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EFFICACY AND SAFETY OF ALCOHOL ASSISTED EPITHELIAL DELAMINATION IN RECURRENT CORNEAL EROSION SYNDROME

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ABSTRACT

Introduction: Recurrent Corneal Erosion Syndrome is a resistant condition to treat. Many modalities of treatment is available. Alcohol assisted epithelial delamination is relatively a new procedure and not widely practiced. This study evaluates the efficacy and safety of the procedure.

Material & Methods: This is a retrospective study conducted in our hospital. We have enrolled 30 patients who underwent the procedure within last two years. Patients with RCE who remained symptomatic despite topical lubrication was included. Patients were followed up at 1 day, 4 days, 1 week, and 1 month. Success was defined as resolution of symptoms after 1 month of treatment. The preoperative and postoperative data were collected from EMR and analyzed.

Results: Twenty nine patients were stable after the procedure. One patient required repeated treatment. There were no post operative complications. No patients lost any line of visual acuity.

Conclusion: Alcohol assisted epithelial delamination is a safe and effective procedure for treating patients with recurrent corneal erosion syndrome.

Keywords: Recurrent corneal erosion syndrome, Alcohol assisted epithelial delamination.

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INTRODUCTION

Recurrent corneal erosion syndrome (RCES) usually starts with a trivial injury to the eye. In some patients it may be secondary to dystrophy of epithelial basement membrane. The epithelium gets abraded with injury and the regrowing epithelium does not get a strong adhesion with basement membrane and easily get torn off frequently resulting in RCE. Minor trauma like eyelid cornea interaction during sleep can be sufficient for precipitating detachment. The pathology is not clearly understood. It is thought to be due to abnormal material on basement membrane preventing adhesion between newly formed epithelial cells and basement membrane. There are several other theories including hemidesmosome weakness, activation of matrix metalloproteinase as part of an inflammatory process.^{1, 2} Gelatinase activities (Matrix metalloprotease-2, Matrix metalloprotease-9) is

up regulated in epithelium of patients with RCE. Typical findings at histology are an abnormal basement membrane protruding into the epithelium and intraepithelial microcysts. Recurrent corneal erosions are characterized by sudden onset of eye pain, usually at night or upon first awakening, accompanied by redness, photophobia and tearing. Individual episodes may vary in severity and duration. Minor episodes usually last from 30 minutes to several hours. An epithelial defect may not be present at the time of examination but the extent of loose epithelium may be highlighted by areas of pooling of fluorescein and rapid tear film breakup. More severe episodes may last for several days and are often associated with greater pain, eyelid edema, decreased vision, and extreme photophobia. Once the defect is healed, slit lamp examination may show punctuate epithelial erosions in milder cases (microform erosions) and a frank epithelial defect or a large area of edematous non-adherent

epithelium in severe cases (macroform erosions)³(Figure1). These will typically be bilateral in corneal dystrophy and unilateral if injury is the cause. RCES is a painful condition frequently affecting lifestyle and comfort of patients³. Various modalities of treatment have been tried for this condition like frequent application of lubricant eye drops in milder cases. When conservative measures fail a number of treatments have been advocated like corneal scraping, use of soft high water containing bandage contact lens(BCL)⁴ , Nd YAG laser puncture⁵, alcohol assisted epithelial delamination, superficial keratectomy with diamond burr⁶, anterior stromal puncture⁷, phototherapeutic keratectomy^{8,9}etc of which alcohol assisted delamination is a relatively new and less widely practiced procedure. Delamination of the corneal epithelium with dilute alcohol has become a valuable alternative for the treatment of recurrent corneal erosions. It seems to be a quick, safe and economical procedure that can achieve excellent clinical results.¹⁰This study aims at evaluating the efficacy and safety of alcohol assisted delamination of corneal epithelium (ADCE) in RCES.



