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Nursing Care for Patients with Anterior Segment Problems
THE ANTERIOR SEGMENT

Course Objectives

At the completion of Posterior Segment Orientation, the orientee will be able to:

Anatomy and Physiology
1. State the function of the cornea, uveal tract, uveal tract angle, and the lens
2. Describe the aqueous flow in the eye

Disorders
3. Describe the difference between Fuch’s Dystrophy and Bullous Keratopathy
4. Describe the Pathophysiology of Glaucoma
5. State 2 difference between Primary Angle Closure Glaucoma and Primary Open-Angle Glaucoma

Diagnostic Procedures
6. Enumerate the 3 Types of Tonometers
7. Describe 2 diagnostic exams for Corneal Disorders.

Equipments, Instrumentation and Set-up
8. Describe the difference between Phacoemulsification and Extra Capsular Cataract Extraction (ECCE)
9. Describe the difference between Goniotomy and Trabeculotomy
10. Identify 3 examples of dilating eye drops
Course pre-requisites

1. Basic knowledge of the Ophthalmic Terminologies and Abbreviations.


The Anterior Segment

The anterior segment is the first third portion of the eye. The structures included are, the Cornea, the Uveal Tract (Uvea), and the Lens.

THE CORNEA

It is a curved structure anterior to the eye. It is clear and avascular. The cornea is one of the most powerful refracting medium that focuses light in the retina. It is extremely sensitive due to the numerous sensory nerve endings originating from the fifth cranial nerve. The cornea and the sclera meet at the junction called the limbus. There are five corneal layers namely Epithelium, Bowman’s Membrane, Stroma, Decemet’s Membrane and Endothelium.

FYI

The cornea receives its nutrition from the tear film, aqueous humor, and the perilimbal vessels.

THE UVEAL TRACT (UVEA)

It consists of the iris, ciliary body, and choroid. Its primary function is to supply nutrition to the
eye, the choroid for the retina and the aqueous humor for the anterior structure.

- **Iris**
  - Pigmented portion of the eye that regulates the amount of light passing through the pupil, it contains the central opening.
  - Muscular portion composed of the sphincter muscle that constricts (Parasympathetic, *miosis*) and dilator muscle that dilates the pupil (sympathetic, *mydriasis*).
  - Vascular portion responsible for the nourishment of the aqueous humor through diffusion.

- **Ciliary Body**
  - Extends from the root of the iris to the *Ora Serrata* where the peripheral retina terminates.
  - Composed of the *ciliary process* and the *ciliary muscle*.
  - Ciliary processes are projection like structures that are attached to *Zonules*, the suspensory ligaments of the lens.
  - Ciliary muscle are responsible for the focusing ability of the lens.
  - Ciliary epithelium is responsible for the formation of the aqueous humor by active secretion.
  - Anterior Chamber is filled with Aqueous Humor which flow around the eye and empties into the internal angles of the eye; This nourishes the lens and the cornea and takes debris out of the eye.

- **Anterior Chamber Angle** is the junction between the Iris and the Cornea; At the angle, tiny spores called the Trabecular Meshwork are responsible for draining the aqueous to the Canal of Schlemm which then drain out of the eye via the episcleral veins; The production and outflow should remain equal to maintain normal *Intraocular Pressure IOP* of 10 to 21mmHg.

**Flow of Aqueous Humor:**

- The aqueous humor is produced in the ciliary body. It flows in the posterior chamber (below the iris and above the lens) and exits the pupil and into the anterior chamber (below the cornea above the iris). The fluid flows out the trabecular meshwork and into the Canal of Schlemm. It then drains out of the eye through the episcleral veins and aqueous veins.

Other structures associated with the IOP is the Optic Nerve. It is located at the posterior part of the globe. It transmits visual stimuli to the brain. The optic disc is the head of the optic nerve. It can be visualized by direct fundus examination. The optic disc has a small physiologic cup or depression in the center. This is important in determining the extent of glaucoma on a patient.
• **Choroid** – It originates from the Ora Serrata and extends to the retina. It is responsible for the nourishment of the retina.

**THE LENS**

The lens is a transparent, biconvex, refractive structure in the eye which is located beneath the iris and just above the vitreous. It reflects light into the retina. It is composed 65% water, 35% proteins with trace minerals. It receives nourishment from the aqueous humor. The lens structure is made up of the capsule (anterior and posterior), the cortex, and the nucleus.

The capsule has suspensory ligaments called the Zonules that is attached to the ciliary processes. It plays a vital role in the focusing ability (accommodation) of the lens.

**FYI**

When the ciliary muscle **relaxes**, it flattens the lens, generally improving the **focus for farther** objects. When it **contracts**, the lens becomes more convex, generally improving the **focus for closer** objects.

**References:**

- 1999 Eye Poster from Anatomical Chart Co. Skokie, IL
- Boyd-Monk, Steinmetz III, *Nursing Care of the Eye*, Norwalk, CN: Appleton and Lange
Practice Test: Anterior Segment: Anatomy and Physiology

(Please submit to preceptor for your file)

Name: ___________________________
Date: _______________________

Please check box for the appropriate answers

1. What are the structures that make up the anterior segment? Check all that apply.
   - □ Retina
   - □ Uveal Tract
   - □ Lens
   - □ Cornea

2. These are suspensory ligaments attached to the lens and the ciliary processes that is responsible for accommodation.
   - □ Ciliary Muscle
   - □ Zonules
   - □ Trabecular Meshwork

3. It provides nutrition to the cornea, iris and the lens.
   - □ Vitreous Humor
   - □ Choriocapillaries
   - □ Episcleral Veins
   - □ Aqueous Humor

4. When this layer is damaged, it does not regenerate but rather slides over each other to compensate for the break.
   - □ Epithelium of the cornea
   - □ Endothelium of the cornea
   - □ Stroma of the cornea
   - □ Bruch’s Membrane

5. This structure is responsible for the secretion of the aqueous humor.
   - □ Cornea
   - □ Iris
   - □ Ciliary body
   - □ Lens

6. What structures are responsible for accommodation, focusing ability of the eye? Check all that apply.
   - □ Zonules
   - □ Ciliary Processes
   - □ Trabecular Meshwork
   - □ Ciliary Muscle
   - □ Lens
   - □ Cornea
Disorders of the Anterior Segment

The most common disorders or anomaly of the Anterior Segment are discussed in this section. It is classified according to Disorders of the Cornea, Disorders of the Uveal Tract and Disorders of the Lens.

DISORDERS OF THE CORNEA

• **Fuch’s Corneal Dystrophy**

  It is a corneal disorder where the endothelial cells *gradually deteriorates*. It loses its ability to maintain a physiologic dehydration in the cornea as the disease progresses. This causes the stroma to swell (cloudy cornea) therefore causing visual changes. It is a hereditary disease that normally affect women more than men. Both eyes are normally affected.

  **Symptoms include**: sensitivity to light, glare, foggy or blurred vision, halos around lights and eye pain. As the disease worsens, small blisters appear on the surface of the cornea. This condition is called **Bullous Keratopathy**. Eye pain occurs when these blisters rupture.

  ![Normal Endothelium](image)

  ![Fuch’s Corneal Dystrophy](image)

  Image by: www.bio-optics.com/articles/01/art0100.htm

**DIAGNOSTIC EXAMS** *(refer to diagnostic section of the manual for detailed discussion)*

- **Slit Lamp Examination** – allows direct examination of the cornea with the use of a *Slit Lamp Apparatus*.
- **Visual Acuity Testing**
- **Pachymetry** – measures the thickness of the cornea

**TREATMENT**

**Supportive**

- **Eye Drops** – topical dehydrating agents e.g. Hypertonic Saline
- **Soft Contact Lenses** - to relieve discomfort for the ruptured bullae

**Curative**

- **Penetrating Keratoplasty (PK) Surgery** – permanent removal of the diseased cornea and replacement of a healthy donor cornea.
- **Decemet Stripping of Endothelium Keratoplasty (DSEK)** - replacement of the abnormal endothelium with a healthy donor endothelium.

• **Bullous Keratopathy**

  It is a condition where there is swelling of the cornea and presence of bullae due to Fuch’s Dystrophy or Corneal Endothelial Trauma.

  **Symptoms include** blurred vision, eye pain, and glare. Eye pain and foreign body sensation are due to rupture of the fluid-filled bullae.

  ![Bullous Keratopathy](image)

  Image taken from: bellaireeye.com/eye_corneal.shtml

  Corneal endothelial trauma occurs usually during surgery with removal of lens or improper placement of the Intraocular Lens. It is called **pseudophakic bullous keratopathy** when an artificial lens is present and **aphakic bullous keratopathy** is when no artificial lens is present.
DIAGNOSTIC EXAMS (refer to diagnostic section of the manual for detailed discussion)

- **Slit Lamp Examination** – allows direct examination of the cornea with the use of a Slit Lamp Apparatus.
- **Visual Acuity Testing**
- **Pachymetry** – it measures the thickness of the cornea.

