1. **(Dara)** Review the layers of the eyelid. Which layers do you suture? What sutures do you use? When do you remove them?

From superficial to deep, layers of the eyelid are: skin, subcutaneous tissue, orbicularis oculi, orbital septum & tarsal plates (Contains meibomian glands as is 10mm high in the upper lid and 4 mm high in the lower lid), palpebral conjunctiva.

Briefly, repairing a full-thickness lid laceration involves a three-layer closure with a fine plain gut suture (6.0 or 7.0) on the conjunctival side (to avoid irritation of the scleral conjunctiva), a fine absorbable suture in the tarsal plate, and a fine monofilament on the external surface (6.0 Prolene). Ideally, the Prolene suture should be removed after 3-4 days.

2. **(Deya)** What is an entropion and how do you fix it?

**Entropion**

I. **Congenital** - Extremely rare, usually lower lid
   - Hypertrophy of pretarsal orbicularis
   - Deficiency, absence, or inversion/kink of tarsal plate
   - Dehiscence of eyelid retractors

II. **Involutorial (senile)**
   - Loss of orbital volume—enophthalmos
   - Upward migration of preseptal orbicularis
   - Laxity or dehiscence of eyelid retractors
   - Thinning of tarsal plate

III. **Cicatricial**
   - Scarring of palpebral conjunctiva

IV. **Acute spastic**
   - Ocular irritation (infectious, inflammatory)

**Treatment**

I. **Medical** - for those with acute spastic entropion or those who decline surgery
   - Ocular lubrication and tear preparations
   - Eyelid hygiene, antibiotics, and corticosteroids for blepharitis (may cause spastic entropion)
   - Botox for spastic entropion (orbicularis oculi)

II. **Surgical**
   - Snellen- suture correction
   - Horizontal tightening
   - Weis procedure- full-thickness horizontal lid incision
   - Quickert procedure- combination of horizontal tightening and Weis procedure
   - Inferior retractor placation
   - Orbicularis fixation
   - Wedge excision of tarsal plate
3. **(Amy)** What is an ectropion and how do you fix it?

Ectropion is an abnormal eversion (outward turning) of the lid margin away from the globe. Without normal lid globe apposition, the eye is at risk for corneal exposure, tearing, keratinization of the palpebral conjunctiva, and visual loss. Patients often complain of irritated or red eyes with tearing. They may constantly wipe their eyes, resulting in exacerbation of the lid laxity and ectropion. Ectropion can be congenital, involutional, cicatricial (scarring of anterior lamella), paralytic (Bell's palsy), or mechanical (neurofibroma). Involutional ectropion is the most common and is often seen in the elderly due to age-related weakness of the canthal ligaments and the pretarsal orbicularis. Because of gravity, ectropion more commonly involves the lower lid and often has a component of horizontal lid laxity. Laxity-related ectropion typically begins medially and progresses laterally over time.

Initially, ectropion can be treated conservatively with lubrication, tape closure, cold compresses, squinting exercises, and perioperative corticosteroids. In cicatricial ectropion, digital massage or steroid injection may help stretch the scar. Paralytic ectropion may be treated with paste-on external upper lid weights. Surgical therapy depends upon the etiology. Horizontal lid laxity can be corrected using a horizontal lid shortening procedure, frequently the lateral tarsal strip procedure. In a lateral strip procedure, an inferior cantholysis is performed so that the lower lid is freely mobile. If excess lid skin is present, an appropriate triangle of full-thickness lid is excised. A portion of the lateral lid is split and the meibomian orifices of the lateral strip are trimmed away. The lateral strip of tarsus is secured to the periosteum with sutures.

In cicatricial ectropion, augmentation of the anterior lamellae and excision of any cicatrix is performed; lid lengthening can be done using a full-thickness skin graft from the upper lid (best color-match) or postauricular skin. Medial ectropion may respond to a medial conjunctival spindle procedure with excision of the medial conjunctiva and retractors. Complete (tarsal) ectropion occasionally requires reinsertion of the lower lid retractors (capsulopalpebral fascia) to the inferior tarsal border.

4. **(David)** How do you repair a canalicular injury? How do you do a DCR?

Canalicular injury is usually repaired by placing a silicone stent in the injured canalicular system +/- in the normal canalicular system. First the punctum is dilated. Next the medial cut end of the canalicular system is identified, requiring either high-powered magnifying loupes or an operating microscope. The stent is then placed through the punctum, through the medial cut end of the canalicular laceration, and retrieved from the nose. The laceration is then reapproximated with 6-0, 7-0, or 8-0 Vicryls.