Figure 1

MATERIAL AND METHODS

This is a retrospective study done in Al Salama eye hospital which is an associate institution of MES Medical College during the period of January 2013- January 2015. Institutional ethics committee approval was obtained. A total of 30 eyes of 30 patients were enrolled in the study. Only those patients who did not respond to medical therapy are selected to undergo this procedure. Moreover, as Alcohol assisted epithelial delamination itself is a rarely done

procedure, the sample size in this study remained small. The inclusion criterion was any patient with recurrent corneal erosion syndrome from any cause in whom symptoms were not controlled by topical lubricants. Pre-operatively visual acuity, refraction, slit lamp examination and intraocular pressure (IOP) by non contact tonometer (NCT) was recorded. All procedures were carried out in an operating room under topical anesthesia and after installation of 5% betadine into conjunctival sac. Absolute alcohol was diluted with sterile water to a 50% solution in a 1 ml syringe. A circular well (optical zone marker 4–6 mm in diameter, Bausch and Lomb, Kingston-upon-Thames, Surrey, UK) of diameter sufficient to encompass the area of erosions was placed onto the cornea and held with firm downward pressure. A few drops of the alcohol solution were then placed inside the well so that the entire treatment area was covered, and left for a duration of 30 s. The alcohol was then drained from the well with a surgical sponge (K-Sponge-Katena Products, Denville, New Jersey, USA) and the well removed from the cornea. The surface of the eye was irrigated with balanced salt solution to wash away residual alcohol. Using a fresh dry surgical sponge, the treated area of corneal epithelium was completely debrided from the corneal surface as a single sheet. The corneal surface was gently irrigated again with balanced salt solution and a BCL inserted. The patient was treated with topical lubricants four times a day and seen on the next day. BCL was removed at follow up and wound examined with fluorescein. Postoperatively visual acuity in logMAR, refraction, slit lamp examination, intraocular pressure (IOP) by NCT and severity of symptoms were recorded and the data was collected from EMR and compiled on an excel chart. Patients were followed up after the procedure 1 week, 1 month, 3 months and 6 months. Success was defined as complete resolution of RCES after treatment. Failure was defined as presence of recurrence with no improvement or worsening of symptoms following treatment. Statistical analysis was done with the help of SPSS software.

Statistical methods:¹¹⁻¹⁴ Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean \pm SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed

at 5 % level of significance. The following assumptions on data are made: 1. Dependent variables should be normally distributed, 2.Samples drawn from the population should be random, Cases of the samples should be independent. Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale within each group. Paired Proportion test has been used to find the significance of proportion in paired data. Significant figures + Suggestive significance (P value: 0.05<P<0.10)

* Moderately significant (P value: 0.01<P ≤ 0.05)

** Strongly significant (P value: P≤0.01)

Statistical software: The Statistical software SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

30 eyes of 30 patients were studied. Mean age of the patients was 37.47±10.80 ranging from 16-54yrs .The age distribution of the patients with RCES showed largest number of patients between 31-40 yrs (30%). (Chart 1) . Among the 30 patients that underwent the procedure no intra-operative complications were observed. The mean preoperative uncorrected visual acuity (UCVA) ranging from logMAR 0-0.8 was 0.14±0.24.On examination of patients during postoperative visits on 1st week, 1 month, 3 months, 6 months follow up, mean Uncorrected Visual acuity (UCVA) remained the same (0.14±0.24)(Table 1&2). Similarly during follow up visits of all the 30 patients, BCVA was observed to be stable (Table 3). No loss of best corrected visual acuity (BCVA) was recorded in any of the patients. During the initial follow up period of first week, there were no signs of infections, corneal ulcers or other complications recorded. Preoperatively the mean IOP was 15.17±2.41. Mean IOP of patients at 1st week 1 month , 3 months and 6 months follow up is 14.90±2.35,(p value 0.118) 14.77±2.16 (p value 0.050+), 14.80±2.06 (p value 0.054+) and 14.83±2.02 (p value 0.161)respectively (Table 4).No patient developed a significant increase in intraocular pressure after the procedure. Postoperatively during each follow up visits patients underwent slit lamp examination with fluorescent staining and the clinical parameters