TREATMENT

**Supportive**

- **Eye Drops** – topical dehydrating agents e.g. Hypertonic Saline
- **Soft Contact Lenses** - to relieve discomfort from the ruptured bullae

**Curative**

- **Penetrating Keratoplasty (PK) Surgery** – It is the permanent removal of the diseased cornea and replacement of a donor cornea.

**Keratoconus**

It is a non-inflammatory disorder wherein there is thinning of the central cornea. It causes corneal irregularities. The cone becomes more pronounced.

**Symptoms:**
- Astigmatism,
- Nearsightedness,
- Blurred Vision, and
- Glare.

DIAGNOSTIC EXAM

- **Munson’s Sign** (protrusion of lower lid when patient looks down).
- **Visual Acuity Testing**
- **Slit Lamp Examination**
- **Corneal Topography** - maps out general curvature of cornea.

**Pachymetry** – measures the thickness of cornea.

**Corneal Ulcer**

It is a break on the layers of the cornea due to several causes.

**CAUSES**

- **Viral** - e.g. Herpes Simplex Virus (HSV)
- **Bacterial** – e.g. Pseudomonas aeruginosa,
- **Fungi** – e.g. Candida albicans
- **Hypersensitivity/Allergic reactions**
- **Vitamin A deficiency - Xerophthalmia**
- **Exposure Keratitis** – may develop when there is prolonged exposure of the cornea by failure of the lids to close brought on by trauma, Bell’s palsy, exophthalmos, etc.

**SYMPTOMS/SIGNS**

- Pain, mild to severe
- Visual changes
- Photophobia
- Tearing
- Mucopurulent discharge or Hypopion (bacterial)

DIAGNOSTIC EXAMS (refer to diagnostic section of the manual for detailed discussion)

- **Visual Acuity Testing**
- **Slit Lamp Examination**
- **Corneal Cultures and Sensitivity**

TREATMENT

- **Goal is to remove or treat offending cause** (e.g. antibiotic drops)
- **Surgery** – amniotic membrane graft or penetrating keratoplasty
• **Corneal Trauma**
  It denotes injury to the cornea from mild (abrasions), moderate (corneal foreign bodies) to severe (lacerations and perforations).

  **SYMPTOMS**
  - Red, irritated eye
  - Light sensitivity
  - Eye pain (mild to severe)

  **DIAGNOSTIC EXAMS** *(refer to diagnostic section of the manual for detailed discussion)*
  - Visual Acuity Testing
  - Slit Lamp Examination

  **TREATMENT**
  - **Supportive**
    - Instill prescribed drops or ointments
    - Patch the eye according to orders for mild abrasions to promote healing of the epithelium.
  - **Curative**
    - Surgical repair of corneal lacerations and perforations.

• **Band Keratopathy**
  Bank keratopathy results from precipitation of calcium salts on surface of cornea (directly under the epithelium).

  **SYMPTOMS**
  - Decreased vision
  - Foreign body sensation
  - Ocular irritation
  - Redness

  **DIAGNOSTIC AND TREATMENT**
  - Visual Acuity Testing
  - Band Keratopathy Removal

**Additional Reading:**
- Steven-Johnson Syndrome
- Corneal Edema
- Trichiasis

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**DISORDERS OF THE UVEAL TRACT**

**UVEITIS**

It is the inflammation of the iris, the ciliary body, and the choroid. It may involve one or all portions at the same time. It is classified according to affected area: **Anterior** (area around the iris), **Intermediate** (ciliary body, front end of retina, and vitreous) **Posterior** (choroid, retina and optic nerve) and **Panuveitis** (all structures).

**CAUSES**

- Idiopathic in most cases
- Allergens, fungi, bacteria, virus, chemicals
- Trauma/Injury/surgical
- Genetic Factors
- Associated with systemic disease e.g. Rheumatoid Arthritis
- Systemic Infection e.g. Histoplasmosis, toxoplasmosis for posterior uveitis

**SYMPTOMS/SIGNS**

- Pain in or around the eye
- Light sensitivity
- Blurred vision
- Irregular pupils of the involved eye due to synechiae of iris
- Increase in Intraocular Pressure (IOP)
- **Flare and cells**, hallmark sign; milkiness of the aqueous humor for anterior uveitis
- Hypopyon
- Eye injection (eye redness)

**DIAGNOSTIC EXAMS** *(refer to diagnostic section of the manual for detailed discussion)*

- Visual Acuity Testing
- **Slit Lamp Examination**
- **Tonometry**—measures the IOP
- **Indirect Ophthalmoscopy**—inspects the back of the eye
- **Differential Diagnosis by Laboratory works and General Inspection**—important to distinguish from other disorders that may present the same symptoms.

### FYI
**Terms:**
- **Iritis**—inflammation of the iris
- **Cyclitis**—inflammation of the ciliary body and anterior vitreous.
- **Iridocyclitis**—inflammation of the iris, ciliary body, and the anterior vitreous.
- **Choroiditis**—inflammation of only the choroid
- **Retinitis**—inflammation of only the retina
- **Choroidoretinitis**—inflammation of both layers where the choroid is more affected
- **Retinochoroiditis**—inflammation of both layers where the retina is more affected

- **UVEAL TRAUMA**
  Mechanical trauma often produces injuries that range from mild contusions (Traumatic Miosis, temporary), moderate contusions (iris and choroidal hemorrhages) to most severe (perforations).
  - **Traumatic Miosis** (spasm of accommodation) - noted immediately after injury and is temporary.
  - **Iritis**—inflammation of iris resulting from leakage of cells and proteins (increased permeability of the vessels).
  - **Hyphema**—presence of blood inside anterior chamber. Occurs when trauma is strong enough to rupture blood vessels in iris.
  - **Choroidal hemorrhage/detachment**—caused by contusion of choroid.
  - **Perforating wounds**—can concur with any corneal lacerations or intraocular foreign body; It can produce **fibrosis** for smaller wound, **hemorrhage** when ciliary body or choroid are affected, and **hypotony and loss of eye** for massive injuries; Some may need **surgery** to close wound or fish out intraocular foreign body.

### GLAUCOMA
(Disorder of the Angle and Its Surrounding Structure)
It is the leading cause of blindness in the United States. It is an optic neuropathy characterized by optic disc cupping and visual field loss.

### FYI
- **Congenital Glaucoma**—failure of trabecular meshwork to develop and function well therefore aqueous is unable to drain out of eye. This consequently increases IOP. Signs and symptoms include large eyes, cloudy cornea, photophobia (early symptom), epiphora.
- **Angle-closure** means that angle of anterior chamber becomes smaller meaning draining of aqueous humor is slower. This increases IOP. (e.g. inherent anatomical defect, lens displacement, synechiae, etc)
- **Open Angle** means that there is physical or mechanical blockage of angle that prevents aqueous to drain out of the eye consequently increasing IOP. (e.g. bld cells from trauma)
- **Primary** means that there are no evidence of any preexisting ocular or systemic disease.
- **Secondary** means there is preexisting ocular or systemic condition that precipitated the glaucoma (e.g. bleeding due to trauma, inflammatory process, tumor, dislocated lens, etc).

[http://www.trabectome.com/Patients/SilentThiefOfSight/](http://www.trabectome.com/Patients/SilentThiefOfSight/)

Destruction of the ganglion cells and atrophy of the retina occurs when the pressure in the eye (**intraocular pressure IOP**) is much greater than the circulation and tissues of the eye could take. Causes
may depend on the type of glaucoma. It can be classified as *congenital* vs *acquired*;
angle-closure (narrow-angle) vs open-angle (wide-angled); or primary vs secondary.

- **Primary Open-Angle Glaucoma (POAG)**
  - also known as chronic open angle glaucoma (COAG), chronic simple glaucoma.
  - disease process is subtle and painless and may take several years to produce damage to the retina and the optic nerve.
  - most common form of glaucoma.
  - etiology is unknown but it is believed to be caused by abnormality in trabecular meshwork.

- **Primary Angle-Closure Glaucoma**
  - blockage of anterior chamber angle by iris tissue. It may be relative or absolute. It can be caused by synechiae (abnormal adhesions) or lens where iris bulges forward closing the angle.

- **Secondary Glaucoma**
  - Inflammatory process (e.g. uveitis)
  - Neovascular Membranes
  - Lens-Induced (e.g. subluxed lens, mature cataract, etc.)
  - Trauma (e.g. bleeding, lacerations, traumatic cataract)
  - Sturge-Weber Syndrome

**SYMPTOMS/SIGNS** (General)
- May vary according to classification
- IOP greater that 21mmHg
- Glaucomatous Optic Nerve- Large C/D ratio.

