Question 1

Which of the following is the mechanism by which trabeculectomy lowers intraocular pressure?

1. Bypasses the trabecular meshwork
2. Enhances outflow through an intact trabecular meshwork
3. Decreases aqueous production
4. Opens the ends of Schlemm canal
Question 2

Which of the following is a risk factor for failure of trabeculectomy?

1. Advanced age
2. Exfoliation syndrome
3. Inflammatory glaucoma
4. Pigmentary glaucoma
Question 3

During trabeculectomy, a surgical iridectomy is most important in which of the following eyes?

1. Hyperopic
2. Myopic
3. Eyes with pigment dispersion syndrome
4. Pseudophakic
Question 4

Aqueous misdirection (malignant glaucoma) is most likely to develop in an eye with which of the following refractive errors?

1. – 8.00 D
2. – 3.00 D
3. Plano
4. + 5.00 D
Trabeculectomy

Wallace L.M. Alward, M.D.
Frederick C. Blodi Chair
Department of Ophthalmology
University of Iowa Carver College of Medicine
Conflicts

• I have no conflicts in relation to this talk

• I am on the Data and Safety Monitoring Committee for InnFocus Vision
Disclaimer

• There are more variations on trabeculectomy than there are glaucoma surgeons
Disclaimer

• There are more variations on trabeculectomy than there are glaucoma surgeons

• This talk will give general concepts on one way to do a trabeculectomy
The Bleb

• When von Graefé developed the surgical iridectomy it was found that many of the patients with good pressures had developed an inadvertent bleb
Full Thickness Surgery

• This led to the development of the original filtration procedures
Full Thickness Surgery

• This led to the development of the original filtration procedures
• A full thickness hole was made through the sclera and covered by conjunctiva
• This led to the development of the original filtration procedures
• A full thickness hole was made through the sclera and covered by conjunctiva
• This created a intentional filtering bleb
Full Thickness Surgery

- This led to the development of the original filtration procedures
- A full thickness hole was made through the sclera and covered by conjunctiva
- This created an intentional filtering bleb
- While these procedures often led to low IOPs, they were fraught with complications
Full Thickness Surgery
Full Thickness Surgery
Full Thickness Surgery
Full Thickness Surgery

• This is a 54 year-old full thickness bleb
Trabeculectomy

- Trabeculectomy was designed to open the ends of Schlemm canal to permit fluid to leave the eye without the complications associated with full-thickness surgeries.
Trabeculectomy

• However, the only successful trabeculectomies did develop filtering blebs
Trabeculectomy

• However, the only successful trabeculectomies did develop filtering blebs

• So, trabeculectomy became a more controlled way to do the same thing that full-thickness surgeries did
Trabeculectomy
Trabeculectomy
Trabeculectomy

• However, the only successful trabeculectomies did develop filtering blebs
• So, trabeculectomy became a more controlled way to do the same thing that full-thickness surgeries did
• The term trabeculectomy is a misnomer
Trabeculectomy

• While the complications associated with full thickness procedures are reduced with trabeculectomy, they are not eliminated
Trabeculectomy

• While the complications associated with full thickness procedures are reduced with trabeculectomy, they are not eliminated

• We continue the hunt for a bleb-less glaucoma surgery
Trabeculectomy Indications

- Poorly controlled glaucoma
Trabeculectomy Indications

• Poorly controlled glaucoma

• Usually used after medical management and trabeculoplasty have failed
Trabeculectomy Indications

• Medical and laser management are designed to make the balance between aqueous production and outflow more favorable
Trabeculectomy Indications

• Medical and laser management are designed to make the balance between aqueous production and outflow more favorable

• Trabeculectomy abandons the trabecular meshwork
Trabeculectomy Indications

• Sometime used in patients who cannot comply with medical management
Trabeculectomy Indications

• Sometime used in patients who cannot comply with medical management
  – But, if there is a concern that the patient won’t take post-operative steroids a tube-shunt may be a better option
Trabeculectomy Indications

- Sometime used in patients who cannot comply with medical management

- Sometimes when an IOP is required that is lower than episcleral venous pressure
Trabeculectomy Indications