assessed included presence of loose epithelium, erosions and epithelial defect. In all, 29 eyes of 30 patients (96.7%) did not develop loose epithelium or erosions (table 5&6) after treatment with alcohol assisted epithelial delamination and were free of symptoms. One (3.3%) patient developed recurrence of loose epithelium and recurrent erosions(graph1) during the 3rd month follow up associated with symptoms(P<0.001%)who underwent repeat procedure and further follow up revealed healthy epithelium with resolution of symptoms. Among the 30 patients, pre operatively 16 patients (53.3%) presented with epithelial defect and 14 patients (46.7%) did not. Postoperatively 28 out of 30 (93.3%) patients did not develop epithelial defect, 2 (6.7%) of them presented with a persistent epithelial defect in the 1st week of follow up which healed on examination during follow ups (P<0.001).

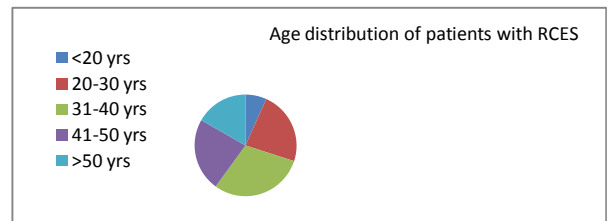
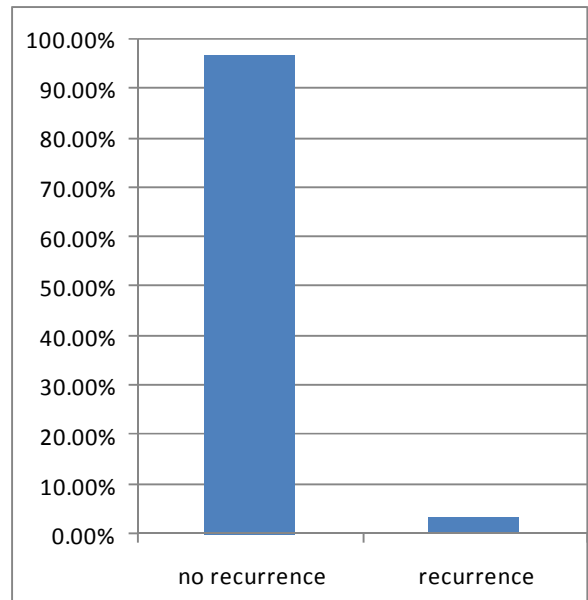


CHART-1: Age distribution of patients with RCES



Graph 1-Post operative percentage of recurrence in RCES after ADCE, (n=30)

Table 1: UCVA: An Assessment at Pre-Operative, Post-Operative Day1, Week1, and Month1

UCVA	Min-Max	Mean ± SD
Pre operative	0.00-0.80	0.14±0.24
Post op 1 st day	0.00-0.80	0.14±0.24
Post op 4 th day	0.00-0.80	0.14±0.24
Post op 1 st week	0.00-0.80	0.14±0.24
Post op 1 st month	0.00-0.80	0.14±0.24

Table 2: UCVA: An assessment at pre-operative, Post-operative, 1st week, 1 month, 3 months & 6 months

UCVA	Pre Operative	Post op 1 st week	Post op 1 st month	Post op 3 months	Post op 6 months	% change
0-0.5	28 (93.3%)	28 (93.3%)	28 (93.3%)	28 (93.3%)	28 (93.3%)	0.0%
0.5-1	2 (6.7%)	2 (6.7%)	2 (6.7%)	2 (6.7%)	2 (6.7%)	0.0%
1-1.3	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.0%
1.3-1.7	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.0%
>1.7	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.0%
Total	30 (100%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)	-

Table 3: BCVA: An assessment at pre-operative, post-operative 1st week, 1 month, 3 months & 6 months

BCVA	Pre Operative	Post op 1 st week	Post op 1 month	Post op 3 months	Post op 6 months	% change
-	20	20	20	20	20	0.0%
0	10	10	10	10	10	0.0%
Total	30	30	30	30	30	-

Table 4: IOP: An Assessment at Pre-Operative, Post-Operative 1st Week, 1 Month, 3 Months & 6 Months.

