

- 1) Peds 2**
- 2) Plastics 2**
- 3) Retina 8**
- 4) Trauma 11**

Peds

1) IO MYOTOMY

An inferior oblique myotomy usually is performed between the nerve to the inferior oblique muscle and the insertion of the muscle.

- After the muscle is crushed with one or two hemostats, transverse surgical sectioning of the muscle is performed.

Suture ligatures or cautery may be used for hemostasis.

- the severed ends of the inferior oblique muscle tend to reunite, and the preoperative state may be resumed within several months.

2) IO MYECTOMY

An inferior oblique myectomy includes removal of a section of the muscle to reduce the tendency of the myotomized ends to reunite.

Two hemostats are used, as with the myotomy, except that a space of 5 mm or more is maintained between the hemostats so that the segment of muscle between the hemostats can be removed.

Cautery, ligature, or both are used for hemostasis.

This procedure offers the same advantages as the myectomy, but the cut ends still tend to reunite.

Because the recurrence rate is high and the procedure is difficult to perform, this procedure is no longer performed

3) IO Recession

The major advantage of the recession is that it allows the weakening procedure to be titrated according to the severity of the overaction. For 1+ overaction, the inferior oblique muscle is recessed 6 mm, for 2+ overaction, 10 mm, and for 3+ overaction, 14 mm, which is the maximum recession.

The standard inferior-temporal fornix incision is made through the conjunctiva and Tenon's capsule with a Westcott scissors.

The incision is placed approximately 8 mm posterior to the limbus, anterior to the fat pad

The Westcott scissors is used to open the intermuscular septum along the posterior border of the inferior oblique muscle..

- After the lateral rectus muscle is hooked with a Stevens and then a Green muscle hook, the lateral rectus muscle is tented to allow placement of a 4-0 silk suture beneath the insertion of the lateral rectus muscle

- a hook is placed within the incision and drawn inferior-temporally to expose the inferior oblique muscle.

- A double-armed 6-0 synthetic suture, such as Vicryl with a half-circle spatula needle is placed within the insertion of the inferior oblique with a locked bite at the anterior and posterior border

- the muscle is sectioned from the globe and recessed 6 mm by placing the anterior suture 4 mm lateral to the lateral insertion of the inferior rectus muscle and the posterior suture 3 mm more laterally.

- The 10-mm recession requires placement of the anterior suture 2 mm temporal and 3 mm posterior to the temporal insertion of the inferior rectus muscle, with the posterior suture placed 3 mm more posteriorly.

- The 14-mm recession requires placement of the anterior and posterior sutures parallel to the inferior-temporal vortex vein, which usually is found 8 mm posterior to the temporal insertion of the inferior rectus muscle.

- Optional closure of the incision with a 6-0 Vicryl suture. The incision may be allowed to heal without a suture.

4. **Superior oblique tendon tuck procedure** in the left eye.

- A conjunctival incision is made temporal to the insertion of the superior rectus muscle.
- With the superior rectus muscle engaged on a Jameson muscle hook, the globe is held in maximal depression and a Stevens tenotomy hook is passed under the superior oblique tendon near its scleral insertion.
- The superior oblique tendon is retrieved from the orbit and tendon laxity is assessed.
- The tendon is removed from the muscle hook and placed on a Bishop tendon tucker.
- The tucker is tightened until snug.
- The redundant tendon is sewn to itself with 5-0 braided Dacron suture forming a provisional tuck. - The tendon is released into the orbit and the amount of tendon tuck evaluated using forced ductions.
- If satisfactory, the sutures are cut and the conjunctival incision is closed at the surgeon's option.

Left superior oblique tendon tenotomy performed through a nasal conjunctival approach.

- . A conjunctival incision is made medial to the superior rectus muscle insertion.
- The superior rectus muscle is engaged on a Jameson hook.
- . The left superior oblique tendon is identified as a white, cordlike structure existing from beneath the medial rectus muscle and entering Tenon's capsule.
- Redundant Tenon's capsule is unloaded, but extensive dissection should be avoided
- The superior oblique tendon is cut at the medial border of the superior rectus muscle;
- The superior nasal quadrant of the globe is carefully examined for missed tendon fibers..
- Complete tenotomy is confirmed by performing forced ductions.

