PROTOCOLS FOR INJURIES TO THE EYE

CORNEAL ABRASION

I. BACKGROUND

A corneal abrasion is usually caused by a foreign body or other object striking the eye. This results in a disruption of the corneal epithelium.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical Findings

Patients complain of pain and blurred vision. Photophobia may also be present. Symptoms may not occur for several hours following an injury.

B. Appropriate Diagnostic Tests and Examinations

Comprehensive examination by an ophthalmologist to rule out a foreign body under the lids, embedded in the cornea or sclera, or penetrating into the eye. The comprehensive examination should include a determination of visual acuity, a slit lamp examination and a dilated fundus examination when indicated.

III. TREATMENT

A. Outpatient Treatment

Topical antibiotics, cycloplegics, and pressure patch at the discretion of the physician. Analgesics may be indicated for severe pain.

B. Duration of Treatment

May require daily visits until cornea sufficiently healed, usually within twenty-four to seventy-two hours but may be longer with more extensive injuries. In uncomplicated cases, return to work anticipated within one to two days. The duration of disability may be longer if significant iritis is present.

IV. ANTICIPATED OUTCOME

Full recovery.

CORNEAL FOREIGN BODY

I. BACKGROUND

A corneal foreign body most often occurs when striking metal on metal or striking stone. Auto body workers and machinists are the greatest risk for a corneal foreign body. Hot metal may perforate the cornea and enter the eye. Foreign bodies may be contaminated and pose a risk for corneal ulcers.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical Findings

The onset of pain occurs either immediately after the injury or within the first twenty-four hours. Typically there is a sensation of something in the eye, pain, and photophobia. The pain is aggravated by blinking or moving the eye. Vision may be affected if the foreign body is in the visual axis.

B. Appropriate Diagnostic Tests and Examinations

A comprehensive examination by an ophthalmologist is necessary, including determination of visual acuity, slit lamp and dilated fundus examination to rule out intraocular foreign bodies. An orbital x-ray or CT scan may be indicated if there is a suspicion of ocular or orbital penetration.

III. TREATMENT

A. Outpatient Treatment

Superficial or embedded corneal foreign bodies are usually removed at the slit lamp in the emergency room or ophthalmologist's office. Topical antibiotics, cycloplegics, and pressure patch are used at the discretion of the physician. Analgesics, including narcotics may be necessary for the first several days. Daily visits may be necessary until the cornea is healed.

B. Estimated Duration of Care

Return to work anticipated within one to two days in uncomplicated cases.

C. Anticipated Outcome

Full recovery unless the foreign body leaves a significant scar in the visual axis. This may result in diminished visual acuity or may require spectacles, a contact lens, or corneal surgery to improve the vision.

HYPHEMA

I. BACKGROUND

Hyphema is bleeding within the anterior chamber of the eye. It is typically caused by severe blunt trauma to the eye rupturing intraocular blood vessels. Hyphema may be associated with disruption of the trabecular meshwork and lead to angle recession glaucoma. Elevated intraocular pressure with hyphema may cause blood staining of the cornea. Hyphema in patients with sickle cell anemia also poses significant risk to vision. The most significant risk with hyphema is rebleeding which will occur in up to 30% of cases within the third to fifth day. Rebleeding may cause marked elevation of intraocular pressure, as well as corneal blood staining and visual loss. Late complications may include angle-recession glaucoma and cataract.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical Findings

Hyphema generally occurs after severe blunt trauma to the eye. It can range from red blood cells visible within the anterior chamber to a layered clot filling the entire anterior chamber. Intraocular pressure is often elevated.

B. Appropriate Diagnostic Tests and Examinations

This is an ocular emergency and requires immediate referral to an ophthalmologist. Appropriate diagnostic tests include a comprehensive exam by an ophthalmologist including a slit lamp exam, determination of the intraocular pressure, and dilated fundus examination if possible. Orbital x-rays may be indicated to rule out other orbital injuries depending on the mechanism of injury. A platelet count and coagulation studies may be indicated, and a sickle prep or hemoglobin electrophoresis should be performed if there is a question of sickle cell anemia.

III. TREATMENT

A. Outpatient Treatment

If the individual is reliable and the hyphema is not severe and there are no other complicating factors, this condition can be managed as an outpatient. All patients require strict bed rest for five days except for daily examinations. Topical cycloplegics, steroids, and ocular hypotensive agents are indicated at the discretion of the physician. Oral prednisone and/or aminocaproic acid may also be used at the discretion of the physician. A hard shield is typically worn throughout the day and night. After several weeks a gonioscopy is indicated to evaluate the trabecular meshwork.