A dacryocystorhinostomy (DCR) was first done by Celsus in 50 AD. It can be done externally, but it is more commonly done endoscopically now. It bypasses blockage of the nasolacrimal duct via fistulization of the lacrimal sac into the inferior meatus of the nasal cavity. Most commonly done for epiphora. A regular or lighted probe is inserted into the upper or lower canalculus, and this probe is then viewed endoscopically. For an endoscopic DCR, the anterior portion of the middle turbinate is used as a landmark. A mucosal flap is elevated, exposing the lacrimal fossa. The frontal process of the maxillary bone and some of the lacrimal bone is drilled out, exposing the nasal lacrimal sac. A probe is placed to tent the sac, and this sac is incised to create a neo-ostium so that tears can drain from the canalculus directly into the nose through the middle turbinate and bypass any obstruction in the nasolacrimal duct. This ostium is kept open with a Crawford tube stent with a silicone tube placed through the puncta into the sac and out the nose. The tubes are kept in place for anywhere from six weeks to six months.

5. **(Kathy)** What is blepharospasm and how is it treated?

Blepharospasm is an idiopathic progressive involuntary spasm of the orbicularis oculi and upper face (corrugators and procerus muscles). Extension of the spasms to include the lower face is not uncommon. In advanced cases, the eyes may be closed for as much as 1/3 of the patient’s waking time, rendering the patient functionally blind. Blepharospasm is generally considered to be central in origin, although the exact mechanism is not yet determined.
Sept 27: Eyelid Reconstruction

Management is directed toward selective destruction of the peripheral nerve branches innervating the orbicularis oculi muscles. This can be achieved surgically by dissecting out and exposing the upper branches of the facial nerve, confirmation with nerve stimulation, and resection of all branches to the orbicularis oculi. Periorbital myectomy also may produce acceptable long-term results. Success has also been obtained with botulinum A toxin, which interferes with the presynaptic release of acetylcholine. More than 90% of patients have experienced some relief of symptoms, although the average duration of the maximum improvement is only 11 to 14 weeks. Long-term improvement is prevented by regeneration of axons after management.

6. (Josh) How do you repair a full thickness laceration of an eyelid margin?

In the upper and lower eyelids, special concern should be given to lacerations that involve the lid margin to prevent unsightly notching. Repair of a lid margin laceration involves a three layer closure with a fine plain gut suture (6-0 or 7-0) on the conjunctival side to avoid irritation of the scleral conjunctiva. A fine absorbable suture should be used in the tarsal plate, and a fine monofilament on the external surface.

7. (Caroline) You are late to the operating room case, so you’re attending rips off 20% of your lower lid. How would you fix it? What if it was 50%? What if it was 70%?

*20% defect:*

**Direct Closure**
- Defects up to 30% of the lower eyelid in young patients, up to 45% in the elderly patient.
- In borderline cases, a lateral cantholysis may provide up to 5 mm additional length

*50% defect:*

**Tenzel Rotational Flap** – musculocutaneous flap is rotated beginning at the lateral canthus, extending upward in a semicircular fashion and must extend above the lateral canthal angle to ensure elevation of the lower eyelid during wound healing. Conjunctiva from the inferior fornix should be advanced or rotated into position to cover the posterior surface of the skin muscle flap

*70% defect:

1. **Tarsconjunctival bridge flap (modified Hughes procedure)** – 2 stages
   This procedure effectively recreates the posterior lamella of the lower eyelid through use of a segment of upper eyelid tarsus and conjunctiva
   - Tarsus and conjunctiva of the upper eyelid are cut horizontally 4 mm prox. to eyelid margin and dissected away from the levator aponeurosis and Müller muscle
   - The bridge flap is advanced into the defect of the lower eyelid and sutured to the remnants of the medial and lateral tarsus of the lower eyelid
   - Full-thickness skin graft is placed over the anterior surface
   - Separate flap at 4-6 weeks

2. **Rotational Cheek Flap (Mustarde)** – can reconstruct entire eyelid
   Incision begins at the lateral canthal angle, extends upward onto the temple, and swings posteriorly just anterior to the ear and then inferiorly across the mandible. The posterior lamella of this flap must be reconstructed with a free tarsoconjunctival graft, a nasal septal cartilage graft, or with mucous membrane.

8. (tali) You resect a basal cell and remove 50% of the upper eyelid. How do you reconstruct this?