Fig. 14. **Right superior oblique tendon tenotomy** performed through a temporal conjunctival approach. A. Conjunctival incision is made lateral to the superior rectus muscle insertion. B. The superior rectus muscle is engaged on a Green hook. C. The conjunctival opening is moved over the muscle hook and the medial border of the superior rectus muscle is exposed. The superior oblique tendon is visible exiting from under the superior rectus muscle (arrow). D and E. The superior oblique tendon is isolated on a muscle hook. F. Tenon's capsule carefully unloaded. G. The superior oblique tendon is cut adjacent to the medial border of the superior rectus muscle. H. The superior nasal quadrant of the globe is carefully examined for missed tendon fibers. I. Complete tenotomy is confirmed by performing forced ductions.

1) PLASTICS

A) Lagophthalmos, exposure

a) temporary tarsorrhaphy

- for:

- 1) close with 6-0 nylon, tarsus to tarsus
- 2) remove 7-10 days after to prevent infection

b) permanent tarsorrhaphy

- for:

- 1) scrape lateral 4 mm of mucosal margin surface of upper and lower lid
- 2) 1 double armed 5-0 vicryl mattress suture is placed in the the upper and lower tarsus in the lateral canthal region (needle away from the eye) and are tied laterally
- 3) can leave closed until problem (eg dry eye with ulcer) resolves

c) gold weight insertion

for: eventually, insert gold weight for CN 7 palsy

- 1) Incise in lid crease
- 2) dissect to tarsus
- 3) suture gold weight to tarsus with 7-0 silk partial thickness bites
- 4) close orbicularis with 7-0 vicryl and skin with 6-0 plain

B) Punctal ectropion:

medial spindle procedure

- excise spindle section of conj. + lower eyelid retractors
- sew closed with 7-0 Vicryl or chromic including lower retractors

C) Horizontal laxity

Lateral Tarsal Strip

- after clamping, skin incision is from the lateral canthus angling 15° below the horizontal for 1 cm
- medial cut edge of eyelid is grasped with a toothed forceps
- lower limb of the LCT is severed with scissors
- the lateral eyelid is divided at the gray line with a blade
- The lid-splitting incision is carried medially for 5 to 7 mm (depending on the amount of tightening desired).
- The anterior lamella (skin and muscle) is resected.
- The mucosa of the posterior lamella is removed by scraping with a scalpel.
- 2 4-0 Vicryl or 5-0 nylon or 4-0 Prolene suture on a P2 needle passed through tarsus and periosteum
- secure lower eyelid 2 mm inside the lateral orbital rim.
- angle formed by suturing upper lid gray line to tarsal strip laterally with 6-0 plain
- skin closed with 6-0 plain or nylon

D) entropion repair

i) Quickert everting sutures

- temporary treatment
- Three 4-0 silk mattress (or 6-0 plain which can be left) sutures are introduced in a double-armed manner from the palpebral surface of the eyelid near the inferior fornix.
- The sutures are brought anteriorly along the anterior surface of (but not in) the tarsus, and exit the skin just inferior to the cilia.
- they are tied on the skin side (with bolsters for silk?)
- This rotates the eyelid margin away from the globe

ii) LTS + reinsertion of lower lid retractors

- The lower eyelid retractors are approached from 1) the conjunctival or 2) skin surface
- The skin approach allows simultaneous correction of the overriding orbicularis
- The conjunctival approach avoids placing an incision in the eyelid skin

1) The conjunctival approach:

- The lower eyelid is first controlled with marginal 4-0 silk traction sutures.
- The eyelid is then everted over a Desmarres retractor.
- The conjunctiva is incised along the inferior border of the tarsus.
- the conjunctiva is dissected from the lower eyelid retractors.
- A white, horizontal line (the edge of the recessed lower eyelid retractor) can be identified.
- The lower eyelid retractor is reattached to the inferior border of the tarsus with .
- The conjunctiva is sutured to the inferior tarsal border with 7-0 vicryl.
- Alternatively, the lower eyelid retractor and conjunctiva are reattached by one suture that picks up the free edges of both.

2) The cutaneous approach:

- A subciliary incision is made.
- A skin-muscle flap is dissected inferiorly to the orbital rim off the tarsus
- The orbital septum is opened and the lower eyelid retractor is identified.
- A frank dehiscence may be seen.
- The lower eyelid retractor is dissected free
- Once freed, the lower eyelid retractor is sutured to the anterior, inferior surface of the tarsus with 6-0 vicryl?
- The skin is closed with 6-0 plain.