**DIAGNOSTIC EXAMS** (refer to diagnostic section of the manual for detailed discussion)

- **Tonometry**- measures eye pressure
- **Perimetry** – test for visual field loss
- **Visual acuity** – baseline acuity testing
- **Gonioscopy** – allows direct observation of the iridocorneal angle.
- **Ophthalmoscopy (Direct and Indirect)** – allows examination of the optic nerve disc and optic nerve cup.

**TREATMENT**
**Pharmacologic**

- *Increases Aqueous Outflow*
  - **Miotics:** Carbachol, Pilocarpine
  - **Prostaglandins:** Xalatan, Rescula
- **Adrenergic Derivatives**: Propine, Epifrin, Epinal

- **Decrease Aqueous Production**
  - **Carbonic Anhydrase Inhibitors**: Diamox, Azopt, Trusopt
  - **β-adrenergic blocker**: Betoptic, Betagan, Timolol, Ocupress
  - **α-adrenergic agonist**: Alphagan, Iopidine

- **Hyperosmotic Agents**
  - increase osmosis; Causes movement of intraocular water into systemic circulation.
  - Glycerol, Osmitrol, Isosorbide, Mannitol

**Laser Treatment**
- **Laser iridectomy** - creates a hole through iris to facilitate flow of aqueous humor.
- **Laser iridoplasty** - flattens iris at the edge of iridocorneal angle to facilitate drainage of aqueous to trabecular meshwork.
- **Diode laser cycloablation** - reduces secretion of aqueous by destroying some ciliary epithelium therefore lowering IOP.

**Surgery**
- Child may undergo **Examination under Anesthesia** to rule out glaucoma. Diagnostic tests are done while the child is asleep.
- **Trabeculotomy** – Usually done in congenital glaucoma; Involves creation of an opening through trabecular meshwork with use of harms trabeculotome; Facilitates draining through canal of schlemm; Usually done under scleral tunnel.
- **Goniotomy** – Involves creation of an opening through trabecular meshwork with a use of a sharp knife or blade. Usually done clear cornea.

- **Trabeculectomy** – a type of filtering surgery where normal outflow of aqueous is bypassed by creating a new route of drainage; Fluid exits through sclera and into conjunctiva which serves as a reservoir; Fluid is then reabsorbed systemically.

- **Intraocular Implant for Glaucoma** – a type of filtering surgery wherein fluid flows out of eye with use of a artificial reservoir or a glaucoma implant.

- **Trabectome Procedure** – It is a minimally invasive procedure wherein the trabecular meshwork is destroyed by electrocautery to improve outflow to the canal of schlemm.

DISORDERS OF THE LENS

- **CATARACT**
  It is the opacity of the lens. It obstructs the light to pass through the retina.

<table>
<thead>
<tr>
<th>FYI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature opacity of <em>all</em> lens protein</td>
</tr>
<tr>
<td>Immature opacity of <em>some</em> lens protein</td>
</tr>
<tr>
<td>Hypermature refers to the cortical protein being liquefied.</td>
</tr>
</tbody>
</table>

**RISK FACTORS**
- Aging (above 40)
- Genetic Influences
- Environmental
- Metabolic
- Drugs
- Trauma
SYMPTOMS
- Primarily visual disturbances
- Painless blurring of vision (near and far) due to decreased transparency of the lens.

TYPES
- **Age-Related Cataract** – slow in progression usually after middle ages; may be cortical, nuclear or posterior subcapsular cataract.

- **Childhood Cataract** – may be present after birth (congenital, hereditary); Must be removed immediately within first 2 months of life to prevent *Amaurosis*.

- **Traumatic Cataract** – clouding of lens after penetration of aqueous or vitreous in capsule due to trauma (e.g. blunt trauma to the eye); foreign body.

- **Secondary Cataract** – may be associated with systemic disorders such as diabetes; drug-induced (corticosteroids); Intraocular disease (chronic uveitis, glaucoma); Improper positioning for Gas Tamponade (C₃F₈ or SF₆)

DIAGNOSTIC EXAMINATION
- **Visual Acuity Testing**
- **Slit Lamp Examination**

TREATMENT
- **Surgical Removal of the Cataract** (Discussed in detail in Section 4)
  - Irrigation/Aspiration or Anterior Vitrectomy for childhood cataract.
  - Phacoemulsification/Extracapsular Cataract Extraction for adult cataract, natural or acquired.

- **DISLOCATED LENS (ECTOPIA LENTIS)**
  May be *partial* or *complete* dislocation; Hereditary or traumatic.

SYMPTOMS
- Blurred vision
- Leukocoria (white pupil) - for congenital
- Iridodonesis – trembling of the iris due to lack of support from the dislocation.
- Red eye for complete lens dislocation
- Hereditary – blurring of vision due to lens out of line of vision (e.g. Marfan’s Syndrome)
- Traumatic – lens dislocation due to contusion or blunt trauma to the eye.

References:
- 1999 Eye Poster from Anatomical Chart Co. Skokie, IL
- Boyd-Monk, SteinmetzIII, *Nursing Care of the Eye*, Norwalk, CN: Appleton and Lange
Practice Test: Anterior Segment: Disorders
(Please submit to preceptor for your file)

Name: ___________________________
Date: _______________

Please check box for the appropriate answers

1. It is a condition wherein there is swelling of the cornea and presence of a bullae.
   - Fuch’s Dystrophy
   - Corneal Ulcer
   - Bullous Keratopathy
   - Keratoconus

2. Loss of the physiologic dehydration of the cornea due to deterioration of the endothelium.
   - Keratoconus
   - Fuch’s Dystrophy
   - Bullous Keratopathy

3. This type of glaucoma is painless and takes several years to produce damage to the retina.
   - Primary Open-Angle Glaucoma
   - Secondary Glaucoma
   - Primary Angle-Closure Glaucoma
   - Congenital Glaucoma

4. This decreases the aqueous fluid production of the eye
   - Betaxolol
   - Pilocarpine
   - Carbachol
   - Miochol

5. This increases the aqueous outflow out of the eye
   - Betagan
   - Miochol
   - Betoptic
   - Mannitol

6. This increases osmosis causing movement of intraocular water into systemic circulation.
   - Betagan
   - Miochol
   - Betoptic
   - Mannitol

7. It is the trembling of the iris due to lack of support from the dislocation.
   - Leukokoria
   - Cataract
   - Iridodonesis

SC 2/23/2009
Diagnostic Procedures in Anterior Segment

VISUAL ACUITY TESTING (VA)

VA is the assessment of the eye’s ability to distinguish object detail (letters, numbers or objects) at a certain distance (usually 20 feet).

This test will give the examiner a baseline for the patient’s central vision. It is important to record the patient’s VA before instilling medications to the eye.

FYI

<table>
<thead>
<tr>
<th>Snellen Chart</th>
<th>it is the most commonly used chart to test distance vision.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaeger or Lebehnson Card</td>
<td>it is used to test near vision</td>
</tr>
</tbody>
</table>

Normal Acuity : 20/20

How to test for Visual Acuity?

1. The patient should be seated or standing at or equal to a distance of 20 ft from the chart.

Eyes are tested one eye at a time using an occluder. Remember to face the patient in order to observe any squinting, head tilting, etc.

2. Take the vision with the corrective lenses. Document sc(without correction). If checked with corrective lenses (contact and glasses), write cc (with correction).

3. Ask the patient to start reading the line (left to right) on the chart that can be seen most clearly. If a letters are missed or misread while line is being read, a number is debited e.g OU: 20/30 -2 . But if a person reads a line perfectly and can only read one or two letters on next line, it is credited e.g OU: 20/30 +1.

4. If a patient without correction is found to have a vision less than 20/400 , the vision is rechecked with a pinhole. An improvement in vision signifies a corrective lens is needed.

Visual Acuity in Low Vision Patients

5. If a patient cannot see the 20/400 line, walk him towards the chart until he sees the top letter. Then estimate the distance of the patient and document. An example is 4/200 means a patient can see the E card at 4ft.

6. If still could not see, return him to the chair then record the distance at which he can count the number of fingers you are holding up. Document as C.F. (counting fingers) e.g. OU: C.F. 2ft.

7. If a patient is unable to count, determine ability to discern hand movement. Documented as H/M (Hand Movements) e.g OD: H/M. OS: H/M.

8. If still unable to discern hand movements, a penlight is shone in each eye and turned on and off. The patient should be able to determine if the light is on or off. If positive, document, LP (light perception) e.g. OU: LP.
9. If no light perception, document NLP (No Light Perception). e.g. OD: 20/30 OS: NLP

How to test Visual Acuity for Pediatric Patients?

