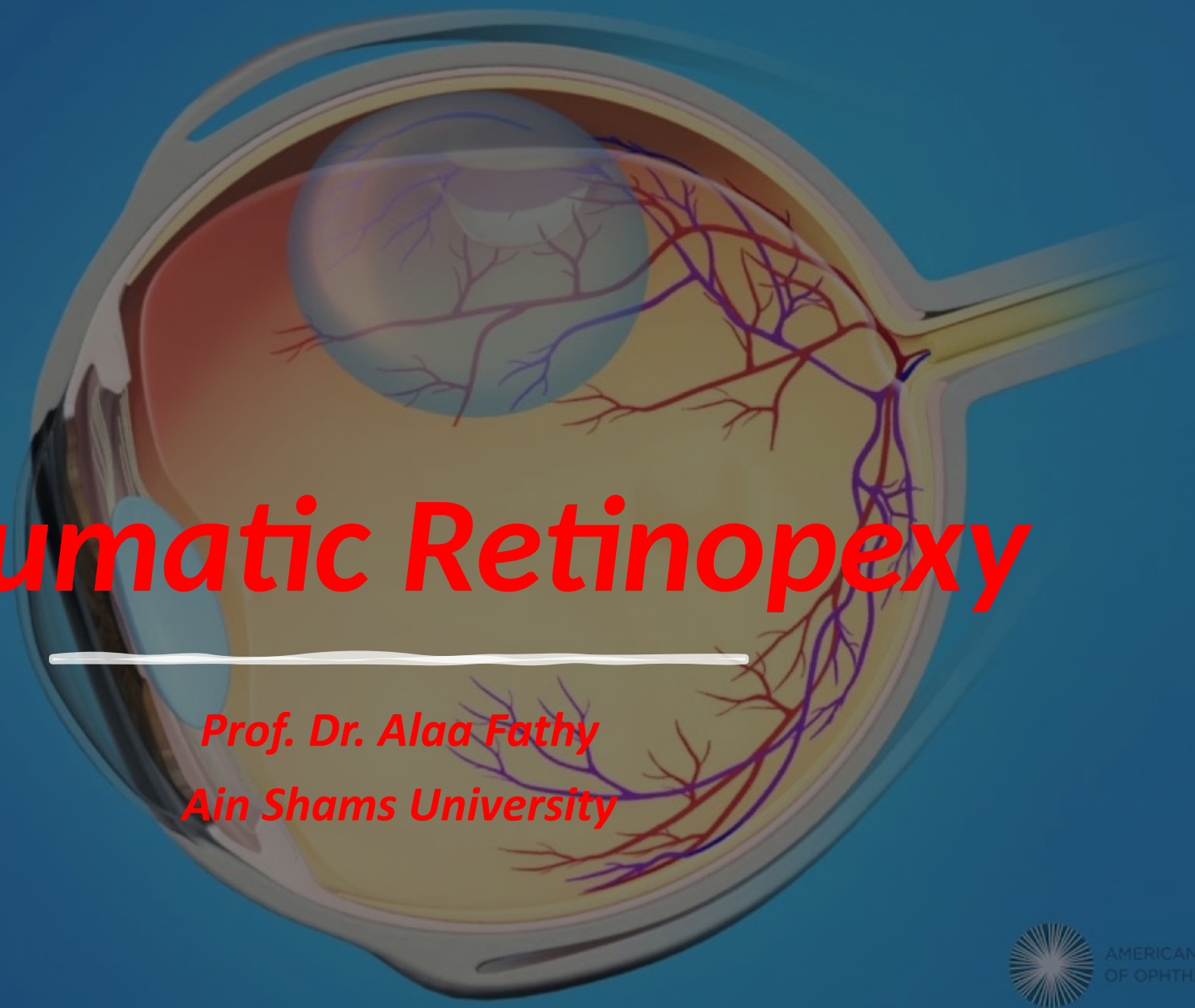




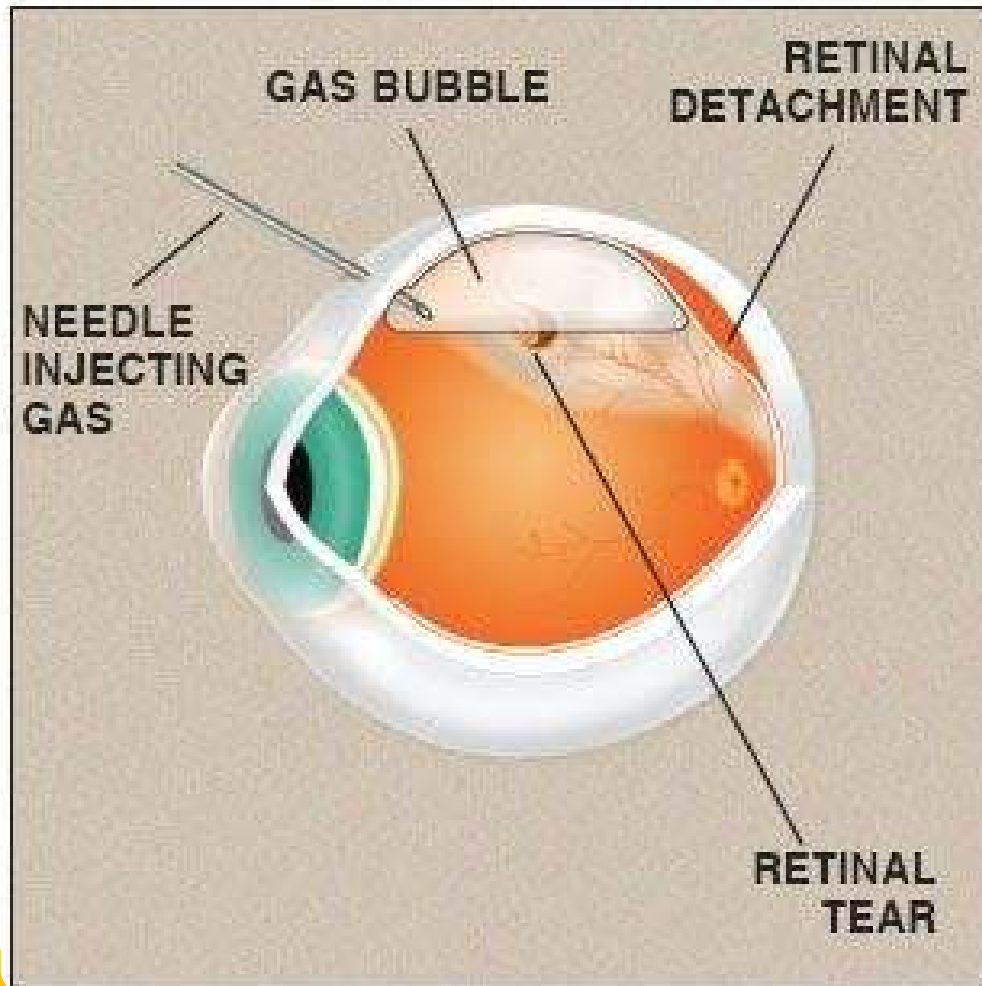
Pneumatic Retinopexy

*Prof. Dr. Alaa Fathy
Ain Shams University*

PNEUMATIC RETINOPEXY

- *Pneumatic retinopexy (PR) is a minimally invasive procedure for repairing uncomplicated rhegmatogenous retinal detachment.*

