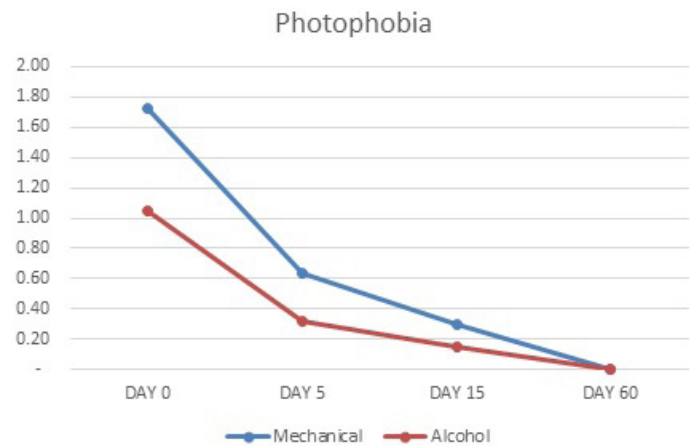
Graph 3: Graph showing the comparison of mean scores for watering and subsequent follow-up.

Photophobia

Eyes who had mechanical debridement had significantly more (P-value= 0.0238) photophobia with the mean score of 1.72 compared to alcohol assisted eyes which was 1.04. Also, both eye groups noticed a reduction in mean scores on day 5 with mechanical debridement (0.63) being higher than alcohol-assisted (0.31). The P-value was 0.0508 so the difference may or may not be significant. As noted earlier, day 15 and day 60 showed no significant difference (P-value=0.3196) (Table 4) (Graph 4).

Day	0		5	
	Mechanical	Alcohol	Mechanical	Alcohol
Method of epithelial removal				
Mean	1.72	1.04	0.63	0.31
Standard Deviation	1.07	0.84	0.53	0.47
P Value	0.0238		0.0508	

Table 4: Mean, Standard deviation and P-value on day 0 and day 5 for photophobia.



Graph 4: Graph showing the comparison of mean scores for photophobia and subsequent follow-up.

Discussion

In this study, we compared the patient's comfort by two methods of epithelial debridement in PRK i.e mechanical and alcohol-assisted. In general, the epithelial healing takes about 3 to 4 days,

which is where we would expect some patient discomfort. The study showed a higher mean score for mechanical debridement in regards to all the symptoms (pain, FB sensation, watering, and photophobia) on day 0 and day 5 check-ups. On the other hand, we did not find any significant difference between the two methods on day 15 and day 60 which is beyond the epithelial healing time.

In our study, comparison of Pain and FB sensation on day 0 showed no significant difference whereas on day 5 both symptoms had a significant difference with mechanical debridement being on the higher side of mean scores.

Mohammad Ghoreishi et al. study had a mean pain score of 4.7 ± 1.2 in the alcohol group versus 5.3 ± 1.5 in the mechanical group ($P=0.22$) which is similar to our study. Also, FB sensation in their study was more in mechanical debridement patients (11.6%) compared to alcohol-assisted (9.9%) [6].

In contrast, Blake et al found that patients reported significantly more severe postoperative pain with alcohol-assisted epithelial removal on postoperative day 1, but the difference was not significant by day 3 [7].

Lee HK et al. study revealed Postoperative pain, sub-epithelial opacity, and BSCVA were similar regardless of the epithelial removal procedure [8].

Watering and photophobia complaints on the day of surgery were more in mechanical debridement eyes with mean scores of 2.09 and 1.72 as compared to alcohol-assisted eyes where the scores were 1.45 and 1.04. In both of them, the P-value was <0.05 suggesting a significant difference between the methods. We also noticed that a drop in both complaints on day 5, with mechanical debridement eyes having higher mean scores (0.68 and 0.63) than alcohol-assisted eyes (0.36 and 0.31) but the difference was not significant (P -value for watering = 0.069 and P -value for photophobia = 0.508). To the best of our knowledge literature search showed no studies regarding the comparison of watering and photophobia post PRK with alcohol-assisted and mechanical debridement. On day 15 and day 60 there was no difference in the two methods of debridement.