B. Inpatient Treatment

If there is a significant hyphema, marked elevation of intraocular pressure, other complicating factors (e.g. sickle cell anemia, hyphema in a monocular patient, other ocular injuries) or if the individual does not seem reliable, hospital admission may be indicated to insure strict bed rest and regular follow-up. Oral prednisone and/or aminocaproic acid may also be used at the discretion of the physician. Hospitalization should last five days. Persistent elevated intraocular pressure, corneal blood staining, or persistence of the hyphema in the setting of sickle cell anemia may require surgical evacuation of the clot.

C. Estimated Duration of Care

Return to work anticipated in three weeks for uncomplicated cases. If there is evidence of disruption of intraocular structures, they will require lifetime monitoring for glaucoma and cataracts.

D. Anticipated Outcome

Resolution of the hyphema with return of visual acuity. These individuals should wear polycarbonate safety glasses if involved in an occupation where there is continued risk of ocular injury.

EYELID LACERATION

I. BACKGROUND

Eyelid lacerations may occur from blunt injuries or from laceration by a sharp object. The lacerations may only involve skin but may involve the eyelid muscles, eyelid margin, the lacrimal drainage system, and may be associated with an orbital foreign body.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical Findings

There is often profuse bleeding. Lacerations through the eyelid margin, in the medial canthus, or resulting in exposure of orbital fat indicate severe injuries and require immediate evaluation. Retained orbital foreign bodies must also be suspected, especially if the injury is caused by an explosion or fragmented object. With severe injuries to the lids, injury to the eye must be ruled out.

B. Appropriate Diagnostic Tests and Examinations

A comprehensive examination by an ophthalmologist including determination of visual acuity, slit lamp and dilated fundus examination is necessary to rule out ocular or orbital injury or foreign body.

III. TREATMENT

A. Outpatient Treatment

Superficial lacerations or lacerations not involving the lacrimal system or entering the orbit may be repaired in the emergency room or office. Sutures are removed over one to two weeks. Topical and oral antibiotics are usually prescribed. Analgesics may be necessary for pain.

B. Inpatient treatment

Injuries involving the lacrimal drainage system or penetrating the orbit should be repaired in the operating room. These repairs may require general anesthesia. Intravenous antibiotics are often indicated. Depending on the severity of the injury and overall condition of the patient, these individuals may be discharged from the recovery room or may require a one to two day hospital stay.

C. Estimated Duration of Care

Return to work anticipated within two weeks in uncomplicated cases. Medical follow-up four weeks if uncomplicated. Damage to the eyelid muscles resulting in traumatic ptosis may require six to twelve months to resolve, or may ultimately require surgical repair.

D. Anticipated Outcome

Resumption of normal eyelid function.

CANALICULAR LACERATION

I. BACKGROUND

Laceration in the medial eyelid may injure the upper or lower canaliculus or lacrimal sac. Disruption of the lacrimal drainage system may result in constant tearing or the development of an abscess within the lacrimal sac (dacryocystitis). Constant tearing may be no more than a nuisance, but it may also obstruct vision and the presence of an infection within the lacrimal system usually requires surgical repair.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical Findings

There is usually a laceration in the medial eyelid. The laceration may at first glance seem trivial, but any laceration medial to the punctum should raise the suspicion of a canalicular laceration. There may be tearing or bloody tears. The punctum may be displaced laterally.

B. Appropriate Diagnostic Tests and Examinations

A comprehensive examination by an ophthalmologist including determination of visual acuity, slit lamp and dilated fundus examination to rule out other orbital or ocular injuries is necessary. Probing of the canaliculus is indicated to determine if the canaliculus is lacerated and the extent of the injuries. Orbital x-rays or CT scan may be indicated if a fracture or foreign body is suspected.

III. TREATMENT

A. Outpatient Treatment

Repair of canalicular lacerations requires the operating room, frequently using the operating microscope. The lacerated canaliculi are intubated either with a silicone tube or other stent and the cut ends reapproximated. Depending on the severity of the injury, other complicating factors, and general condition of the patient, these individuals can be discharged from the recovery room. Topical drops and oral antibiotics may be indicated.

B. Inpatient Treatment

If the individual has eaten recently, it may be necessary to delay the surgery for twenty-four to forty-eight hours. Hospital admission may be required if the wound is contaminated and intravenous antibiotics are needed. Admission is also indicated in the presence of other complicating injuries. Complex reconstruction requiring prolonged general anesthesia would also require admission.

