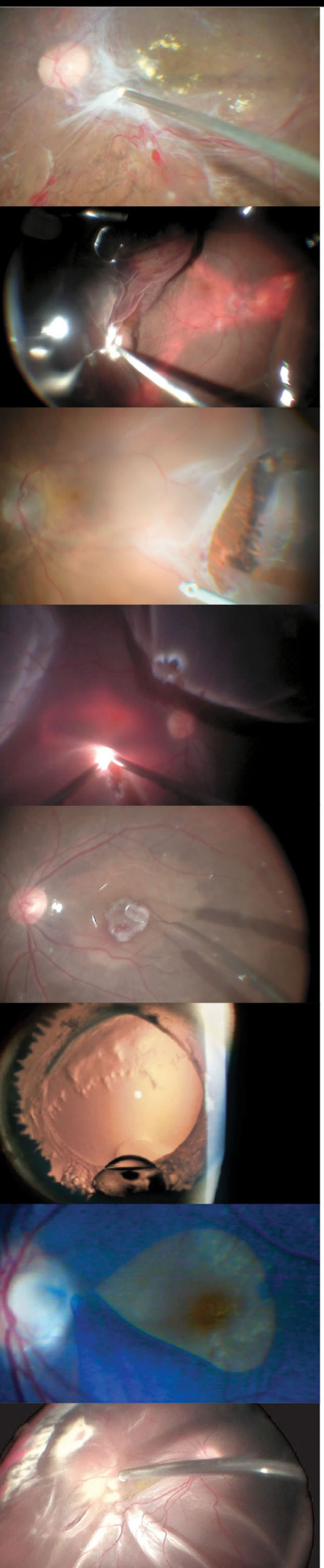
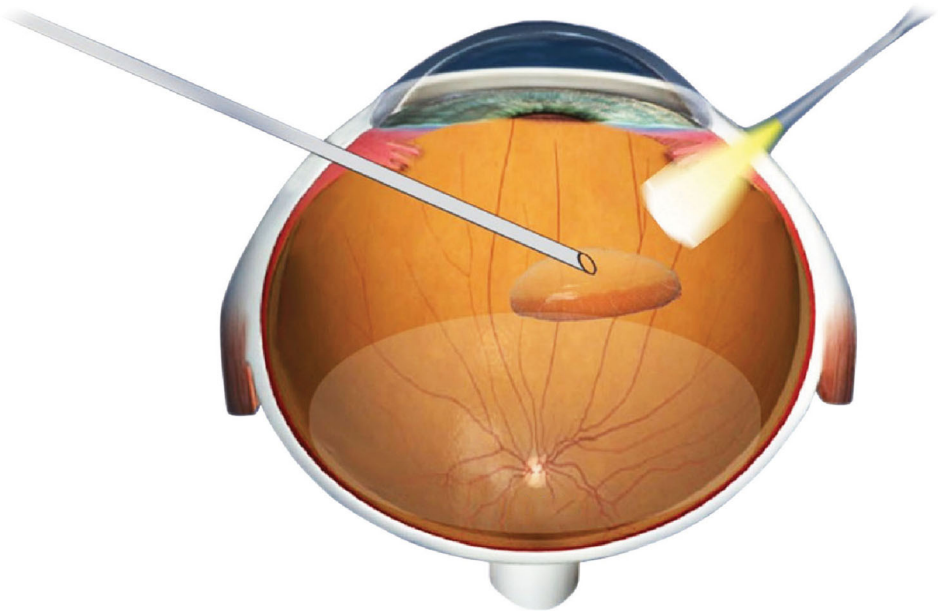
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Retina and Vitreous Surgery

A Practical Guide to Theory, Practice & Management

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2nd Edition

JAYPEE

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CHAPTER 24

Managing Complications of Vitreoretinal Surgeries

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PREOPERATIVE COMPLICATIONS

Globe Perforation from Peribulbar/ Retrobulbar Block *(Video 1, Chapter 24)*

Good safe anesthesia is essential for any intraocular surgery.

Conventional method for peribulbar block is injecting the anesthetic solution outside the muscle cone (Fig. 24.1A) and retrobulbar block, inside the muscle cone (Fig. 24.1B). Inferior injection is given at the junction of outer one-third and inner two-third of inferior orbital rim directing the needle towards the apex of orbital muscle cone. Superior injection is given nasally just above the medial cants along the supraorbital bony notch.

Globe perforation occurs from peribulbar or retrobulbar block.

Risk factors:

- High myope with elongated globe
- Thin sclera
- Faulty needle direction
- Uncooperative patients are also to be considered as the etiologies.

Intraocular damage due to:

- Mechanical retinal injury, development of retinal tear and detachment. Intraocular needle entry can cause primary entry break (Fig. 24.1C) and secondary break formation due to further retinal injury (Fig. 24.1D)
- Direct injury to optic nerve
- Sometimes toxic effects of anesthetic agents, administered intraocularly.

Clinically, the situation should be suspected in:

1. Cases with recent history of ophthalmic surgery under local anesthesia.
2. Hypotony.
3. No fundal glow.

On USG: There are vitreous tract formation, vitreous hemorrhage, sometimes retinal incarceration (Fig. 24.1E) and retinal detachment. Retinal incarceration at the entry site or exit sites can cause true foreshortening with tissue loss. In chronic cases, it may also shorten due to fibrous contraction associated with the healing process.

Simple laser barrage around the slit-like superior break sometimes save the eye in single break scenario (Fig. 24.1F).

Perforation with Vitreous Hemorrhage (Video 2, Chapter 24)

Animation: Intraocular entry of needle causes primary entry break and sometimes secondary break due to retinal injury.

Case discussion

- A case of status postcataract surgery with postoperative vitreous hemorrhage
- Primary entry break detected superiorly (Fig. 24.2A) and it was lasered (Fig. 24.2B).

Perforation with Vitreous Hemorrhage with Partial Retinal Detachment (Video 3, Chapter 24)