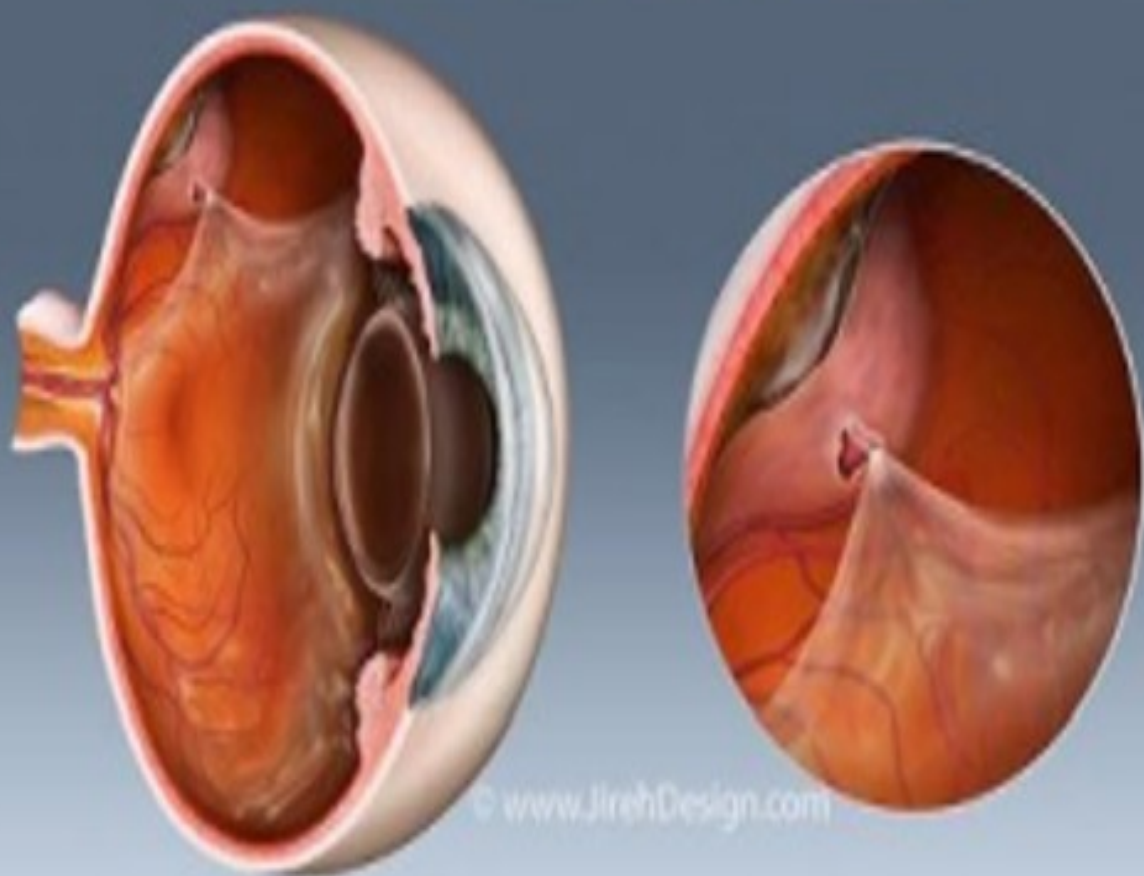




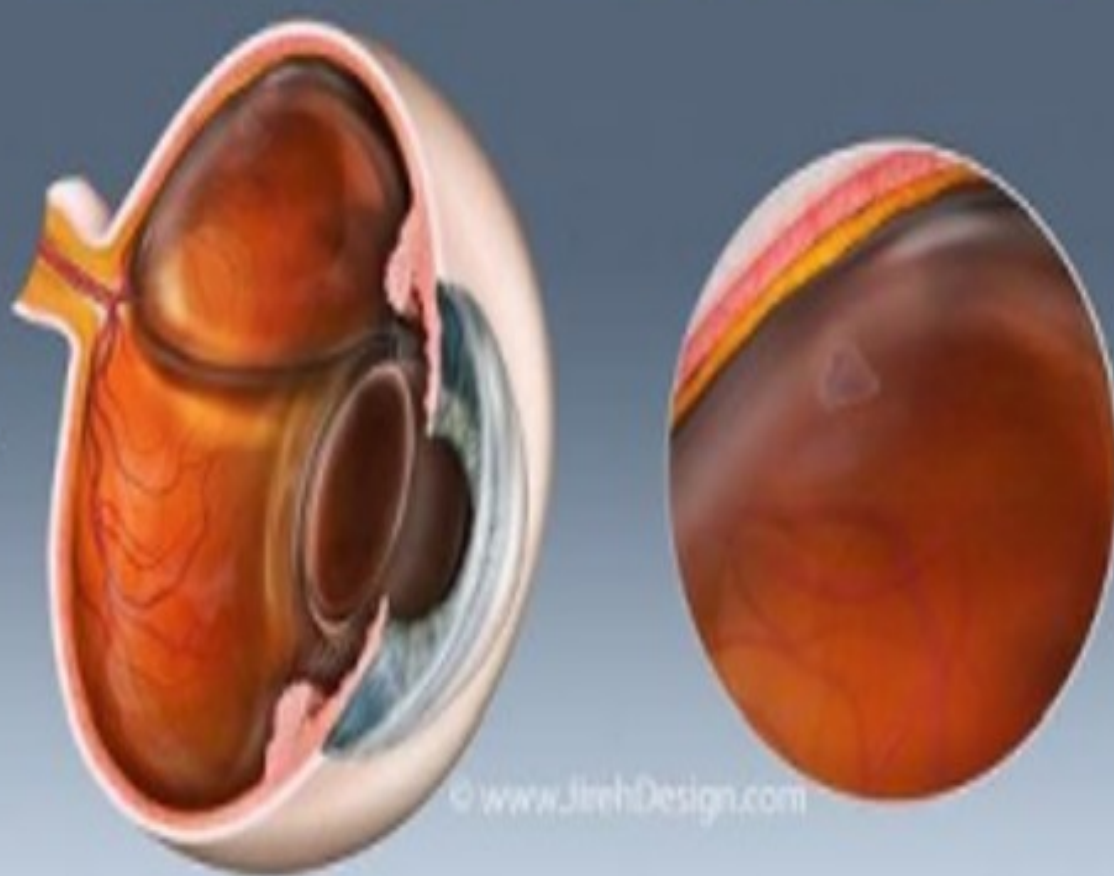
- ***PR involves the injection of an intravitreal gas or air bubble to tamponade the retinal break(s), coupled with laser retinopexy or cryoretinopexy to seal the break site(s).***
- ***This two-step procedure facilitates apposition of the retina by means of the eye's innate ability to resorb subretinal fluid .***

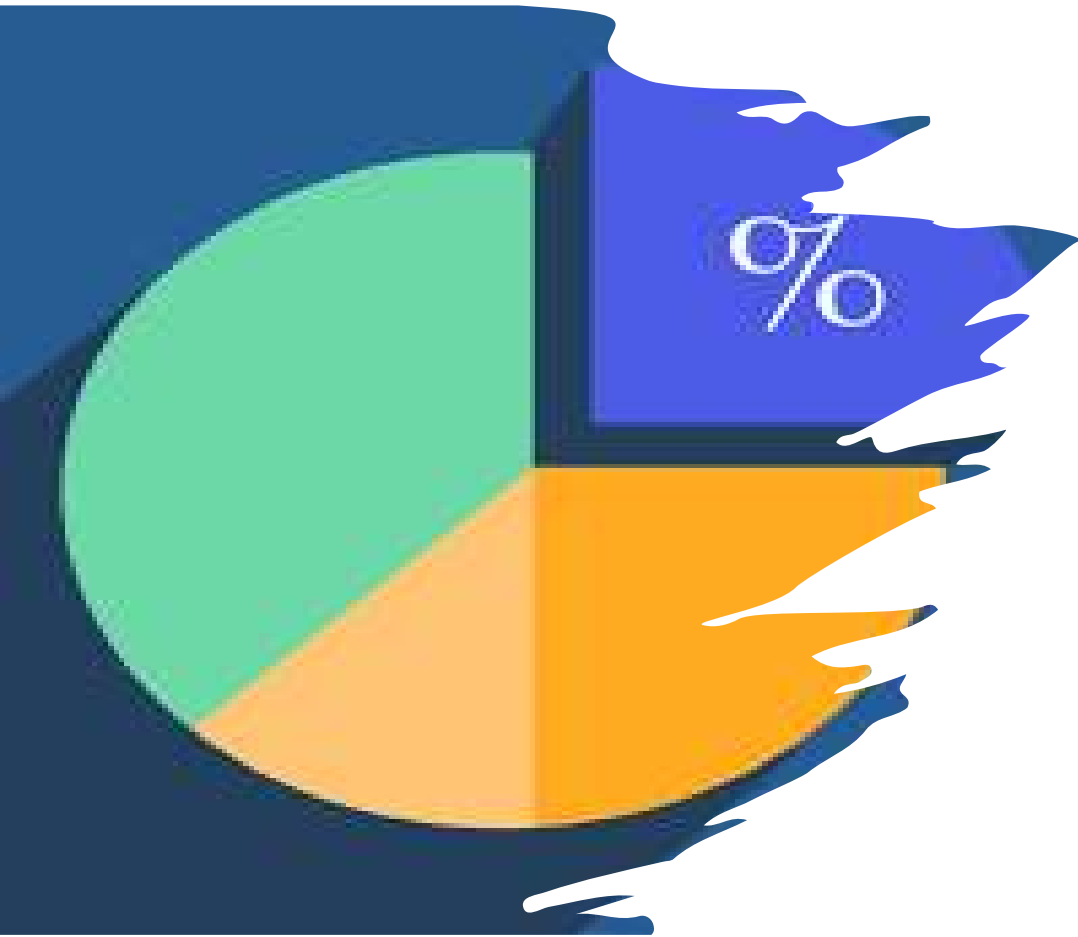
PNEUMATIC RETINOPEXY

Posterior vitreous detachment
with retinal tear & detachment

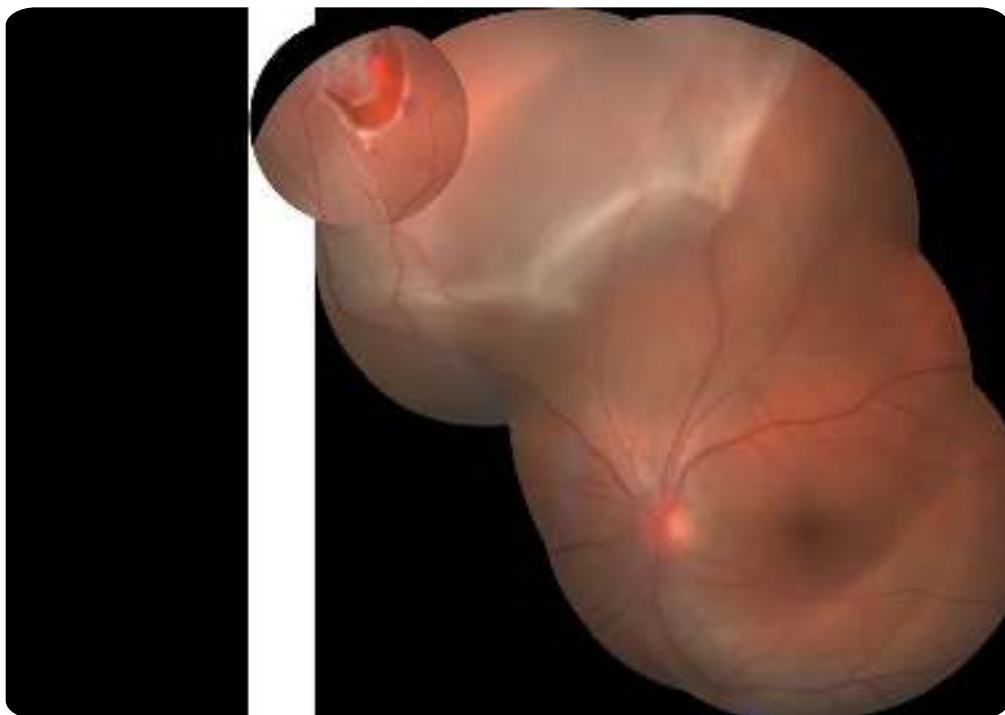


Post-operative pneumatic retinopexy
Gas bubble presses retina flat, tear closed & dry





- *PR is used to treat up to 15% of all retinal detachments in the United States.*



Indications

- *Single retinal breaks no larger than 1 clock hour or a group of smaller breaks within the same quadrant of the fundus involving the superior 8 clock hours in phakic or pseudo-phakic eyes with no proliferative vitreoretinopathy.*

- *The patient's overall physical and cognitive health, as well as social environment and lifestyle, should allow for postprocedural head positioning such that the injected gas bubble remains over the retinal break(s).*

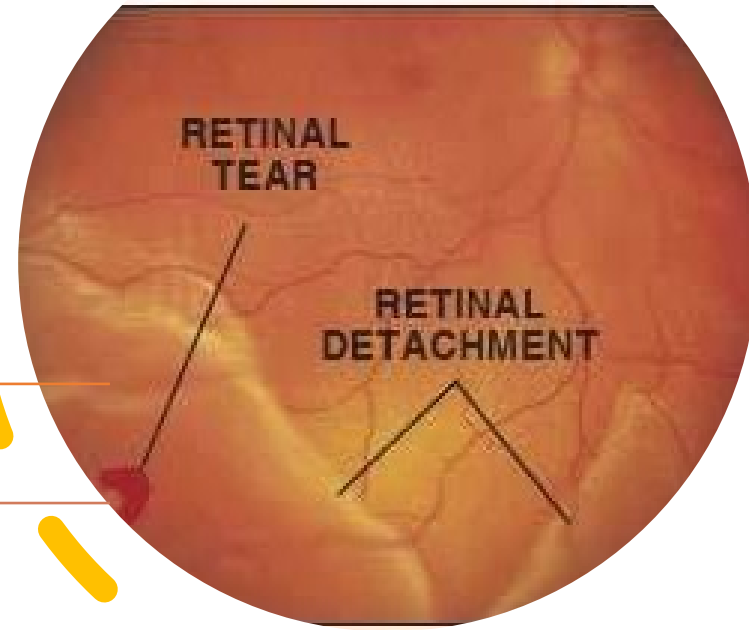
Contraindications

Inferior break

an inferior break (inf.4 clock hours is a general contraindication to PR. Even under maximal intravitreal expansion, the gas bubble may not cover the inferior retina with standard post-PR positioning.

Advanced glaucoma

Despite the use of anterior chamber paracentesis as part of the procedure, there is a risk for a spike in IOP with injection of gas into the vitreous cavity. Thus, advanced glaucoma may be a relative contraindication to PR.



Proliferative vitreoretinopathy (PVR)

- *Extensive PVR (grade C or D) with retinal traction may result in persistent RD despite adequate gas tamponade of the causative break.*

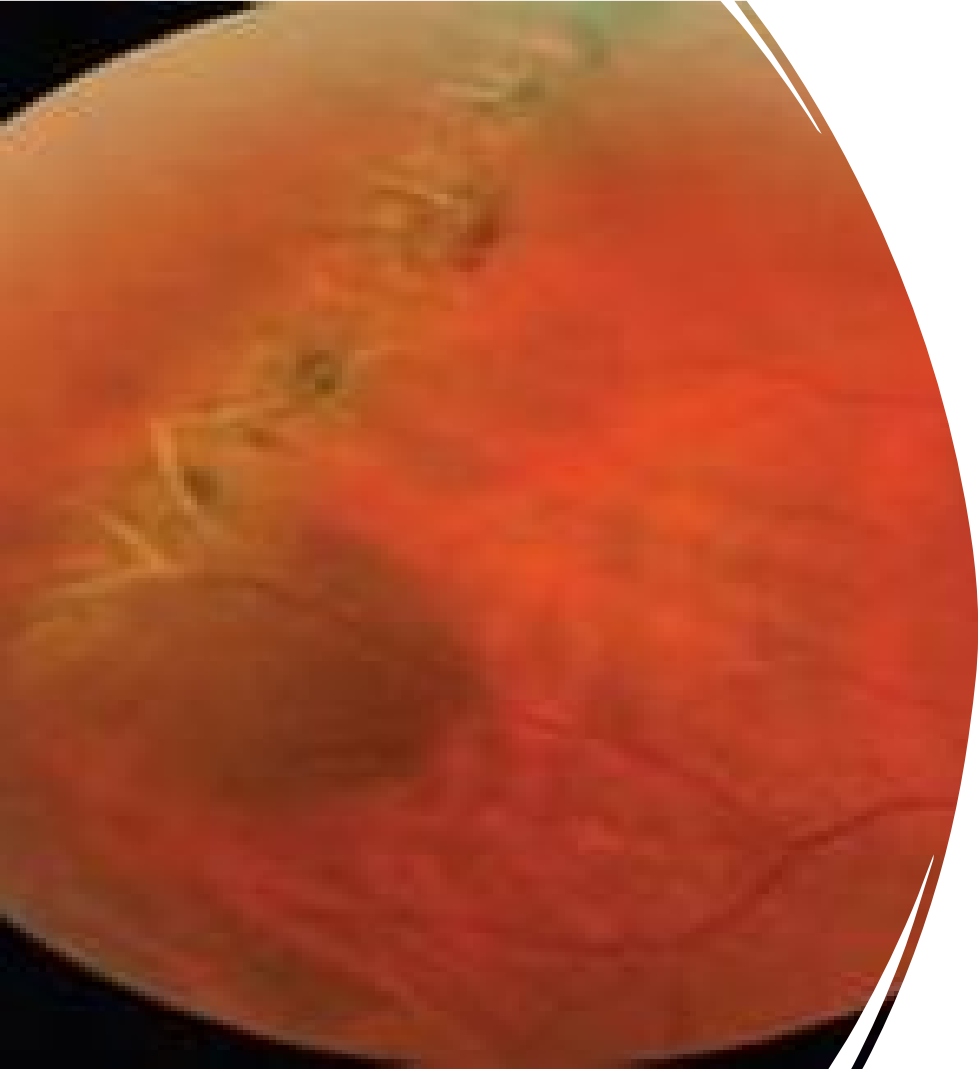


Lens status.

- *PR should be avoided in patients with lens instability or aphakia because of the potential migration of the gas bubble into the anterior chamber and poor tamponade of the retinal break(s).*

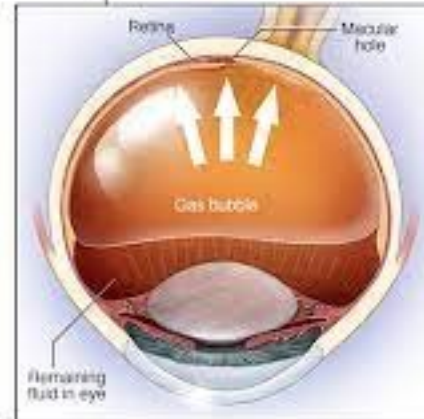


Lattice degeneration



-
- *Extensive lattice degeneration, however, may represent an increased risk for new retinal breaks and is considered a contraindication by some surgeons.*

Disabilities preventing adequate head positioning



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Single break
spanning >1 clock-
hour of the retinal
arc.

Multiple breaks
spanning >3 clock-
hours of the
retinal arc

Selection of Tamponade Agent

- *The tamponade agent for PR is selected based on the size and duration of the bubble needed to sufficiently cover all retinal breaks.*

-



Selection of Tamponade Agent

- ***Sulfur hexafluoride gas (SF_6) is commonly used as a tamponade agent in PR.***
- ***Perfluoropropane gas (C_3F_8) is more expansible and has a longer duration of action compared to SF_6 .***
- ***Therefore, C_3F_8 may be preferable for the treatment of larger retinal breaks or multiple smaller breaks.***



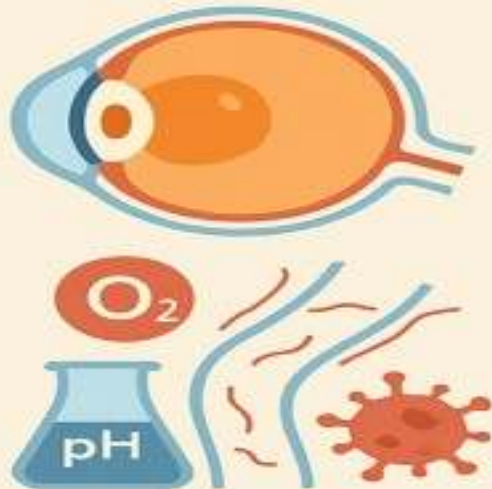
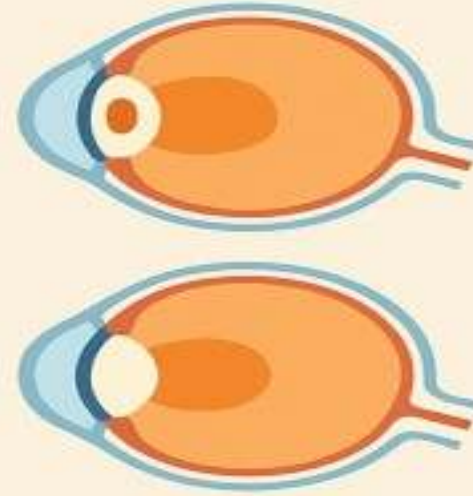
Air

- *For small breaks, filtered air can be used rather than gas, as air produces fewer biochemical and structural changes in the vitreous than does either SF6 or C3F8.*
- *However, because air bubbles do not expand within the vitreous cavity and have a shorter duration of action, the use of filtered air requires a larger-volume injection and, consequently, multiple paracenteses before and after injection to avoid post-injection elevation in IOP.*

GAS INJECTION IN THE EYE

STRUCTURAL CHANGES

- Intraocular Pressure Elevation
- Vitreous Cavity Replacement
- Retinal Flattening and Tamponade
- Lens and Corneal Effects



BIOCHEMICAL CHANGES

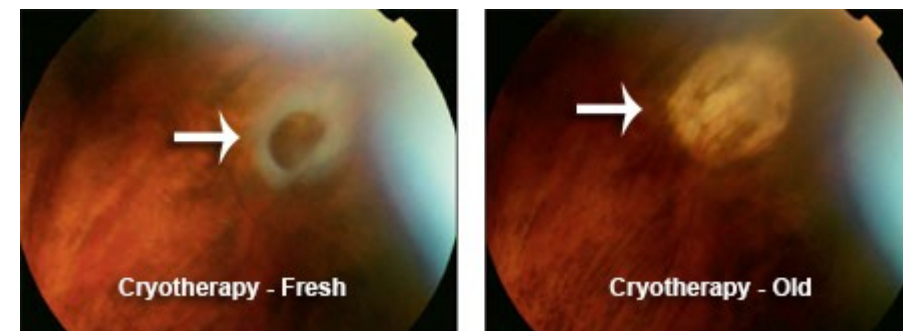
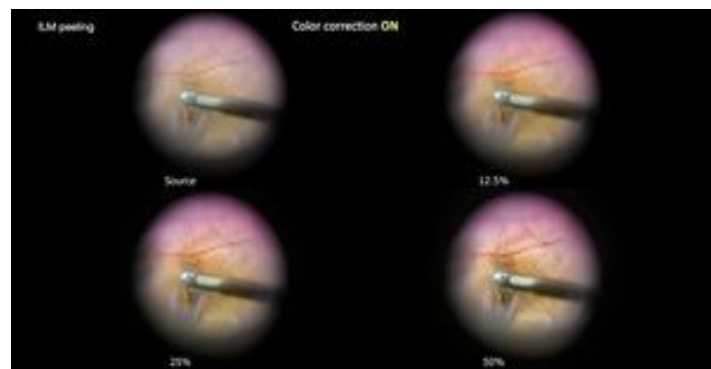
- Altered Oxygen Tension
- pH and Metabolic Changes
- Inflammatory Response
- Barrier Disruption

Surgical Technique



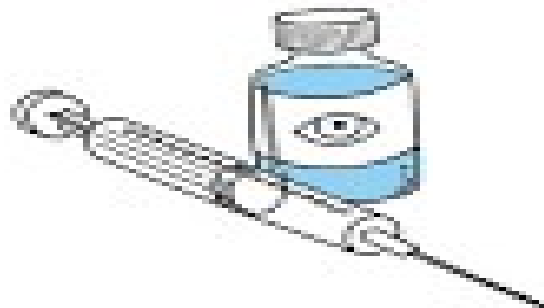
- *Carefully examine the eye with indirect ophthalmoscopy and scleral depression to identify areas of pathology.*

- Perform cryoretinopexy. (Note: Alternatively, retinopexy can be performed using laser photocoagulation once retinal apposition has been achieved after gas injection.)

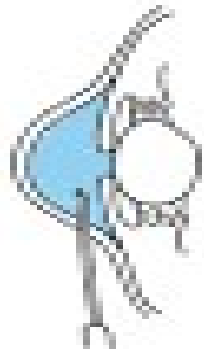


- Filter perfluoropropane gas (C_3F_8), sulfur hexafluoride gas (SF_6), or air into a tuberculin syringe on a 30-g needle.
- Perform an anterior chamber paracentesis to remove 0.1 to 0.25 mL of aqueous humor.

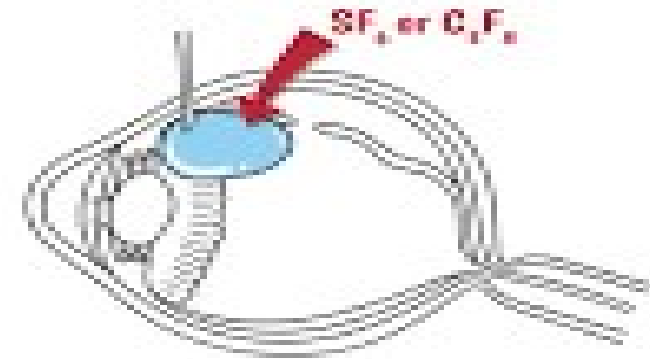
1. LOCAL ANESTHETIC



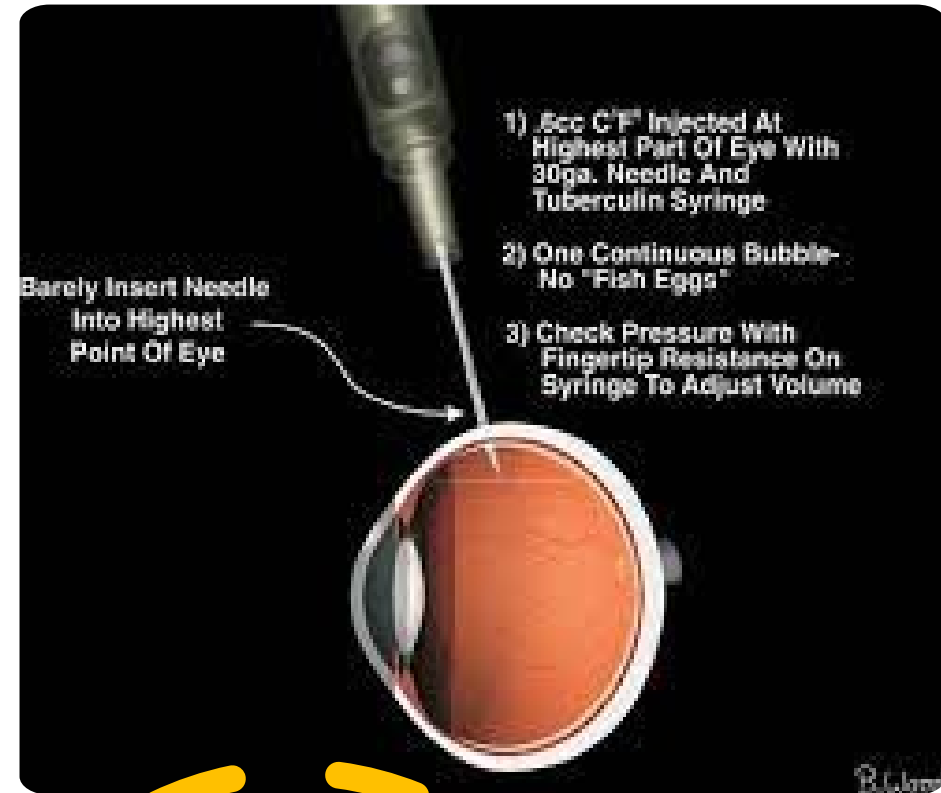
2. PARACENTESIS



3. INJECT GAS



- ***Select a site perpendicular to the sclera, farthest away from the site of the underlying detachment, and enter 3 to 4 mm from the limbus.***
- ***Withdraw the needle so that only its tip remains in the vitreous cavity, then carefully inject C3F8 (0.2-0.3 mL), SF6 (0.5-0.6 mL), or filtered air (0.8 mL), making sure that the needle tip is not in the suprachoroidal space.***



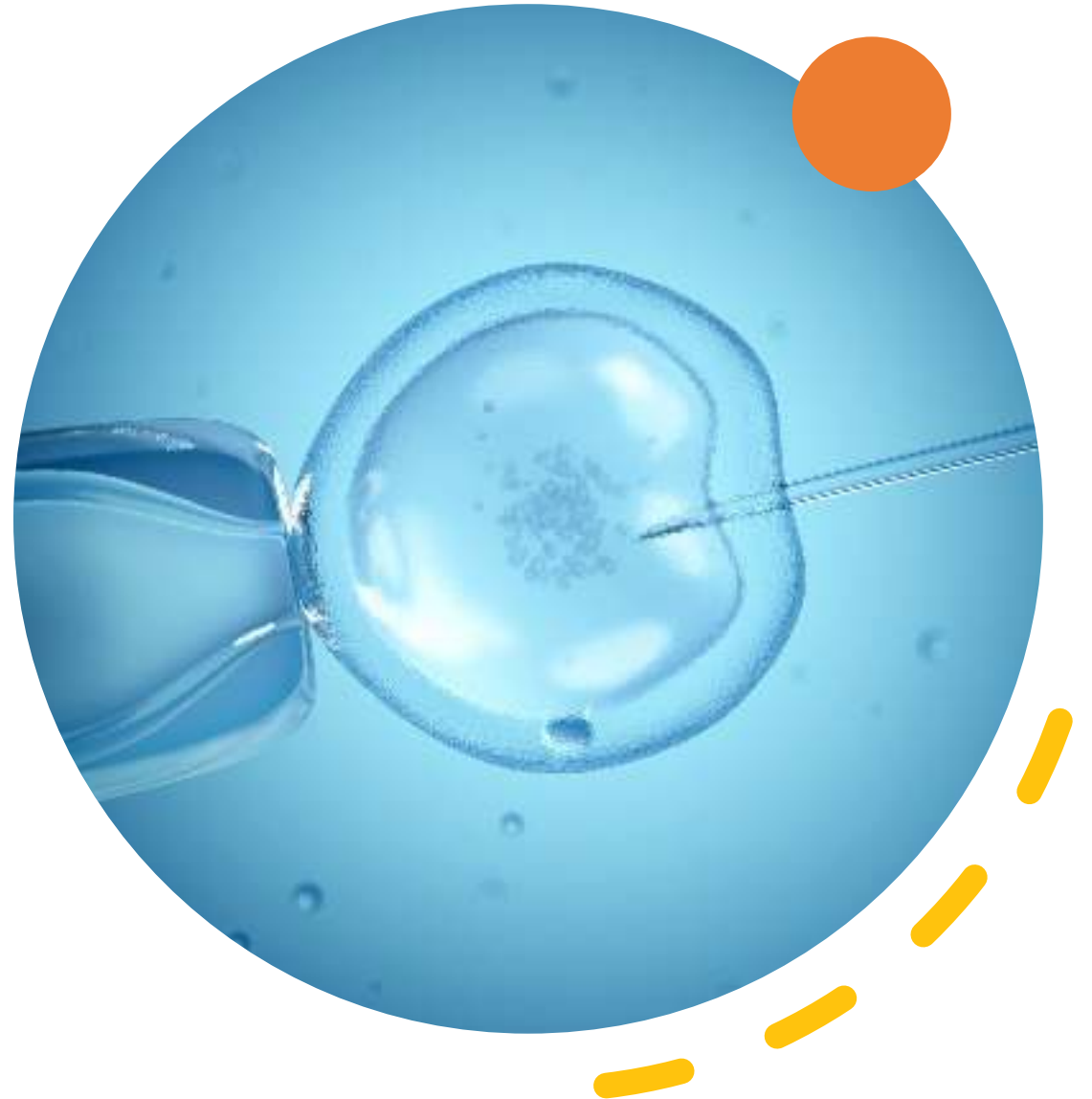
Pearl

- *at least three-quarters of the needle should be withdrawn prior to injection. This makes it easier for the gas emerging from the shaft to enter the vitreous cavity as a single coalesced bubble.*



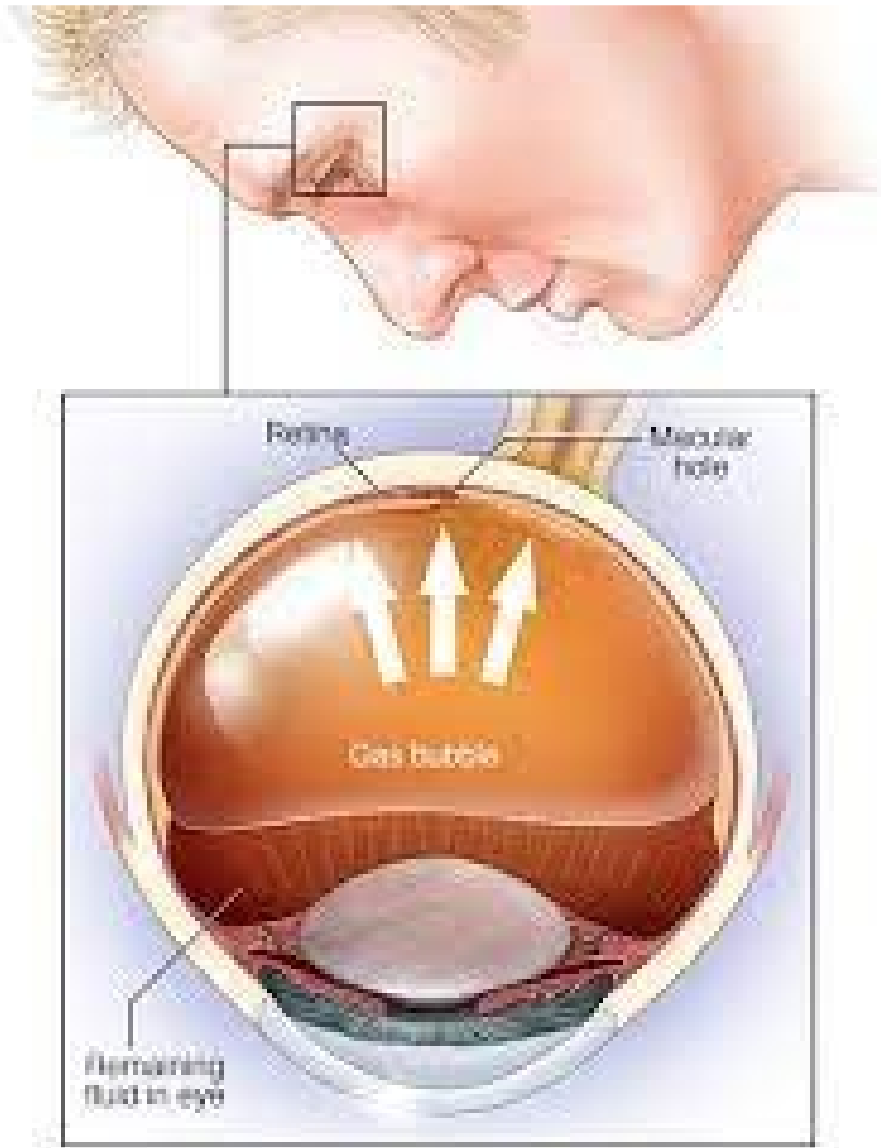
Pearl

- *Proper gas injection technique and careful indirect ophthalmoscopy are essential for preventing formation of fish-egg bubbles.*
- *If small bubbles do form, light strokes on the sclera with a cotton-tipped applicator may break the surface tension of the bubbles.*

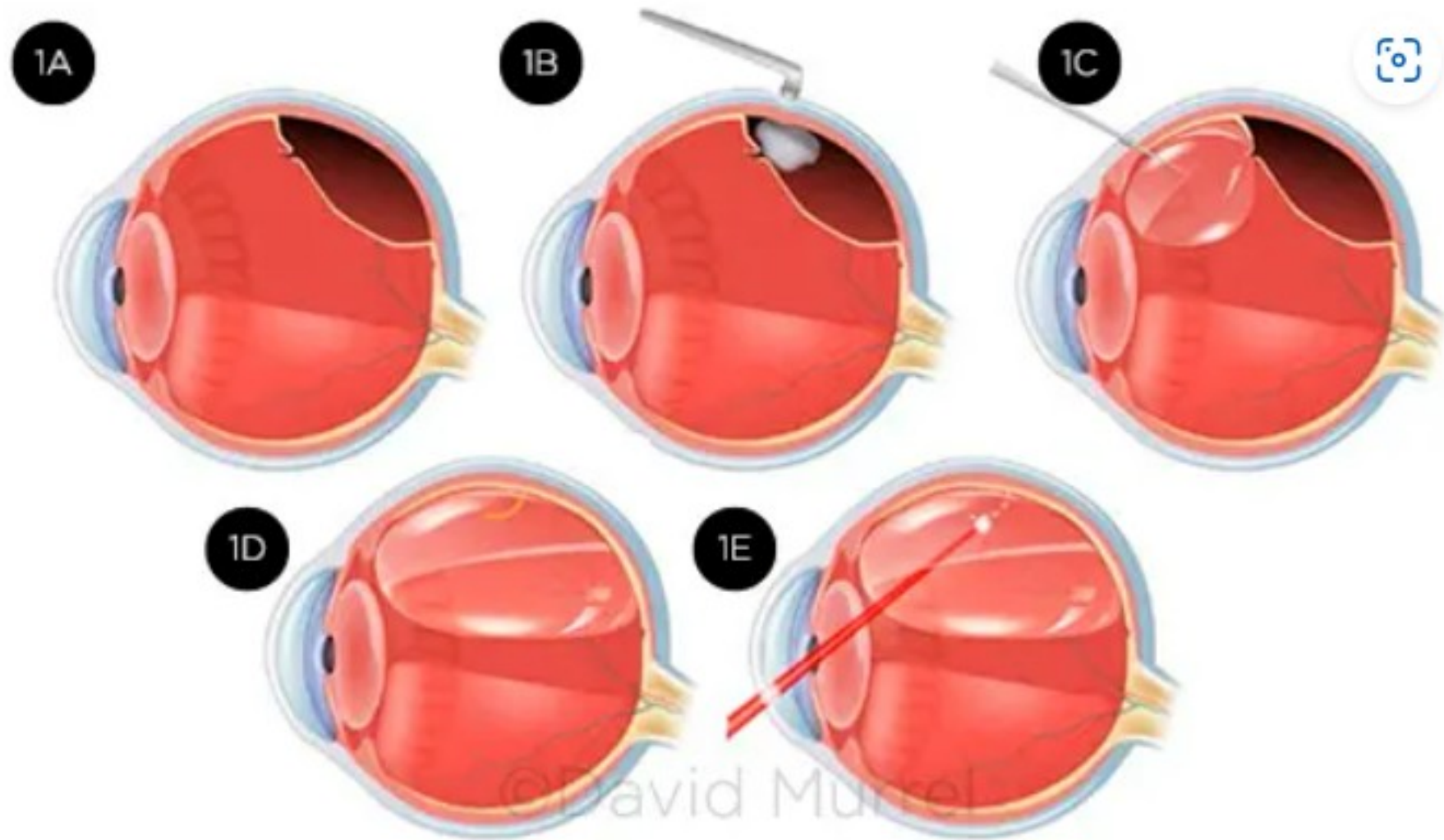


-
- *Press gently on the injection site while rotating the patient's head in the same direction of the injection so that air or gas moves to the opposite equadrent.*



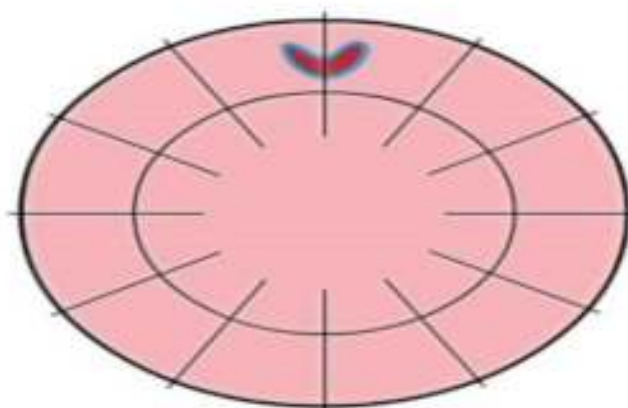


- ***Re-examine with indirect ophthalmoscopy to confirm perfusion of the central retinal artery (repeat paracentesis if arterial pulsations are absent).***
- ***Review head positioning and gas bubble precautions with the patient, with attention to later expansion of the gas bubble.***



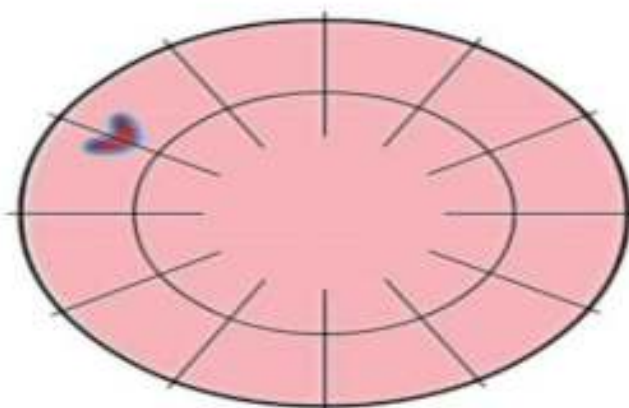
then

12 O'CLOCK



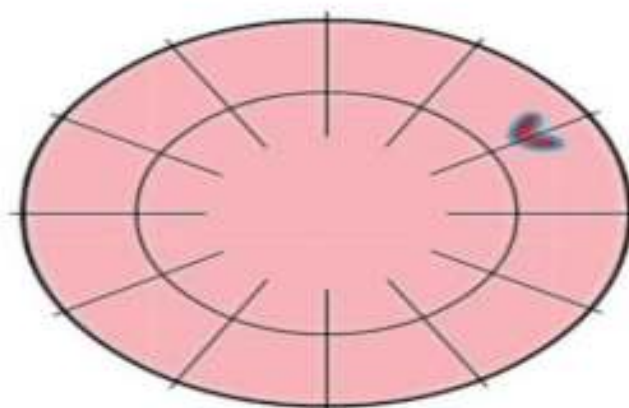
0° UPRIGHT

10 O'CLOCK



45° LEFT

2 O'CLOCK



45° RIGHT

Complications

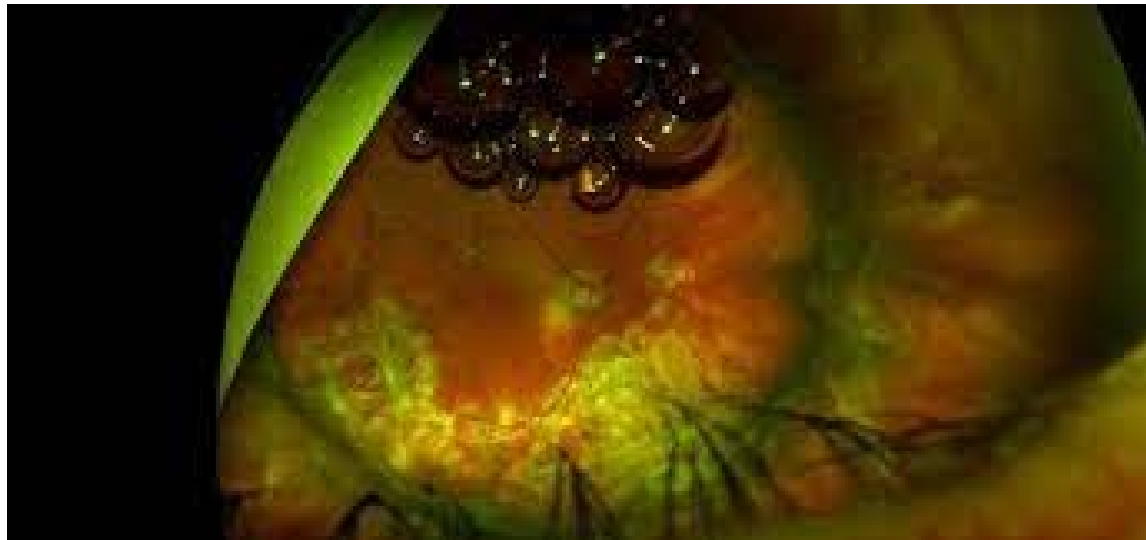


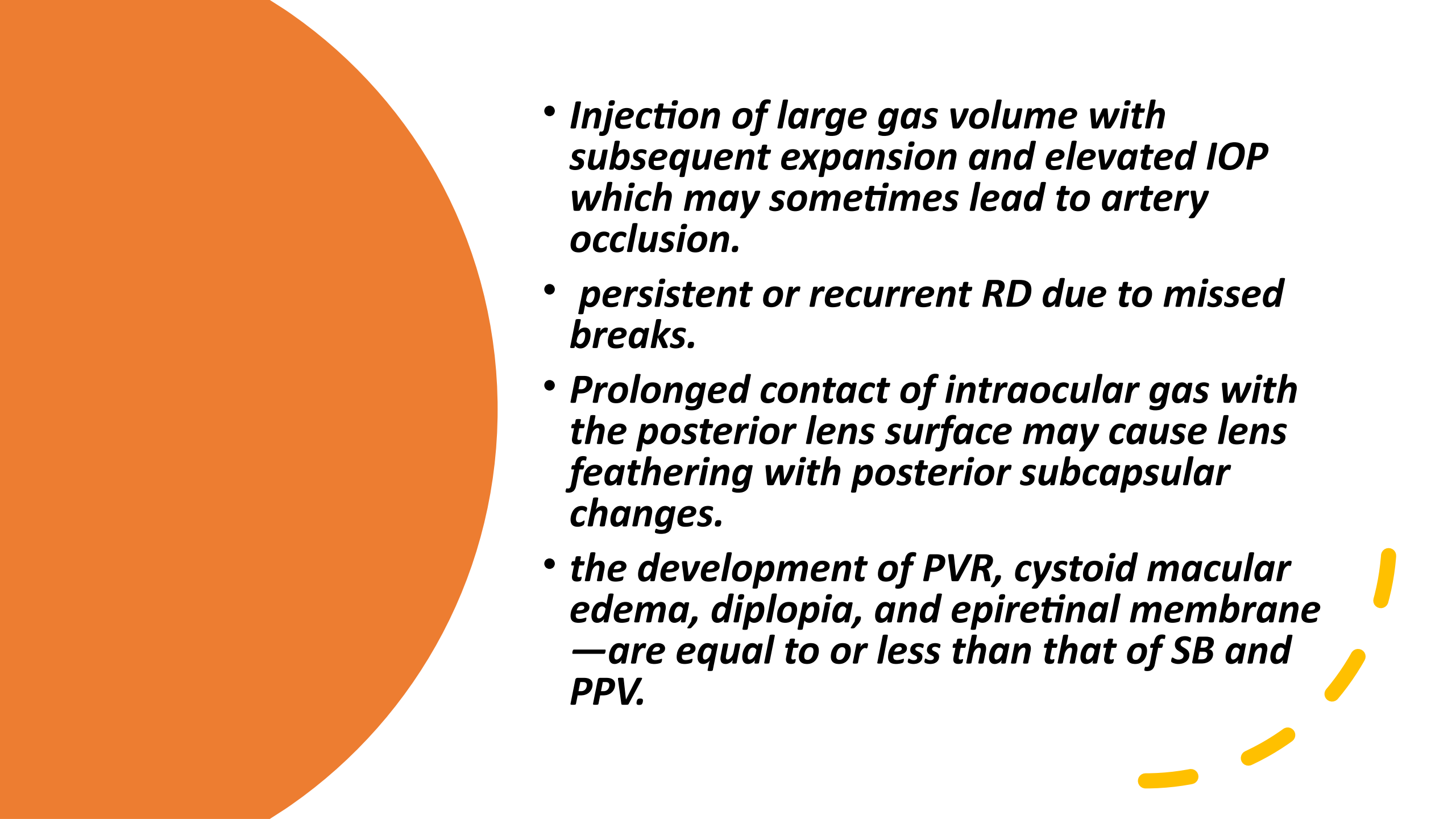
Vitreous displacement:- It is not uncommon for the expansile gas bubble to move and displace the vitreous.



This displacement may create new breaks or reopen a break that was just treated, either of which may lead to failure of reattachment.

The formation of smaller gas bubbles (“fish eggs”), which have the potential to enter the subretinal space through the existing retinal break(s).



- 
- *Injection of large gas volume with subsequent expansion and elevated IOP which may sometimes lead to artery occlusion.*
 - *persistent or recurrent RD due to missed breaks.*
 - *Prolonged contact of intraocular gas with the posterior lens surface may cause lens feathering with posterior subcapsular changes.*
 - *the development of PVR, cystoid macular edema, diplopia, and epiretinal membrane —are equal to or less than that of SB and PPV.*

Advantages

PR has demonstrated rates of final reattachment comparable to those reported in SB and primary PPV. .

Can be done as an office-based procedure.

When done in the OR , PR does not use systemic anesthesia or sedation.

It eliminates or reduces the general discomfort and morbidity associated with surgery.

Advantages

PR also provides a substantial cost benefit, with an estimated cost that is between 25% and 50% of that of PPV and SB (individually or in combination).

For scenarios in which PPV or SB surgery is warranted—such as in cases of RRD complicated by PVR of grade C or D—but access to vitreoretinal surgical facilities is limited, PR may maintain macular attachment until the appropriate surgical team and resources can be allocated.

Disadvantages

Good patient cooperation and appropriate case selection with postprocedural head positioning are essential for successful outcome.

Successful PR requires a high degree of surgical skill, and experience with indirect ophthalmoscopy and retinopexy.

The procedure becomes increasingly difficult when dense cataract, vitreous hemorrhage, or other media opacity obscures the identification of retinal breaks.

Conclusion



PR is a safe, low-cost, well-tolerated procedure that is often underutilized.



Successful outcome is primarily dependent on a thorough retinal examination that identifies all breaks and on careful patient selection.

Thank You!

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