Protocolized eye care prevents corneal complications in ventilated patients in a medical intensive care unit

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ABSTRACT

Background: Eye care is an essential component in the management of critically ill patients. Standardized eye care can prevent corneal complications in ventilated patients. **Objective:** This study was designed to compare old and new practices of corneal care for reduction in corneal complications in ventilated patients. **Methods:** This study was done in three phases each of six month duration. Phase 1 was the ongoing practice of eye care in the unit. Before the start of phase 2, a new protocol was made for eye care. Corneal complications were observed in terms of haziness, dryness, and ulceration. All nursing staffs were educated and made compliant with the new protocol. In phase 2, a follow-up audit was done to check the effectiveness and compliance to protocol. In phase 3, a follow-up audit was started 3 months after phase 2. **Results:** In phase 1, total ventilated patients were 40 with 240 ventilator days. The corneal dryness rate was 40 per 1000 ventilator days while the haziness and ulceration rate was 16 per 1000 ventilator days each. In the second phase 2, total ventilated patients were 53 making 561 ventilator days. The rate of corneal haziness and dryness was 3.52 and 1.78 per 1000 ventilator days, respectively, with no case of corneal ulceration. In phase 3, the number of ventilated patients was 91 with 1114 ventilator days. The corneal dryness rate was 2.69 while the haziness and ulceration rate was 1.79 each. **Conclusion:** Protocolized eye care can reduce the risk of corneal complications in ventilated patients.

Key words: *Corneal complications, eye care, ventilated patients*

INTRODUCTION

With recent advances in the critical care medicine, it is evident that intensive care plan cannot limit itself with the resuscitative measures only. In contrast, it needs to provide the quality care plan to every organ of the patient. In the recent literature,[1,2] eye care became the integral part of care plan for critically ill patients. Those patients who are mechanically ventilated have high propensity to develop exposure keratitis which may lead to corneal perforation and blindness.[3] In addition to alteration in the protective mechanism of eyes, intensive care environment predisposes exposure of ocular surface to microorganisms and complication of overzealous resuscitation that may end up with chemosis and other eye complications.[4] The incidence of eye-related complications in intensive care patients in different studies varies from 3% to 60% which include exposure keratitis and other corneal complications as well.[5] A variety of eye care regimens are available for intensive care patients, but nothing is conclusive so far. The basic principle for preventing eye-related complication is meticulous and protocolized care.

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In our intensive care unit, patients are admitted from different medical specialties. The aim and objective of intensive care is to provide general and specific critical care plan to each patients. In this regard, a protocol was introduced for the provision of eye care to all ventilated and nonventilated patients with the aim of none to very minimal corneal complication so as to prevent any long-term visual disability.

METHODS

This study has prospective observational cohort design and it was done as a quality audit. Since it was an audit, so informed consent was waived. This study was done in a 10-bedded medical intensive care unit of a tertiary care hospital in Riyadh. All mechanically ventilated patients admitted in the ICU for more than 24 h were included. Total duration of the audit was 18 months in three different phases. Demographic characteristics, comorbidities, reason of ICU admission, and the length of ICU stay were recorded in a predesigned performa.

Phase 1 included observation of current ongoing practice of eye care in the medical intensive care unit. Six months of prospective data were collected. The continuing practice included washing hand and wearing gloves, cleaning eye with normal saline-soaked cotton balls, application of lubricant (Lacrilube) every 4 h, closure of eye lid manually if not completely close, and application of eye pads if needed. Nursing staff used to provide eye care but in case of any redness, edema, or any other changes in normal examination of eyes then an ICU physician was referred.

Phase 2 started with the introduction of protocol provided for open chamber eye care in the medical intensive care unit. Health care staffs responsible for patients' care were educated about this protocol. This protocol covered a more systematic and explicit form of eye care. It includes examination of conjunctive for any redness or exudates, presence or absence of blink response, complete or incomplete closure of eye lid, instillation of refresh eye drops, and taping of eye lids. Other adjunctive measures incorporated were tracheal suctioning from the side of patients and eye closure at time of suctioning. Any abnormality in eyes that was observed by nursing staff was communicated to ICU physicians or whenever necessary ophthalmologists. Phase 2 continued for 6 months.

Phase 3 was conducted after 3 months of phase 2 to monitor the compliance and effectiveness of the audit. Phase 3 was also done for 6 months. The corneal complications were the measurable outcome of this audit. Complications were described in terms of dryness, haziness, and ulceration.

RESULTS

Totally, 400 patients admitted in the medical intensive care unit during the eighteenth month of the study period. A total of 186 patients were included in the whole period of the audit and 214 were excluded because of not fulfilling the inclusion criteria. The breakup of these patients as per three phases of this audit is as follows; phase 1 included 40 patients while 53 and 91 patients in phase 2 and 3, respectively. Demographic characteristic of patients in three phases are summarized in Table 1.

Three corneal complications were noted: Haziness, dryness and ulceration in relation to ventilator days. In phase 1, there were 40 patients with 240 ventilator days. The total rate of corneal complication was 72 out of 1000 ventilator days. The rate of corneal dryness was 40 per 1000 ventilator days. Corneal haziness was 16 per 1000 ventilatory days, and ulceration was also 16 per 1000 ventilator days.