Case discussion

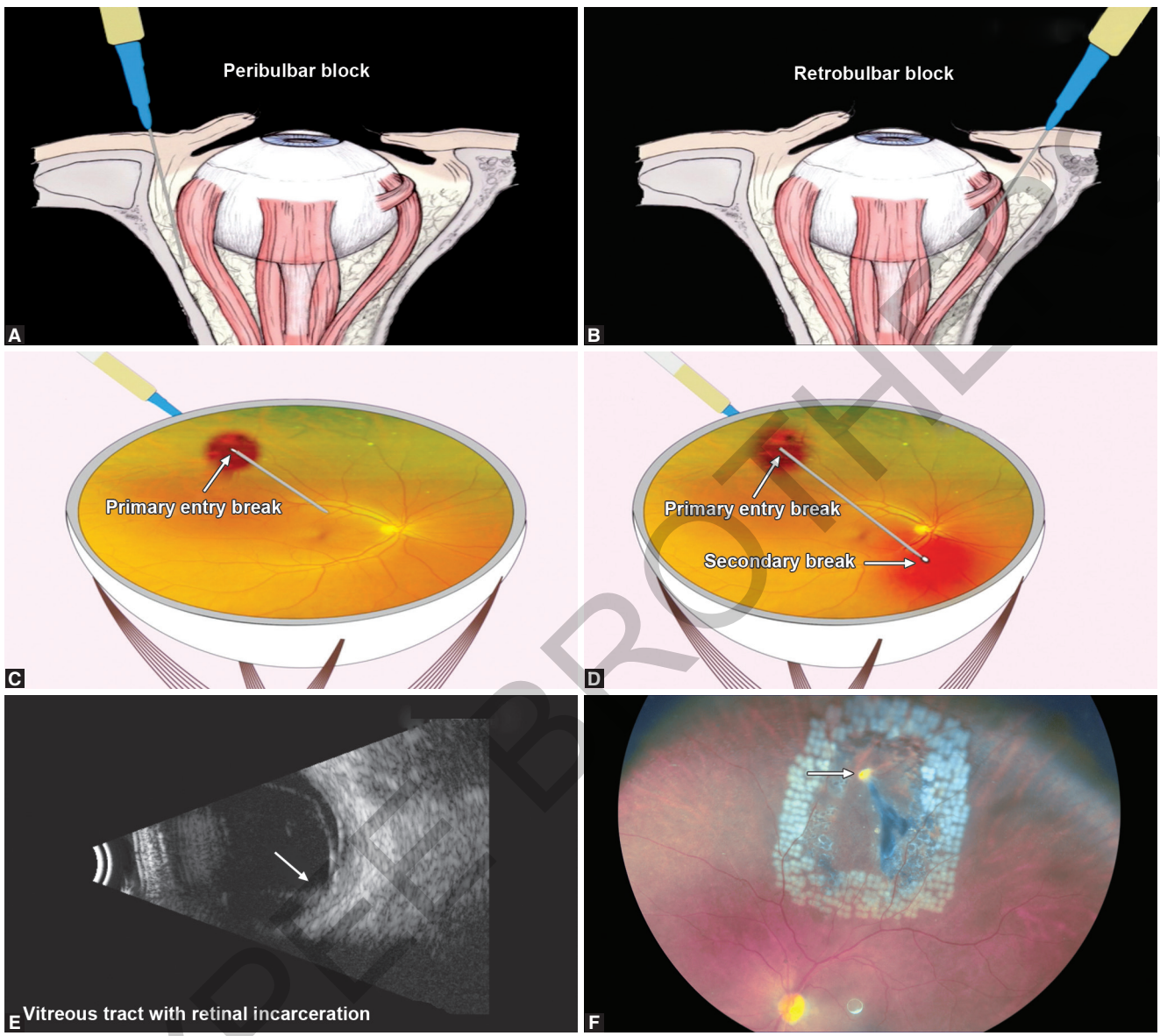
- A case of postcataract surgery vitreous hemorrhage (Fig. 24.3A) with partial retinal detachment in supero-temporal periphery
- Both primary entry (Fig. 24.3B) and secondary breaks (Fig. 24.3C) detected
- RD settled by FAX and breaks were lasered with long acting C_3F_8 gas injection (Fig. 24.3D).

Perforation with Vitreous Hemorrhage with Total Retinal Detachment (Video 4, Chapter 24)

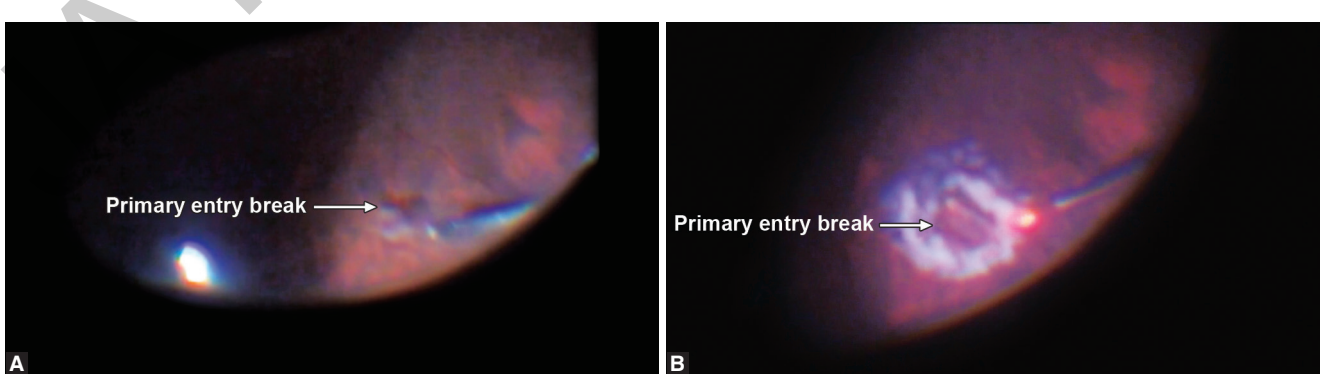
Globe perforation can lead to retinal detachment (Fig. 24.4A)

Case discussion

- A case of postcataract surgery vitreous hemorrhage with total retinal detachment

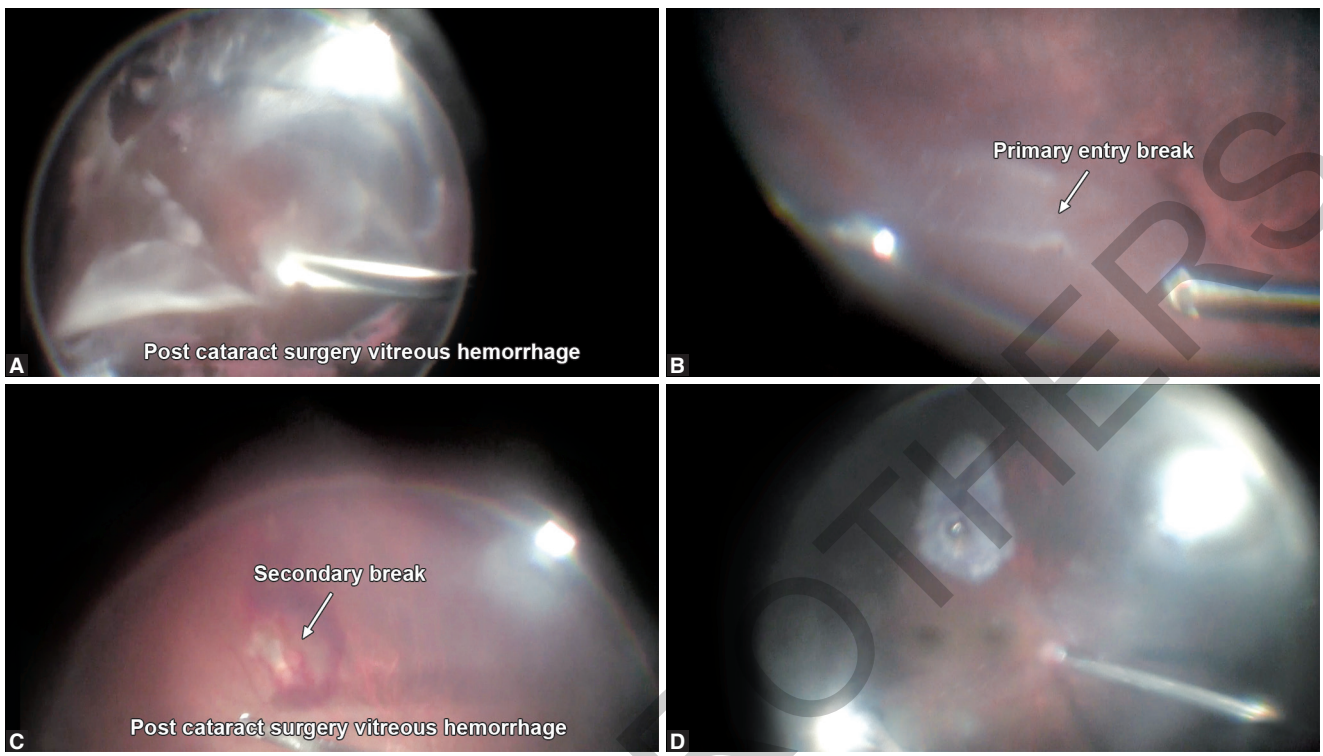


Figs 24.1A to F: (A) Peribulbar anesthesia; (B) Retrobulbar anesthesia; (C and D) Shows intraocular needle entry can cause primary and secondary break; (E) USG shows vitreous tract formation, vitreous hemorrhage and retinal incarceration in a case of globe perforation; (F) Sometimes laser barrage around the visible superior slit-like break saves the vision



Figs 24.2A and B: Needle entry break in a case of postcataract surgery vitreous hemorrhage

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Figs 24.3A to D: Intraoperative steps of surgery managing postcataract surgery vitreous hemorrhage with partial retinal detachment

- Multiple posterior pole secondary breaks, nasal to the optic disc detected (Fig. 24.4B)
- Primary entry was superior, suggesting the needle path (Fig. 24.4C)
- Retina settled with FAX (Fig. 24.4D) and all breaks were lasered (Fig. 24.4E)
- Silicone oil was used as endotamponade (Fig. 24.4F).

Perforation with Macular Break with Retinal Detachment (Video 5, Chapter 24)

- Needle can directly hit macula (Fig. 24.5A) due to globe perforation during periocular anesthesia, carrying very poor visual prognosis.

Case discussion

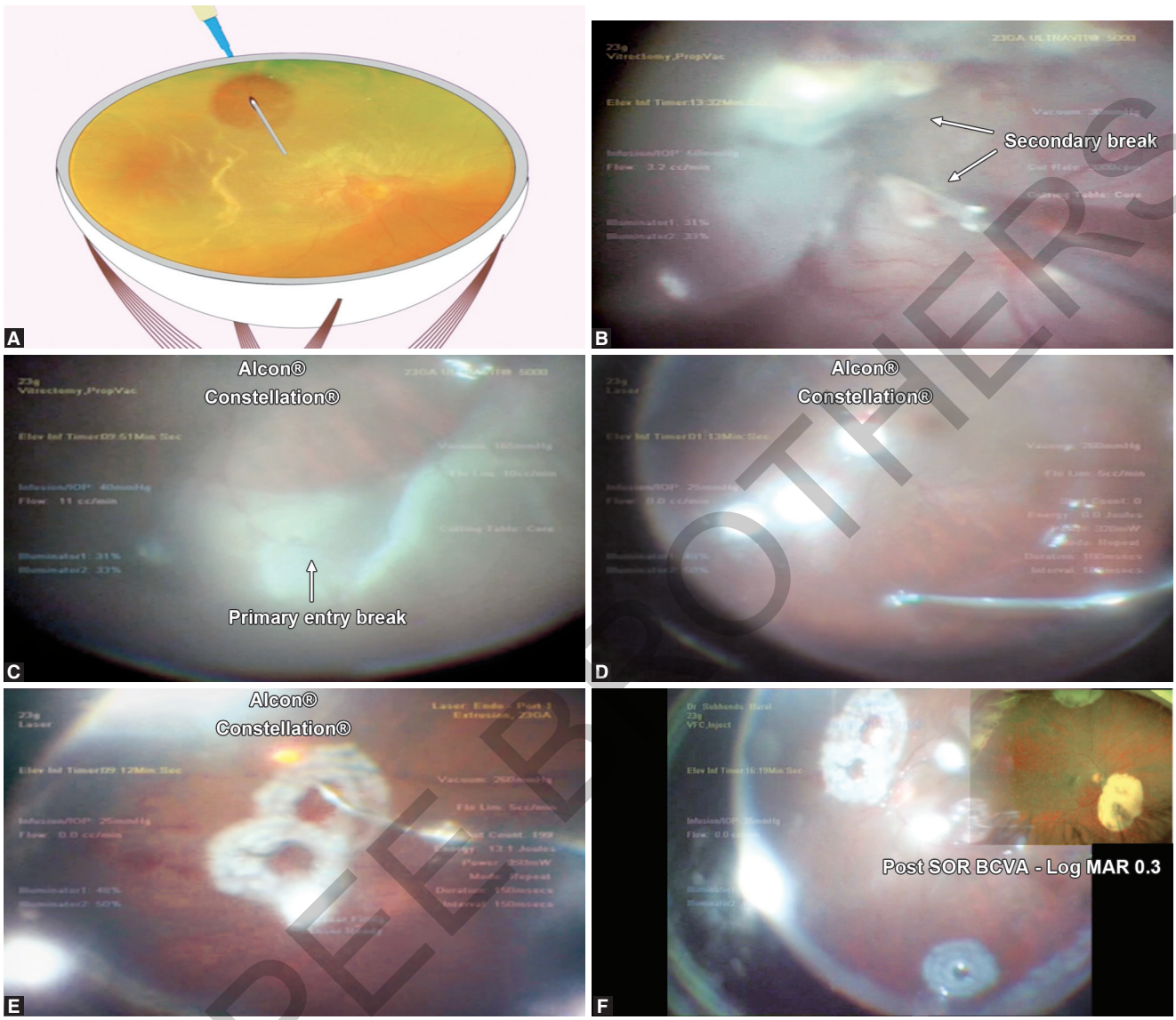
- A case of postpterygium surgery vitreous hemorrhage with total retinal detachment with secondary slit-like large macular break (Fig. 24.5B)
- Primary slit-like tear detected in superotemporal periphery suggesting wrong site of peribulbar block with globe perforation (Fig. 24.5C)
- PFCL injected (Fig. 24.5D)
- Peripheral vitreous hemorrhage removed (Fig. 24.5E) and vitreous base excision completed (Fig. 24.5F)
- Macular ERM removed (Fig. 24.5G)
- Retina settled by FAX
- All breaks lasered (Fig. 24.5H) and the case ended up with silicone oil tamponade (Fig. 24.5I).

Perforation with Hemorrhagic Retinal Detachment with Retinal Incarceration (Video 6, Chapter 24)

Case discussion

- A case of abandoned cataract surgery with vitreous hemorrhage
- Phacoemulsification completed (Fig. 24.6A) with IOL implantation (Fig. 24.6B)
- Hemorrhagic retinal detachment detected after clearing vitreous hemorrhage
- A large posterior pole secondary breaks, superonasal to the optic disk, extending to macula detected (Fig. 24.6C)
- Subretinal blood removed using back-flush needle (Fig. 24.6D).
- Retina was incarcerated to the RPE-choroid at the break margin (Fig. 24.6E). This incarcerated retinal tags released (Figs 24.6F and G)
- Primary entry break was inferior at 6'O clock (Fig. 24.6H)
- Retina settled with FAX (Fig. 24.6I) and all breaks were lasered (Fig. 24.6J)
- Silicone oil was used as endotamponade.