Infants and young children
- VA is done by moving a bright light or interesting object in front of the patient and in various directions while observing the movement of the uncovered eye.
- It is documented as F&F (or fix and follow) if normal response is obtained.

Children over 3 years
- VA testing can be accomplished by using an Allen Card (different shapes and pictures).
- Ask patient to identify all figures first then check one eye at a time starting with the right eye.
- Ask the patient to identify figures from left to right, top to bottom. The images gradually reduces in size then document value.

SLIT LAMP EXAMINATION
- A Slitlamp is a biomicroscope from which a brilliant slit-like beam of light can be projected into the anterior part of the eye. The ophthalmologist can study these structures in microscopic detail.
- This sliver of light when focused enables the observer to localize the depth and size of the lesion in the cornea, anterior chamber, lens, and anterior vitreous.

PERIMETRY TESTING
- Is used to evaluate the field of vision. The visual field is the area or extent of physical space visible to an eye in a given position.
- Visual acuity is sharpest at the very top of the field and declines progressively toward the periphery.

DIRECT OPHTHALMOSCOPY
A direct ophthalmoscope is a hand held instrument with varying plus and minus lenses. The lenses can be rotated into place enabling the examiner to bring the cornea, lens, and retina into focus sequentially. The fundus is examined for abnormalities, the optic nerve, the vasculatures (central retina vein and artery)

INDIRECT OPHTHALMOSCOPY
An instrument commonly used by ophthalmologist. It produces bright and intense light. It is used in conjunction with a hand-held 20 diopter lens. This instruments enables the examiner to see larger areas of the retina, although in an unmagnified state.

TONOMETRY
Is used to measure IOP by determining the amount of force necessary to indent or flatten (applanate) a small anterior area of the globe of the eye. The principle involved is that a soft eye is dented more easily than a hard eye. Pressure is measured in milliliters of mercury. (mm Hg)

TYPES OF TONOMETERS
- Goldman Applanation Tonometer - requires a cobalt blue light source and a small droplet of fluorescein on the ocular
surface; pressure reading through the use of microscope and blue light.

- **Tono-Pen** – portable; electronic tonometer
- **Pneumotonometr** - requires a continuous gas supply and separate gauge container with analog readout attached to a long tube and pressure probe.

**ULTRASONOGRAPHY**

Uses ultrasound (high frequency sound waves bounced off the tissue surfaces and an electronic image is reproduced on the screen) has the ability to detect, outline and characterize soft tissue of the eye and orbit, regardless of intervening opacities of cornea, lens and vitreous.
- Ultrasound can document changes such as neoplasm, Intraocular foreign body, retinal detachment, and vitreous hemorrhage
  - (A-scan) - used in determining axial length measurements.
  - (B-scan) - presents two dimensional outline or cross section of the globe and the technique are used for graphic display.

**PACHYMETRY**

Measurement of corneal thickness. Normal cornea 0.56 to 0.58mm centrally; 0.80 to 1.00mm peripherally. Indicated prior to refractive surgery, assessment of corneal dystrophies.

**KERATOMETRY**

Is the measurement of the central corneal radius of curve. Measuring corneal astigmatism, corneal lens fitting, prior to refractive surgery.

**GONIOSCOPY**

Application of mirrored lens to corneal surface to examine anterior chamber angles structures. It is to determine whether the angle is open or closed.

**References:**

- 1999 Eye Poster from Anatomical Chart Co. Skokie, IL.
Practice Test: Anterior Segment: Diagnostic
(Please submit to preceptor for your file)

Name: _______________________________
Date: ___________________

Please check box for the appropriate answers

1. Measurement of the corneal thickness.
   - Perimetry
   - Keratometry

2. Is used to measure IOP by determining the amount of force necessary to indent or flatten (applanate) a small anterior area of the globe of the eye.
   - Pachymetry
   - Tonometry

3. It is the assessment of the eye’s ability to distinguish objects and letters at a certain distance.
   - Keratometry
   - Visual Acuity Testing
   - Perimetry
   - Ischihara Test

4. This device measures the IOP wherein it uses a fluorescein strip and cobalt blue light to read the pressure.
   - Goldmann Applanation Tonometer
   - Pneumotonometer
   - Tono-Pen

5. Test to measure visual fields of the eye.
   - Pachymetry
   - Keratometry
   - Visual Acuity Testing
   - Perimetry

6. Measures the general curvature of the cornea
   - Pachymetry
   - Keratometry
   - Visual Acuity Testing
   - Perimetry

7. Visualization of the anterior chamber angle using a specialized mirrors.
   - Gonioscopy
   - Ultrasound
   - Pachymetry
   - Indirect Ophthalmoscopy

8. Type of ultrasound wherein is determines the axial length of the eye. Generally used for IOL calculations.
   - A-Scan
   - B-Scan

SC 2/23/2009
The most common surgical procedures for Anterior Segment are listed below.

- **CORNEA**
  - Penetrating Keratoplasty
  - Decemet Stripping and Endothelial Keratoplasty
  - Lamellar Keratoplasty
  - Band Keratopathy Removal
  - Corneal Wound Repair
  - Keratoprosthesis (Temporary or Permanent)

- **UVEAL TRACT (UVEA)**
  - Intraocular Injection of Steroids
  - Trabeculectomy
  - Trabeculotomy
  - Goniotomy
  - Intraocular Implant for Glaucoma
  - Bleb Revision
  - Examination Under Anesthesia

- **LENS**
  - Cataract Extraction: Phacoemulsification with Intraocular Lens (IOL) Implant
  - Cataract Extraction: Extra capsular with IOL
  - Anterior Vitrectomy
  - Suture Fixation of IOL (Iris or Scleral)

### CORNEA

**PENETRATING KERATOPLASTY (PK)**

**Overview**

It is the removal of patient’s diseased cornea and replacing it with a donor’s cornea. Corneal tissues are ordered from Eye Bank. To remain viable, they are placed in a medium (optisol) that is usually good for 2-3 days. Important to check expiration date before use. During Surgery, ensure stability of table and corneal container. Ensure correct size of Trephine and Donor Punch. (see Policy on Handling Corneal/Scleral Tissue)

**SURGICAL STEPS:**

**Step 1** - Measures the Patient’s Cornea using a caliper. Surgeon picks type and size of trephine and punch.

**Step 2** - Prepares the Donor Cornea on the table. Surgeon cuts the donor cornea and puts it aside. Keep moist.

**Step 3** - Cuts the Patients Cornea with a trephine; uses Left and Right corneal scissors. Sets it aside. Replaces the patients cornea with the donor cornea.

**Step 4** - Places 4 cardinal sutures (temporary sutures) to secure it while placing the permanent stitch. Usually 12,3,6,9 o’clock using a 10-0 Nylon.

**Step 5** - Places the permanent stitch. May do running or interrupted stitch using a 10-0 Nylon.

**Step 6** - Checks for leaks on the wound. May use fluorescein strip.

**OPERATING ROOM ITEMS**

**EQUIPMENT**

- Anterior Microscope
- Infinity Machine**

**INSTRUMENTS**

- PK Tray- 0.12mm Forceps, left and right corneal scissors, needle holder, vannas scissors, fleringa rings**
- Corneal Marker 4 & 8**

**SUPPLIES**

- Intraocular Pack
- Donor Punches (refer to surgeon preference)
- Trephine Blades (refer to surgeon preference)
- Bipolar Cautery**
- Anterior Vitrectomy Probe**
DECEMETS STRIPPING AND ENDOTHELIAL KERATOPLASTY
(Overview)

This new surgical approach which replaces diseased endothelium and supporting decemets membrane with a new donor endothelium. It bypasses traditional PK approach to replace diseased endothelium.

Corneal tissues are ordered from Eye Bank. To remain viable, they are placed in a medium (optisol) that is usually good for 2-3 days. The tissue comes from eye bank pre cut. It is important to check expiration date before use. Ensure stability of table and cornea container. Ensure correct size of the Trephine and the Donor Punch.

SURGICAL STEPS:
Step 1 - Surgeon picks donor punch size — usually 8.5mm coronet donor punch.
Step 2 - Prepares the (pre-cut) donor cornea using the donor punch. Sets it aside.
Step 3 - Marks the patient's cornea using the donor punch and a marking pen.
Step 4 - “Scores” the patient’s endothelium using a reverse sinskey hook, usually following the circumference of the mark.
Step 5 - “Scrapes” the endothelium using a Terry Scraper
Step 6 - Inspects the patient’s endothelium for completeness.
Step 7 - Picks up the donor endothelium using a Charlie Forceps and replace it under the patient’s cornea.
Step 8 - Adjusts the graft with a reverse sinskey
Step 9 - Places air bubble in the eye. Waits for 10 minutes for it to adhere.
Step 10 - Checks for adherence of the graft. Surgery finished.

