# Evidence-based approach to management of glaucoma during pregnancy

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# I do not have financial interests

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**Thai Eye Socioeconomics Study (TESS)**

29-year-old African American woman had advanced visual field loss from traumatic glaucoma/angle recession.

She undergoing trabeculectomy with mitomycin C 6 weeks ago presented with uncontrolled intraocular pressure on maximal medical therapy.

Her pressure was 57 mmHg, including oral acetazolamide.

# What if she told you she is now **pregnant**

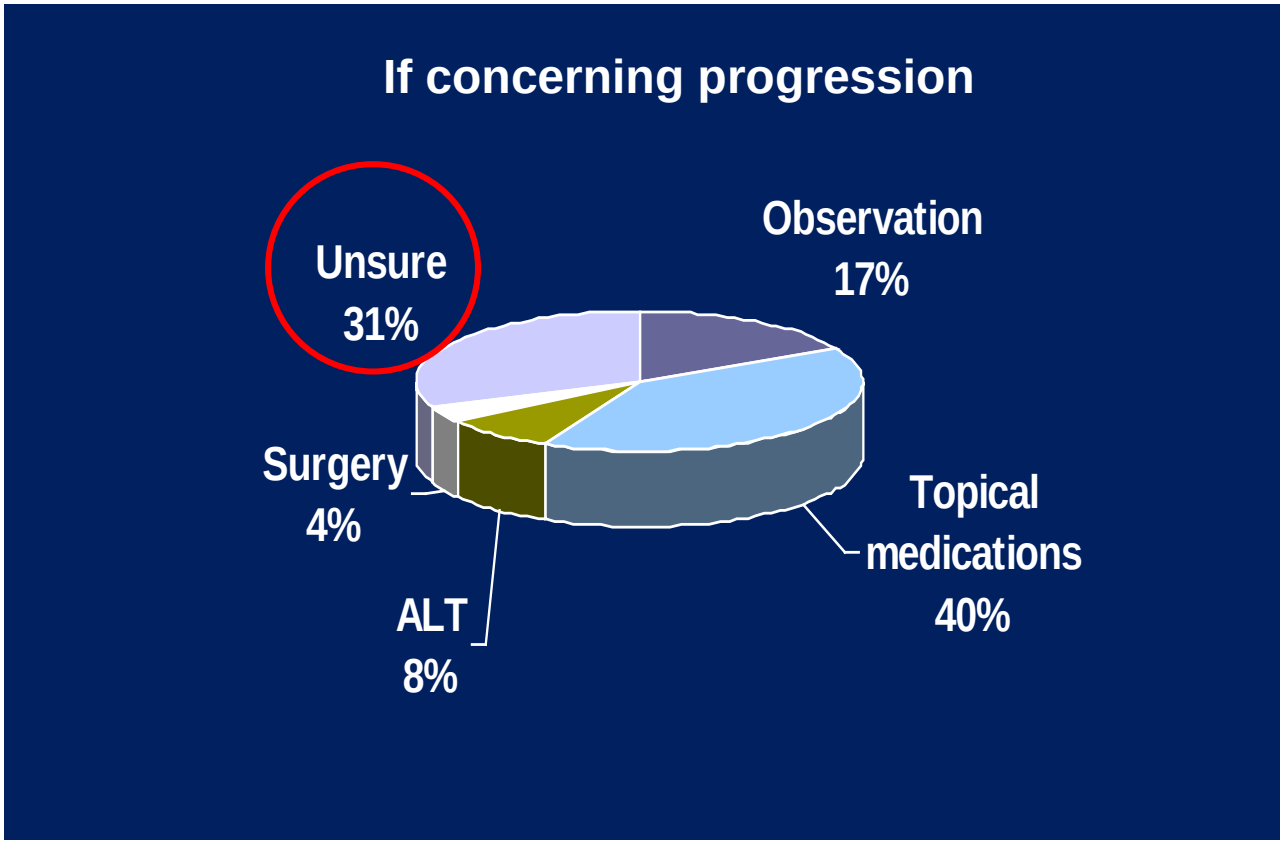
- Does pregnancy make it better or worse?
- Medical and surgical considerations during pregnancy
  - How about mitomycin use during the first trimester?
- Special considerations during labor and lactation

# Glaucoma during pregnancy

1) Incidence of glaucoma during the childbearing age (age < 40) < 0.5%
    - Increased maternal age
        - By 90% in women aged 35-39
        - By 50% in women aged 45-54
2) No guidelines
3) According to a survey in the UK, only 1/3 of consultants had experience with the treatment of glaucoma during pregnancy