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Figs 24.4A to F: Intraoperative steps of surgery managing postcataract surgery vitreous hemorrhage with total retinal detachment

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INTRAOPERATIVE COMPLICATIONS

I. Preoperative complications
II. Intraoperative complications

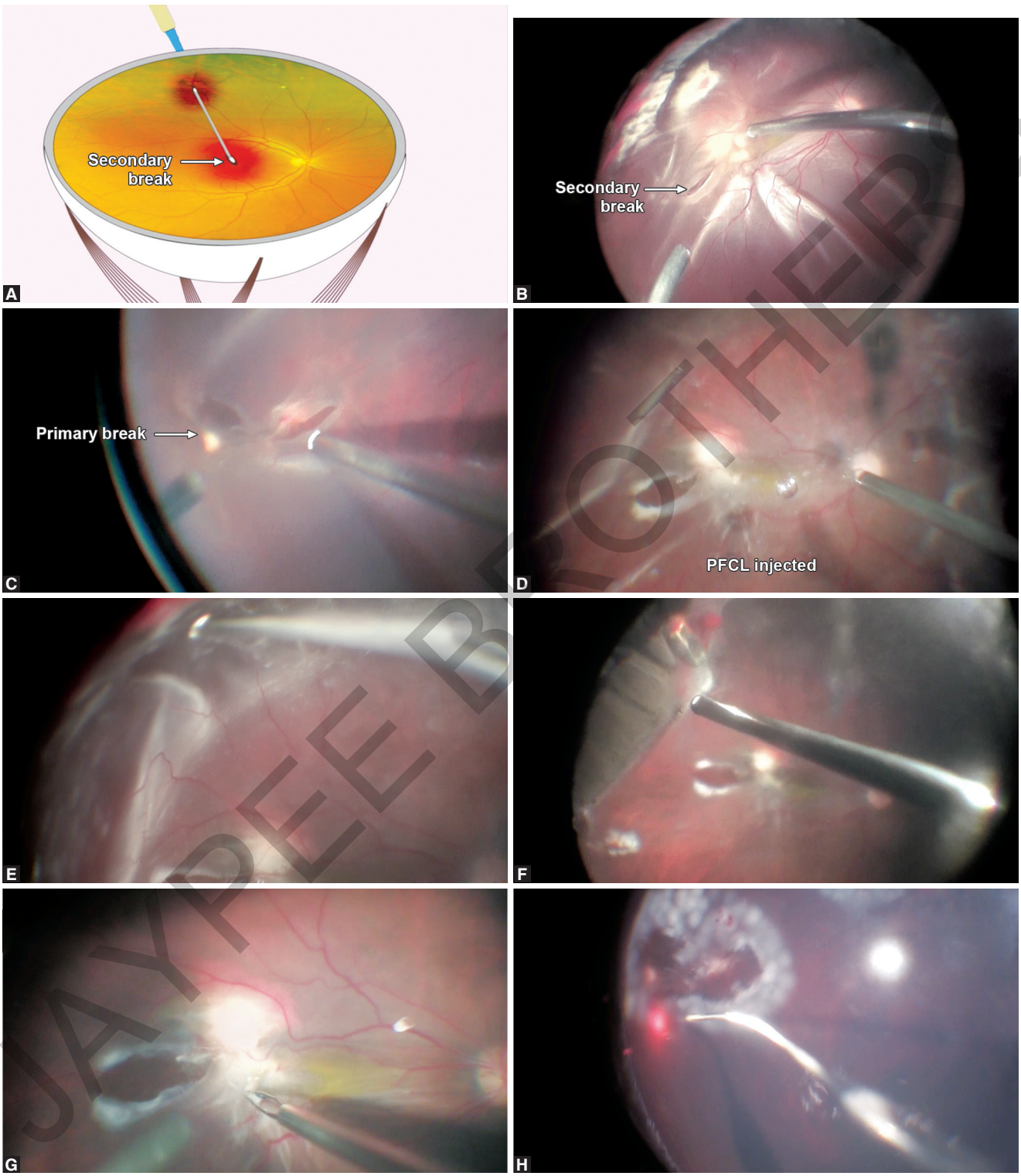
Complications of Scleral Buckling

A. Complications During Tagging Muscles

a. Partial tagging of recti muscles
b. Tagging of oblique muscles
c. Muscle disinsertion and muscle loss
d. Damage to the vortex vein
e. Oculocardiac reflex

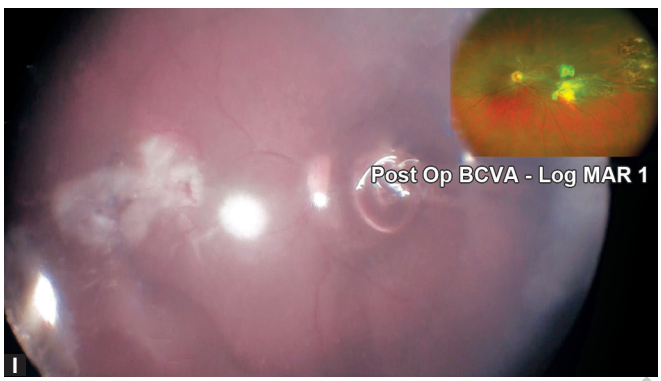
B. Complications During Cryoretinopexy

a. Inadequate cryopexy
b. Excessive cryopexy
c. *Scleral rupture:* This may occur in high myopic eyes or eyes with extreme scleral thinning. The surgeon can realize it if there is a sudden gush of subretinal fluid. The surgeon should immediately release the tractional sutures of the muscles and release speculum to avoid further loss of SRF and then should go for repair of scleral rupture. One should pass sutures through relatively healthy areas to repair the scleral rupture.



Figs 24.5A to H

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Figs 24.5A to I: Intraoperative steps of surgery managing postpterygium surgery vitreous hemorrhage with total retinal detachment

C. Complications during Drainage of Subretinal Fluid

a. Choroidal hemorrhage and subretinal hemorrhage
   - It occurs in 3–4% of cases with drainage procedures
   - Higher chances in high myopia, glaucoma, patients with diabetes and cardiovascular diseases and sometimes with the preoperative use of warfarin or aspirin.
   - It occurs when a large choroidal vessel is punctured or damaged and if intravascular pressure in the choroidal vessels exceeds the intraocular pressure, especially in cases of profound hypotony, just after drainage of SRF.
   - This complication can be avoided by proper selection of the site of drainage, i.e., just above or below the recti muscles. Prior coagulation of the large choroidal by diathermy or infrared laser lowers the risk of choroidal haemorrhage.

b. Dry tap
   - It means the absence of drainage of SRF through the site of the scleral incision.
   - Improperly chosen site of drainage, i.e., at the area of minimal SRF/no SRF or inadequate full-thickness perforation of sclera-choroid (especially in hypermetropic eyes), can result in a dry tap.
   - Proper site selection is necessary after visualization of subretinal fluid configuration and retinal elevation.
   - If there is 'a dry tap' on the 'first attempt', make sure regarding the depth of the scleral incision and visibility of large choroidal vessels (especially under an operating microscope).
   - If still 'a dry tap' on the 'second attempt' or a dry tap even after the adequate depth of scleral incision, then repeat indirect ophthalmoscopy should be performed to confirm the retina elevation and SRF configuration. In these cases, a second site selection is necessary.

c. Retinal perforation and vitreoretinal incarceration
   - It may occur if drainage is done at the wrong site, where there is minimal or no SRF. Sometimes, vitreoretinal incarceration occurs at the drainage site in 2–3% of cases.
   - If the depth assessment during needle drainage is not adequate, it may lead to retinal perforation. However, large-sized scleral incisions and increased pressure over the globe at the beginning of SRF drainage are two main factors responsible for vitreoretinal prolapse and incarceration. Increased pressure over the globe occurs when the surgeon tries to induce fast drainage in the presence of a large scleral incision.
   - Maintaining a relatively constant IOP is very important during drainage. Globe indentation at the ora serrata in the meridian of the drainage site helps elevate the retina over the site and allows free movement of SRF to the sclerotomy site.
   - If there is a high risk of vitreoretinal incarceration, it is better to close the sclerotomy by suturing or placing a buckle over the drainage site. The vitrectomy cutter should make the scleral drainage site free from any vitreous fibers.
   - If there is already considerable vitreoretinal incarceration, it is better to reposition the herniated tissue, then suture the sclerotomy site, do the I/O, and check for any evidence of a break or any residual incarceration at the drainage site. Gentle cryotherapy and buckle placement over the drainage site is a good option in the majority and rarely is further vitrectomy needed to settle the retina.

d. Suprachoroidal hemorrhage occurs rarely after drainage of subretinal fluid due to precipitation of extreme hypotony after the drainage procedure. Sometimes, an infusion cannula can be placed before starting drainage of SRF to combat severe hypotony if it sets in.