OPERATING ROOM ITEMS
**  Standby only
EQUIPMENT
- Anterior Microscope

INSTRUMENTS
- PK Tray
- DSEK Set- Reverse sinskey, Charlie forceps and Terry Scraper
- Simcoe** to remove viscoelastic

SUPPLIES
- Intraocular Pack
- Donor Punches (refer to surgeon preference)
- Marking Pen**

SUTURE
- 10-0 Vicryl**
- 10-0 Nylon**

MEDICATON
- BSS or BSS Plus for Irrigation
- Local Block: 2% Lidocaine + 0.75% Macaine**
- Viscoelastic: Healon Reg or GV
- Subconj. Inj.: Ancef and/or decadron

After surgery, the patient may need to assume a flat position. (Please refer to Nursing Care Section for Positioning)
LAMELLAR KERATOPLASTY
(Overview)

It is the replacement of diseased anterior cornea (Bowman and some Stroma) with a new donor corneal tissue. Deep Lamellar Keratoplasty extends to full thickness of stroma wherein only endothelium is left in place. Advantages are less risk for rejection, intact patient endothelium, less invasive than PK, and no wound leaks or flat AC. Corneal tissues are ordered from Eye Bank. To remain viable, they are placed in a medium (optisol) that is usually good for 2-3 days. It is important to check expiration date before use. Ensure stability of table and cornea container. Ensure correct size of the Trephine and the Donor Punch.

(see Policy on Handling Corneal/Scleral Tissue)

SURGICAL STEPS
Step 1 - Surgeon picks donor punch size
Step 2 - Prepares the (pre-cut) donor cornea using the donor punch. Sets it aside.
Step 3 - Marks the patient’s cornea with an 8 marker
Step 4 - Trephines the cornea (partial-thickness) using the same donor punch (same size)
Step 5 - Dissects the patient’s anterior cornea with a crescent blade. Removes it and places it in the medium.
Step 6 - Replaces the patient’s anterior cornea with the donor anterior cornea.
Step 7 - Sews it in place with a 10-0 nylon

OPERATING ROOM ITEMS
** Standby only
EQUIPMENT
- Anterior Microscope

INSTRUMENTS
- PK Tray

SUPPLIES
- Intraocular Pack
- Donor Punches (refer to surgeon preference)
- Crescent Knife
- Marking Pen**

SUTURE
- 10-0 Nylon

MEDICATON
- BSS for Irrigation
- Proparacaine 5%
- Local Block: 2% Lidocaine + 0.75% Macaine**
- Subconj. Inj.: Ancef and/or decadron

BAND KERATOPATHY REMOVAL
(OVERVIEW)

It is the removal of calcium deposits on surface of cornea. It uses ethylenediaminetetraacetic acid (EDTA) solution.

SURGICAL STEPS
Step 1 - Removes the epithelium using a beaver blade.
Step 2 - Places waterbath (or small trephine) on the cornea.
Step 3 - Bathes the cornea with EDTA solution. Refer to surgeon preference for concentration.
Step 4 - May excise excess deposits using a crescent blade or 15° knife.
Step 5 - May place a bandage contact lens to reduce discomfort.

OPERATING ROOM ITEMS
** Standby only
EQUIPMENT
- Anterior Microscope

INSTRUMENTS
- Cataract Tray or Glaucoma Tray
- Water bath
SUPPLIES
- Intraocular Pack
- Crescent Knife**

MEDICATON
- BSS for Irrigation
- Proparacaine 5%
- ethylenediamine-tetraacetic acid (EDTA) solution

CORNEAL WOUND REPAIR

It is the repair of any penetrating wounds or dehiscence on cornea. This may be a result of injury, trauma or previous surgery.

SURGICAL STEPS
- Surgeon chooses what suture to use. Normally uses 10-0 Nylon, 9-0 Nylon or 8-0 Nylon.
- Closes the wound using a 0.12 forceps and suture.
- May inject intravitreal antibiotics after surgery.

OPERATING ROOM ITEMS
** Standby only
EQUIPMENT
- Anterior Microscope

INSTRUMENTS
- Cataract Tray or Glaucoma Tray

SUPPLIES
- Intraocular Pack

MEDICATON
- BSS for Irrigation
- Proparacaine 5%

KERATOPROSTHESIS

It is a device intended to provide a transparent optical pathway through an opacified cornea, either intraoperatively or permanently (FDA). Temporary Keratoprosthesis is used as an adjunct to vitreoretinal surgeries. This is removed after surgery and patient cornea. Permanent Keratoprosthesis is used to allow transmission of light in an opaque cornea for patients that are not a reasonable candidate for a corneal transplant. Corneal tissues are ordered from Eye Bank. To remain viable, they are placed in a medium (optisol) that is usually good for 2-3 days. Important to check the expiration date before use. Ensure stability of the table and cornea container. Ensure correct size of the Trephine and the Donor Punch.

(see Policy on Handling Corneal/Scleral Tissue)

SURGICAL STEPS:

Step 1 - Measures the Patient’s Cornea using a caliper. Surgeon picks type and size of trephine and punch.
Step 2 - Prepares the Donor Cornea and the Keratoprosthesis on the table. Surgeon cuts the donor cornea and puts it aside. Keep moist.
Step 3 - Cuts the Patients Cornea with a trephine; uses Left and Right corneal scissors. Sets it aside. Replaces the patients cornea with the prepared Keratoprosthesis.
Step 4 - Places the permanent stitch. May do running or interrupted stitch using a 10-0 Nylon.
Step 5 - May need anterior vitrectomy
Step 6 - Checks for leaks on the wound. May use fluorescein strip.
OPERATING ROOM ITEMS
** Standby only

EQUIPMENT
- Anterior Microscope
- Infinity Machine **

INSTRUMENT
- PK Tray- 0.12mm Forceps, left and right corneal scissors, needle holder, vannas scissors, flieringa rings**
- Corneal Marker 4 & 8**

SUPPLIES
- Intraocular Pack
- Donor Punches (refer to surgeon preference)
- Trephine Blades (refer to surgeon preference)
- Bipolar Cautery**
- Anterior Vitrectomy Probe**

SUTURE
- 10-0 Nylon
- 7-0 Polysorb or 7-0 Sofsilk** for flieringa ring

MEDICATON
- BSS for Irrigation
- Local Block: 2% Lidocaine + 0.75% Macaine
- Viscoelastic: Healon Reg or GV
- Miotics: Miochol or Miostat
- Subconj. Inj.: Ancef and/or decadron

Tray Case Only
- Anterior Microscope
- Lid Speculum (Wire)
- Caliper
- 0.12 Forceps
- BSS 15ml
- 5% Betadine
- 4x4 Gauze
- Eye Drape**
- Kenalog 40mg/ml vial
- TBS

TRABECULECTOMY (Overview)

Ab externo (from the outside) Trabeculectomy is a type of filtration surgery which removes a small tissue of eye angle to allow drainage of aqueous to a conjunctival reservoir (bleb), thus, decreasing the IOP. This procedure may use an antimetabolite to prevents tissue healing and allows the bleb to remain patent. The drug of choice are Mitomycin C or 5-fluorouracil.

SURGICAL STEPS:

Step 1 - Places a traction (bridal) suture to stabilize the eye (refer to Surgeon Preference for suture).

Step 2 - Dissects the conjunctiva and Tenon's capsule using a 0.12 forceps and Westcott or sharp iris scissors

Step 3 - Cauterizes blood vessels using an 18g Eraser or 23g Tapered Cautery

Step 4 - Prepares Scleral Flap. Uses a 15° Knife to make a flap and dissects sclera with a crescent blade near the limbus.

Step 5 - Administration of Antimetabolite. (Refer to surgeons preference for type of antimetabolite). May be done prior to flap creation; May use weck sponges or merocel wipes to soak the antimetabolite;

After the surgery, the circulating nurse will collect and complete the documentation for the specimen. (Please see Policy on Collection and Documentation of Corneal/Scleral Tissues)

UVEAL TRACT (Uvea)

INTRAOCULAR INJECTION OF STEROID

It is used to treat uveitis. The goal of treatment is to reduce inflammation of uvea. Drug of choice is Kenalog 40mg/ml 0.1ml in a TBS and 30g needle.
Irrigates profusely with BSS after sponges removed.

**Step 6 - Anterior Chamber Incision**, using a 15° Knife. A gush of fluid is noticed. May enlarge incision with a *Kelly Punch*.

