



EFFECT OF EYELID TAPING FREQUENCY AND OCULAR LUBRICATION ON PREVENTION OF EXPOSURE KERATOPATHY IN SEDATED ICU PATIENTS

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INTRODUCTION

Patients in an intensive care unit (ICU) on sedation or intubated with Glasgow Coma Scale¹ of E1 are potentially vulnerable to ocular surface disease due to inadequate eyelid closure leading to corneal drying, epithelial breakdown, and infection. Preventative eye care measures are often overlooked since the medical and nursing teams in the ICU are mainly concerned with stabilization of the cardiovascular, respiratory and neurological status, and patients are unable to convey ocular symptoms.² Exposure keratopathy refers to the drying of the cornea with subsequent epithelial breakdown. This often occurs due to a failure of the eyelids to cover the globe, as there is a reduced level of consciousness, resulting in improper wetting of the ocular surface by tears³ decreased tear production and rate of blink reflex is reduced⁴. The reported incidence of exposure keratopathy in critically ill patients ranges from 13.2% to over 60%, depending on patient characteristics and preventive eye-care practices.⁵

If left untreated, exposure keratopathy may progress to corneal ulceration, microbial keratitis, scarring, and permanent visual impairment. A few studies done till now have shown lagophthalmos in 17% to 75% of patients who were admitted to the ICU⁶⁻⁸ and Ocular Surface Disorder in 23% to 60% of them⁹, especially in the first week¹⁰ of admission.

At present, eyelid taping is done when the patient does not have spontaneous closure. But there is no standard protocol followed. The tape is changed everyday or once in two days, which leads to increase in exposure of ocular surface. Some hospitals also use lubricant drops, ointments, and moisture chambers to keep the surface moist.

Sometimes eye care is so neglected that, that eyelid taping is not even done till signs like congestion, chemosis, epithelial defect occurs. The tape might get loosened due to perspiration, improper application, facial edema and other causes which may result in intermittent surface exposure. Hence a better method has to be evaluated to prevent complications.

Although several preventive strategies have been described, the effect of eyelid taping frequency on exposure keratopathy has not been adequately evaluated. Since frequent tape replacement is a simple, inexpensive intervention that can be incorporated into routine nursing care, determining its effectiveness may help optimize ICU eye-care protocols. Therefore, the present study was undertaken to evaluate the effect of eyelid taping frequency and adjunctive ocular lubrication on the prevention of exposure keratopathy in sedated ICU patients.

METHODOLOGY

Study Design: Prospective comparative study

Study Population:

- 120 intubated/sedated ICU patients with GCS score of E1 on admission
 - Cornea clear at presentation during admission
 - Patients with corneal/scleral show at rest
- Patients were randomly divided into three groups. The allocation was based on first eligible patient was in group 1, second was in group 2, third was in group 3, fourth was in group 1 and so on.

- **Group 1:** Eyelid taping alone
- **Group 2:** Eyelid taping with Carboxymethylcellulose (CMC) 1 % eye drops four times daily
- **Group 3:** Eyelid taping with Hydroxypropyl methylcellulose (HPMC) gel three times daily

Each group was further subdivided into:

- Control subgroup: Tape changed every 24 hours (Right eye)



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- Test subgroup: Tape changed every 6 hours (Left eye)

Patients who were sedated in ICU for 14 days were taken into consideration. These patients had E1 on GCS examination and either same or no amount of lagophthalmos was present in the beginning, but the lagophthalmos was not graded. Any chemosis which was present was noted. The treatment protocol was started on day 1 itself.

Patients were examined daily for a 2 week period by an Ophthalmologist (who was not aware of the group that the patient belonged to), using a portable hand held slit lamp and the patient's corneas were tested daily using 1% Fluorescein eye drops under cobalt blue filter every alternate day. Eyelid position, corneal and conjunctival changes were noted. The development of any pathology was documented on day 7 and day 14.

Patients who developed epithelial defects were additionally treated with topical antibiotic eye drops administered six times daily and were monitored for the development of exposure keratopathy over a period of two weeks during their ICU stay.

A total of 120 sedated/intubated ICU patients (240 eyes) were included in the study, with 40 patients allocated to each treatment group. The mean age of the study population was 62.4 ± 8.7 years, and 68 (56.7%) were male while 52 (43.3%) were female. Control Eyes (Right Eye; Tape Changed Every 24 Hours)

After 7 days, epithelial defects (ED) were observed in 12.5% (5/40) of patients in Group A, 5.0% (2/40) in Group B, and 2.5% (1/40) in Group C. Overall, ED developed in 6.7% (8/120) of control eyes.