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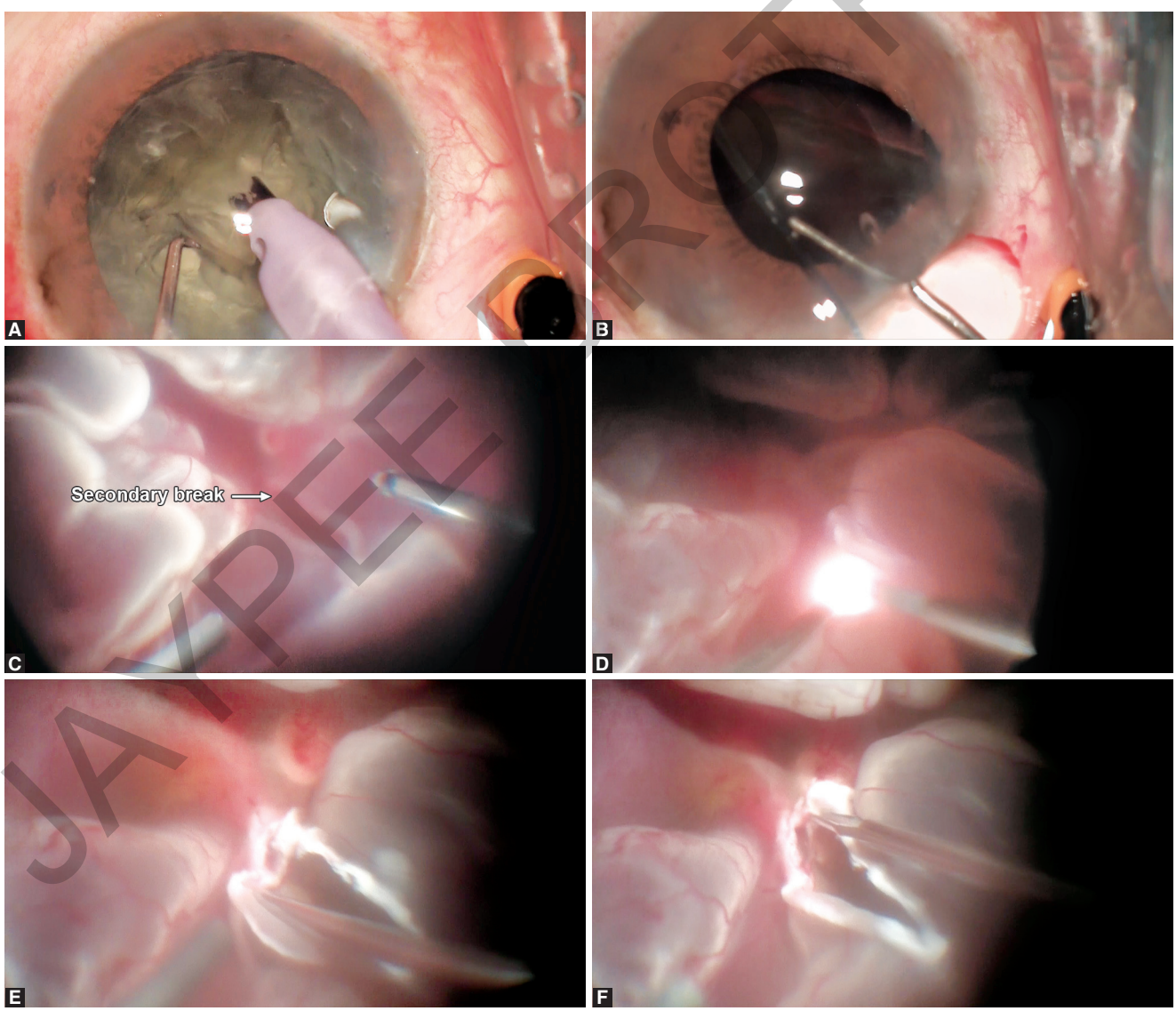
D. Complications During Gas Injection

a. *Fish-egg air/gas bubble:* Single bubble formation after intravitreal air or gas injection is desirable by a smart, gentle push, but sometimes multiple gases or air bubbles may mimic the appearance of fish eggs. The risk factors for this "fish egg air/gas bubbles are:
   i. If the needle is not inserted at the highest point of the eye
   ii. If very slowly or very rapidly injected

   This phenomenon is not welcomed because
   i. It may hamper further visibility for retinopexy and
   ii. A very small air/gas bubble, smaller than the retinal break, can pass into the subretinal space and may complicate the prognosis by delaying the reattachment.

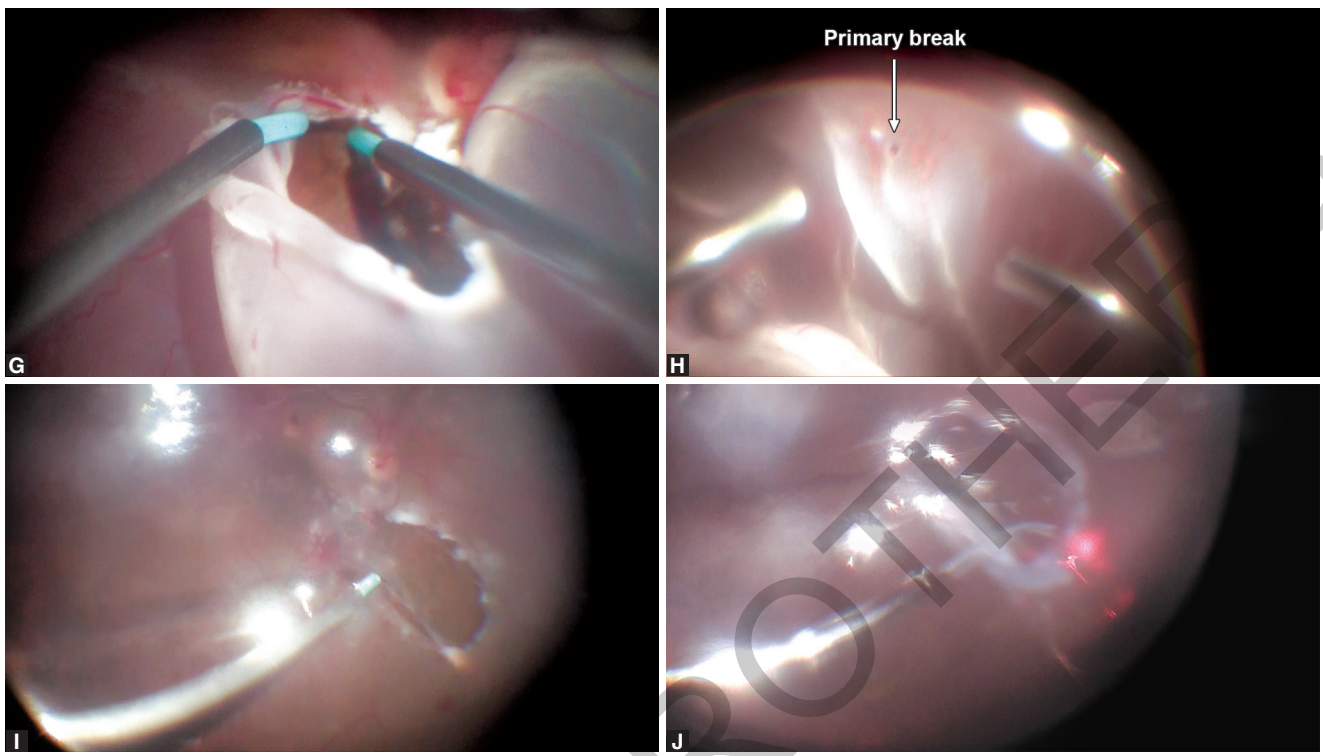
b. *Gas in the canal of Petit:* In young patients with thicker anterior hyaloids, air/gas may be injected between the anterior hyaloid space and crystalline lens, called the Canal of Petit. The gas collects in a ring shape behind the periphery of the crystalline lens, creating an appearance known as the "sausage" or "doughnut" sign. This will never happen if the tip of the needle is well inside the vitreous cavity.

   A small amount of trapped gas inside the Canal of Petit will be absorbed spontaneously, but a larger amount needs overnight face-down positioning or to be



Figs 24.6A to F

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Figs 24.6A to J: Intraoperative steps of surgery managing abandoned cataract surgery with vitreous hemorrhage with hemorrhagic retinal detachment

drained by tuberculin syringe and 30G needle via pars plana route.

c. Subretinal air/gas may occur due to direct injection of air/gas into the subretinal space or entry of a small bubble through the retinal break in case of "multiple small gas bubbles" formation. Sometimes, unrelieved traction can lead to the passage of small gas bubbles into the subretinal space. Many times, it decreases the success rate.

E. Complications of Buckling

a. No break detected
b. Inability to close retinal break on the buckle-radial implant

F. Buckle-related Complications

a. *Buckle exposure:* It can present with or without infection. Without infection, an exposed buckle may be present for a long time without producing any symptoms (Fig. 24.7).
b. Buckle intrusion
c. Anterior migration of buckle
d. Buckle infection—it may present as:
   i *Acute buckle infection:* Where eyes will be congested and there will be exudates or active discharge over the exposed buckle.
   ii. *Chronic buckle infection:* Where eyes will be congested and there will be exudates or active discharge over the exposed buckle.

Management of buckle infection: An infected buckle should always be removed. This should be done under topical antibiotic coverage (preferably a combination of antibiotic drops covering both gram-positive and gram-negative organisms).

Steps of buckle removal:
1. Conjunctival opening
2. Removal of the buckle with buckle sutures
3. Localization of encirclage bands
4. Cutting of band
5. Removal of encirclage band along with all sutures by firm but gentle traction.

Organisms responsible for buckle infection: Mostly *Staph epidermis* and *Staph aureus*.

Complications during buckle removal:
   i. Occurrence of retinal detachment
   ii. Globe rupture
   iii. Vitreous hemorrhage
   iv. Infection, i.e., endophthalmitis and
   v. Phthisis bulbi.

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Fig. 24.7: Postoperative exposed infected sponge buckle (blue arrow)



Fig. 24.8: Surgery in a small globe with small palpebral apparture

Problems in Initiating Surgery

Deep Set and Small Eyes (Fig. 24.8)

Causes: Abnormally deep set eyes-skull malformation, congenital (Trisomy 9 Mosaicism), post-trauma with orbital fat atrophy.

Small palpebral fissure: Blepharophimosis, Edward's syndrome, eyes with epicanthic fold, post-trauma scarring.

Small eyes: Congenital (Patau syndrome), microphthalmos, high hypermetropia, nanophthalmos.

Difficulties:

- Difficulty in sclerotomy placement
- Entry site retinal tear at periphery due to narrow pars plana
- Risk of lens touch
- Fogging of wide-angle viewing system (WAVS) due to higher humidity around the ocular surface
- Difficulty in contact lens placement
- Standard-sized instruments too large for smaller eyes
- Risk of choroidal detachment in microphthalmic eyes
- Pooling of fluid
- Difficulty in angulation of instruments.

Management:

1. Often temporal approach
2. Careful position of patient's head
3. *Cathotomy:* if necessary,
   Cathotomy for small palpebral fissure *(Video 7, Chapter 24)*:
   - In case of eyes with small palpebral fissure, a straight artery forceps is to be held at lateral canthus at the junction of two limbs of 'Y' and the lateral canthus is to be crushed with the artery forceps along the straight limb of 'Y' up to the bony margin of orbit for one to two minutes (Fig. 24.9A). Then the crushed straight limb of the lateral canthus is to be cut with a scissor with small snips (Fig. 24.9B). This will widen the palpebral aperture to introduce trocar-cannula complex easily.
4. Tractional sutures.

Scarred and Adherent Conjunctiva

Making of sclerotome ports are difficult as shifting conjunctiva to make sclerotomies are difficult (Fig. 24.9C). One has to choose different places to get movable, loose conjunctiva and to avoid previous sites of sclerotomies.

Slippage of Infusion Cannula *(Video 8, Chapter 24)*

Case Discussion

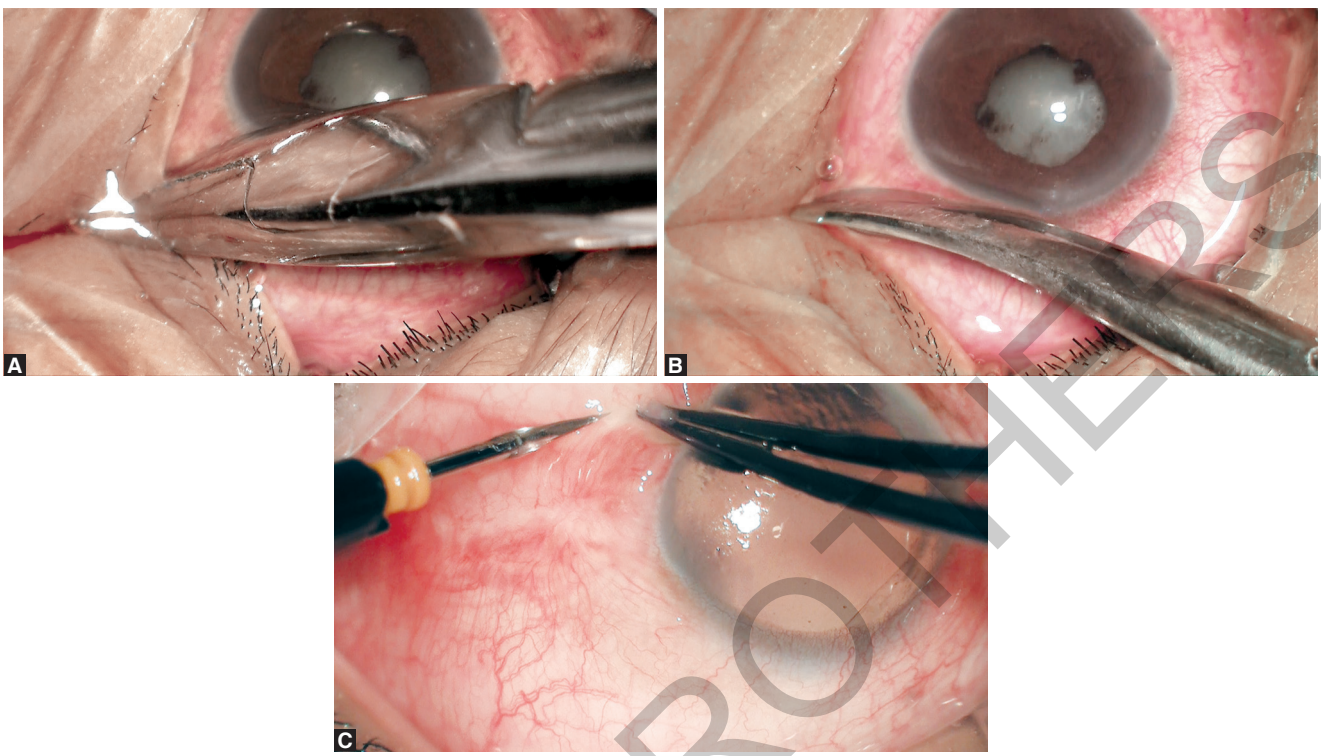
- Soft part of infusion cannula came out during vitreous base excision in a case of retinal detachment (Fig. 24.10A)
- Metallic end of infusion cannula along with cannula was removed
- A new infusion cannula was fitted in the superonasal cannula to build up the intravitreal tone (Fig. 24.10B)
- Now a trocar-cannula was introduced in the same scleral tunnel and trocar blade was removed
- Infusion cannula was removed from the superonasal cannula and fitted to the inferotemporal cannula again.

Suprachoroidal Infusion *(Video 9, Chapter 24)*

Case Discussion

- It was also a case of Giant Retinal Tear with choroidal detachment

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Figs 24.9A to C: (A and B) Technique of canthotomy; (C) Post-vitrectomy scarred conjunctiva

- There was difficulty in introducing trocar-cannula due to soft eye
- Tip of infusion cannula was not visible
- Saline was injected into the vitreous cavity to raise IOP
- Trocar-cannula was introduced for left-handed port and trocar was removed
- Endoilluminator was introduced through the cannula and tip of infusion cannula was seen in suprachoroidal space (Fig. 24.11A)
- Now this endoilluminator tip was used to separate the choroidal layers from the tip of infusion cannula to make it intravitreal (Fig. 24.11B).
- Now infusion was made on
- Right-handed trocar cannula was introduced
- Then vitrectomy was started.

Subretinal Infusion *(Video 10, Chapter 24)*

Case Discussion

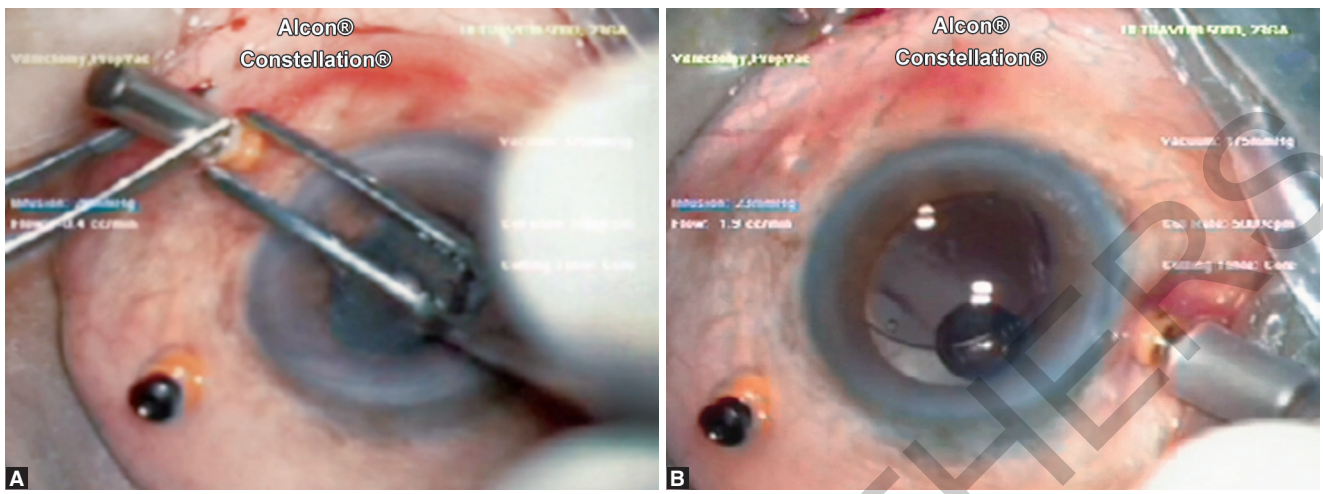
- PVD induction was done in a case of bullous RD
- Fluid-air exchange was started for internal drainage of SRF through separate retinotomy
- But tip of 25G infusion cannula was seen in subretinal space (Fig. 24.12A)
- Cutter was used to make it intravitreal and infusion fluid was made on
- Cautery was done for the surrounding retinotomy
- Fluid-air exchange was started again keeping tip of infusion inside the vitreous cavity (Fig. 24.12B)
- Internal drainage of SRF was completed again
- Peripheral breaks were lasered as well as around the retinotomy behind the infusion cannula.

Retinal Incarceration at the Cannula Tip *(Video 11, Chapter 24)*

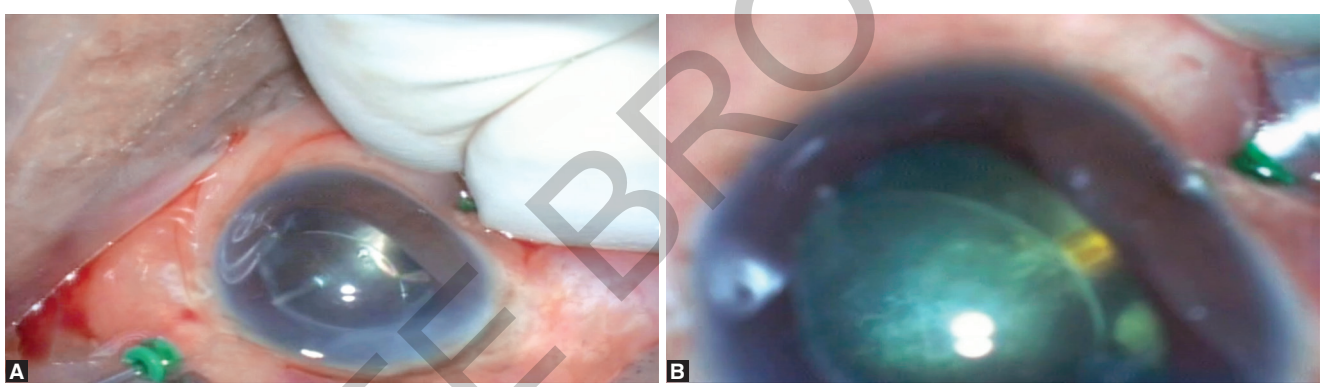
Case Discussion

- In a case of choroidal coloboma with retinal detachment, during vitreous base excision, retinal incarceration seen at the cannula tip (Fig. 24.13A)
- Incarcerated detached retina separated from the cannula and retinectomy done for the redundant retina at the base of the cannula (Fig. 24.13B)
- Subretinal blood removed. PFCL injected to stabilize posterior pole and for peripheral internal drainage of SRF
- Fluid-air exchange done
- Laser done surrounding the retinal breaks.

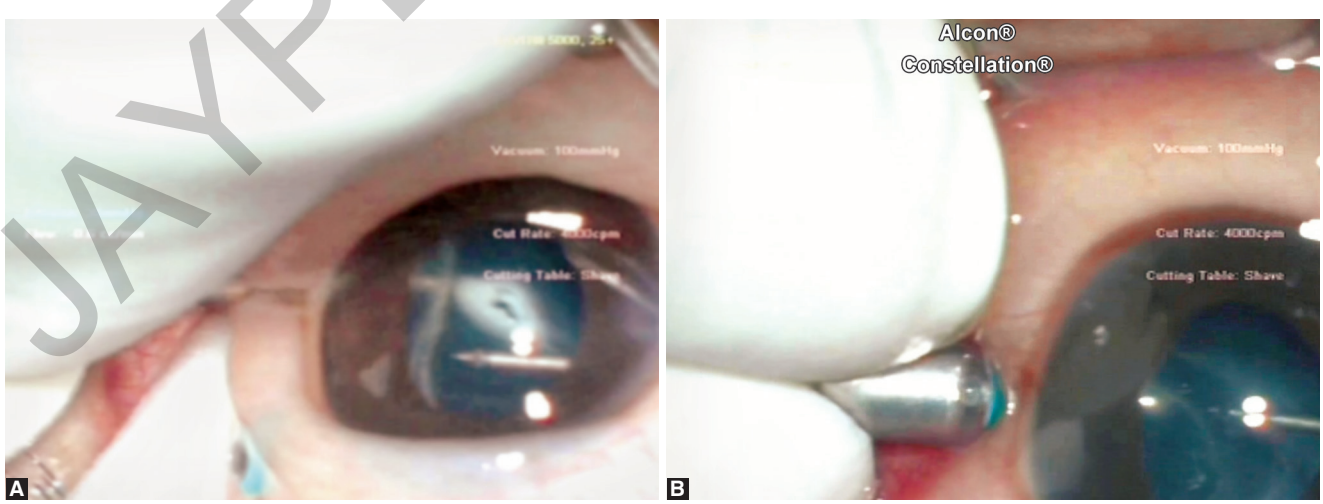
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Figs 24.10A and B: Intraoperative steps of surgery managing slippage of infusion cannula

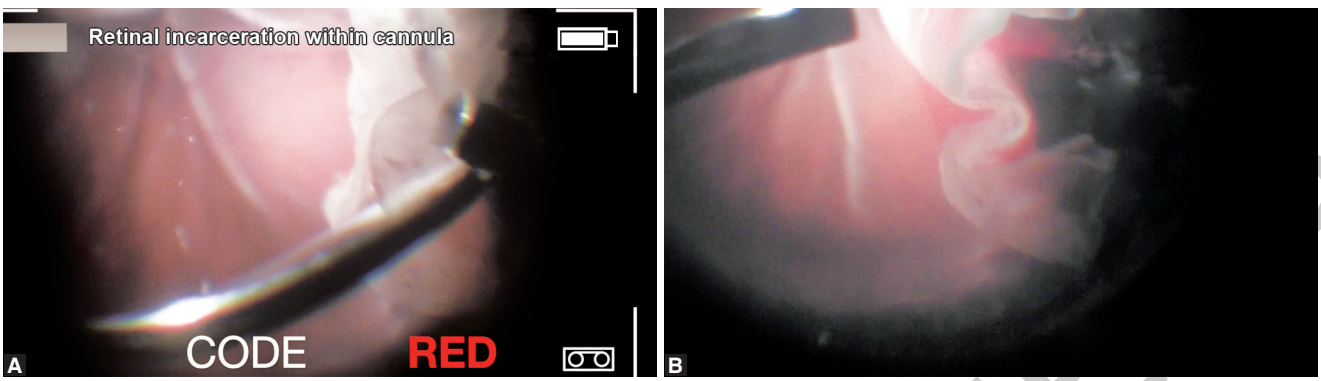


Figs 24.11A and B: Intraoperative steps of surgery managing suprachoroidal infusion tip

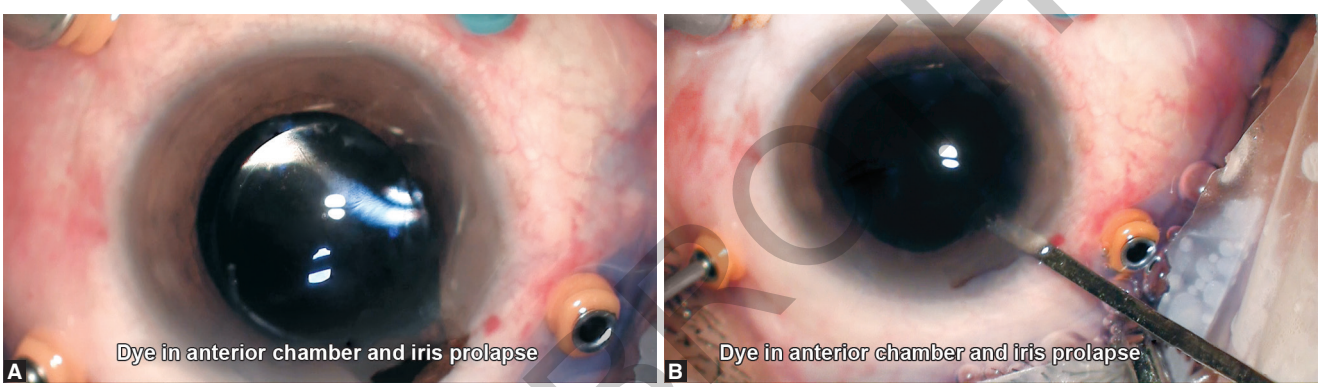


Figs 24.12A and B: Intraoperative steps of surgery managing subretinal infusion

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Figs 24.13A and B: Intraoperative steps of surgery managing retinal incarceration at cannula tip



Figs 24.14A and B: Intraoperative steps of surgery managing iris prolapse during dye injection in a case of combined phacoemulsification with ERM removal surgery

Complications during Phacovitrectomy

1. *Extension during capsulorrhexis:* It may happen due to sudden introduction of infusion fluid inside the vitreous cavity, resulting in increase in intravitreal pressure and shallowing of anterior chamber. Limited anterior vitrectomy reduce intravitreal pressure and then injecting more viscoelastic into anterior chamber deepen anterior chamber and flatten convex anterior lens capsule and now surgeon can complete further capsulorrhexis.
2. *Inadvertent posterior capsular tear:* Sudden introduction of multiple air bubbles from infusion port can hamper the visibility. During removal of these retro IOL air bubbles by cutter may damage posterior capsule. Removal of these retro IOL air bubbles should be done by passive suction of silicone tipped flute needle/back-flush needle instead of cutter.
3. *Iris prolapse during dye injection (Video 12, Chapter 24):* It can happen during injection of dye to stain ILM or ERM due to sudden increase in IOP. The other cannula should be open and repositioning of iris tissue with adjustment of IOP solves the problem.

   Case discussion
   - A case of combined phacoemulsification with ERM removal
   - Posterior chamber IOL implanted
   - Trypan blue stain ERM removed
   - But just after injecting Brilliant Blue dye, prolapse of iris tissue seen through the phaco main wound (Fig. 24.14A)
   - Prolapsed iris repositioned again (Fig. 24.14B)
   - And proceeded for peeling ILM.
4. *Sudden influx of air bubbles behind IOL (Video 13, Chapter 24):* Influx of air bubble during vitrectomy may blur the media (Fig. 24.15). Removal of retro IOL air bubbles should be done cautiously as it may cause posterior capsular tear.

Complications during PVD Induction

Complications with Attached Retina

- Inadvertent break formation at the mid-periphery or far periphery may happen during PVD induction when hyaloid face is abnormally thickened and very much

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