**Step 7 - May or may not do a peripheral iridectomy*. Usually uses a vannas scissors.

**Step 8 - Sutures the scleral flap** using a 10-0 Nylon. Adjusts sutures to allow adequate aqueous flow.

**Step 9 - Closes the conjunctival layer.** (refer to Surgeon Preference for suture).

**OPERATING ROOM ITEMS**

**Standby only**

**EQUIPMENT**
- Anterior Microscope
- Mentor Cautery

**INSTRUMENTS**
- Glaucoma Tray
- Cataract Tray and Kelly punch for combined cases**

**SUPPLIES**
- Intraocular Pack
- 18g or 23g Eraser cautery
- Crescent knife
- Bipolar Cautery**

**SUTURE**
- 10-0 Nylon
- 8-0 Sofsilk**
- 4-0 Sofsilk**
- 10-0 Vicryl or 8-0 Polysorb**

**MEDICATON**
- BSS for Irrigation
- Mitomycin C or 5-Fluorouracil
- Local Block: 2% Lidocaine + 0.75% Macaine
- Viscoelastic: Healon Reg or GV
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron

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**TRABECULOTOMY (Overview)**

It is the removal of some trabecular meshwork tissues to facilitate drainage out of the eye using a special instrument called *Harms Trabeculotome*.

![Harms trabeculotome](image)

The procedure is done for *congenital glaucoma* and when cornea is hazy preventing visualization of eye structures. This procedure is usually performed on patients 1mos to 2 years. Approach usually is by *scleral tunnel*.

**SURGICAL STEPS:**

**Step 1 - Places a traction (bridal) suture** to stabilize the eye (refer to Surgeon Preference for suture).

**Step 2 - Dissects the conjunctiva and Tenon’s capsule** using a 0.12 forceps and Westcott or sharp iris scissors

**Step 3 - Cauterizes blood vessels** using an 18g Eraser or 23g Tapered Cautery

**Step 4 - Prepares Scleral Flap.** Uses a 15° Knife to make a flap and dissects sclera with a crescent blade near the limbus.

**Step 5 - Incises an opening from the flap** to access the trabecular meshwork using a 15° Knife

**Step 6 - Creates an opening to the trabecular meshwork**

**Step 7 - Closes the flap** with a 10-0 Nylon

**Step 8 - Closes the conjunctiva** (refer to surgeon preference for suture)

**OPERATING ROOM ITEMS**

**Standby only**
**EQUIPMENT**
- Anterior Microscope
- Mentor Cautery

**INSTRUMENTS**
- Glaucoma Tray
- Harms Trabeculotome

**SUPPLIES**
- Intraocular Pack
- 18g or 23g Eraser cautery
- Crescent knife
- Bipolar Cautery**

**SUTURE**
- 10-0 Nylon
- 8-0 Sofsilk**
- 4-0 Sofsilk**
- 10-0 Vicryl or 8-0 Polysorb**

**MEDICATON**
- BSS for Irrigation
- Local Block: 2% Lidocaine + 0.75% Macaine
- Viscoelastic: Healon Reg or GV
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron

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**GONIOTOMY, SURGICAL (Overview)**

It is the surgical cutting of trabecular meshwork to allow passage of aqueous humor to Schlemm’s Canal. It uses a **barkan knife** or **Needleblade** and a **Gonioprism lens**

It is performed usually **clear corneal** approach. This is a procedure done for **congenital glaucoma** when the cornea is clear and able to visualize the structures.

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**SURGICAL STEPS:**

**Step 1** - Places a traction (bridal) suture to stabilize the eye (refer to Surgeon Preference for suture).

**Step 2** - Creates a corneal incision using a **15° Knife**

**Step 3** - Uses the **Barkan Knife or Needleblade** to excise the trabecular meshwork

**Step 4** - Fills the AC with BSS on a cannula to maintain pressure in the eye

**Step 6** - Closes the wound with 10-0 Nylon or 10-0 Vicryl

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**OPERATING ROOM ITEMS**

**** Standby only

**EQUIPMENT**
- Anterior Microscope
- Mentor Cautery

**INSTRUMENTS**
- Glaucoma Tray
- Barkan Knife
- Gonioprism lens

**SUPPLIES**
- Intraocular Pack
- 18g or 23g Eraser cautery
- Crescent knife
- Bipolar Cautery**

**SUTURE**
- 10-0 Nylon
- 8-0 Sofsilk**
- 4-0 Sofsilk**
- 10-0 Vicryl or 8-0 Polysorb**

**MEDICATON**
- BSS for Irrigation
- Local Block: 2% Lidocaine + 0.75% Macaine
- Viscoelastic: Healon Reg or GV
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron
INTRAOCULAR IMPLANT FOR GLAUCOMA OR TUBE SHUNT SURGERY (Overview)

It is the placement of an artificial reservoir (Glaucoma Valves) to promote drainage of the aqueous fluid out of the eye to maintain the normal IOP.

The Baerveldt and Ahmed tube-shunt are most commonly used. Click link to watch video of surgical steps http://www.baerveldt.com/video.asp

SURGICAL STEPS:
Step 1 - Places a traction (bridal) suture to stabilize the eye (refer to Surgeon Preference for suture).
Step 2 - Dissects the conjunctiva and Tenon’s capsule using a 0.12 forceps and Westcott or sharp iris scissors
Step 3 - Identifies the rectus muscles using Jameson hooks

Step 4 - Cauterizes blood vessels using an 18g Eraser or 23g Tapered Cautery if needed
Step 5 - Prepares the implant: assure the patency of tube and pre-places sutures on the implant
Step 6 - Positions and sutures the reservoir to the sclera (refer to Surgeon Preference for suture).
Step 7 - Inserts the implant tube to the AC. May cut to size. Punctures AC using a 23g butterfly.
Step 8 - Sews in a patch graft (Processed or Corneal tissue) to cover the tube.
Step 9 - Closes the conjunctival layer. (refer to Surgeon Preference for suture).

OPERATING ROOM ITEMS
** Standby only

EQUIPMENT
- Anterior Microscope
- Mentor Cautery

INSTRUMENTS
- Glaucoma Tray
- Tube Shunt Set-Jameson Hook, Nugent forceps, Stevens Scissors and Sheets orceps

SUPPLIES
- Intraocular Pack
- Glaucoma Implant (refer to Surgeon Preference)
- 18g or 23g Eraser cautery
- Crescent knife
- Bipolar Cautery**

SUTURE
(refer to Surgeon Preference for suture)

MEDICATON
- BSS for Irrigation
- Local Block: 2% Lidocaine + 0.75% Macaine
- Viscoelastic: Healon Reg or GV**
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron

The circulating nurse documents type of Glaucoma Valve was used.
BLEB REVISION (Overview)

It is a surgical procedure to repair a leaking bleb. An intact conjunctival bleb is important to maintain normal IOP and prevent infection.

SURGICAL STEPS:

Step 1 - Places a traction (bridal) suture to stabilize the eye (refer to Surgeon Preference for suture).
Step 2 - Dissects the conjunctiva using a 0.12 forceps and Westcott or sharp iris scissors.
Step 3 - Cauterizes blood vessels using an 18g Eraser or 23g Tapered Cautery if needed.
Step 4 - May revise suture of flap using a 10-0 Nylon suture. Checks for appropriate flow of aqueous fluid.
Step 5 - Closes and repairs the leaky conjunctiva.

** Standby only

EQUIPMENT
- Anterior Microscope
- Mentor Cautery

INSTRUMENTS
- Glaucoma Tray

SUPPLIES
- Intraocular Pack
- Glaucoma Implant (refer to Surgeon Preference)
- 18g or 23g Eraser cautery
- Crescent knife
- Bipolar Cautery**

SUTURE
- 10-0 Nylon
(refer to Surgeon Preference for suture)

MEDICATON
- BSS for Irrigation
- Local Block: 2% Lidocaine + 0.75% Macaine
- Viscoelastic: Healon Reg or GV**
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron

TRABECTOME PROCEDURE (Overview)

It is a minimally invasive procedure wherein the trabecular meshwork is destroyed by electrocautery to improve outflow to canal of Schlemm consequently decreases the IOP.

Click the link below:
http://www.neomedix.net/Learning/Library/?library=videos

SURGICAL STEPS:

Step 1 - Adjusts Microscope and Patient. Tilted to maximize visualization of the trabecular meshwork.
Step 2 - Incision and Viscoelastic placement. (Clear Cornea) Uses 1.7mm Keratome and Ocucoat. (prepare according to manufacturer’s recommendation).
Step 3 - Visualization of the Trabecular Meshwork using a Goniolens.
Step 4 - Tissue Ablation. Inserts the probe, replaces the goniolens and starts tissue ablation.
Step 5 - Irrigation/Aspiration. Removes debris.