IOP	Min-Max	Mean ± SD	difference	t value	P value
Pre operative	11.00-19.00	15.17±2.41	-	-	-
Post op 1 st week	10.00-19.00	14.90±2.35	0.267	1.610	0.118
Post op 1 month	11.00-19.00	14.77±2.16	0.400	2.048	0.050+
Post op 3 months	11.00-18.00	14.80±2.06	0.367	2.009	0.054+
Post op 6 months	11.00-18.00	14.83±2.02	0.333	1.439	0.161

Table 5: Loose epithelium: An assessment at pre-operative, post-operative day 1 week, 1 month, 3 months, 6 months

Loose epithelium	Pre Operative	Post op 1 st week	Post op 1 month	Post op 3 months	Post op 6 months	% change
Nil	0(0%)	30(100%)	30(100%)	29(96.7%)	30(100%)	100.0%
Present	30(100%)	0(0%)	0(0%)	1(3.3%)	0(0%)	- 100.0%
Total	30(100%)	30(100%)	30(100%)	30(100%)	30(100%)	-

P<0.001**, Significant, paired Proportion test

Table 6: Erosions: An assessment at pre-operative, post-operative 1 week, 1 month, 3 months, 6 months

Erosions	Pre Operative	Post op 1 st week	Post op 1 month	Post op 3 months	Post op 6 months	% change
Nil	0(0%)	30(100%)	30(100%)	29 (96.7%)	30 (100%)	100.0%
Present	30(100%)	0(0%)	0(0%)	1 (3.3%)	0 (0%)	- 100.0%
Total	30(100%)	30(100%)	30(100%)	30 (100%)	30 (100%)	-

P<0.001**, Significant, paired Proportion test

Table 7: Epithelial defect: An assessment at pre-operative, post-operative day 1 week, 1 month, 3 months, & 6 months

Epithelial defect	Pre Operative	Post op 1 st week	Post op 1 month	Post op 3 months	Post op 6 months	% change
Nil	16 (53.3%)	28 (93.3%)	30 (100%)	30 (100%)	30 (100%)	46.7%
Present	14 (46.7%)	2 (6.7%)	0 (0%)	0 (0%)	0 (0%)	-46.7%
Total	30 (100%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)	-

P<0.001**, Significant, paired Proportion test

DISCUSSION

RCES is a condition that significantly affects patients' quality of life and ability to work. Management of RCE syndrome is usually aimed at regenerating or repairing the epithelial basement membrane to restore the adhesion between the epithelium and the anterior stoma. Various treatment modalities have been tried for this condition. Anterior stromal puncture and Nd:YAG laser puncture are also effective treatments that work by encouraging scar tissue formation, which promotes adhesion between the basement membrane and corneal epithelium.⁴⁻⁷

Phototherapeutic keratectomy (PTK) has also been used to treat recalcitrant RCE successfully, with success rates varying between 60%–100%.¹⁵⁻¹⁸ In cases where patients initially had recurrence of symptoms after PTK, re-treatment with PTK, has been associated with a high rate of resolution of symptoms, but has the potential to induce a hyperopic shift.⁸ Successful medical treatments for RCE have included topical steroid and oral

tetracycline (doxycycline) as inhibitors of matrix metalloproteinase-9¹⁹ and topical autologous serum drops.²⁰ Despite the effectiveness of PTK for treating RCE, its high cost and lack of widespread availability limit its application in general ophthalmic practice. In contrast, ADCE only requires standard minor-operations, ophthalmic equipment and resources. It was originally described in a retrospective case series and shown to be a safe and effective treatment for RCE by Dua *et al.* Dua H.S *et al*³, studied the efficacy of alcohol delamination in the management of recurrent corneal erosions in which 12 patients with RCE who did not respond to conventional management were treated with alcohol delamination. Eleven of the 12 eyes of patients had dramatic relief of symptoms over the follow-up period; there were no residual effects from the application of alcohol noted in any patient. They concluded that Alcohol delamination appears to be a novel, simple, inexpensive treatment for RCEs. Unlike other methods, the removed epithelium is available as a sheet that may be subjected to further examination, though some of the changes observed may reflect the effect of alcohol on the epithelium. The results of the first prospective case series of ADCE to treat recalcitrant RCE suggest that it is effective at eliminating symptoms in the majority of patients and has a good safety profile. Ravinder P. Singh *et al*¹⁰ prospectively evaluated the efficacy of alcohol delamination of the corneal epithelium in 20 eyes of 20 patients with recalcitrant recurrent corneal erosion syndrome. They underwent alcohol assisted delamination. 2 eyes were lost to follow up. Of the 18 eyes, 15 (83%) showed complete resolution of symptoms at 1 month follow-up and were considered successes. No loss of vision was observed in any of the patients. Menucci *et al*²¹ in February 2010 conducted an electron microscopic study of cornea epithelium in the procedure alcohol delamination in patients with recurrent corneal erosions. They investigated by electron microscopy the plane of separation of the epithelial sheet from its substratum in the procedure of alcohol delamination (ALD) in patients with recurrent corneal erosion syndrome. ALD enables efficient removal of the epithelium with an almost complete preservation of the lamina densa in traumatic RCE. A randomized controlled trial of alcohol delamination and

phototherapeutic keratectomy for the treatment of recurrent corneal erosion syndrome by Chan *et al*²² in 2013 concluded that Alcohol delamination is an alternative treatment for managing RCES with promising results compared with PTK. 17 eyes were treated with ALD, 16 eyes were treated with PRK. Overall, there was complete or partial resolution of symptoms in 11 eyes in the ALD group and 10 eyes in the PTK group. Recurrence of symptoms was observed in five eyes in the ALD group and six eyes in the PTK group. There were no long-term complications. Alcohol assisted delamination of corneal epithelium (ADCE) has the advantage of being much more widely available and much less expensive to perform compared to PTK. In this study, recurrence of RCES was mainly assessed by clinical parameters on slit lamp examination namely loose epithelium, erosions and epithelial defect. Only 1 patient developed recurrent epithelial erosions after the procedure who underwent repeat treatment and was relieved of RCES. Also this treatment did not cause any infection or corneal ulcers following the procedure. There was no loss of visual acuity and no rise of intraocular pressure or any other complications observed in the study ensuring a good safety profile. This study suggests ADCE as an effective method to treat RCES. Re-treatment could also be considered in cases where symptoms recur. The main limitation of this study is the small sample size of patients. as alcohol assisted delamination is a relatively new and less widely practiced procedure. A prospective trial comparing a larger group of patients with recurrent corneal erosion treated with alcohol assisted epithelial delamination with those treated with other techniques could be a better way to compare the safety and efficacy of the technique.

CONCLUSION

Alcohol assisted epithelial delamination is a safe and effective procedure for treating patients with recurrent corneal erosion syndrome.

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REFERENCES

1.Goldman JM, Dohlman CH, Kravitt BA. The basement membrane of the human cornea in recurrent

