

## Review Article

**Ocular care for unconscious patients in ICU**

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DOI: <https://doi.org/10.3329/bccj.v11i1.66048>**Abstract:**

*Patient requiring ICU support may be conscious or unconscious. Unconscious person has no control upon him or herself or environment. Patients who have much chance for recovery from their illness should be monitored for apparently minor disabilities or ICU related opportunistic diseases. It is also applicable for an unconsciousness state. In ICU 24-hours special health care to be provided with trained person. Extended stay in an ICU is one of the major issues for development of ocular problems. Lac of eye care facilities or negligence or ignorance, prevents early detection. The key to the treatment in ICU is understanding of the underlying pathophysiology of general and ocular problems.*

**Introduction:**

Demand and availability of ICU services is increasing day by day. Expertise ICU services is time demanding. Unconscious patients' needs sophisticated life support. Patients may be adult or pediatric; all need a close and constant monitoring. Close and often continuous monitoring of multiple organ systems is required most of the critically ill patients. The Critical care or intensive care unit (ICU) is the term used to describe "the care of patients who are extremely ill and whose clinical condition is unstable or potentially unstable". So it has a comprehensive care of a critically ill patient. This unit is to be specially designed and equipped with modern facility, staffed by skilled personnel of different sub specialty to provide effective and safe care for dependent patients with life threatening or potentially serious problems.<sup>1</sup>

**Technological advances:**

In monitoring, medical care, diagnostic testing, and therapeutics have improved patient care outcomes.<sup>2</sup> But other than emergency interventions, care for patients who are medically unstable and have comorbidities or developing other illness should not be overlooked. Patients who have much chance for recovery from their illness should be monitored for apparently minor disabilities or ICU related opportunistic diseases. It is also applicable for a unconsciousness state in which a patient is totally unaware of both self and external surroundings, and unable to respond to any problems.

**Clinical examination:**

Ocular examination is one of the prime importance and never forgotten by the ICU personals. The most commonly checked is pupillary abnormality, which is one of the cardinal features differentiating surgical disorders from medical disorders.

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Fundoscopy examination is also carried out in unconscious patients to rule out subarachnoid hemorrhages, diabetic retinopathy, hypertensive encephalopathy, increased intracranial pressure etc. Patient requiring ICU support may be conscious or unconscious. Unconscious person who has no control upon him or herself or environment. They are fully dependent upon others for monitoring his/her vital functions. Conscious patients can complain about their problems. But it is the role ICU staff to find out problems and provide proper management.<sup>3</sup> Most of the patients coming to ICU have impairment of major organs. So it becomes the prime importance and treatment is focused on the management of these life threatening conditions. If the person is unconscious more emphasis is attracted towards general illness.

**Eye complications in ICU:**

Most of the neglected part of eye care in unconscious patients is external surface examination.<sup>4</sup> Eye surface complications as dry eye, corneal abrasion, and conjunctivitis are commonly found in critically ill patients in the ICU. Lower Glasgow coma scale (GCS), and longer stay in the ICU are of the important factors. Most prevalent alarming ophthalmologic disorders identified in critically ill or unconscious subjects are keratopathy, chemosis, and microbial keratitis. Some uncommon eye disorders as metastatic endogenous endophthalmitis, acute primary angle closure glaucoma, ischemic optic neuropathy, pupil abnormalities, vascular occlusions and rhino-orbital cerebral mucormycosis are reported. Early diagnosis and effective treatment of all above will help to prevent visual loss.<sup>5</sup>

Assessment of the degree of ocular surface exposure is essential to prevent a number of sight threatening conditions. Incomplete eyelid closure assessment is utmost necessary. Are the lids completely closed? Keeping the question in mind, assessment should be made at a regular interval.

**Vigilance and monitoring:**

If the lids are properly closed no treatment is indicated at the moment. But regular assessment of the ocular surface by manually opening and closing the lids briefly is required.

Observation of purulent discharge or any whitish corneal lesions warrants attention.

On the other hand, if the blink rate <1 blink per 10 seconds or any whitening of cornea, redness or swelling of conjunctiva needs expert consultation.