Other repairs: Weis procedure, cauterization on skin side

E) ectropion repair

i) temporary: inverting sutures: opposite of Quickert:

- go from high on inner side (just below tarsus) towards inferior on skin surface with 2 double-armed chromic tied with cotton pledgets on lower skin surface

ii) permanent: LTS +/- inverting sutures

iii) ant/post lamellar graft for cicatricial

F) Ptosis

i) Fascinella-Servat

- excision of upper tarsus, lower Muller's and overlying conjunctiva

ii) levator resection/reinsertion

- lid crease incision
- cut through septum
- identify levator aponeurosis
- 5-0 Vicryl to suture levator to tarsus
- 6-0 plain to close skin

iii) frontalis suspension

G) lid defect

Lid repairs of defects

I) upper lid

A) small (<25%)

- 1) direct closure
- 2) upper crus lateral cantholysis to advance lateral lid

B) moderate (25-50)

- 1) upper crus lateral cantholysis
 - 2) semicircular flap (Tenzel)
 - or 3) tarsal-conjunctival flap from adjacent upper lid tarsus with skin graft (pre-auric.)
 - or 4) full-thickness (skin + muscle + tarsus + conj) graft from contralateral upper lid
 - or 5) tarsoconjunctival graft from contralateral upper eyelid with adjacent skin flap
- partial

C) large (>50%) - need advancement of tissues

- 1) full thickness lower lid flap (Cutler-Beard) behind lid "bridge"
- 2) posterior lamellar graft (ear, palate) with adjacent skin flap
- 3) tarsoconjunctival graft from contralateral upper eyelid with adjacent skin flap

II) lower lid

A) small (<25%)

- 1) direct closure
- 2) lower crus lat. cantholysis to advance lateral lid

B) moderate (25-50%)

- 1) lower crus lateral cantolysis
- 2) semicircular flap (Tenzel)
- or 3) tarsal-conjunctival flap from adjacent lower lid tarsus with skin graft (pre-auric.)
- or 4) full-thickness (skin + muscle + tarsus + conj) graft from contralateral upper lid
- or 5) tarsoconjunctival graft from contralateral *upper* eyelid with adjacent skin flap

C) large(>50%) - need advancement of tissues

- 1) upper lid tarsus-conj flap + skin graft (modified Hughes)
 - 2) tarso-conjunctival graft from upper lid + adjacent skin flap
 - 3) posterior lamellar graft (ear, palate) with adjacent skin flap
- NB: either posterior or anterior lamella must have vasc. supply (1 graft, 1 flap) except for small full thickness graft which often don't do well

Large flaps

- 1) Mustarde - to anterior ear (for lower lid)
- 2) Cutler-Beard (for upper lid)
- 3) glabellar (for medial canthal area)

H) Lid laceration

- 5-0 or 6-0 interrupted Vicryl should be placed *in the tarsus* 1 to 2 mm from the eyelid margin
- In the upper eyelid this should be a partial-thickness bite, while in the lower eyelid this may be a full-thickness bite since corneal abrasions are less likely from lower eyelid sutures.
- This initial suture is placed to result in the correct approximation of the margin edges.
- After placement of this initial suture, interrupted 6-0 silk sutures are placed in the eyelid margin.
- One suture is placed in the mucocutaneous margin, one in the gray line, and one in the posterior eyelash line.

- The suture bites should be approximately 2 mm from the edge of either side of the laceration and 2 mm deep.
- Before the margin sutures are tied, additional Vicryl can be placed intratarsally. Three such sutures are usually sufficient in the upper eyelid tarsus, and two are placed in the lower eyelid tarsus.
- Absorbable sutures should be used to reapproximate the orbicularis muscle after the tarsal sutures are tied.
- The skin is closed with 6-0 or 7-0 silk or nylon, sutures
- In children, 6-0 mild chromic or fast-absorbing gut sutures can be used for skin closure.
- leave margin sutures for 10-14 days; others: 1 week

I) canalicular laceration

Identification of the proximal cut end:

- the medial end of the canaliculus can usually be found by following the probe and examining the other side of the laceration looking for the characteristic shape and glistening epithelium of the canaliculus
- Allowing tissue swelling to subside with time, applying ice compresses, and injecting hyaluronidase solution with massage may restore normal contour and alignment so that the lacrimal laceration may be identified.
- If the opening cannot be identified, irrigation of the opposite canaliculus with air and flooding the field with water can demonstrate air bubbles emerging from the laceration site.
- Milky corticosteroid suspensions or diluted fluorescein can also be irrigated through the opposite canaliculus and subsequently visualized at the laceration opening.
- Injection of methylene blue is not advised because it stains the tissues and may further obscure the anatomy.