• Sometime used in patients who cannot comply with medical management

• Sometimes when an IOP is required that is lower than episcleral venous pressure
  – Normal tension glaucoma
Trabeculectomy Contraindications

- Blind eye
- Lack of mobile conjunctiva
Risk Factors for Failure

- Aphakia
- Pseudophakia (ECCE)
- Previously failed filtration surgery
- Youth
- Inflammatory glaucoma
- Dark skin pigmentation
- Neovascular glaucoma
- Iridocorneal-endothelial syndrome
Why I like Trabeculectomy
Why I like Trabeculectomy (and I do)
Why I like Trabeculectomy

• In my hands I can get lower pressures than with any other procedure
Why I like Trabeculectomy

- Recent patient
- Had glaucoma progressing at normal IOPs
- Underwent trabeculectomy with mitomycin C
- Referred back for cataract surgery 11 years later
- IOP 4 mmHg OU on no medications
03-19-2002 SITA-Standard

GHT: Outside normal limits

4.2 mm
20/20

Fovea: 35 dB
MD: -2.09 dB P < 5%
FL: 1/16
PSD: 5.87 dB P < 0.5%
FN: 0 %
FP: 1 %

08-15-2013 SITA-Standard

GHT: Outside normal limits

3.5 mm
20/30

Fovea: 32 dB
MD: -2.25 dB P < 5%
FL: 3/17
PSD: 4.13 dB P < 0.5%
FN: 1 %
FP: 4 %
Why I like Trabeculectomy

• Proband of the family in which we discovered the myocilin gene. 27 years old.
Why I like Trabeculectomy

• Underwent a trabeculectomy in 1986. No antimetabolites like 5-FU or mitomycin.
Why I like Trabeculectomy

• 2018 his IOP was 11 mmHg.
Why I like Trabeculectomy

• In my hands I can get lower pressures than with any other procedure

• It leaves more futures options than tube shunt surgeries
Preparing for Procedure

• Examine conjunctiva – especially if the patient has had prior surgery
Preparing for Procedure

• Examine conjunctiva – especially if the patient has had prior surgery

• Stop anticoagulants if possible
Preparing for Procedure

• If the IOP is extremely high it should be lowered
Preparing for Procedure

• If the IOP is extremely high it should be lowered
  – IV mannitol
Preparing for Procedure

• If the IOP is extremely high it should be lowered
  – IV mannitol
  – early paracentesis
Anesthesia

• Retrobulbar or “Topical”
Exposure

- Traction suture
Exposure

• Traction suture
  – optional if a retrobulbar block isn’t used
Conjunctival Incision

• Limbus-based or fornix-based
Scleral Flap

• Location at or close to 12:00

• I prefer just nasal or temporal to 12:00
Scleral Flap

• Deep perpendicular walls are critical
Scleral Flap

- Deep perpendicular walls are critical
Scleral Flap

• Deep perpendicular walls are critical

• Everything about trabeculectomy is about control
Paracentesis

- To allow reformation of the anterior chamber
Paracentesis

• To allow reformation of the anterior chamber

• If topical instill preservative-free lidocaine
Paracentesis

- To allow reformation of the anterior chamber
- If topical instill preservative-free lidocaine
- & acetylcholine (Miochol®)
Antimetabolite

• Usually mitomycin C (0.1 – 0.5 mg/ml for up 5 minutes)
Antimetabolite

• Usually mitomycin C (0.1 – 0.5 mg/ml for up to 5 minutes)
• Sometimes 5-fluorouracil (50 mg/ml)
Antimetabolite

- Usually mitomycin C (0.1 – 0.5 mg/ml for up to 5 minutes)
- Sometimes 5-fluorouracil (50 mg/ml)
- Sometimes surgery can be done without
Antimetabolite

- Usually mitomycin C (0.1 – 0.5 mg/ml for up 5 minutes)
- Sometimes 5-fluorouracil (50 mg/ml)
- Sometimes surgery can be done without
- Can be administered before surgery, before flap creation, or after flap creation
Sclerostomy

- Actually usually cornea, not sclera, that is excised
Sclerostomy

• Actually usually cornea, not sclera, that is excised

• Kelly punch or scissors
Iridectomy

• I always perform in hyperopic phakic patients
Iridectomy

- I always perform in hyperopic phakic patients
- I rarely use in myopic or pseudophakic individuals
Flap Closure