- May repair primarily eyelid defects up to 25-30% in younger person and 40% in older person with increasing skin laxity

**Full thickness repair options:**

**Tenzel flap (semicircular rotation flap):** May be used for defects of 40-60% of upper lid. Lateralizes feceted to create continous eyelash line for eye protection.
Sept 27: Eyelid Reconstruction

- Superiorly-based mucocutaneous flap starting at lateral canthus and extending in semicircle inferiorly with diameter of at least 3 cm. The skin is incised down to the periosteum of the orbital rim. Once flap dissected, a lateral canthotomy performed on upper limb of lateral canthal tendon to help rotation. Burrow triangle removed from superior edge of defect to create pentagonal defect. Flap advanced into defect and tarsal plate reapproximated with 7.0 silk. Lateral canthus reconstructed. Fixation of muscle to periorbital superior to lateral canthal tendon avoids post-op eyelid droop. Donor site closed primarily.

**Cutler-Beard flap (bridge flap): Full-thickness lower lip flap designed for broad, shallow upper eyelid defects**

- Flap based in central portion of lower lid. Skin of lower lid incised horizontally below the inferior edge of the tarsus. The length of the incision corresponds to the size of the defect to be reconstructed. Make a full-thickness incision through the skin, lid retractors, and the conjunctiva. The cornea must be protected to prevent inadvertent injury. Full-thickness vertical incisions are made from the ends of the horizontal incision. The vertical length of the incisions depends on the vertical dimension of the upper eyelid defect and can be extended as far as the conjunctival fornix.
- Closure does not require tarsal reconstruction. If no tarsal reconstruction, the skin-conjunctival flap is passed under the lower eyelid tarsal bridge and secured to the edges of the defect in 2 layers. Absorbable sutures with knots away from the cornea are used to close the conjunctival layer. The skin-muscle layer is closed with permanent monofilament sutures, which are removed in 5-7 days.
- If desire to reconstruct the tarsus, may use various sources: free tarsal graft from the contralateral upper eyelid, sepal cartilage, or auricular cartilage.
- Requires second stage: performed in 6-8 weeks. Flap divided and eyelid contured.

**Periorbital Donor Sites**

- If large-volume tissue loss or inadequate eyelid skin available.
- Disadvantage: the surrounding skin is of a different quality and thickness

**Temporal Forehead Flap**

- Transposition flap for full-thickness eyelid defects. Scar may be hidden in brow margin.
- This is skin/muscle flap. May need conjunctival reconstruction separately

**Forehead Flap**

- Used for large defects in upper eyelid. Blood supply based on supratrochlear or supraorital artery. Elevate flap in subgaleal plane.
- Disadvantage: Second stage for flap division in 2 weeks. Is also very thick flap for eyelid so used as last resort

**Full-thickness defects of lid margin**

Repairing a full-thickness eyelid defect must be reconstructed in layers in order to allow normal function and requires the reconstruction of both anterior and posterior lamellae. One of the reconstructive lamellae has to be well vascularised, in order to support the second lamella. Combination of a flap and a graft, or combination of two flaps are possible. Combination of two grafts must be avoided, for it leads to necrosis.

Repairing a **vertical full-thickness** eyelid defect depends on the horizontal extent of the defect:
- Defect affecting less than 25 % of the lid margin: direct closure
- Defect affecting less than 33 % of the lid margin: direct closure with cantholysis and septrolysis.
- Defect affecting less than 50 % of the lid margin: lateral rotational flap
- Defect affecting more than 50 % of the lid margin: different pedicle flaps: Kollner flap for lower eyelid, Cutler-Beard flap for upper eyelid.

For primary repair, the tarsal edges are first prepared by forming vertically oriented ends that can be directly approximated. A Burow triangle of eyelid skin is excised above the tarsal edges, thus forming a pentagonal defect. The lid is repaired in layers by first approximating the tarsal edges at the lid margin (gray line). Preferred sutures are 6-0 silk sutures because monofilament permanent sutures are not as soft and can cause conjunctival irritation. Next, the tarsus is reapproximated using 6-0 polyglactic sutures. Use 2-3 interrupted sutures with knots tied superficially. The skin is closed with 6-0 silk sutures. Keep the skin suture ends long so that they can be tied under the most superior suture. This helps to keep the suture ends away from the conjunctiva. The skin sutures are removed in 5 days, and the lid margin suture is removed in 7-10 days.