Stenting the canaliculus

- canalicular lacerations should be stented as part of their repair.
 - Both monocanicular and bicanicular stents have been described.
 - Bicanicular stents usually consist of silicone tubing (Crawford tubes) attached to metallic probes, which are passed through the upper and lower canaliculi, across the lacerated portion of the canaliculus, and down the nasolacrimal duct into the nose.
- These tubes are very easy to pass through the lacrimal system and retrieve from the nose with a Crawford hook
- The probes are then removed and the ends of the silicone shortened and sutured or tied to themselves and to a larger bolster to prevent the tube from being inadvertently pulled out of the canaliculi.

The nose must be anesthetized with either topical cocaine (4% or 10%), 4% topical lidocaine, or benzocaine spray for successful passage of the tubes.

. In general, the repaired canaliculus should remain stented for at least 3 months and if possible longer to prevent a stricture from forming within the repaired canaliculus.

Suturing the wound

- some surgeons recommend directly suturing the edges of the canaliculus to each other using 8-0 absorbable sutures
- Placing mattress sutures anterior, posterior, and, if possible, inferior to the sides of the canaliculus without actually suturing the edges of the canaliculus together is usually sufficient for canalicular re-formation over a silicone stent (Double-armed 6-0, 7-0, or 8-0 polyglactin 910)
- 5-0 or 6-0 polyglactin sutures can be used to close the deep tissue layers and orbicularis muscle.
- If possible, one of these sutures should be used to connect the medial end of the tarsus to the lateral end of the cut medial canthal tendon.

- This will aid in holding the eyelid in place against the globe.
- In deep lacerations, every attempt should be made to place this suture into the deep portion of the medial canthal tendon, which inserts onto the posterior lacrimal crest.
- The skin is closed with nonabsorbable 6-0 or 7-0 sutures.

I) enucleation

Indications: (mine)

- 1) tumor
- 2) severe trauma (symp. ophthalmia risk)
- 3) endophthalmitis (prevents infection from reaching orbit)

Procedure

- general anesthesia
- 360 degree peritomy
- remove muscles with 5-0 vicryl attached to muscles and clamp sutures (Bulldog?)
- free attachments
- cut nerve in 1 swoop
- insert gaze to prevent bleeding
- measure implant
- insert medpor implant with dacron shell (other options: Allen, hydroxyappetite)
- attach muscles to shell
- sew Tenon's closed with running 6-0 Vicryl need good closure
- close conj (8-0 plain or vicryl?)

Indications

- 1) eye with intraocular malignancy
- 2) eye suspected of malignancy which is NLP
- 3) chronically painful eye with poor vision
- 4) severe trauma (sympathetic ophthalmia)

J) evisceration

Indications

- 1) blind painful eye (eg, neovascular glaucoma)
- cut off cornea
 - scoop out uvea
 - insert small implant
 - tie sclera over implant

Post-op: prosthesis over implant with scleral shell

k) blind painful eye: retrobulbar alcohol injection

Indications

- 1) blind painful eye

Procedure

- 1) 2 cc anesthetic (lidocaine + marcaine)
- 2) 0.5cc 100% alcohol

Post op: prosthesis on top

Complications

- 1) swelling
- 2) Persistent anesthesia of periorbital region
- 3) ptosis
- 4) extraocular muscle palsy

Approaches for Orbital Surgery

Anterior orbitotomy: anterior lesions, lacrimal lesions (except clinical benign mixed)

Medial orbitotomy: medial intra and extraconal lesions; optic nerve lesions

Lateral orbitotomy: Benign mixed (clinical), posterior and lateral intra and extra conal tumors

2) RETINA

a) scleral buckle

- retrobulbar
- 360 degree peritomy
- 4-0 silk around muscles
- cryo tears
- 360 band with buckle of RD
- Watzke sleeve

b) pneumatic retinopexy

Tear eligible for pneumatic retinopexy

- 1) superior tear from 8:00 to 4:00
- 2) break is less than 1 clock hour
- 3) PVR < C

Steps:

- 1) retrobulbar anesthesia (subconj?)
- 2) 1/4 inch 30G needle
- 3) 4 mm back from pars plana
- 4) enter tip into eye towards center
- 5) inject 0.3 cc of C3F8 or SF6 briskly

Post-op

- 1) patient lies with tear most superior
- 2) remains in this position for at least 16 hours per day x 5 days

Ratios of the maximum volume of the expanded gas bubble: original volume of injected gas

- 1) SF6: 2
 - 2) perfluoroethane (C2F6): 3
 - 3) perfluoropropane (C3F8): 4
- 20% SF6 used by Chen for pneumatic retinopexy?
 - In pneumatic retinopexy where relatively small volumes of gas are injected, pure gases can be safely used since they are unlikely to overfill the vitreous volume.