Sutures Wound
OPERATING ROOM ITEMS
** Standby only

EQUIPMENT
- Anterior Microscope
- Trabectome Machine

INSTRUMENTS
- Glaucoma Tray

SUPPLIES
- Intraocular Pack
- Trabectome Pack - Probe, I&A cannula, Fluidics set, 1.7 Keratome, Ocucoat, Sterile drapes

SUTURE
- 10-0 Vicryl

MEDICATON
- BSS for Irrigation
- Proparacaine 5%
- 2% Lidocaine gel
- Subconj. Inj.: Ancef and/or decadron

EXAMINATION UNDER ANESTHESIA (Overview)
This is an examination of eyes while patient is asleep. This is usually done in the Operating Room where anesthesiologist monitor and sedate a patient while attending physicians conduct their diagnostic exams. It is recommended for neonates, pediatric, and for adult patients who cannot tolerate routine eye examinations. Diagnostic tools used may vary (Refer to section III). Examination and equipment will depend on suspected diagnosis (i.e. Retinopathy of prematurity, glaucoma, etc)

L E N S

CATARACT EXTRACTION:
Phacoemulsification with IOL
- Removal of the cataract with the use of an ultrasound and involves placement of artificial lens (IOL).
- Less invasive, less healing time and may offer good results immediately after surgery than a traditional extracapsular extraction.
- Facilitated by full dilation of the eye using dilating drops and intracameral injection of Epinephrine 1:1000. (Refer to Appendix II for Dilating Drops)

SURGICAL STEPS
Step 1 - Initial incision with Keratome or Diamond knife
Step 2 - Injection of Epinephrine or Viscoelastic to dilate the pupil and protect endothelium respectively.
Step 3 - Capsulotomy and Capsulorrhexis. Removal of the anterior capsule (membrane) in a circular fashion using a cystotome or a utrata.
Step 4 - Hydrodissection. Delineate the nucleus from the cortex and the capsule.
Step 5 - Phacoemulsification. Emulsifies the nucleus using a special probe that emits ultrasound waves.
Step 6 - Irrigation/Aspiration. Removes cortical materials and cleans debris from the bag (capsule)
Step 7 - Placement of Artificial Lens. After replacement of viscoelastic, may inject or fold the lens. Adjusts lens with a sinskey hook or sheets forceps.

Step 8 - Removal of Viscoelastic using I&A.

Step 9 - Miosis. Constricts the pupil to secure lens in the bag. (e.g. Miochol or Miostat)

Step 10 - Stitch and Sub. Conj.. May or may not need

OPERATING ROOM ITEMS
** Standby only

EQUIPMENT
- Anterior Microscope
- Infinity Machine

INSTRUMENTS
- Phaco Tray
- Cataract Tray and Clear Cornea Tray**
- Modified Cataract Tray
- Ozil Handpiece
- Folding Forceps**
- Rhein System**
- Chopper**-Nagahara, Seibel or Haefeger

SUPPLIES
- Cataract Custom Pack- 1.1mm, 0.9mm or kelman (refer to Surgeon Preference)
- Keratome – 2.75mm or 3.0mm
- Irrigating Cystotome
- Hydrodissecting Cannula**
- Crescent Knife**
- 18g Eraser Cautery**
- Bipolar Cautery**

SUTURE
- 10-0 Nylon**
- 10-0 Vicryl**

MEDICATON
- BSS for Irrigation
- BSS 500ml + 0.5cc of Epinephrine 1:1000
  1ml amp (Bottle Labeled)
- Epinephrine 1:1000 1ml amp
- Proparacaine Drops 5%
- Tetracaine Drops**

- Local Block: 2% Lidocaine + 0.75% Macaine**
- Viscoelastic: Viscoat, Healon Reg or GV
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron

CATARACT EXTRACTION:
Extracapsular with IOL (ECCE)

It is the manual removal of whole cataract through a scleral wound and replacement of an artificial lens. It requires several stitches consequently prolongs healing time. This procedure is more painful than phacoemulsification.

SURGICAL STEPS
Step 1 - Preplaces Bridal Suture (Refer to surgeon preference for suture) — secures the eye
Step 2 - Conjunctival Dissection 180°. Exposure of sclera; cauterize blood vessel prn; Uses 0.12 forceps and Westcott scissors
Step 3 - Measures with caliper. Measures extent of wound.
Step 4 - Dissects sclera up to the limbus. Uses a crescent blade
Step 5 - Viscoelastic. (Refer to surgeon preference)
Step 6 - Capsulotomy. Removal of anterior capsule using a cystotome and utrata
Step 7 - Extension of wound. May use corneal scissors.
Step 8 - Pre-places sutures. Promotes controlled expulsion of the cataract.
Step 9 - Lens Delivery. Facilitated by a lens loop.
Step 11 - Placement of Artificial Lens. After replacement of viscoelastic, IOL is inserted.
Step 12 - Sutures the Wound. Uses 10-0 Nylon
Step 13 - Removal of Viscoelastic using I&A.
Step 14 - Miosis. Constricts the pupil to secure lens in the bag. (e.g. Miochol or Miostat).
Step 15 - Conjunctival Closure. May use conj. Cautery or Stitch.

OPERATING ROOM ITEMS
**  Standby only
EQUIPMENT
- Anterior Microscope
- Mentor Cautery
INSTRUMENTS
- Cataract Tray
- Folding Forceps**

SUPPLIES
- Intraocular Pack
- Keratome — 2.75mm or 3.0mm
- Irrigating Cystotome
- Crescent Knife**
- 18g Eraser Cautery**
- Bipolar Cautery**

SUTURE
- 10-0 Nylon
- 8-0 Sofsilk
- 10-0 Vicryl**

MEDICATON
- BSS for Irrigation
- BSS 500ml + 0.5cc of Epinephrine 1:1000 1ml amp (Bottle Labeled)
- Epinephrine 1:1000 1ml amp
- Proparacaine Drops 5%
- Tetracaine Drops**
- Local Block: 2% Lidocaine + O.75% Macaine**
- Viscoelastic: Viscoat, Healon Reg or GV
- Miotics: Miochol or Miostat**
- Subconj. Inj.: Ancef and/or decadron

SUTURE FIXATION OF IOL (Iris or Sclera)
This procedure is done to place IOL into the eye without capsular and zonular support (e.g. Dislocated Lens, posterior capsule tear). For Surgical steps, click link below

OPERATING ROOM ITEMS
**  Standby only
EQUIPMENT
- Anterior Microscope
- Infinity Machine**
- Mentor Cautery
INSTRUMENTS
- Cataract Tray
- Folding Forceps**

SUPPLIES
- Intraocular Pack
- Keratome — 2.75mm or 3.0mm
- Irrigating Cystotome
- Crescent Knife**
- 18g Eraser Cautery**
- Bipolar Cautery**

SUTURE
- 10-0 Nylon
- 10-0 Prolene suture
- 8-0 Sofsilk or 4-0 Sofsilk
- 10-0 Vicryl**

MEDICATON
- BSS for Irrigation
- BSS 500ml + 0.5cc of Epinephrine 1:1000 1ml amp (Bottle Labeled)
- Epinephrine 1:1000 1ml amp
- Proparacaine Drops 5%
- Tetracaine Drops**
- Local Block: 2% Lidocaine + O.75% Macaine**
- Viscoelastic: Viscoat, Healon Reg or GV
- Miotics: Miochol or Miostat**
ANTERIOR VITRECTOMY (Overview)
Vitreous in the anterior segment may produce symptoms such as AC shallowing, corneal edema, synchiae, irregular iris, and sometimes retinal detachment. Removal can be facilitated by manual cutting (sharp iris scissors and wecks) or by using a cutter (Anterior Vitrector).