**Tenzel flap**

Larger defects of the upper eyelid that comprise up to two thirds of the lid can be closed with a semicircular, or Tenzel, flap. In this procedure, extra skin is rotated from the lateral orbit and the defect is closed as described in primary closure. The flap starts from the lateral canthus and extends as a semicircle inferiorly to a diameter of 2 cm. The skin is incised down to the periosteum of the orbital rim. The upper limb of the lateral canthal tendon is cut to facilitate flap rotation. A Burow triangle is then removed from the superior edge of the defect to create a pentagonal defect. The primary defect is closed as described in the previous section.
Sept 27: Eyelid Reconstruction

If tension at the wound edges is excessive, the orbital septum, the levator aponeurosis, and the conjunctiva at the semicircular flap can be sequentially cut to relieve tension. The semicircular flap is closed by first placing a 5-0 monofilament permanent vertical mattress suture at the lateral canthus through a bolster. The first limb of the suture is placed through the skin of the intact inferior lateral canthus and then brought out at the skin of the semicircular flap. The short limb of the vertical mattress is placed through the semicircular flap, the intact limb of the canthal tendon, and then the skin of the intact eyelid. The remainder of the flap is then closed with permanent sutures in interrupted fashion.

**Cutler-Beard flap**

Defects involving more than 50% of the upper eyelid can be closed with an inferiorly based skin-conjunctival (Cutler-Beard) flap. The skin of the lower eyelid is incised horizontally below the inferior edge of the tarsus. The length of the incision corresponds to the size of the defect to be reconstructed. Make a full-thickness incision through the skin, lid retractors, and the conjunctiva. The cornea must be protected to prevent inadvertent injury. Full-thickness vertical incisions are made from the ends of the horizontal incision. The vertical length of the incisions depends on the vertical dimension of the upper eyelid defect and can be extended as far as the conjunctival fornix.

Closure of the defect can be accomplished with or without tarsal reconstruction. If tarsal reconstruction is not undertaken, the skin-conjunctival flap is passed under the lower eyelid tarsal bridge and secured to the edges of the defect in 2 layers. Absorbable sutures with knots away from the cornea are used to close the conjunctival layer. The skin-muscle layer is closed with permanent monofilament sutures, which are removed in 5-7 days.

In the Cutler-Beard flap, the missing tarsus is typically not recreated. When tarsal reconstruction is planned, several options are available for tarsal replacement, including a free tarsal graft from the contralateral upper eyelid, septal cartilage, or auricular cartilage. A tarsal graft represents the best reconstructive option, in terms of consistency, thickness, and curvature.

The tarsal graft is harvested from the cephalic border of the intact tarsus. The upper eyelid is inverted, and the cephalic border of the tarsus is identified. The horizontal dimension of the graft is then marked. The vertical dimension of the graft is 5 mm at the cephalic border. At least a 5-mm caudal wedge of tarsus must be preserved to prevent secondary deformity of the donor side. The incision is through the conjunctiva and tarsus. Care must be taken to avoid damage to the overlying upper eyelid retractor and the skin. The donor area can be left open to heal. The harvested tarsus is denuded of conjunctiva and placed in between the skin and conjunctiva of the lower lid flap. The lateral edges can be secured to the remnants of native tarsus.

The second stage of the Cutler-Beard flap is performed in 6-8 weeks. During the second stage, the flap is divided and the upper eyelid is contoured to match the contralateral eyelid. Protect the cornea while the flap pedicle is divided sharply at the level of the new lid margin. The incision is beveled superiorly to obtain more conjunctiva than skin. Ensure that the extra length of conjunctiva is 1-2 mm; this will be wrapped around the edge of the newly formed lid margin. The inferior edge of the lower tarsal bridge is sharply reopened, and the flap remnant is contoured for proper no-tension closure. The wound is closed in layers. Obviously, the reconstructed upper eyelid will lack lashes.

**Postoperative details:** Apply an ophthalmic antibiotic ointment to the surgical site at the conclusion of surgery, and a pressure patch is commonly applied. Pressure bandages are useful to reduce postoperative edema and bleeding and to immobilize the advanced tissue flaps or skin grafts. In addition, 4-0 silk traction sutures placed in the lid margin are useful in selected cases to keep the reconstructed eyelid stretched and to help reduce retraction of the tissues. The pressure patch, traction sutures, and stents for skin grafts are removed in 3-5 days. Antibiotic ointment application is continued until skin healing is complete. Oral antibiotics are routinely administered for patients who are immunocompromised or have reduced healing capacity.

**Follow-up care:** Most sutures are removed in 5-7 days. If during suture removal the wound becomes dehiscent, the remaining sutures are left in place for another week. Silk lid margin sutures are usually left in place for 10-14 days.