C. Estimated Duration of Care

Return to work anticipated in two weeks in uncomplicated cases. Medical follow-up three to six months. Occasionally the repair is unsuccessful, and lacrimal bypass surgery is indicated.

D. Anticipated Outcome

Return of normal eyelid function and elimination of tearing.

ORBITAL CONTUSION

I. BACKGROUND

An orbital contusion is usually a result of blunt trauma causing swelling and ecchymosis of the orbit. A pure orbital contusion is not associated with any fractures or significant lacerations. There may be significant swelling and initial double vision, but visual acuity is not usually affected, and ocular motility and diplopia return towards normal within several days.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical Findings

If there is a history of blunt trauma to the ocular area, there may be progressive swelling of the lids with ptosis, proptosis of the eye, and diplopia. The swelling and diplopia should improve over several days. Visual acuity is usually normal.

B. Appropriate Diagnostic Tests and Examinations

Orbital x-rays are indicated to rule out a fracture. A CT scan is indicated if the diplopia persists or if there is suspicion of an orbital fracture in spite of normal plain films. A comprehensive examination by an ophthalmologist, including assessment of visual acuity, slit lamp examination, and dilated fundus examination are necessary to rule out concomitant intraocular injury.

III. TREATMENT

A. Outpatient Treatment

If there are no complicating injuries, an orbital contusion is treated as an outpatient. Analgesics, ice packs, and systemic antibiotics may be indicated.

B. Inpatient Treatment

Diminished visual acuity or severe pain may indicate more extensive injury and may warrant hospital admission for further evaluation and treatment.

C. Estimated Duration of Care

Return to work in one to two days in uncomplicated cases. Disability may be longer if diplopia or ptosis persist.

D. Anticipated Outcome

Resolution of the swelling and diplopia with return of normal ocular motility.

ORBITAL FRACTURE

I. BACKGROUND

Fractures of the orbit may be indirect, resulting in “blowout” of the orbital floor or medial wall, or direct involving fractures of the orbital rims. Fractures of the orbit open communication between the orbit and the sinuses. Significant fractures may cause ocular motility disturbance from entrapment of orbital content, enophthalmos due to prolapse of the orbital contents into the sinus, and dystopia of the eye.

II. DIAGNOSTIC CRITERIA

A. Pertinent History and Physical findings

There is a history of blunt trauma to the eye, usually by an object larger than the bony orbital opening. The eye may appear proptotic or enophthalmic. Ocular motility is usually diminished. The intraocular pressure may elevate when the eye is turned away from an entrapped muscle. There is usually numbness over the cheek due to injury to the infraorbital nerve. There may be a palpable fracture of the orbital rim. There may also be a fracture of the zygomatic arch. This causes flattening of the cheek and may interfere with opening the mouth.

B. Appropriate Diagnostic Tests and Examinations

A comprehensive examination by an ophthalmologist is necessary, including a determination of visual acuity, slit lamp examination, and dilated fundus examination to rule out intraocular injury. X-ray of the orbits may miss up to 20% of orbital fractures. A coronal CT scan is indicated, especially if surgery is contemplated.

III. TREATMENT

A. Outpatient Treatment

Not all orbital fractures require repair. If there is no enophthalmos or diplopia, repair may not be necessary. It is appropriate to follow the patient on an outpatient basis for the first one to two weeks to determine if the diplopia is resolving. Oral antibiotics are usually given prophylactically. Analgesics may be required.

B. Inpatient Treatment

Severe facial fractures require hospital admission. Other complicating injuries may also make hospital admission necessary. Surgical repair of the fractures is usually undertaken within the first three weeks. This usually requires a one to three day hospital stay postoperatively.

C. Estimated Duration of Care

Disability from orbital fracture is usually due to diplopia. Double vision while looking straight ahead or down makes driving, operating machinery, reading, typing, and close work difficult. Double vision within the central 20 degrees of the visual field is considered a 100% loss of ocular motility according to the American Medical Association's Guide to Evaluation of Permanent Impairment.

Diplopia may resolve spontaneously within one to two weeks with small fractures not requiring repair. More severe fractures may have more persistent diplopia. Generally, double vision resolves within two to three weeks after surgical repair unless there is intrinsic damage to the extraocular muscles. It is rarely necessary that eye muscle surgery or further orbital surgery is necessary.

Light work may be done when diplopia is resolved. Heavy work can generally be resumed three weeks after injury if surgery is not required, or three weeks after surgical repair.