Estimated time for the presence of therapeutic volume of gas (Duane's)

- 1) air, less than 1 day
- 2) SF6, 3 to 4 days
- 3) perfluoropropane (C3F8): 16 days

c) gas/fluid exchange in vitrectomy

- the address the problem of an expanding gas bubble the surgeon injects nonexpansile or a slightly expansile concentration of gas.
- The nonexpansile concentration of SF6 was initially reported at 40%.
- Most surgeons err on the side of caution by using a 20% concentration of SF6 when attempting a total or near-total fluid-gas exchange at the conclusion of vitrectomy.
- A nonexpansile concentration of perfluoropropane is about 12%
- NB: stop NO2 when injecting expansile gases in OR

d) vitreous substitutes

i) silicone oil

- inferior PI in aphakes

ii) perfluorocarbons: decaline

- don't put into diabetic retina (will go under holes in retina)

Complications of Silicone Oil

- 1) band
- 2) glaucoma
- 3) fibrosis around silicone

Treatment of post-op endophthalmitis

- 1) AC tap: 27-30G needle: remove 0.1 cc
- 2) Vit tap + intravit injection of Vanco and Genta
 - i) 25 G needle, 3mm posterior to inferotemporal limbus, 1 cm into vitreous
 - ii) withdraw 0.3 cc of vitreous fluid
 - iii) inject 0.1 cc of each - Vanco (1 mg) and Genta (0.1 mg)
- 3) Gram stain
- 4) cultures
- 5) topical Vanco (50mg/ml) and Genta (14mg/ml) Q 1H post-op
- 6) topical steroids

- patients with suspected infectious endophthalmitis are taken to the operating room to obtain diagnostic anterior chamber and vitreous samples for culture.
- local anesthesia with a retrobulbar block,
- the anterior chamber aspirate is obtained using a 25- or 27-gauge needle attached to a tuberculin syringe to aspirate about 0.1 ml of aqueous
- The aqueous sample is immediately inoculated onto fresh, pre-labeled culture media (e.g., blood agar, chocolate agar, and liquid thioglycolate or other anaerobic media) to be incubated at 37°C (body temperature) for bacterial isolation.
- Sabouraud agar and blood agar are inoculated and maintained at 25°C (room temperature) in cases of more indolent or delayed endophthalmitis in which a fungal cause is considered.
- Several drops of the specimen are placed onto slides for Gram and Giemsa staining and, in cases of suspected fungal endophthalmitis, for staining with Grocott's methenamine silver.
- The anterior chamber usually re-forms in 3 to 5 minutes while the culture media and slides for staining are prepared
- Attention is then directed to obtaining the vitreous sample.
- The vitreous specimen can be obtained by aspiration through a needle, with a vitrectomy biopsy procedure, or as part of a full therapeutic vitrectomy.
- The aspiration technique is performed by opening the conjunctiva and making a sclerotomy incision 2.5 to 4 mm posterior to the limbus. A 22-gauge needle attached to a tuberculin syringe is then introduced through the sclerotomy incision into the midvitreous. Careful manipulation of the needle will usually allow 0.2 to 0.3 ml of liquid vitreous to be aspirated (Fig. 9). The specimen is immediately inoculated onto separate culture media and placed on slides for staining as described for the anterior chamber aspirate.
- If an adequate vitreous sample cannot be obtained in the above manner, then the pars plana incision is enlarged to accommodate a mechanized vitreous instrument. When the technique of vitrectomy biopsy is used, infusion is usually recommended to prevent the globe from collapsing, but recently a single sclerotomy vitreous biopsy technique without infusion has been described by Doft.
- He recommends use of a single 20-gauge sclerotomy without infusion, which avoids additional sclerotomy openings. Under the operating microscope, the vitrectomy cutter enters centrally in the anterior vitreous cavity, cutting the vitreous at a rapid rate and aspirating 0.15 to 0.25 ml into

the syringe. This technique allows for adequate culture material and also provides space for the injection of intravitreal antibiotics at the completion of the procedure.