• I am looking for no flow
Flap Closure

- I am looking for no flow

- But “burpable”
Flap Closure

• I am looking for no flow

• But “burpable”

• Two (or more) primary sutures + two “safety sutures”
Flap Closure
Flap Closure

“Safety”
Flap Closure

• Can use releasable sutures that pass out onto the cornea if there is no laser available or if the conjunctiva is too thick for laser suture lysis
Conjunctival Closure

Running (one or two layer)

Running horizontal mattress
Postoperative Management

• Frequent corticosteroids
Postoperative Management

• Frequent corticosteroids
  – I use every two hours for three weeks and then slowly taper
Postoperative Management

• Frequent corticosteroids
  – I use every two hours for three weeks and then slowly taper

• Atropine
Postoperative Management

• Frequent corticosteroids
  – I use every two hours for three weeks and then slowly taper

• Atropine
  – I give in the OR for everyone and use post operatively in patients with angle closure
Postoperative Management

• Frequent corticosteroids
  – I use every two hours for three weeks and then slowly taper

• Atropine
  – I give in the OR for everyone and use post operatively in patients with angle closure

• Combination steroid/antibiotic at bedtime
Postoperative Management

- I see weekly for six weeks and then less frequently
Postoperative Management

• I usually massage if the IOP is too high
Postoperative Management

• I begin laser suture lysis at about three weeks
Postoperative Management

- **Lens**: Hoskins, Ritch, or similar
- **Laser**: Argon green or Krypton red (if hemorrhage present)
- **Spot size**: 50 or 100 µ
- **Duration**: 0.02 to 0.05 seconds
- **Power**: 250 to 500 mW
# Postoperative Management

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And if All Goes Well
Postoperative Lifestyle

• Avoid anything that increases the risk of surface infection
Postoperative Lifestyle

- Avoid anything that increases the risk of surface infection
  - contact lens wear
  - swimming
  - work in extremely dusty/dirty environments
Early Complications

• Pressure too high
Early Complications

- Pressure too high
  - usually overly tight sutures
Early Complications

• Pressure too high
  – usually overly tight sutures
  – treat with massage or laser suture lysis
Early Complications

- Pressure too high
  - usually overly tight sutures
  - treat with massage or laser suture lysis
  - sclerostomy may be blocked with fibrin or iris
Early Complications

- Pressure too high with flat or shallow AC
Early Complications

• Pressure too high with flat or shallow AC
  – Pupillary block
Early Complications

• Pressure too high with flat or shallow AC
  – Pupillary block
    • central chamber deeper than periphery
Early Complications

• Pressure too high with flat or shallow AC
  – Pupillary block
  – Aqueous misdirection
Early Complications

• Pressure too high with flat or shallow AC
  – Pupillary block

  – Aqueous misdirection
    • uniformly flat anterior chamber
Early Complications

• Pressure too high with flat or shallow AC
  – Pupillary block
  – Aqueous misdirection
  – Suprachoroidal hemorrhage
Early Complications

• Pressure too high with flat or shallow AC
  – Pupillary block
  – Aqueous misdirection
  – Suprachoroidal hemorrhage
    • Pain!!
Early Complications

- Pressure too high with flat or shallow AC
  - Pupillary block
  - Aqueous misdirection
  - Suprachoroidal hemorrhage
    - Pain!!
Early Complications

- Pressure too high with flat or shallow AC
  - Beware of applanating lens in a flat chamber and recording falsely high IOP
Early Complications

- Pressure too low
Early Complications

• Pressure too low
  – overfiltration
Early Complications

• Pressure too low
  – overfiltration
  – leak
Early Complications

- Pressure too low
  - overfiltration
  - leak
  - can lead to:
    - shallow or flat AC
    - choroidal effusion
    - suprachoroidal hemorrhage
Early Complications

- Hyphema
Early Complications

• Snuff
  – loss of central vision at the time of surgery
Early Complications

• Snuff
  – loss of central vision at the time of surgery
  – while once felt to be common, it is actually pretty rare
Early Complications