Anterior Vitrectomy is done to remove vitreous that prolapsed into anterior chamber (AC) following an eye surgery such as cataract extraction or PK. This procedure can be scheduled simultaneously with other procedures such as IOL exchange and secondary lens implantation. For Surgical steps, click link below
http://www.medrounds.org/bookstore/ProductDetail.php?produt_id=86

OPERATING ROOM ITEMS
** Standby only
EQUIPMENT
- Anterior Microscope
- Infinity Machine

INSTRUMENTS
- Cataract Tray
- Folding Forceps**

SUPPLIES
- Cataract Custom Pack- 1.1mm, 0.9mm or kelman (refer to Surgeon Preference)
- Keratome — 2.75mm or 3.0mm
- Irrigating Cystotome
- Crescent Knife**
- 18g Eraser Cautery**
- Bipolar Cautery**

SUTURE
- 10-0 Nylon

- 10-0 Prolene suture
- 8-0 Sofsilk or 4-0 Sofsilk
- 10-0 Vicryl**

References:
- 1999 Eye Poster from Anatomical Chart Co. Skokie, IL)
- Boyd-Monk, SteinmetzIII, Nursing Care of the Eye, Norwalk, CN: Appleton and Lange
Practice Test: Anterior Segment: Equipment, Instrumentation and OR Set-up

(Please submit to preceptor for your file)

Name: ___________________________
Date: _________________

Please check box for the appropriate answers

1. Procedure done to secure the IOL in the eye for those that does no have a full capsular or zonular support.
   - [ ] Cataract Extraction
   - [ ] Suture Fixation of IOL
   - [ ] Anterior Vitrectomy
   - [ ] Trabeulectomy

2. Procedure done to remove the opacified lens using an ultrasound probe.
   - [ ] Phacomeulsification
   - [ ] Extra Capsular Cataract Extraction (ECCE)

3. Removal of full diseased cornea and replacement of a new donor cornea
   - [ ] Decemet Stripping and Endothelial Keratoplasty
   - [ ] Penetrating Keratoplasty
   - [ ] Lamellar Keratoplasty

4. Removal of the anterior cornea and replacement of a new donor tissue.
   - [ ] Decemet Stripping and Endothelial Keratoplasty
   - [ ] Penetrating Keratoplasty
   - [ ] Lamellar Keratoplasty

5. Removal of the diseased endothelium and replacement of a new donor endothelium
   - [ ] Decemet Stripping and Endothelial Keratoplasty
   - [ ] Penetrating Keratoplasty
   - [ ] Lamellar Keratoplasty

6. What is the purpose of placing a viscoelastic in the eye? Check all that is appropriate.
   - [ ] Prevents opacity of the lens
   - [ ] Prevents corneal edema
   - [ ] Prevents trauma on the endothelium
   - [ ] Prevents corneal dryness

7. What is the purpose of placing an Epinephrine 1:1000 intracameraly during a cataract extraction?
   - [ ] Promotes dilation of the pupils
   - [ ] Promotes aqueous flow out of the eye
Nursing Care of Patients having Anterior Segment Surgery

PRE-OPERATIVE CARE

- **Dilation** - i.e. Phenylephrine 2.5%, Tropicamide1%, etc. (See Appendix 2 for Dilating drops)
  - Instruct patient that they may have blurred vision for hours depending on type of dilating drops used. Have a guide/family member accompany them after surgery.
  - Dilating drops may have a systemic effect (increase blood pressure), it is used cautiously on patients with high blood pressure. Initial vital signs should be taken.
  - It should not be used on a patient who has a narrow angle and shallow anterior chamber. This may precipitate an acute glaucoma attack.
  - It is contraindicated for patients who are hypersensitive to the drug.
  - Some dilating drops cannot be used for infants and children. Use phenylephrine 10% cautiously for elderly patients.
  - Always check for expiration date and sterility of the eye drops
  - Assist patient in ambulation if necessary due to blurred vision.

INTRAOPERATIVE CARE

- Includes care given to patients immediately prior, during and immediately after surgery.
  - Circulating nurse assumes care of patient upon arrival to Operating Room Suite.

Prior to Surgery

- Follow unit procedure regarding universal protocol.
- It is important for Circulating Nurse to make a quick assessment regarding:
  - Verification of Patient Name and Birthdate (ID Bracelet, 2nd identifier) against consent and ID Bracelet.
  - Verification of operative eye against consent.
  - Evaluation of patient’s ambulating needs.
  - Pain Scale
  - Jewelries and dentures
  - NPO status
  - any contact lenses
  - need for TEDS & SCD’s intraoperatively see SCD protocol
  - Proper positioning difficulties
  - Ask the patient “Does he have a companion to take him home?”
  - Note: Encourage verbalization of any concerns prior to surgery.
- Check for completeness of consent. This includes:
  - First page - Ensure correct names (patient and surgeon) and procedures are written. It must be signed (patient & surgeon) and witnessed. It should be properly dated
  - Second page - Consent should be properly dated and correct name of patient should be written; Signed by patient and surgeon.
  - Advanced Directives should be included in chart.
  - A copy of a Power of Attorney or Will should be provided in chart.
- Check for Room Ready
  - Make sure all equipment are functioning well (i.e. suction, O₂ tanks, microscopes, etc)
  - Supplies, Equipment, Medication and Implants necessary for surgery should be ready for use before bringing patient in the room.
  - Ensure that Intraocular Lens (IOL) and IOL Calculations are available and are brought inside prior to bringing patient in the room.
• Ensure cornea tissue is available for use (corneal transplant, DSEK, ETC) prior to bringing patient in the room.
• Ensure correct eye is properly marked.
• Communicate to OR team (Surgeon, Anesthesia, Scrub person) that patient is ready to go in OR suite.

During Surgery
• Secure environment to prevent any falls.
• Provide patients with warm blankets/Bair huggers
• Place SCD’s according to protocol
• Assist OR team when necessary
• Initiate team Time-Out before incision

After Surgery
• Assess patient (orientation, comfort, skin integrity, etc.)
• Position patient according to surgeon’s preference
• Instruct patient regarding what to expect immediately after surgery (taken to WECPIII, light snacks, etc.)
• Endorse “flat on bed” instructions to post-op nurse after DSEK surgery.

POSTOPERATIVE CARE: includes care given to patients after surgery.
• Retrobulbar anesthesia. In the PACU, determine if patient had general or regional anesthesia (retrobulbar or peribulbar) intraoperatively. The delivery of care will vary depending on type of anesthesia given. General anesthesia care will be discussed under PACU portion of orientation.
  - General considerations for ophthalmic regional anesthesia patient:
  o Mobility. A regional block and an eye patch may interfere with vision therefore patient is a high risk for falls.
  o Eye Patch and Eye Shield. It must be placed over blocked eye for protection. (see protocol)
  o Patching non-operative eye. A patch is placed on patient’s low vision, non-operative eye after surgery. Since patient will not be able to use both eyes, this will give post-op nurses a cue that he is at risk for falls.
Appendix A:

Surgical Trays

- Phaco Tray
- Glaucoma Tray
- PK Tray
- EUA Set
- Subtenon Set
- Cataract Tray
Appendix B:

Miscellaneous
Canaloplasty with iTrack

- New technique to treat Open Angle Glaucoma (OAG)
- Improves the trebeculocanaliculat outflow pathway
- iTrack allows surgeons to perform 360° of canaloplasty under the direct visualization of a beacon lighted tip.
- Click link below for additional information:
  http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2813597/
- Click below for video presentation:
  http://www.iscienceinterventional.com/US/presentations.htm

**Supplies:** (Draft)

- Intraocular Pack
- Glaucoma Tray or Cataract Tray
- iTrack Pack
- 300 Micron Precision Depth (Straight) # 7203.03
- Alcon Grieshaber Microsurgery knife #681.26
- 30g Canaloplasty cannula # 07-6035
- 9-0 Prolene 6”
- Healon GV
- Parabolic marker**
- 10-0 Vicryl or 8-0 Polysorb (conj Closure)
- 10-0 Nylon (Flap Closure)
- Cautery Tip and cord
- 8-0 Polysorb for traction suture.
- 4- “AA” Batteries (Replacement)
- iLumin (Light Box)
** may not need

**Surgical Steps.**

Click link:  http://www.peckareyeclinic.co.uk/videos.htm

1. Typically, a fornix based conjunctival incision is created to allow for a superficial scleral flap followed by a deeper inner scleral flap to attain access to Schlemm’s canal.

2. The first flap is approximately 50% thick and the subsequent deeper flap is fashioned to expose and unroof Schlemm’s canal.
3. The canal's ostia (opening) are then viscodilated to allow for insertion of the microcatheter. (Note: The lighted tip allows for the surgeon to visualize the cannulation of Schlemm's canal for 360 degrees while the OVD injector allows for simultaneous injection of viscoelastic every two clock hours as the catheter is advanced.)

4. After complete circumferential catheterization of the canal the distal tip of the catheter emerges at the scleral cut down at which point a 9-0 polypropylene suture is tied to the tip.

5. The microcatheter is then retracted pulling the suture in the canal.

6. The suture is then cut away from the microcatheter and seated against the inner wall of Schlemm's canal and tied in a loop.

7. Tension is then placed on the suture to maintain an inward radial force on the trabecular meshwork. High-resolution ultrasound biomicroscopy using the iUltrasound (iScience Interventional, Menlo Park, CA) is then utilized to visualize the amount of distention placed on trabecular meshwork in order to assess suture tensioning.

8. Once adequate tension is obtained, the suture is secured with locking knots. The descemetic window which was partially created while fashioning the deep scleral flap is now enlarged anteriorly. The deep scleral flap is then excised and the superficial flap is sutured watertight to avert bleb formation. The conjunctiva is then reapproximated to limbus.

References: