Pneumatic Retinopexy (PR) 101
Tips & Tricks

Caroline Baumal, M.D.

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Associate Professor, Tufts University Medical Center
Vitreoretinal Surgery, New England Eye Center
Boston, MA
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What is Pneumatic retinopexy PR?

• Office based procedure for RRD repair

• Pneumatic +
  – Intravitreal gas /air injection PLUS

• Retinopexy
  – cryotherapy pre gas or laser post gas

• Hilton and Grizzard 1985, Tornambe
• Analogous to Scleral buckle procedure-scleral buckle
• 15% RD repair in US
Pneumatic Retinopexy / PR

Classical PR candidate:

- single break, multiple breaks within 1 clock hour
- superior 8 clock hours (between 8 to 4)
- clear media
- able to position
- mobile retina
- Extreme or non-traditional PR → everything else

- Exclude eyes with PVR, inferior break, GRT, vireous hemorrhage, large breaks
Pros of Pneumatic Retinopexy / PR

- immediate access
- office based
- no NPO requirement
- no sedation
- minimally invasive (less than other procedures)
- fast recovery
- fly sooner (vs. PPV)
- less procedural complications
- If no insurance - no OR, less red tape
- reduced hospital costs
Pros of Pneumatic Retinopexy / PR

- Success primary PR 80% + (all comers)
- Overall eventual 98% success
- PR failure associated with 2 anatomic issues
  - Inferior break & visible traction on break
- Annual health care savings in US 6 to 30 million dollars by increasing PR utilization from 15% to 20-35%
Cons of Pneumatic Retinopexy / PR

• +/- time consuming for MD
  – complete retina exam
  – Learning curve
• office equipment
  – cryotherapy or laser (indirect)
  – Access to gas
• experience with procedure
• +/- more follow up
• not effective for all RD types
• more strict positioning x 4-5 days
• may require another procedure
Classic PR candidate: RRD

VA = 20/25
RD

3 mos post – PR VA = 20/20
NOT Pneumatic Retinopexy / PR!

- Inferior break
- immobility of retina
- PVR
Principles of Rhegmatogeous RRD repair

• 1. Find all breaks

• 2. Treat all breaks

• 3. Support all sealed breaks
  – SINGLE gas bubble!
Find ALL breaks

- Careful complete dilated exam

- Pearls:
  - Lincoffs rules
  - Pseudophakic holes
  - No break
    - rhegmatogenous?
    - Features of RD
    - Consider B scan
Lincoff rules for Rhegmatogenus RD = probability of locating retinal break

I. SUPERIOR TEMPORAL OR NASAL DETACHMENTS:
   In 98% the primary break lies within 1½ clock hours of the highest border.

II. TOTAL OR SUPERIOR DETACHMENTS THAT CROSS THE 12 O’CLOCK MERIDIAN:
    In 93% the primary break is at 12 o’clock or in a triangle, the apex of which is at the ora serrata and the sides intersect the equator 1 hour to either side of 12 o’clock.

III. INFERIOR DETACHMENTS:
    In 95% the higher side of the detachment indicates on which side of the 6 o’clock radian an inferior break lies.
    *When an interior detachment is bullous the primary break lies above the horizontal meridian.

Figure. Rules for finding the primary break in rhegmatogenous retinal detachment.
Where is the break?
Find ALL breaks

- Lincoff's rule applies

- Possibility of undetected breaks
Treat all breaks

• Modality
  – CRYOTHERAPY !!!! vs laser
  – breaks in detached retina
  – Treat lattice in attached retina

• Timing
  – Pre or post gas
  – Laser difficult post gas-patient intolerance
Treat all breaks

• Pearls
  – Do not over cryo, avoid base of tear, extend to ora unless posterior
  – Laser lattice in attached retina
  – Hold probe correctly-avoid shaft depression, parallax,
  – Parallax errors can occur when indenting the sclera in bullous RD
  – The break may thus be more anterior than expected
Case: Which eye had PVD alone vs PR for RD repair
3. SUPPORT BREAKS

KEY-SINGLE intravitreal gas bubble

- Maximal effect of expansile forces
- Limited amount of gas for a short duration
- 0.35-0.45 cc 100% SF6 vs C3F8
- Reduce fish egg complications
3. SUPPORT BREAKS
Single intravitreal gas bubble technique

- Position head correctly to inject gas
  - The quadrant where gas is injected must be the most superior part of the eye

- If lying on back → position chin up,
  tell patient to look up,
  inject at 6 o’clock,
  after cryotherapy
3. SUPPORT BREAKS

KEY - Single intravitreal gas bubble technique

- Inject into the gas bubble
- Inject small amount (0.1ml) gas
- Pull needle externally/back 1mm
- This positions the needle into the intraocular bubble so remaining gas is injected into bubble
- Controlled, even slow injection, like PFCL
- 1ml syringe
Inject gas – uppermost point of eye, into bubble

FIGURE 8-5. A: Incorrect orientation of the needle during gas injection resulting in multiple, small gas bubbles or “fish eggs.” B: Correct orientation of the needle being in the uppermost part of the eye, vertical with respect to the ground, and pulled back slightly. A single gas bubble is obtained.
3. SUPPORT BREAKS
KEY - Single intravitreal gas bubble technique
3. SUPPORT BREAKS

Single intravitreal gas bubble technique
Internet pictures - Consider patient and head position? Which quadrant to inject gas?
Inferior Gas Injection with patient sitting up

AVOID!
How to resolve multiple gas bubbles aka fish eggs

- Inject correctly
- Position face down/nose to floor x 3-4 hours, then position to close the break
- **DO NOT FLICK THE EYE**
- If a bubble gets into the break, continue positioning to close the break—it will work its way out in 1-2d
Overall PR procedure