- epithelial erosion syndrome. *Trans Am Acad Ophthalmol* 1998; 82:
2. Garrana RM, Zieske MA, Assouline M, et al. Matrix metalloproteinases in Epithelia from human recurrent corneal erosion. *Invest Ophthalmol Vis Sci* 1999; 40:2506–12.
 3. Dua H, Lagnado R, Raj D, Singh R, Mantry S, Gray T et al. Alcohol Delamination of the Corneal Epithelium: An Alternative in the Management of Recurrent Corneal Erosions. *Ophthalmology*. 2006; 113(3):404-411..
 4. Kenyon K. Recurrent Corneal Erosion. *International Ophthalmology Clinics*. 1979;19(2):169-196.
 5. Geggel H. Successful Treatment of Recurrent Corneal Erosion with Nd: YAG Anterior Stromal Puncture. *American Journal of Ophthalmology*. 1990; 110(4):404-407.
 6. Sridhar M, Rapuano C, Cosar C, Cohen E, Laibson P. Phototherapeutic keratectomy versus diamond burr polishing of Bowman's membrane in the treatment of recurrent corneal erosions associated with anterior basement membrane dystrophy. *Ophthalmology*. 2002; 109(4):674-679.
 7. Rubinfield RS, Laibson PR, Cohen EJ, et al. Anterior stromal puncture for recurrent erosions: further experience and new instrumentation. *Ophthalmic Surg* 1990; 21:318-326.
 8. Maini R. Phototherapeutic keratectomy re-treatment for recurrent corneal erosion syndrome. *British Journal of Ophthalmology*. 2002; 86(3):270-272.
 9. Hykin P, Foss A, Pavesio C, Dart J. The natural history and management of recurrent corneal erosion: A prospective randomised trial. *Eye*. 1994; 8(1):35-40.
 10. Singh R, Raj D, Pherwani A, Lagnado R, Abedin A, Eatamadi H et al. Alcohol delamination of the corneal epithelium for recalcitrant recurrent corneal erosion syndrome: a prospective study of efficacy and safety. *British Journal of Ophthalmology*. 2007; 91(7):908-911.
 11. Bernard Rosner (2000), *Fundamentals of Biostatistics*, 5th Edition, Duxbury, page 80-240
 12. Robert H Riffenburg (2005), *Statistics in Medicine*, second edition, Academic press. 85-125.
 13. Sunder Rao P S S, Richard J(2006): *An Introduction to Biostatistics, A manual for students in health sciences*, New Delhi: Prentice hall of India. 4th edition, 86-160
 14. Suresh K.P. and Chandrasekhar S (2012). Sample Size estimation and Power analysis for Clinical research studies. *Journal Human Reproduction Science*, 5(1), 7-13.
 15. Jain S, Austin DJ. Phototherapeutic keratectomy for the treatment of recurrent corneal erosions. *J Cataract Refract Surg* 1999; 25:1610–14.
 16. Dausch D, Landes M, Klein R, et al. Phototherapeutic keratectomy in recurrent corneal epithelial erosion. *Refract Corneal Surg* 1993; 9:419–24.
 17. O'Brart D, Muir M, Marshall J. Phototherapeutic keratectomy for recurrent corneal erosions. *Eye*. 1994;8(4):378-383.
 18. Bernauer W, DeCock R, Dart JK. Phototherapeutic keratectomy recurrent corneal erosions refractory to other forms of treatment. *Eye* 1996; 10:561–4
 19. Dursun D, Kim MC, Solomon A. Treatment of recalcitrant recurrent corneal erosions with inhibitors of matrix metalloproteinase-9, doxycycline and Corticosteroids. *Am J Ophthalmology* 2001; 132:8–13.
 20. Holzer MP, Auffarth GU, Specht H, et al. Combination of transepithelial phototherapeutic keratectomy and autologous serum eye drops for treatment of recurrent corneal erosions. *J Cataract Refract Surg* 2005; 31:1603–6.
 21. Mencucci, R. et al. "Alcohol Delamination in the Treatment of Recurrent Corneal Erosion: An Electron Microscopic Study". *British Journal of Ophthalmology* 94.7 (2010): 933-939
 22. Chan E, Jhanji V, Constantinou M, Amiel H, Snibson G, Vajpayee R. A randomized controlled trial of alcohol delamination and phototherapeutic keratectomy for the treatment of recurrent corneal erosion syndrome. *British Journal of Ophthalmology*. 2013.

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