# Questionnaire survey in the UK

**26% (of 282) had experience with the treatment**






Vaideanu D, Fraser S. Eye 2005

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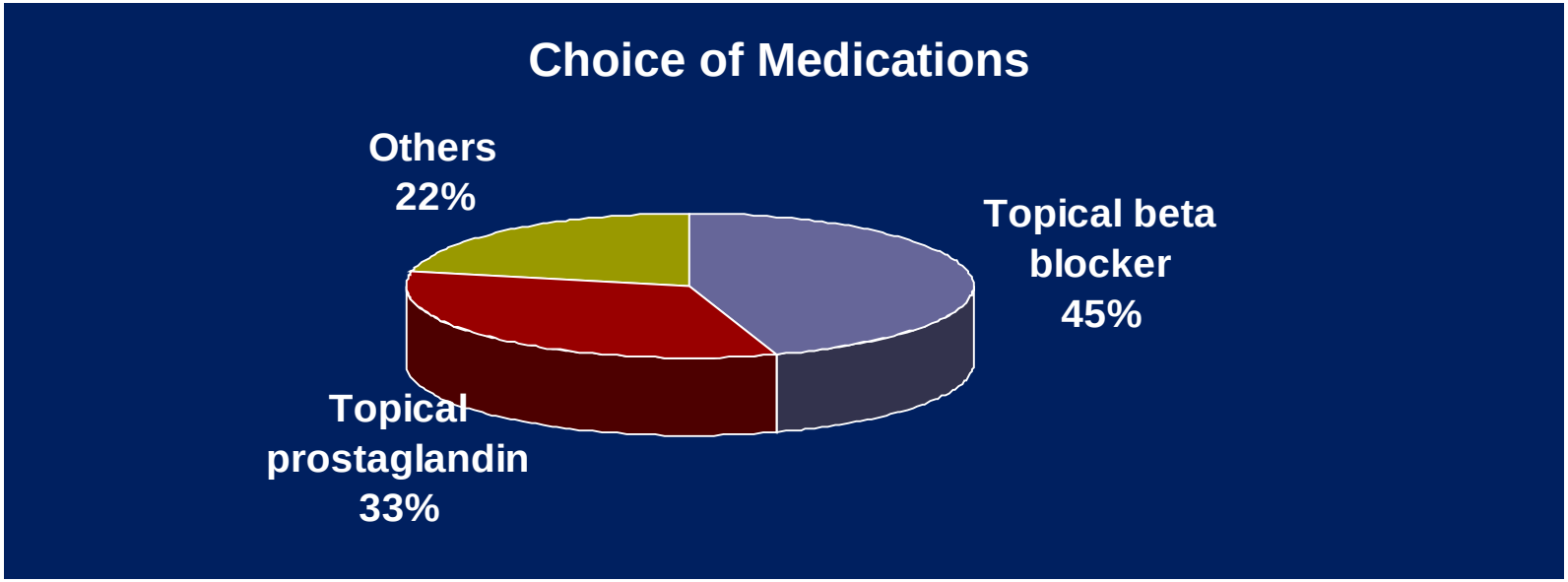





Vaideanu D, Fraser S. Eye 2005

# Glaucoma during pregnancy

**Good news**

•IOP decreases by 10% throughout pregnancy, which persists several months after delivery

•The majority 2/3 are stable

**Not so good news**

•About 1/3 are concerning

- Progression based on visual field (18%)
- IOP elevation (18%)