Unconscious, sedated and/or paralyzed patients and those with a lower GCS score is fully dependent on healthcare professionals to maintain their ocular surface to prevent complications such as corneal abrasion, infection and ulceration, perforations and which ultimately may lead to blindness.<sup>6</sup>

When successfully treated during their time in a critical care unit even if the patient is terminally ill, proper eye care will help to maintain the health of the corneal tissue and preserve the option of eye donation, desired by the patient or the patient's near one.

### **Pathophysiology:**

The key to the treatment of unconsciousness is an understanding of the underlying pathophysiology of general and ocular problems. All critically ill patients are in a state of absent or compromised eye defense mechanisms. They are at risk of eye complications following ocular surface disease.<sup>7</sup> Management of organ failures is the prime importance usually focused in the ICUs, treatment. Even than locating an ocular problem, eye care becomes a side issue and as a result ophthalmological complications do occur.<sup>8</sup>

The ocular surface is constantly exposed to environmental pathogens. Natural defense mechanisms of the ocular surface are adequate to prevent microbial assault. Physical protection is given by the lids and continuous flow of tear flushing out the micro-organisms. Corneal epithelium helps defend the eye from external exposure and related insults. It has got avascular, stratified, nonkeratinized epithelium, which is intimately associated with the maintenance of physiologic homeostasis of lacrymation. On the other hand, tears provide lubrication to the surface, oxygen to the cornea, wash away pathogens, and adhere to the eyes via mucins produced by the conjunctival epithelium.

So, the tear film coats the cornea and conjunctiva. It has got several important functions. It provides lubrication, prevents drying of the ocular surface epithelia, helps in refracting light, supplies oxygen. Tear is an important component of the innate defense system of the eye, which provides protection against a range of potential pathogens. Lysozyme, lactoferrin, tear lipocalin, and secretory Immunoglobulin A (IgA) help to prevent infection.<sup>9-12</sup>

The presence of a corneal reflex and the ability to maintain eye closure are essential in protecting the cornea. Patients who are either paralyzed, heavily sedated, unconscious, or on neuromuscular blocking agents can result in impaired eyelid closure and loss of corneal reflex, leading to corneal exposure. On the other hand, exposure of the cornea is at risk for drying, infection, and scarring, which may lead to permanent visual loss.<sup>13-14</sup> The two natural guards of protective mechanisms of the eye are tear secretion and eyelids. These two protect eyes

from every outer threats and dryness.

To protect the eye from harmful agents that can make injury, eyelids quickly respond and cover eyes as a reflex action to safeguard against foreign threats like dust, bright light, insects or any unwanted object. On the other hand, tears keep eyes moist. Tear also clean eyes in case any foreign object succeeds in dodging eyelid reflex. Germs are generally expelled out of the eyes with the help of tears but in most of the cases ventilated patients lose this ability of natural cleaning. Use of sedatives and muscle relaxants in intensive care patients causes either loss of blinking reflex or ability to keep eyes open. They need care for these eye iatrogenic conditions.

These essential natural eye protection mechanisms are impaired particularly in ventilated patients or those who are partially or fully unconscious or sedated while on ventilator. Impaired lid closure is seen in patient suffering from proptosis or who is highly debilitated. They can suffer from evaporation of tears leading to many ocular complications like tissue scarring, dryness of eyes, corneal abrasion, swelling of eyelids, conjunctival chemosis and eye infections.<sup>14,15</sup>

Some preexisting conditions as floppy eyelid syndrome, Graves' disease, lagophthalmos, Bell's palsy, Myasthenia gravis, Parkinson's disease Sjogren's syndrome, congenital deformities may be an additive factor for ocular complications.<sup>16</sup> Proper proactive measures needed to lessen the chances of infections or any other complication in critically ill patients.

Moreover eyelid swelling, conjunctival swelling (chemosis) with hyperemia, keratitis and eyelid crusting or discharge are the primary signs of infection in an ICU patient. With progression microbial infectious (serious complication associated with the most common agents of superinfection) develops, which may lead to perforation, scleritis, endophthalmitis, and eventually blindness. In ICU set up or treatment purpose muscle relaxants are used. These drugs reduce the tonic contraction of the orbicularis, responsible for keeping the lids closed. On the state of heavy sedation, blink reflex is eliminated. These two predisposes corneal epithelial drying and exposure keratopathy. In absence of proper resolution, secondary bacterial infection may produce a sight-threatening situation.

In ICU setup, patients who are ventilated in a prone position to improve the ventilation perfusion ratio (V/Q) are at particular risk for the development of exposure keratopathy and severe facial swelling and chemosis. Positive end expiratory pressure (PEEP) of 5 cm H<sub>2</sub>O and above is thought to worsen conjunctival chemosis by decreasing venous outflow from the head and neck. Some other factors as fluid imbalances, increased vascular permeability, and positive pressure ventilation (PPV) may increase conjunctival edema, leading to difficulties with eye closure. High flow oxygen through face mask or nebulizer can lead to damage of the corneal epithelium.

Extended stay in an ICU is one of the major issue for development of ocular problems. In some cases, pre-existing condition may have predisposed it. Lac of eye care facilities or

negligence or ignorance, prevents early detection. Early detection is effective in terms of avoiding disease progression, instituting prompt treatment, and preventing the loss of vision. Exposure keratopathy (EK), is a “silent” morbidities. Visual impairment secondary to corneal infection is potential to cause long-term visual disability in post-recovery period.<sup>16</sup> Patients in the intensive care unit are at increased risk of exposure keratopathy.<sup>20</sup> Even patients who are mildly sedated and have occasional spontaneous blink reflex, can also have corneal exposure.<sup>18-20</sup>

### Management:

#### Non drug treatment:

Achievement depends not only on skill nor the drugs, it is the attention and sincerity of the individual in charge of care in ICU. Proper eye examination, sanitization of the hands of ICU staff and eye care equipment before examination and treatment to the patient is important. Examination of the eyes on regular basis and record keeping is of prime importance. Notification of unusual symptoms or sign can prevent patients from serious damages. Due to more concerned with the stabilization of vital systems only, serious eye complications like corneal exposure and microbial keratitis can result in unconscious patients in intensive care units (ICU).<sup>17-18</sup>

To achieve adequate eye closure, various ocular surface protective measures are in use ranging from simple cleaning to suturing the lids. Routine 2-4 hours cleaning of the eyes with gauze soaked in sterile saline water is a good eye protective practice. Routine examination of lid position and ocular surfaces is a good practice in ICU management. Eye examination with the use of a bright hand-held torch is effective. Examination with a portable slit lamp allows detailed bedside corneal and external ocular condition. With this slit lamp fluorescein staining test of cornea is possible. Thus any defect of cornea can be revealed. This modern instrument gives an enormous support in the management of unconscious ICU patient. Position of the eyeball, eyelid should be noted. Repeated and even single blink reflex test can lead to corneal trauma, that might result in significant ocular morbidity. Patient receiving high flow oxygen treatment should be checked routinely for corneal complication, as in many instance several days’ treatments with high flow oxygen showed corneal abrasion of the inferior third. This epithelial defect was related to high flow oxygen which was delivered through the facial mask. Patients are also susceptible to aerosol droplets spread via tracheal suctioning. If the suction catheter is withdrawn directly over the patient’s eye the chance increases. So it should be kept in mind during giving suction. Sometime ‘lid closed’ may be wrongly assessed as having ‘fully apposed’ lids. In this type wrong assessment can give rise to punctate epithelial erosions (PEE) of the inferior third of the cornea due to dryness following exposure. Sometime eyes appear to be closed but actually remain open especially in the medial portion. Hand held slit lamp examination reveals superficial punctate keratopathy (SPK).

#### Drug treatment:

There is a risk of ocular *Pseudomonas aeruginosa* infection among unconscious patients. They should receive 2 hourly eye care. Any swelling, conjunctival hyperemia, corneal clouding, and epithelial loss should be taken in account. Effective management is the restoration of proper lubrication of the eye to prevent damage. A number of options are there. Among them are medical therapy as artificial tear eye drop or ointment, lid taping, lubricants, carbomer eye drops, autologous serum eye drops, maintenance of “moisture chambers”, bandage contact lenses, concurrent broad-spectrum antibiotics, polyethylene covers and eye patches. Exposed corneas should be lubricated every 2 h and patients at risk for corneal exposure had their eyes taped shut.

According to some authority among the various eye care measures undertaken, the most effective is the application of moisture chambers or polyethylene covers. Moisture chambers are found to be more effective corneal protection when compared with lubrication. Again some found only Polyethylene covers are more effective and more time-saving in reducing the incidence of corneal damage in intensive care patients. Carbomer, an acrylic acid polymers eye drops, when used in combination with polyethylene covers, were effective in managing exposure keratopathy.<sup>3,19-24</sup>

**Surgical treatment:** Surgical options as of punctal plugs, tarsorrhaphy, eyelid reconstruction, Gold or platinum weight implant, orbital decompression, conjunctival flap, amniotic membrane graft, even corneal transplantation may require according to need. If adequate corneal protection cannot be achieved with a combination of taping and lubrication temporary suturing of the lids may be the good option. In severe degrees of chemosis with conjunctiva prolapses through the closed lids is a difficult condition. It needs a Frost suture passed through to the upper or lower lid margin to obtain adequate closure to prevent exposure of cornea.

#### Prevention:

Prevention of ocular complications is critically important in the management of unconscious or any ICU patient is the most effective way. In many instance comatose and sedated patient suffers from post-recovery visual loss. Patient's own bacterial flora most commonly causes corneal infections or infiltrates. Keeping patient's face clean and care to be taken to protect the patient's eyes when suctioning gastrointestinal or respiratory secretions are important factors.

Autologous serum eye drops (AS) found to have a potential advantage over traditional therapies as it provides lubrication and contain other biochemical components that closely mimic natural tears.<sup>23</sup> Eye care with a lubricating ointment on a regular set schedule can effectively reduce the prevalence of corneal abrasions in patients in ICU and thus prevent serious complications as corneal ulceration, infection, and visual loss. Eye ointment and polyethylene cover are also a acceptable eye care methods in ICU.<sup>24</sup> The presence of discharge, red eyes and white corneal lesions (which may indicate corneal infection) should make alert the caretakers.

Use of swimming goggles and regular moistening of eyelids with gauze soaked in sterile water providing a moisture chamber, is more effective than using a combination of ocular lubricants and securing tape over the eyelids, in preventing corneal epithelial breakdown in sedated and semiconscious intensive care unit patients.<sup>25-26</sup>

Lid taping is a good option but it was seen that lids were open under the tape and the cornea was exposed. Thus corneal erosion developed in middle-third of the cornea. Repeated removal of the Micropore tape may also lead to some degree of facial skin or eyelid injury. Allergy to the tape material is an unwanted problem. So the use of tape with lubricants are restricted to only those patients who have some form of exposure. The need for proper application of the Micropore tape is essential. Lid taping with Micropore tape in a horizontal position reduces the probability of corneal exposure. The eyes should always be re-lubricated every 4 hours, and taped shut. If taping is also performed, ointment is put in first and the eyes are closed. The position of the lashes is then checked as the lashes must be clear of the cornea otherwise lashes may cause corneal abrasion.<sup>18,27-29</sup> If the management steps fail and the patient's epithelial keratitis continues to progress, there are surgical options available that have been proven effective.

Even taking of proper care there may be appearance of discharge, red eyes and white corneal lesions (which may indicate corneal infection) should alert the ICU staff about the need of specialty care. It should be remembered that unconscious, sedated and/or paralyzed patients and those with a lower Glasgow Coma Scale score are totally depend on healthcare professionals to maintain their ocular surface care.<sup>26,28</sup>

### Conclusion:

In Ocular care in ICU, the important is limiting the overall risk of exposure keratitis through good clinical practices. There is no alternative to develop protocol for close follow-up and monitoring aimed at prevention.

Aims of eye care will be to protect the eye in vulnerable patients i.e. semi-comatose or comatose patients, to identify disease affecting the eye and to deliver treatment to the eye when both preventive and curative.

Prevention of ocular complications in the ICU need regular assessment of the lid position with appropriate intervention and a high index of suspicion for infection are cornerstones of eye care in the critically ill. The family members should be allowed to stay with the patient when and where it is possible.<sup>29</sup>

Again providers should remember that patient management does not end only in the acute care setting. There is a prime importance of post-acute phase of treatment, follow-up examination, depending on individual patient. Despite the awareness of the problem and the preventative measures undertaken, corneal exposure and bacterial keratitis continues to occur in unfortunate patients. Optimum vigilance and careful eye care in unconscious patients can avert the

development the complications and subsequent ocular morbidity.<sup>30</sup>

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