Our study aimed to compare patients comfort levels for the two most common methods of epithelial debridement i.e mechanical and alcohol-assisted removal. The two procedures performed on the same patient helped to negate interpersonal differences in perception of complaints. Also, safety of alcohol has been proven in past by many studies.

What was known Before

- Both methods to be comparable in terms of efficacy and complications [6].
- Twenty percent ethanol is a simple, safe, and effective alternative to mechanical scraping before PRK [4,6].
- Alcohol-assisted debridement appears to be associated with a quicker visual rehabilitation [4,8].

- Postoperative pain was similar regardless of the epithelial removal procedure [6,8].

We attribute lesser complaints in the alcohol-assisted eyes were due to following factors

- A uniform epithelial removal.
- Relatively sharp edge at the borders.
- Less damage to the Bowman's layer (nicks and cuts in mechanical debridement).
- Probably a lower stimulation of keratocytes response in the anterior stroma [9,10].

Conclusion

Our study showed that most complaints were experienced between day 0 and day 5 follow-up which we had expected since the epithelial healing takes about 3-5 days. No difference was noted on day 15 and day 60 follow-ups. In general, mean scores were higher in mechanical debridement eyes than alcohol-assisted eyes. Therefore, we conclude that alcohol-assisted removal of epithelium provides better comfort to the patient.

Limitations of The Study

The sample size of our study is small and a large study would be ideal although this study can certainly act as a pilot study for others to come.

Reference

1. Jay H. Krachmer, Mark J Mannis, Edward J Holland, et al. Refractive surgery-Preoperative considerations. 2010; 3: 1767-1780.
2. Lee HK, Lee KS, Kim JK, et al. Epithelial healing and clinical outcomes in excimer laser photorefractive surgery following three epithelial removal techniques: mechanical, alcohol, and excimer laser. American Journal of Ophthalmology. 2005; 139: 56-63.
3. Campos M, Hertzog L, Wang XW, et al. Corneal surface after deepithelialization using a sharp and a dull instrument. Journal of Ophthalmic Surgery. 1992; 23: 618-621.
4. Juan- Carlos AbadBonnie An, William J. Power, Stephen Foster C, et al. A Prospective Evaluation of Alcohol-assisted versus Mechanical Epithelial Removal before Photorefractive Keratectomy. Ophthalmolgy. 1997; 104: 1566-1574.
5. Sunil Shah, Doyle SJ, Anupam Chatterjee, et al. Comparison of 18% Ethanol and Mechanical Debridement for Epithelial Removal Before Photorefractive Keratectomy. Journal of Refractive Surgery. 1998; 14: 212-214.
6. Mohammad Ghoreishi, Hossein Attarzadeh, Mehdi Tavakoli, et al. Alcohol-assisted versus Mechanical Epithelium Removal in Photorefractive Keratectomy. Journal of Ophthalmic Vision Research. 2010; 5: 223-227.
7. Blake CR, Cervantes-Castañeda RA, Macias-Rodríguez Y, et al. Comparison of postoperative pain in patients following photorefractive keratectomy versus advanced surface ablation. Journal of Cataract and Refractive Surgery. 2005; 31: 1314-1319.
8. Lee HK, Lee KS, Kim JK, et al. Epithelial healing and clinical

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- outcomes in excimer laser photorefractive surgery following three epithelial removal techniques: mechanical, alcohol, and excimer laser. *American Journal of Ophthalmol.* 2005; 139: 56-63.
9. Bahram Einollahi, Alireza Baradaran-Rafii, Mozghan Rezaei-Kanavi, et al. Mechanical Versus Alcohol-assisted Epithelial Debridement During Photorefractive Keratectomy: A Confocal Microscopic Clinical Trial. *Journal of Refractive Surgery.* 2011; 27: 887-893.
10. Javier Tomás-Juan, Ane Murueta-Goyena Larrañaga, and Ludger Hanneken. Corneal Regeneration after Photorefractive Keratectomy: A Review. *Journal of Optometry.* 2015; 8: 149-169.