Brauner Arch Ophthalmol 2006

# Why does intraocular pressure decrease during pregnancy?

**UNCHANGED**
**Aqueous Production**

**INCREASED**
**Trabecular and Uveoscleral Outflow**

**DECREASED**
**Episcleral Venous Pressure**

**10 to 20% IOP reduction**

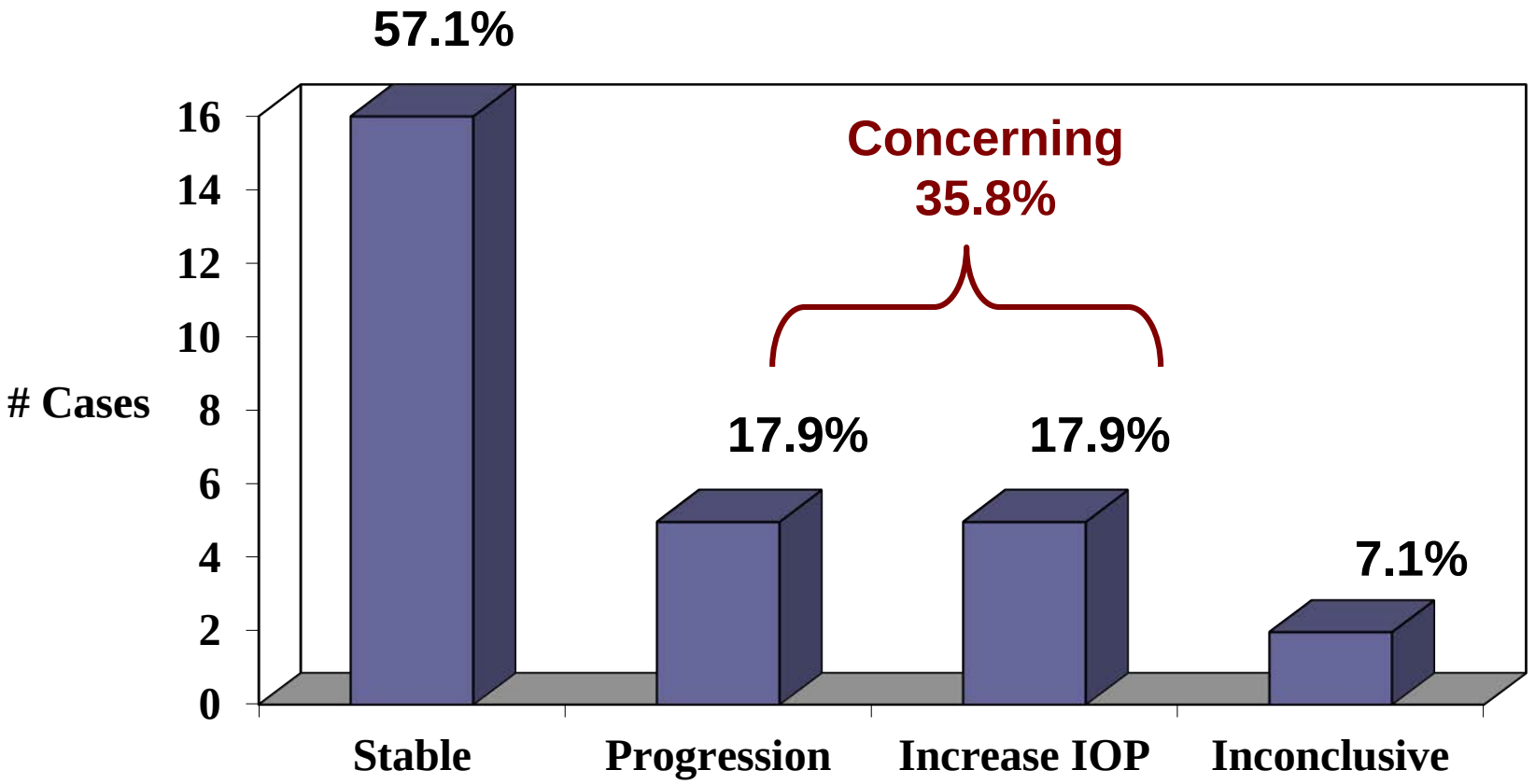
Related to beta HCG and Progesterone



Dinn RB, Harris A et al. OB & GYN survey 2003
Weinreb AJO 1988 Sethi 2016

# The Course of Glaucoma during Pregnancy

28 eyes of 15 pregnant women






Brauner Arch Ophthalmol 2006

# Timing

**First trimester:** concerning teratogenic effects

- Organogenesis

**Second and third trimesters**

- Organ development and maturation

**Third trimester**

- Premature labor and well-being of the newborn

# Factors that increase risk of toxicity

| Maternal Factor | Fetal Factors |
| --- | --- |
| • Increased blood volume and AFP interfere drug binding | • Smaller blood volume<br>• Immature liver and kidney metabolism<br>• Prolonged exposure due to re-circulation through amniotic fluid |



Kooner Teratology 1998

# Approach

**Goal: Temporizing measures to minimize progression**

- **Assess urgency of treatment**
  - Review pre-natal records
  - Severity of glaucoma
  - Set goal of treatment, including target pressure

- Familiarity with drug classification
- Consultations
  - Multidisciplinary approach
    - Glaucoma specialist
    - OB especially in a high-risk pregnancy
- Discuss risks and benefits of treatment with the patient

# Treatment Options

- **Observation**
- **Medical treatment**
  - Topical
  - Oral: Avoid!!!
- **Laser**
  - ALT
  - Diode cyclophotocoagulation
- **Surgical**
  - Trabeculectomy
  - Tube/Shunt