- Careful dilated retina exam and consent
- Procedure room
- SC 2% lido (no epi) at cryo site and gas site (6 oclock)
- Lid speculum in
- Cryotherapy
- Lid speculum out
- Draw up 100% SF6
- Explain head positioning (1 and 2)
- Lid speculum in
- Betadyne
- Position 1-head flat-paracentesis remove 0.1 (phakic), more pseudophakic
- Position 2 (chin up/look superiorly)-gas injection technique with sterile q-tip
- Position 1-paracentesis
- Betadyne, wash off
- Roll on side, sit up, IOP check, ointment, patch, ADIOS
Any procedure questions?
Extreme Case - 10/21/13
Complications of PR

• Majority complications of PR are AVOIDABLE with proper technique & patient cooperation

• Experience in choosing patients & with procedure
• learning curve
• practice
Complications of PR: Failure of PR

- persistent vitreous traction → new breaks
- known vitreous disorder, abnormal appearing vitreous
- PLAN - consider alternative procedure if obvious vitreous traction on break

- missed breaks
- PLAN - Lincoffs rules for location of retinal break in RD
Complications of PR: Procedure

• Cryotherapy
• Gas
• Paracentesis
• Intravitreal injection
Complications of PR: Cryotherapy

- subretinal or intraocular hemorrhage
- crack/new break at edge of cryotherapy
- Pigment dispersion during cryotherapy $\rightarrow$ PVR

- PLAN - Brief intraocular cryotherapy uptake
- Do not move the cryo probe until completely thawed
- avoid heavy cryotherapy, excessive indentation esp in myopes
- Avoid cryotherapy in bed of break
Complications of PR: Cryotherapy

- Overly posterior placement cryoprobe → missed border of break
- PLAN - proper position of cryoprobe
- use striations on the probe
- avoid shaft depression
- beware of parallax

- Lid hypopigmentation
- PLAN - use lid speculum, be aware of hand position
Complications of PR: Paracentesis

- AC hemorrhage
- from IOP fluctuation, inadvertent iris trauma

- PLAN- avoid hypotony or large IOP fluctuation
- consider 2 paracentesis esp. if phakic
- BEVEL of 30 g needle up
- -If pseudophakic, paracentesis bevel up & needle over center of lens to avoid vitreous incarceration if capsule not intact
- -If phakic, paracentesis over iris
Complications of PR: Gas

- Gas Malposition
  - Subretinal
  - pars plana
  - anterior chamber
  - subconjunctival
Subretinal gas

- **Cause**
  - Small bubbles aka Fish Eggs
  - Proper injection technique to avoid fish eggs

- **Risk Factors**
  - Size of breaks
  - Traction on break
  - Incorrect injection procedure
Inject gas into most superior part of eye to inject into the bubble

**FIGURE 8-5.** A: Incorrect orientation of the needle during gas injection resulting in multiple, small gas bubbles or “fish eggs.” B: Correct orientation of the needle being in the uppermost part of the eye, vertical with respect to the ground, and pulled back slightly. A single gas bubble is obtained.
Do not inject gas in the quadrant where the RD is bullous.
Prevention of Subretinal gas

- 1-inject uppermost quadrant
- 2-needle vertical
- 3-Shallow depth
- 4-controlled injection into the bubble
- 5-Inject away from tear
How to resolve multiple gas bubbles/fish eggs

- Inject correctly
- Position face to floor x 4-6 hours
  - bubbles coalesce
  - then position to close the break
- DO NOT FLICK THE EYE
- If small bubble gets into break, continue positioning to close the break, it will work its way out in 1-2d
- If breaks small, unlikely for small bubble to get under retina
Subretinal Gas Management

- Diagnose Early
- Coax through break
  - Position break superiorly
  - Massage
- Small Bubble - leave it alone
- Large bubble - vitrectomy (rare)
‘Pars Plana/Anterior Hyaloid’ Gas

- Anatomy: Canal of Petit
- Diagnosis: Bagel Sign, Gas Immobility
Needle Fails To Penetrate Anterior Hyaloid Face
Management of Pars Plana Gas

1. PREVENTION - put needle in deeper

2. Position Face Down x 6 hours!!!
   - Gas breaks through anterior hyaloid face
   - SUCCESSFUL!!!!

3. Remove and re-inject gas if fear the macula will detach
   #27 needle, Plunger removed
Complication - Gas displacing fluid into macula

The bubble pushes and displaces SRF beneath the macula
Prevention: Steamroller To Prevent Macular Detachment
Paracentesis Complication: Peaked Pupil

Prevention-use 30g small needle,
Do pre and post gas parcentesis
Anterior Chamber Gas

• Cause:
  – Single PCTN After Gas Injection
  – Face up position

• Prevention AC Gas:
  – Tilt Head a Little
  – PCTN BEFORE Gas Injection

• Management:
  – Position face down to put gas into vitreous cavity
  – Rarely remove/replace
Subconjunctival Gas

• **Cause:** Needle track
  – Look for vitreous wick
  – Check for a tear

• **Prevention:**
  – Don’t overfill
  – Cotton Tip

• **Management:**
  – Leave alone
  – Remove and add more gas
Vitreous to limbus

• Cause:
  – open posterior capsule

• Prevention:
  – Bevel towards cornea
  – Stop when fluid no longer enters TB PCTN syringe
  – Position over the center of IOL

• Vitreous incarceration in pars plana
  – Usually NO problem, avoid by performing a PCTN
Summary

• Effective, highly successful procedure

• Minimal complications
  – Most avoidable

– Any questions?