Indications for Tap (Connolly)

- 1) increasing cells or fibrin in AC
- 2) hypopion
- 3) vitreous cells
- 4) decreasing vision
- 5) increasing pain

Indications for PPV for macular hole

- 1) stage 2, 3, or 4 macular hole

Indications for PPV for ERM or Macular tractional syndrome

- 1) vision 20/60 or less

3) TRAUMA

I) General Principles

Preop:

- history very important medicolegally
- wearing protection?
- foreign body
- xray/CT
- previous status of eye
- allergies, meds, PMHx, tetanus status, last meal,
- full eye exam (with ACUITY with pin hole)
- cover globe with shield
- analgesia to minimize squeezing from pain
- no preop antibiotic drops or ung
- surgery within 12 hours
- culture wound in OR
- general anesthesia so no pressure on globe from injection
- broad spectrum prophylactic antibiotics if open globe
- discussion with patient and family:
 - goal of surgery is adequate wound closure with restoration of the contours of the globe
 - vision will likely be affected
 - complications: bleeding and infection
 - complete loss of vision may occur
 - removal of the eye may be indicated
 - the healing period may be quite long
 - additional operations may be indicated to maximize the visual potential
 - a contact lens may be necessary to maximize the vision after healing
 - must have follow-up years after the injury because of the risk of late glaucoma and RD
 - the surgery can be successful in restoring the globe but not result in any functional

vision

Postop:

- topical antibiotics, mydriatics

II) anterior segment

a) conj. laceration

- must be explored to rule out underlying scleral laceration
- can be left to heal by secondary intention or closed with 8-0 plain
- undermining adjacent conj may be necessary, especially for medial lacerations

b) partial thickness corneal laceration

- 1) patching with antibiotics
- 2) CL if irritating
- 3) superficial sutures (10-0 nylon) only if tissue edges irregular and poorly opposed

c) full thickness corneal laceration

1) Small puncture wound

- leakage of aqueous and a flat chamber

Treatment:

- i) trial of pressure patching with Diamox or a bandage soft lens to cause the surrounding stroma to swell and seal the wound

ii) If the anterior chamber has not re-formed within 48 hours, cyanoacrylate can be applied under topical anesthesia in the office and followed by a bandage soft lens

or

iii) Alternatively, a single suture is usually sufficient to close the leaking site and restore the anterior chamber within 30 minutes

II) Shelved corneal lacerations with good approximation

- are often self-sealing
- should be managed conservatively with patching if the tissue is in good approximation
- paracentral iris incarceration can occasionally be repositioned with the use of mydriatic drops

III) Lacerations associated with a flat anterior chamber

- require surgical repair to close the wound, remove incarcerated tissue and to re-form the anterior chamber to prevent the formation of synechiae
- In lacerations extending to the limbus, a conjunctival peritomy is performed and extended far enough posteriorly to ensure that the entire length of the laceration can be visualized
- limbus: first area to be reapproximated (8-0 nylon)
- scleral portion: repaired in an anteroposterior direction (8-0 nylon or silk)
- re-formation of the anterior chamber: stab incision at the limbus with injection of Healon
- cornea: opposing wound edges should be visually aligned, with irregularities in the wound providing landmarks for suture approximation
- cornea sutured with interrupted 10-0 nylon; two-thirds or three-fourths depth (160 degree or ½ circle needle - flatter needle for longer bites)
- In oblique lacerations, the needle should pass **from** the undercut edge **to** the shelved edge, with the length of passage occasionally extending as long as 5 mm (120 degree or 3/8 circle needle)
- place as few sutures as possible in the optical axis
- suture throws should be tied 3-1-1 and buried just beneath the corneal epithelium closest to the limbus
- The wound is then dried and examined to make sure it is watertight

Postop - corneal suture removal

- when suture loosens, or wound becomes becomes vascularized or fibrotic (earlier for peripheral); not earlier than 1 week
- Maturation of the wound is indicated when slit lamp evidence of fibrosis is present along the length of the suture tract. This can occur as early as 4 weeks and is almost always present within 3 months postoperatively.
- Suture removal is accomplished by cutting the loop beneath the epithelial surface at the side *opposite the knot*, and exerting traction on the free end to remove the knotted portion from the cornea.
- Broken sutures that cannot be retrieved should be left in place and, with time, will decay
- Suture removal is ideally performed at the slit lamp, removing every other suture at one visit and the remaining sutures 1 week later.

d) Iris incarceration and prolapse

- Incarcerated iris should be repositioned when at all possible with the use of an iris spatula through a limbal stab wound