By day 14, the incidence of ED increased in all groups. Group A showed the highest rate at 20.0% (8/40), followed by Group B at 7.5% (3/40) and Group C at 5.0% (2/40). Overall, 10.8% (13/120) of control eyes developed ED.

Test Eyes (Left Eye; Tape Changed Every 6 Hours) At day 7, ED was observed in 7.5% (3/40) of eyes in Group A, while no epithelial defects were detected in Groups B and C. The overall incidence of ED was 2.5% (3/120).

At day 14, ED was noted in 10.0% (4/40) of Group A eyes and 2.5% (1/40) of Group B eyes, whereas no epithelial defects were observed in Group C. The overall incidence of ED was 4.2% (5/120).

RESULT

Table 1:- Percentage of Patients Having ED and NC in all 3 Groups in the Control Eyes (Right Eye) After 7 Days

Group	ED	NC	Total
A	5 (12.5%)	35 (87.5%)	40
B	2 (5.0%)	38 (95.0%)	40
C	1 (2.5%)	39 (97.5%)	40
Overall	8 (6.7%)	112 (93.3%)	120

After 7 days of testing the right eye, 8 patients (6.7%) of them had epithelial defect and 112 patients (93.3%) of them had no complications.

Table 2:- Percentage of Patients Having ED and NC in All 3 Groups in the Control Eyes (Right Eye) After 14 Days

Group	ED	NC	Total
A	8 (20.0%)	32 (80.0%)	40
B	3 (7.5%)	37 (92.5%)	40
C	2 (5.0%)	38 (95.0%)	40
Overall	13 (10.8%)	107 (89.2%)	120

After 14 days of testing the right eye, 13 patients (10.8%) of them had epithelial defect and 107 patients (89.2%) of them had no complications.

Table 3:- Percentage of Patients Having ED and NC in All 3 Groups in the Test Eyes (Left Eye) After 7 Days

Group	ED	NC	Total
A	3 (7.5%)	37 (92.5%)	40
B	0 (0%)	40 (100%)	40
C	0 (0%)	40 (100%)	40
Overall	3 (2.5%)	117 (97.5%)	120

After 7 days of testing the left eye, 3 patients (2.5%) of them had epithelial defect and 117 patients (97.5%) of them had no complications.

Table 4:- Percentage of Patients Having ED and NC in All 3 Groups in the Test Eyes (Left Eye) After 14 Days

Group	ED	NC	Total
A	4 (10.0%)	36 (90.0%)	40
B	1 (2.5%)	39 (97.5%)	40
C	0 (0%)	40 (100%)	40
Overall	5 (4.16%)	115 (95.83%)	120

After 14 days of testing the left eye, 5 patients (4.16%) of them had epithelial defect and 115 patients (95.83%) of them had no complications.

Table 5:- Percentage of Patients Having ED and NC in Group A after 7 Days

Group A	ED	NC	Total
Right eye	5 (12.5%)	35(87.5%)	40
Left eye	3(7.5%)	37(92.5%)	40
Overall	8 (10%)	72 (90%)	80

Table 6:- Percentage of Patients Having ED and NC in Group A after 14 Days

Group A	ED	NC	Total
Right eye	8 (20%)	32(80%)	40
Left eye	4(10%)	36(90%)	40
Overall	12 (15%)	68 (85%)	80

Table 7:- Percentage of Patients Having ED and NC in Group A after 14 Days

Group B	ED	NC	Total
Right eye	2 (5%)	38 (95%)	40
Left eye	0 (0%)	40 (100%)	40
Overall	2 (2.5%)	78 (97.5%)	80

Table 8:- Percentage of Patients Having ED and NC in Group A after 14 Days

Group B	ED	NC	Total
Right eye	3 (7.5%)	37(92.5%)	40
Left eye	1 (2.5%)	39(97.5%)	40
Overall	4 (5%)	76 (95%)	80

Table 9:- Percentage of Patients Having ED and NC in Group A after 14 Days

Group C	ED	NC	Total
Right eye	1 (2.5%)	39(97.5%)	40
Left eye	0 (0%)	40(100%)	40
Overall	1 (1.25%)	79 (98.75%)	80

Table 10:- Percentage of Patients Having ED and NC in Group A after 14 Days

Group C	ED	NC	Total
Right eye	2 (5%)	38(95%)	40
Left eye	0 (0%)	40(100%)	40
Overall	2 (2.5%)	78 (97.5%)	80

Comparison of Taping Frequency Across all treatment groups, eyes receiving more frequent eyelid taping (every 6 hours) demonstrated a lower incidence of epithelial defects compared with eyes undergoing tape replacement every 24 hours. At day 14, the overall incidence of ED was reduced from 10.8% in control eyes to 4.2% in test eyes.