Phase 2 was started after introduction of protocol. In this phase, there were 53 patients with 561 ventilator days. Corneal complications in total were 7 out of 1000 ventilator days. Out of which, the rate of corneal dryness was 7 and haziness was 1.8 per 1000 ventilator days. No corneal ulceration was noted in this phase.

Phase 3 had 91 patients making 1114 ventilator days. The total rate of the corneal complication rate was 6.28 per 1000 ventilator days. The rate of corneal dryness was 2.69 per 1000 ventilator days. The rate of haziness and ulceration was 1.79 per 1000 ventilator days each [Figure 1]. Ocular surface infection was not noted during this period.

DISCUSSION

An intensive care unit consists of a complex and dynamic environment which provides not only resuscitative care,

Table 1: Demographic characteristics of patients in three phases

Variables	Phase 1	Phase 2	Phase 3
Total number of patients	40	53	91
Male/Female	15/25	31/22	46/45
Age in years			
<60	21	27	66
>60	15	21	25
Patients with sedation	(Mean 51)	(Mean 50)	(Mean 51)
Patient with sedation and muscle relaxant (%)	32	46	80
Reason of ICU admission	8	7	11
Sepsis	25	30	65
Respiratory disease	10	20	31
Stroke	1	–	4
Liver failure	3	2	1
Miscellaneous	1	1	–
Length of ICU (mean)	3-24 days (Mean 19 days)	5-23 days (Mean 18 days)	3-30 days (Mean 22 days)

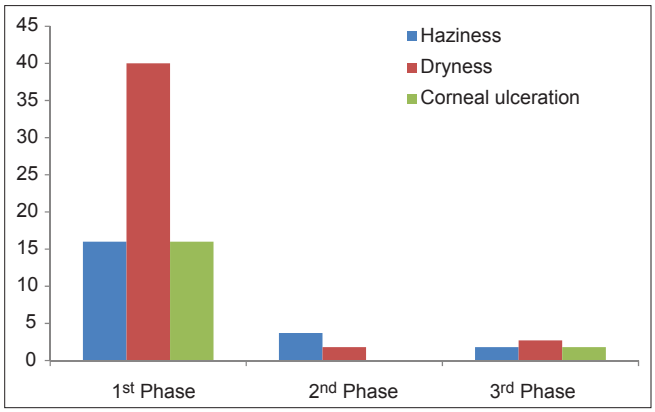

Figure 1: Comparison of the corneal complications rate in phases 1, 2, and 3

but also offers supportive care to every vital or non-vital organ of patients. This audit highlights two objectives of eye care in ventilated patients; one is corneal protection and another is protocol-based care.

It is now a well-known fact that patients in intensive care areas are at increased risk of developing ophthalmic complications, most commonly as a result of excessive resuscitative effort and exposure of eye surface leading to corneal dryness and ulceration.[3] An intact ocular surface is essential for protection against infection. Dryness and disruption of corneal epithelium can lead to blurring of vision, and it can also place the corneal tissue at risk for infection which can complicate with considerable visual loss.[6] It is obvious that patients in intensive care units are susceptible to corneal dehydration, abrasion, and corneal perforation; the incidence of which ranges between 3% and 60%.[1] In our study, the rate of corneal complication was measured in relation with ventilator days. It was observed that prior to the introduction of eye care protocol the complications rate were 72 out of 1000 ventilator days.

In the literature search, it was observed that many therapeutic options are available for preventing ocular complications in mechanically ventilated patients. These options are eyelid tapping, hypromellose with Lacrilube, polyethylene moisture chamber, Geliperm, etc.,[1,7,8] However, these eye care regimens are not always evidence-based, and there is no clear consensus defining the best form of eye care and has not been evaluated thoroughly.[9] A meta-analysis published in 2008[3] defined the incidence of exposure keratopathy from 20% to 42% and favored the moisture chamber method for prevention of keratopathy. The meta-analysis recommended that the simple protocol and good nursing care can prevent ocular-related complications. In one of the randomized controlled trials, it was concluded that Geliperm is as effective as Lacrilube in the prevention of corneal complication.[10]

In our study, corneal complications significantly reduced after introduction of eye care protocol. Nursing staff were educated and made compliant about the protocol. Demographic characteristic and reasons of admissions were not different in three periods. The length of ICU was also observed in three durations which was also not very significant. Ophthalmologists were involved in patients with corneal haziness and ulcer as per protocol. This audit highlighted the importance of protocol-based care in critically ill-ventilated patients. There is ample evidence that protocol-based care can improve the clinical outcomes of critically ill patients in terms of length of stay, duration of mechanical ventilation, etc.[11]

This study has some limitations. First, it is an observational study in the form of an audit so it cannot be generalized but certainly highlights the importance of protocol-based care particularly in relation with eye care that is now sacrosanct with the intensive care management plan. Second, there is possibility of underestimation of the occurrence of ocular complication due to macroscopic examination of eyes.

Evidence-based guidelines are needed for eye care in ventilated patients. Further randomized controlled trials will define the standardized care in ventilated patients. The aim will be to prevent ocular surface complications particularly long-term implications on visual impairment and blindness.

CONCLUSION

Finally, it can be concluded with this study that the implementation and monitoring of protocol can produce an effective strategy for better delivery of care in critically ill patients.

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