- Iris repositioning as well as anterior chamber manipulation is facilitated with the use of sodium hyaluronate
- The iris spatula should sweep the incarcerated iris from the sphincter toward the periphery, thus avoiding bleeding that may occur from an iris dialysis or traction on the ciliary body
- A peripheral iridectomy is recommended adjacent to areas where peripheral incarcerated iris has been repositioned to reduce the incidence of postoperative anterior synechiae
- Iris tissue that has been prolapsed for over **24 hours** or is necrotic or contaminated should probably be excised, cultured, and sent to the pathology department
- It is sometimes difficult to differentiate iris from ciliary body in peripheral lacerations. Involvement of the ciliary body is often associated with extensive bleeding, and this tissue should not be excised unless grossly contaminated.
- Large iris dialyses can be repaired with Prolene if potentially visually disfiguring, by suturing the peripheral edge of the dialysis

e) Lens disruption

- Addressed following closure of the corneal wound:
- lensectomy is then performed using a vitrectomy instrument and balanced salt solution infusion
- The cutting mechanism of the instrument is activated to facilitate aspiration of large pieces of cortex and anterior capsular flaps
- A) If posterior capsule intact
 - If no vitreous in AC, the posterior capsule should be assumed to be intact and every effort made to leave it intact
 - a watertight incision is prepared (NOT back through wound)
 - A limbal rather than pars plana approach enables the posterior capsule to be maintained and reduces loss of lens material into the vitreous during surgery.
 - In patients over the age of 40 with significant nuclear sclerosis, a can phacoemulsification be performed.
 - To reduce the risk of nucleus falling back into the vitreous cavity, it is often safer to enlarge the limbal incision, express the nucleus, and then remove the residual cortex through a watertight wound using irrigation and aspiration with a vitrectomy instrument (ECCE)
- B) If posterior capsule is ruptured
 - If the posterior capsule is ruptured, vitreous in the anterior chamber should be excised sufficiently so that aspiration of residual lens material can be performed and loss of lens material into the posterior segment reduced
 - Following the removal of all lens material, a generous anterior vitrectomy and removal of the residual posterior capsule is performed
 - The surgeon should have no hesitation in performing a sector iridectomy to improve visualization during these procedures, and cosmetic repair of this coloboma is rarely indicated at the end of the procedure
 - It is important that the anterior segment be free of vitreous at the end of the repair to reduce the likelihood of vitreous incarceration in the corneal or limbal wound.

f) Hyphema

- Grade 1 hyphema - blood occupying less than one third of the anterior chamber
- Grade 2 hyphema - blood filling one third to one half of the anterior chamber
- Grade 3 hyphema - blood filling one half to less than total
- Grade 4 hyphema - total clotted hyphemas, often referred to as blackball or eightball hyphema
- elevated IOP in 33% of hyphemas
- secondary bleeding: in 25% of hyphemas
- 1) endothelium status

- 2) elevated IOP
- 3) prolonged contact with blood clot
 - staining takes few months to 2 years to clear

Non-surgical treatment of hyphema

- 1) shield
- 2) no ASA; tylenol for pain
- 3) sleep at 45 degrees
- 4) no physical activity but can ambulate
- 5) weak steroids if iritis important to prevent synechiae
- 6) Amicar - 50mg/kg po Q4h if rebleeds or significant hyphema - inform re: postural hypotension
- 7) Diamox if IOP increased (Neptazane in SCA)
- 8) mannitol if IOP elevated : 1 bag per 24 hours
- 9) RTC stat if pain or decreased vision
- 10) other - controversial - cycloplegia, patching, steroids (topical and po)
- 11) admit if hyphema significant or patient unreliable

- clot remains for longer time if Amicar is used and therefore Amicar should not be used in clots that occupy more than 75% of the AC
- hyphema patients with microhyphemas can be treated on an outpatient basis with systemic
- If the hyphema occupies greater than 50% or the intraocular pressure is elevated, hospitalization is recommended
- The decision to hospitalize also depends on the patient, family members, and ocular injury.
- Daily ocular examinations including IOP, hyphema levels measured
- measure IOP BID if elevated
- A daily corneal examination for corneal blood staining
- The most typical early sign of corneal blood staining is the presence of tiny yellowish granules that initially appear in the posterior third of the corneal stroma.
- An additional finding is a lack of definition or a blurred appearance of the ordinarily sharply defined fibrillar structure of the involved corneal stroma
- These bio-microscopic signs of corneal blood staining usually precede gross staining by only 24 to 36 hours.
- Intervene once staining appears
- for increased IOP: Diamox p.o.; in SCA: Neptazane (less acidosis);
- consider oral glycerine (kids) or mannitol (adults) for IOP > 35; mannitol in young kids can produce dehydration and should probably be avoided
- no mannitol in SCA (dehydrates)

Indications for surgical intervention (usually on or after the fourth day) are:

- (1) 4 days after onset of total hyphema;
- (2) microscopic corneal blood staining (at any time);
- (3) total hyphema with IOP of 50 mmHg or more for 4 days (to prevent optic atrophy);
- (4) total hyphema or hyphema occupying greater than 75% of anterior chamber for 6 days with pressures of 25 mm Hg or more (to prevent corneal blood staining);
- (5) hyphemas greater than 50% retained longer than 8 or 9 days (to prevent peripheral anterior synechiae);
- (6) in patients with sickle cell trait or sickle cell disease, hyphemas of any size, with intraocular pressures of greater than 35 mmHg for more than 24 hours.