# Drug Classification

- **Class A:**
  Safety established in human studies
- **Class B:**
  Presumed safety based on animal studies
- **Class C: Uncertain**
  No human studies
  Animal studies showed adverse effects
- **Class D: Unsafe**
  Evidence of risk in certain clinical circumstance
- **Class X: Highly unsafe**

# Anti-glaucomatous medications

- **Class A:** NONE
- **Class B:**
  - Brimonidine
  - Dipivefrin
- **Class C:**
  - Beta blocker
  - CAI
  - Prostaglandin analog
  - Epinephrine and apraclonidine
  - Parasympatomimetics
- **Class D:** Unsafe
- **Class X:** Highly unsafe
  - Cholinesterase inhibitor ***

Postpone only
in the first trimester



Drake and Vajaranant 2017 Coleman A 2005

# Medical treatment during pregnancy

| | **Pregnancy** |
|---|---|
| **1st Line** | Brimonidine<br>(Class B) |
| **2nd Line** | Beta blocker<br>Class C: 0.25% q am<br>Most commonly used by ophthalmologists and used to treat HTN |
| **3rd Line** | CAI (topical)<br>Class C |
| **Alternative** | Pilocarpine<br>Discontinue near term |
| | Prostaglandin |



Drake and Vajaranant 2017

# Medical treatment during lactation

| | Pregnancy | Lactation |
|---|---|---|
| **1st Line** | Brimonidine<br>(Class B) | **Discontinue** prior to delivery |
| **2nd Line** | Beta blocker<br>Class C: 0.25% q am<br>Most commonly used by ophthalmologists and used to treat HTN | **May discontinue** during nursing in **small infants** due to high concentration in breastmilk |
| **3rd Line** | CAI (topical)<br>Class C | **CAI (topical and oral)** |
| **Alternative** | Pilocarpine<br>Discontinue near term | **Pilocarpine** |
| | Prostaglandin | **Prostaglandin** |



Drake and Vajaranant 2017

# Lactation

- Most drugs present in the maternal circulation are excreted into milk
  - The maximum amount of drug in milk seldom exceed **1% to 2%** of the administered maternal dose
- Evidence of secreted drug in breast milk
  - Timolol:
    - 6-time higher drug concentration in breast milk at 1 1 1/2 hours
    - About 1/80 of the cardiac-effect dose
    - **Caution in small infants with hepatic or renal impairment**



Lustgarten Arch Ophthalmol 1983
Kooner Ann Ophthalmol 1988

# Lactation

Drug level in breast milk often highest 30-120 minutes after the dose

**Recommendations**

**Timolol and acetazolamide**

- Approved by **American Academy of Pediatrics**
- **Timing– administer right after nursing**



Johnson Arch Ophthalmol 2001

# Methods to reduce systemic absorption

- Punctal occlusion
- Lowest concentration
- Gel form– sustained release
- Timing
  - Discontinue near term or prior to delivery
  - Administer drops immediately after nursing
    - Drug level in breast milk highest during 30-120 minutes

# LASER: The least possible risk to fetus

Recommended as a temporizing measure

Reported safety with ALT and diode cyclophotocoagulation



Johnson Arch Ophthalmol 2001 Drake and Vajaranant 2017
Wertheim BJO 2002

# Surgical options

- **Filtering surgery**
  - Trabeculectomy – **antifibrotic agents (Class D)**
  - Glaucoma drainage device
- **Risk of anesthesia**
  - Not recommended during the first trimester
  - Safety reported with uses of retrobulbar block with lidocaine
  - Consider topical anesthesia



Johnson Arch Ophthalmol 2001 Drake and Vajaranant 2017
Wertheim BJO 2002 Razeghinejad 2016

# Preparation for labor

- The effects of labor on IOP
  - No changes in IOP and MOPP during the second and third stage of labor in young healthy women with no glaucoma
    - Excluded women who later needed C-section
    - Unknown in women with glaucoma

**Recommendations:**

- Recommendation on a choice of delivery is inconsistent
  - 2% of C-section reports from Poland were due to eye related conditions (including glaucoma)

29-year-old African American woman had advanced visual field loss from traumatic glaucoma/angle recession. She undergoing trabeculectomy with mitomycin C 6 weeks ago presented with uncontrolled intraocular pressure on maximal medical therapy. Tmax 57 including oral acetazolamide.

# Summary

- Glaucoma in pregnancy although uncommon, can be challenging in management
  - Most cases do well!
- Multidisciplinary approach and familiarity with treatment options is crucial
- Consider temporizing measures to minimize maternal risk of progression as well as fetal risk of adverse effects from medications

# Thank you for your attention

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Illinois Eye AND EAR INFIRMARY

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