Individuals with diplopia in primary gaze, down gaze, or within the central 20 degrees should not drive, operate machinery, or work in a dangerous environment where good peripheral vision is necessary.

D. Anticipated Outcome

Resolution of diplopia and normal functioning of the eye. Numbness over the cheek may persist for one year or longer and is not affected by surgical repair.

CORNEOSCLERAL LACERATIONS

I. BACKGROUND

Corneoscleral lacerations are potentially severe injuries resulting from sharp objects making forceful contact with the globe. The severity of such injuries is quite variable and is dependent on the sharpness of the object and its velocity at the time of impact.

II. DIAGNOSTIC CRITERIA

A detailed examination by an ophthalmologist, including visual acuity, slit lamp exam, intraocular pressure, and dilated fundus exam is necessary to determine the extent of injury. If retained foreign body is anticipated, localizing radiologic studies (e.g., CAT scan of orbits) may be required.

III. TREATMENT

Small partial thickness lacerations may require only follow-up and/or patching. More severe ones may respond to bandage contact lens application and follow-up.

Virtually all full-thickness corneal lacerations require very careful follow-up. Very small ones may respond to bandage lens application with or without cyanoacrylate tissue adhesive and protective shield. Larger ones require surgical repair under general anesthesia and hospitalization.

The goal of management is to restore the eye to its normal anatomic configuration and create a water-tight closure. If the lens is involved in the injury, it often must be removed at the time of surgery. Prolapsing uveal tissue must be replaced. Vitreous must be meticulously removed from the anterior chamber if it is present. Involvement of retinal tissue in the injury can make the prognosis much more guarded, and a vetreoretinal surgeon would then be required at the time of initial repair.

Postoperative management usually consists of forms of cycloplegic, steroid, and antibiotic drops.

IV. ESTIMATED DURATION OF CARE AND ANTICIPATED OUTCOME

Partial thickness laceration patients may be managed as outpatients. The patient should wear a protective shield for three to six weeks. Light work may be done after several days. Usually recovery is quite good with normal visual function after six weeks.

Full thickness simple corneal lacerations require two to four months to heal and remove sutures. Protective shield should be worn for six weeks. Light work could be done after two weeks. Return to full work after suture removal in three to four months if vision is adequate for tasks. Sometimes, corneal scar is extensive, and corneal transplant for visual recovery would be necessary at a later date.

Lacerations involving lens, uveal tissue, and retina may require a week’s hospitalization and perhaps six months to achieve stability. At that time, contact lens correction of the aphakic condition may allow good visual recovery. Many patients with these severe injuries may never recover full vision, either with later cornea transplant and intraocular lens placement.

CHEMICAL OCULAR INJURIES

I. BACKGROUND

Chemical injuries may result from an almost infinite variety of agents contacting the ocular surface. The extent of the injury is largely a function of the nature of the substance involved, how much of the ocular surface is involved, and the duration of exposure. In general, alkali injuries (e.g., ammonia, lye, potassium hydroxide, calcium hydroxide (lime) are the most serious because these agents readily penetrate into the ocular tissue. Acid burns (e.g., sulfuric acid, hydrofluoric acid, nitric acid, acetic acid) may be serious but have less penetration than alkalis.

II. DIAGNOSTIC CRITERIA

A detailed examination by an ophthalmologist is performed after copious irrigation (see Treatment). It is vitally important to know the chemical causing the injury, its concentration, and amount of exposure.

In alkali burns, the Hughes classification (grading of corneal haziness and loss of blood vessels at limbus) is helpful in assessing long-term prognosis.

III. TREATMENT

Acute phase (0 to 7 days). Immediate copious irrigation using any nontoxic irrigating solution is the most important treatment of any chemical injury. It should be continued for at least 30 minutes. Checking the pH until it returns to normal is a good way to determine if enough irrigation is done.

After the irrigation, management by the ophthalmologist may include topical steroids and the use of prophylactic antibiotic drops. Other agents, such as topical ascorbate, cycloplegic agents, etc., may be warranted.

Severe chemical injuries should be hospitalized for treatment for several days. For milder cases, outpatient care with frequent follow-up (every several days for first three weeks) is appropriate.

IV. ESTIMATED DURATION OF CARE AND ANTICIPATED OUTCOME

Quite dependent on extent of initial injury. Milder injuries may return to work after several days. Moderate chemical injuries (if bilateral) may need several weeks to recover. Severe burns (if bilateral) may be blinding. In many cases, corneal transplants, performed months after the initial injury, may be able to restore vision.

PROTOCOL HISTORY:
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