

Eye Complications among Patients Treated in Neuro-Critical Units: Causes and Risk Factors

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Eyes are the windows of the body and brain. Examination of eyes alone helps in identifying several systemic disorders including like vasculitis, storage disorders, diabetes, hypertension etc. Furthermore, as the optic nerve is a direct extension of the brain, disorders affecting the optic nerve leading to optic neuritis as seen in demyelinating illnesses and papilledema as observed in elevated intracranial tension can be detected on ophthalmological examination. Patients with life-threatening situations who need the complete care of a multidisciplinary team are admitted and treated in intensive care units (ICUs). The primary goals of the medical personnel when a patient is in a hospital are to stabilize their state, maintain basic vital functions, and manage life-threatening illnesses. Conditions affecting skin and eyes are generally overlooked and ignored while managing patients in an intensive care unit [1,2].

Patients with serious and life-threatening neurological conditions or their complications are admitted in neurocritical care units. It has been observed that during the management of such conditions few complications also develop which get overlooked and ignored. Ophthalmological complications especially ocular surface abnormalities are the most common amongst these. There are numerous factors including prolonged hospital stays, sedation, and paralysis which increase the risk of abrasions of the cornea and other ocular surface problems in such hospitalized patients [3].

In a neurocritical setting, the factors leading to these eye complications are divided into various categories which are 1) as a result of comorbidities prior to onset of the illness 2) direct result of the neurological illness and lastly 3) as a result of drugs, sedation, and factors related to nursing care. Table 1 summarizes few examples of these factors.

Complications as a result of comorbidities

In patients admitted in neuro-critical, complications can be directly attributed to underlying comorbidities most importantly diabetes mellitus. Microvascular and macrovascular manifestations may worsen or they are accelerated after an acute insult or change in body physiology. Trauma can lead to retinal detachment in proliferative diabetic retinopathy. Uncontrolled diabetes or glycaemic status may

S. No.	Factors	Examples
1.	Complications as a result of comorbidities	1. Diabetic retinal detachment 2. Retinal artery occlusion 3. Orbital cellulitis 4. Rhino-orbital mucormycosis and aspergillosis
2.	Complications as a result of underlying illness	1. Raised intracranial pressure, Papilledema and subsequent optic atrophy 2. Retinal concussion 3. Subconjunctival haemorrhage 4. Chemosis 5. Oculomotor abnormalities 6. Lid swelling and ptosis 7. Uveitis
3.	Complications as a result of drugs, sedation, and nursing care	1. Dryness of eyes (Decreased tear production or increased tear film breakup time) 2. Corneal abrasion and opacity 3. Precipitation of Glaucoma attack 4. Uveitis

Table 1: Factors contributing to ophthalmological complications in neurocritical setting.

predispose to infections like pyogenic orbital cellulitis from staph aureus, fungal infections of eye globe including mucormycosis and aspergillosis [4].

Complications as a result of underlying illness

Critical or life-threatening conditions for which the patients are admitted in the critical care unit can present with ocular signs or ocular complications because of the underlying disease. Patients with head trauma may present with retinal detachment or concussion of retina. Features of raised intracranial pressure can be seen in obstructive hydrocephalus resulting from an infection (for example tuberculosis), large hemispheric infarction, large intracranial space-occupying lesion or diffuse cerebral edema. These can be seen as papilledema on fundus examination and when long-standing, it leads to optic atrophy and subsequent vision impairment. Raised intracranial pressure can lead to herniations presenting as fixed dilated pupil with loss of ocular reflexes. Sixth nerve palsy which is one of the non-localising sign can also be seen. Eye movement restriction due to palsy, decreased blink rate or absent blinking due to comatose state can lead to drying of cornea and conjunctiva causing exposure keratitis, corneal abrasions and subsequent development of corneal opacity. Chemosis and proptosis along with oculomotor palsy which is seen in venous congestion (for example cavernous sinus thrombosis) leads to chemosis, exposure keratitis, decreased tear film breakup time leading to secondary infections of globe. Patients with immunocompromised status as seen in HIV can develop chorioretinitis or uveitis due to opportunistic infections including *Pseudomonas*, cytomegalovirus, *Staphylococcus aureus*, herpes virus, *Candida* endophthalmitis etc [2].

Complications as a result of drugs, sedation and nursing care

Drugs such as sedatives and paralytics decrease the eye movements and blinking leading to exposure keratitis. Anticholinergic side effects of drugs used in the management of various conditions decrease the lacrimation and tear production as seen with anticholinergic, antiparkinsonian, antiemetic, antipsychotic agents, bronchodilators, muscle relaxants and antihistamines etc. On the other hands drugs can precipitate acute attack of angle closure glaucoma like topiramate used for seizures, sedatives (benzodiazepines), bronchodilators etc. improper nursing care and eye padding and use of ophthalmic lubricants and antibiotics can further complicate the manifestations of above-mentioned conditions.

In conclusion, while managing patients in neurocritical care setting, one must be vigilant for ophthalmological complications which are commonly encountered but these are generally overlooked and ignored. Regular screening and examination of such patients by ophthalmologist and a multidisciplinary care of critically ill patients can help prevent or treat these complications at early stage.

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