Surgical intervention for hyphema

- (1) evacuation with closed vitrectomy instrumentation

- (2) paracentesis with 25G needle and BSS exchange
- (3) I and A through a small incision

Complications of hyphema

- 1) posterior synechiae
- 2) PAS
- 3) corneal blood staining
- 4) optic atrophy

III) Posterior segment

a) scleral laceration

- Direct rupture is uncommon and occurs at the site of impact.
- Indirect rupture occurs at a site remote from impact in an area of scleral weakness.
- Retinal dialysis, the most common traumatic retinal break, refers to a retinal break occurring at the anterior edge of the ora serrata and posterior edge of which is attached to the vitreous base

- If a large scleral wound is present, the first objective is to close the most anterior part of the wound.
- The most important principle is to operate only under direct visualization.
- It is unnecessary and even dangerous to expose the entire extent of a long laceration before beginning to suture it.
- The danger of further extrusion of intraocular contents decreases if the surgeon closes part of the laceration, then exposes more, then closes what has been exposed, and so forth.
- If the laceration is posterior to the muscle insertions, the eye must be rotated by muscle bridle sutures (4-0 silk) to provide adequate exposure. Extreme caution is indicated.
- In trauma, muscle hooks should never be passed backward blindly under Tenon's capsule.
- Rather, the surgeon should dissect back carefully until he sees the muscle tendon.
- If the laceration is close to the insertion, the muscle must be temporarily disinserted and sewn with 5-0 Vicryl double armed suture
- Traction sutures are passed through the stump
- Exposure of posterior lacerations can also be achieved by traction sutures in the anterior sclera.
- If the vitreous extrudes through the wound, it should be excised by a vitrectomy instrument or by cellulose sponges and scissors.
- If the uvea is prolapsed, it is best to reposit it gently before closing the sclera.
- Deep scleral bites are recommended, (8-0 nylon or silk)

Post-op meds for penetrating trauma

- 1) topical tobra and vanco
- 2) topical corticosteroids
- 3) intravitreal vanco and genta
- 4) consider sub-Tenons' marcaine for pain

b) Intraocular f.b.

removal of magnetic foreign bodies:

- the majority can be removed by time-honored magnetic techniques.

basic principles of magnetism

- 1) magnetic force is inversely related to the cube of the distance between the magnetic object and the magnet.
- 2) magnetic attraction is related to the composition of the foreign body (more for high iron)

- 3) magnetic attraction is proportional to size of object. (large ones will be attracted more strongly)
- 4) if current is continuously applied, an electromagnet will heat up, losing magnetic force (short, interrupted bursts of current are recommended)
- 5) the longer the tip of the magnet, the less the power projected. The blunt tip should be used for almost all pars plana extractions. (The narrow tip is reserved for the rare case in which the retina surgeon who might want to insert the tip into the eye to avoid retinal damage, and for posterior extractions.)
- 6) lines of force diverge and curve away from the tip. For maximum power, the magnet should be pointed directly at the foreign body.
- There are 3 approaches to the magnetic removal of an intraocular foreign body: limbal, posterior and pars plana.
 - Limbal extraction is used when the foreign body is in the anterior chamber
 - the foreign body can be removed with a magnet or intraocular forceps.
 - The posterior is used in cases in which the foreign body has penetrated the retina and *is embedded in the choroid and sclera*, and especially if it is coated with fibrin or fibrous tissue.
 - The pars plana extraction is used in cases in which the foreign body *is suspended in the vitreous or is lying on the surface of the retina*. It can also be used if only a small part of a large foreign body has penetrated the retina and choroid.
 - The magnet test, in which a magnet is used to induce movement of an intraocular foreign body during ultrasonography, is useful in determining the ferromagnetic properties of intraocular foreign bodies.
 - The resulting retinal or choroidal break should be treated with laser beam, cryotherapy, diathermy, or scleral buckling.