Comparison of Lubrication Strategies Group A consistently demonstrated the highest incidence of epithelial defects throughout the study. At day 14, ED occurred in 20.0% of control eyes and 10.0% of

test eyes in this group. The addition of ocular lubricants substantially reduced corneal complications. Group B showed ED rates of 7.5% and 2.5% in control and test eyes, respectively, at day 14. Group C produced the best outcomes, with ED rates of only 5.0% in control eyes and no cases in test eyes at day 14.

Overall Findings the incidence of epithelial defects increased between day 7 and day 14 in all groups. However, frequent eyelid taping combined with ocular lubrication significantly reduced the

occurrence of exposure-related corneal injury. The lowest rate of epithelial defects was observed in patients receiving HPMC gel with 6-hourly tape changes, among whom no corneal complications were detected throughout the study period.

DISCUSSION

This prospective comparative study demonstrated that mechanical eyelid closure — particularly frequent tape changes every 6 hours — plays a dominant role in preventing exposure keratopathy in sedated ICU patients with a GCS of E1, an observation consistent with and extending the findings of several prior investigations. Exposure keratopathy in the ICU is a well-recognised but underappreciated complication, with reported incidences ranging from 13.2% to over 60%, driven by lagophthalmos, reduced blinking, diminished tear production, and loss of corneal sensation secondary to sedation and neuromuscular blockade. Ahmadinejad et al. (2020) conducted a randomised clinical trial, comparing simple eye ointment, polyethylene cover, and eyelid taping over seven days, with daily portable slit-lamp examination and fluorescein staining. They found that polyethylene cover and eye ointment were both significantly more effective than eyelid taping alone in preventing ocular surface disorders, though no statistically significant difference was observed between the two active interventions.

Rezende do Prado et al. (2026) published a two-arm, double-blind pilot randomised controlled trial comparing an eye protection chamber (with eye drops) against micropore adhesive tape (with eye drops). This study reinforces the conclusion that mechanical protection augmented by lubrication is superior to tape alone, and that more frequent monitoring and better ocular sealing reduce the severity and laterality of corneal injury.

Mercieca et al. (1999) showed the burden of ocular surface disease in ICU patients, stating that ophthalmologic pathologies are not commonly prioritized.

The superiority of the 6-hourly tape change protocol observed here may be explained by the progressive loosening of adhesive tape with time, improper taping techniques which stay for more time, patient diaphoresis, and minor eyelid movement — all of which allow small exposure of the cornea that, even when for a short period of time, is enough to initiate epithelial defect, particularly in patients with poor Bell's phenomenon and decreased aqueous tear production. The addition of CMC 1% drops (Group 2) and HPMC gel (Group 3) further reduced this risk by enriching the tear film and prolonging surface hydration between tape changes, with the proven role of lubricants in increasing ocular surface contact time. Considering these factors, the findings suggest that an integrated eye care protocol which

combines frequent mechanical eyelid closure with appropriate lubrication is the optimal standard of care for intubated/sedated ICU patients.

Although in some cases who have extensive chemosis, it is difficult to close the eyelid using tape (11), for the patient's benefit, a temporary tarsorrhaphy can be done.

A limitation of the study is that the right eye was consistently assigned to the 24-hour taping protocol and the left eye to the 6-hour taping protocol. Random allocation of the intervention to either eye could have reduced the possibility of laterality-related bias.

CONCLUSION

This study establishes that a combination of frequent eyelid taping and ocular lubrication provides the most effective prophylaxis against exposure keratopathy in sedated ICU patients. Taping alone, when changed only every 24 hours, was associated with the highest incidence of keratopathy, whereas increasing the frequency to every 6 hours significantly reduced corneal injury. The addition of CMC 0.5% drops or HPMC gel further lowered risk to near zero, highlighting the complementary roles of mechanical eyelid closure and sustained ocular surface hydration. These findings advocate for a standardized, nurse-led eye care protocol in the ICU that incorporates 6-hourly tape change alongside appropriate lubrication as a simple, low cost, and highly effective strategy to prevent a preventable cause of visual morbidity in critically ill patients.

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