• Snuff
  – loss of central vision at the time of surgery
  – while once felt to be common, it is actually pretty rare
  – typically in eyes with fixation splitting field loss
Early Complications

• Snuff
  – loss of central vision at the time of surgery
  – while once felt to be common, it is actually pretty rare
  – typically in eyes with fixation splitting field loss
Late Complications

• Failure
Late Complications

- Tenon cyst
Late Complications

• Tenon cyst
Late Complications

• Leak
Late Complications

- Infection
Late Complications

• Infection
  – blebitis is infection confined to the filtering bleb
Late Complications

• Infection
  – blebitis is infection confined to the filtering bleb
  – can be treated with topical fortified antibiotics
Late Complications

• Infection
  – blebitis is infection confined to the filtering bleb
  – can be treated with topical fortified antibiotics
  – patients need to be instructed to return stat with any symptoms suggestive of infection
Late Complications

• Infection
  – endophthalmitis develops when the infection moves inside the globe
Late Complications

- Infection
  - endophthalmitis develops when the infection moves inside the globe
  - portends a much worse prognosis
Late Complications

• Bleb migration
Late Complications

- Bleb migration
Late Complications

• Painful bleb
  – dellen
Late Complications

- Painful bleb
  - dysesthesia
Question 1
Which of the following is the mechanism by which trabeculectomy lowers intraocular pressure?

1. Bypasses the trabecular meshwork
2. Enhances outflow through an intact trabecular meshwork
3. Decreases aqueous production
4. Opens the ends of Schlemm canal
Question 1

Which of the following is the mechanism by which trabeculectomy lowers intraocular pressure?

1. Bypasses the trabecular meshwork
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3. Decreases aqueous production
4. Opens the ends of Schlemm canal
Question 2

Which of the following is a risk factor for failure of trabeculectomy?

1. Advanced age
2. Exfoliation syndrome
3. Inflammatory glaucoma
4. Pigmentary glaucoma
Which of the following is a risk factor for failure of trabeculectomy?

1. Advanced age
2. Exfoliation syndrome
3. Inflammatory glaucoma
4. Pigmentary glaucoma
Question 3

During trabeculectomy a surgical iridectomy is most important in which of the following eyes?

1. Hyperopic
2. Myopic
3. Eyes with pigment dispersion syndrome
4. Pseudophakic
Question 3

During trabeculectomy a surgical iridectomy is most important in which of the following eyes?

1. Hyperopic
2. Myopic
3. Eyes with pigment dispersion syndrome
4. Pseudophakic
Aqueous misdirection (malignant glaucoma) is most likely to develop in an eye with which of the following refractive errors?

1. – 8.00 D
2. – 3.00 D
3. Plano
4. + 5.00 D
Aqueous misdirection (malignant glaucoma) is most likely to develop in an eye with which of the following refractive errors?

1. $-8.00\, \text{D}$
2. $-3.00\, \text{D}$
3. Plano
4. $+5.00\, \text{D}$
Key Points

- Trabeculectomy bypasses the trabecular meshwork to create a bleb
Key Points

- Trabeculectomy bypasses the trabecular meshwork to create a bleb
- It can generate very low IOPs
Key Points

• Trabeculectomy bypasses the trabecular meshwork to create a bleb
• It can generate very low IOPs
• But, it has many associated potential complications
Key Points

• Trabeculectomy bypasses the trabecular meshwork to create a bleb
• It can generate very low IOPs
• But, it has many associated potential complications
• Antimetabolites increase the success rate but also the complications
Key Points

- Trabeculectomy bypasses the trabecular meshwork to create a bleb
- It can generate very low IOPs
- But, it has many associated potential complications
- Antimetabolites increase the success rate but also the complications (except failure)
http://curriculum.iowaglaucoma.org/chapter/44.htm
Thank You
Sclerostomy

• Some will use the Express Shunt® at this point
Courtesy of Leon Herndon, MD, Duke University
5-FU Filtering Surgery Study

- Studied the efficacy of subconjunctival 5-FU in enhancing trabeculectomy success

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- In patients with aphakia, pseudophakia and prior failed trabeculectomy
- Increased success rate
- Also increased risk of bleb leak