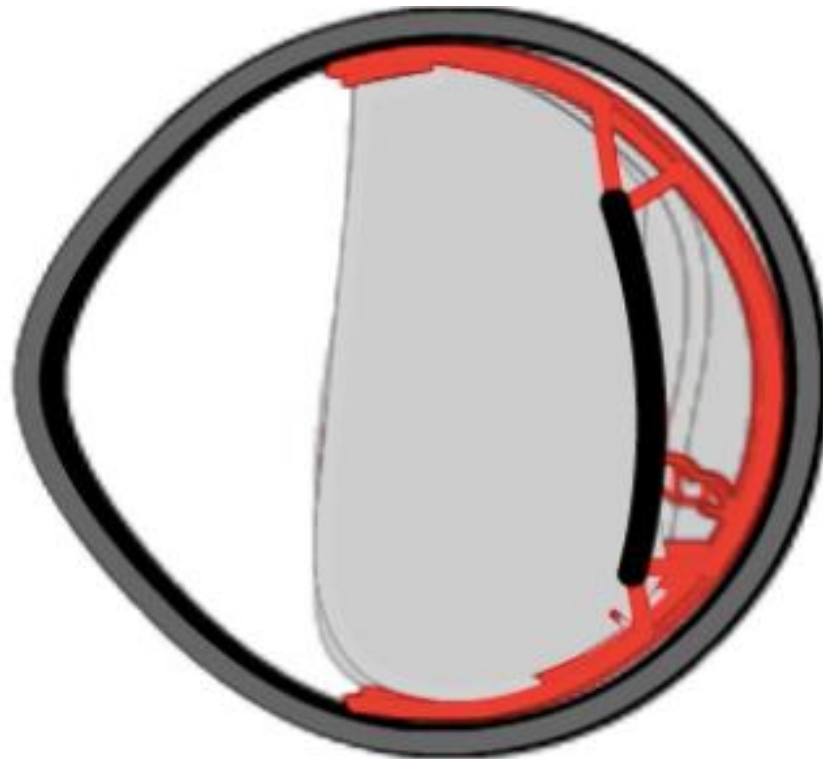


# SURGICAL MANAGEMENT OF DIABETIC RETINOPATHY

*ASIWOME KWESI SENEADZA, MD*

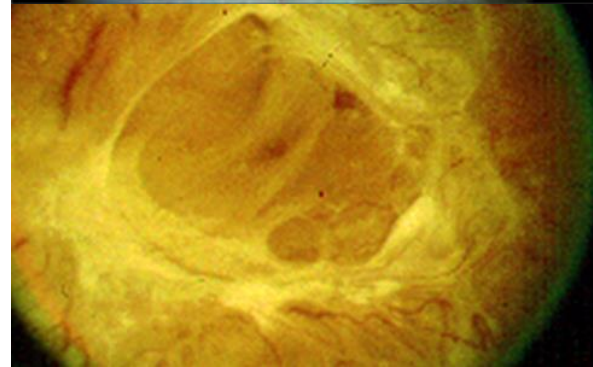


# INTRODUCTION

- Diabetic retinopathy is now one of leading causes of potentially irreversible blindness in working age population.
- Large number of eyes, however, progress toward complications requiring surgical management despite aggressive and valuable interventions.
- PPV was first introduced by Machemer et al. in 1970
- There have been vast improvement both in surgical technique and outcomes

# INDICATIONS FOR VITRECTOMY

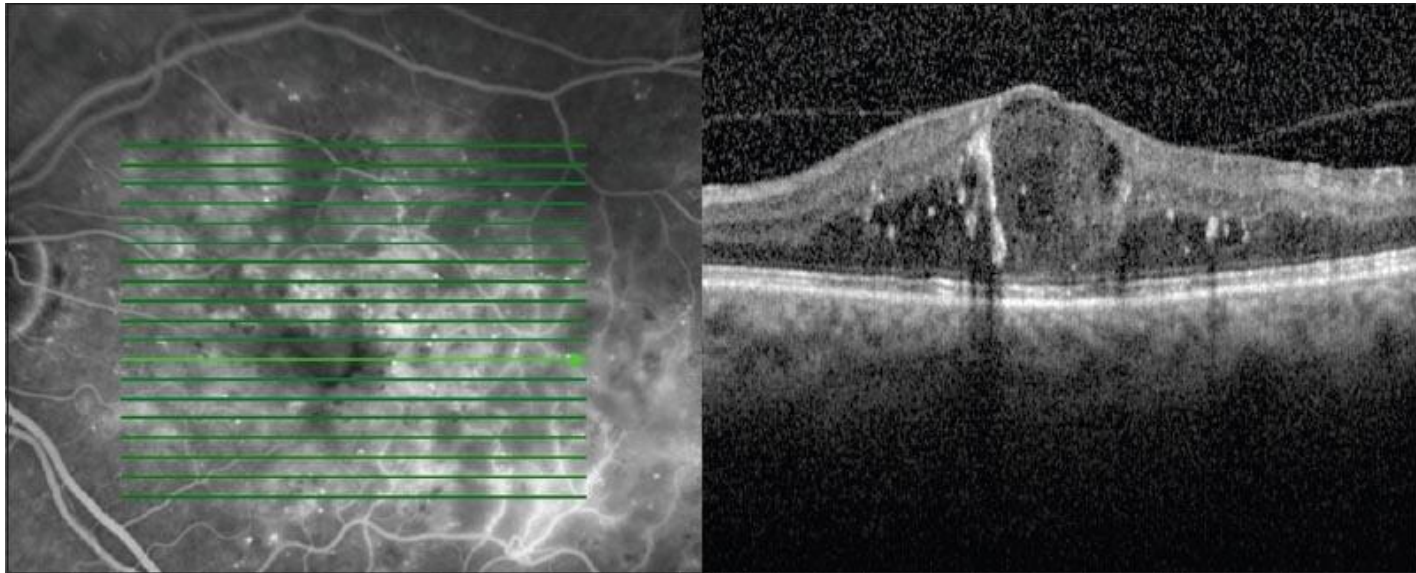
1. NON RESOLVING OR VMT DIABETIC MACULAR EDEMA
  2. PROLIFERATIVE DIABETIC RETINOPATHY
- ◆ MEDIA OPACITY
    - SEVERE NON-CLEARING VH  
(VITREOUS/SUBHYLOID/PREMACULAR)
    - ANTERIOR SEGEMENT NEOVASCULARIZATION WITH VH
  - ◆ TRACTIONAL DEFECTS
    - TRD INVOLVING OR THREATENING THE MACULAR
    - CONBINED TRACTIONLA AND RHEGMATOGENOUS RD
    - PROGRESSIVE FIBROVASCULAR PROLIFERATIVE NON RESPONSIVE TO LASER
    - EPIRETINAL MEMBRANE OR OPACITY VITREOUS FACE CAUSING VISUAL LOSS
  - ◆ COMPLICATION OF PREVIOUS VITRECTOMY SURGERY
  - ◆ GHOST CELL/HEMOLYTIC GLAUCOMA
  - ◆ ANTERIOR HYLOID FIBROVASCULAR PROLIFERATIVE DESPITE ADEQUATE LASER



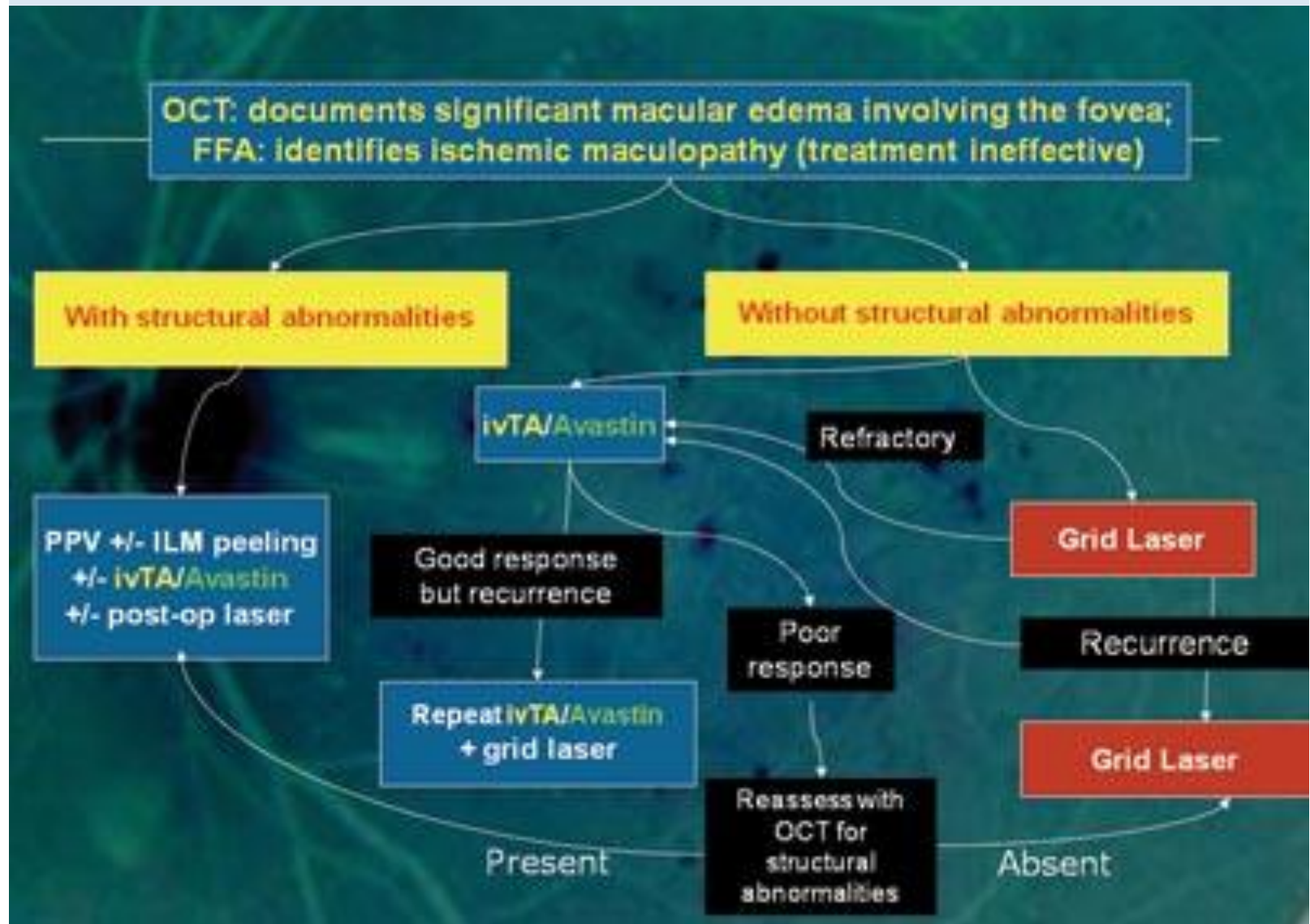
# VITRECTOMY FOR DME

## INDICATIONS

- VITREOMACULAR TRACTION
- DIFFUSE EDEMA NOT RESPONSIVE TO PHARMACOTHERAPY AND LASER



## Suggested treatment algorithm for diabetic macular edema.

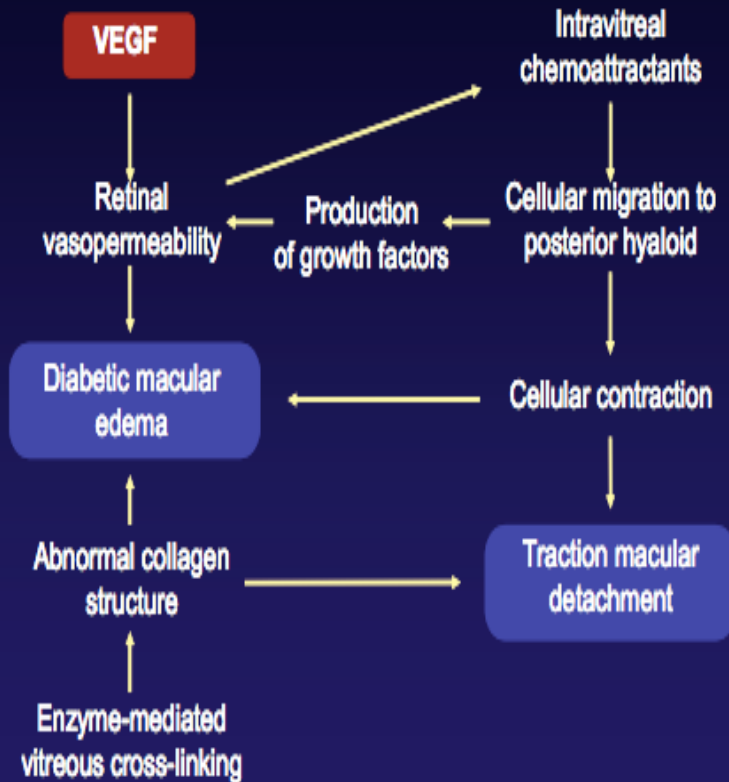




# VITRECTOMY: Pathophysiology

## VMT in DME

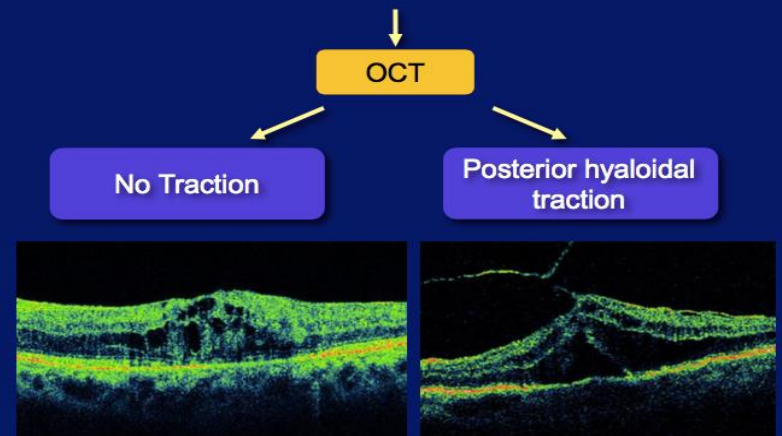
### *Possible mechanisms responsible for diabetic traction*



Improved oxygenation

- Removal of harmful growth factors
- Removal of tractional forces
- Usually reserved for refractory cases

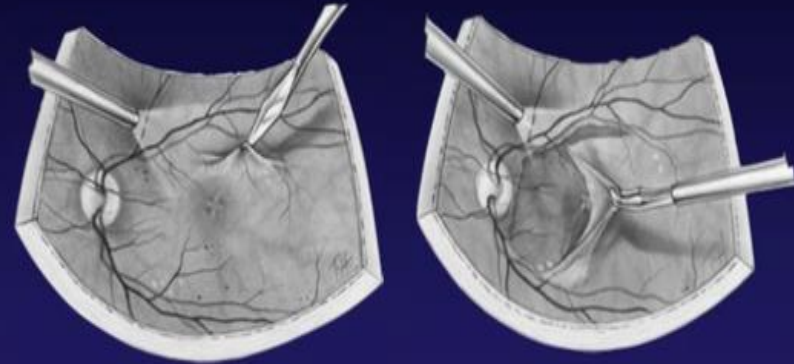
### Macular Edema



# VITRECTOMY: Study

## Vitreotomy for DME and Traction Associated with PHT

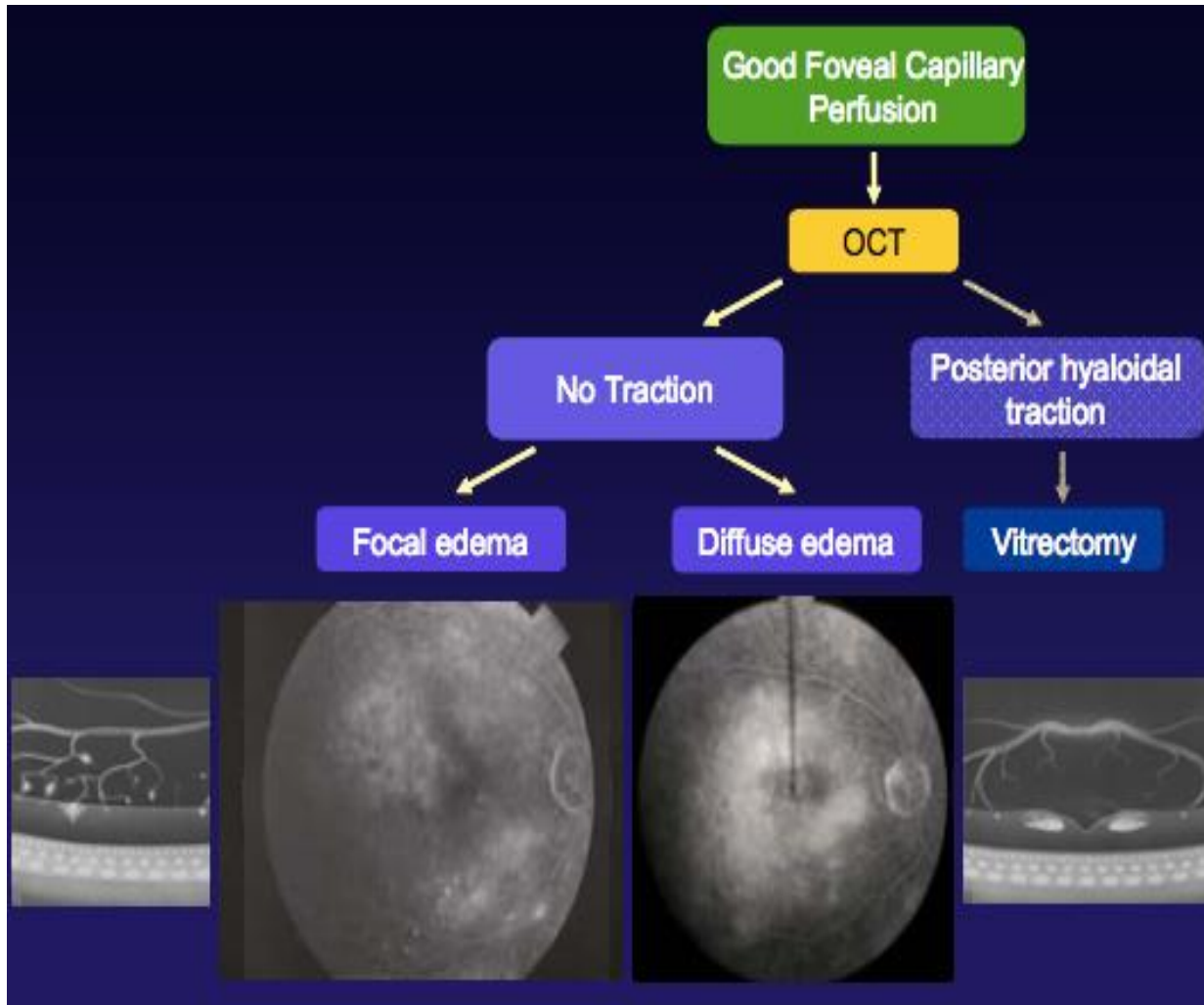
### *Surgery for posterior hyaloidal traction*



Authors	Year	Eyes (No.)	Previous Macular Laser (%)	Complete Resolution of DME (%)	Improvement in Visual Acuity $\geq 2$ lines (%)
Lewis et al.	1992	10	90	80	60
Van Effenterre et al.	1993	22	64	45	86
Harbour et al.	1996	7	57	57	57
Pendergast et al.	2000	55	85	82	49
Gandorfer et al.	2000	12 *	50	50	92

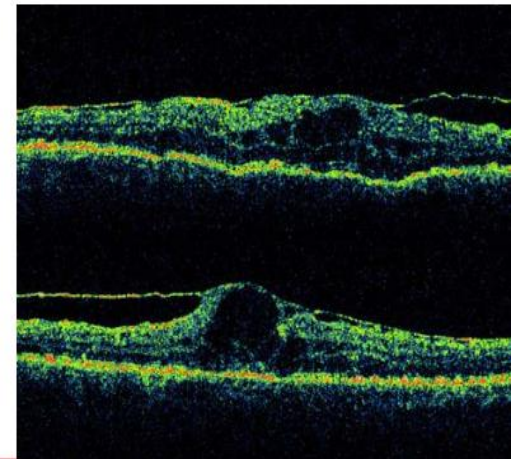
\* 2 eyes without posterior hyaloidal traction

# VITRECTOMY FOR DME



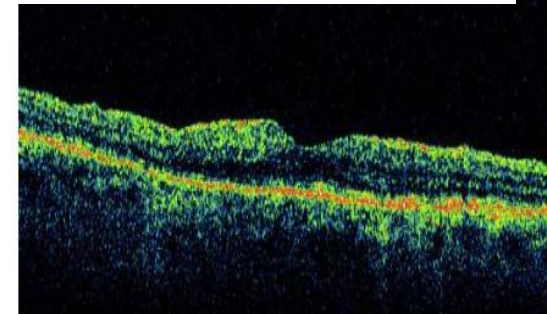
35 yo F DME 20/100

– Treated 6 times over 6 months



35 yo F DME 20/40

– 3 months after PPVx, Mx, ILMx, gas

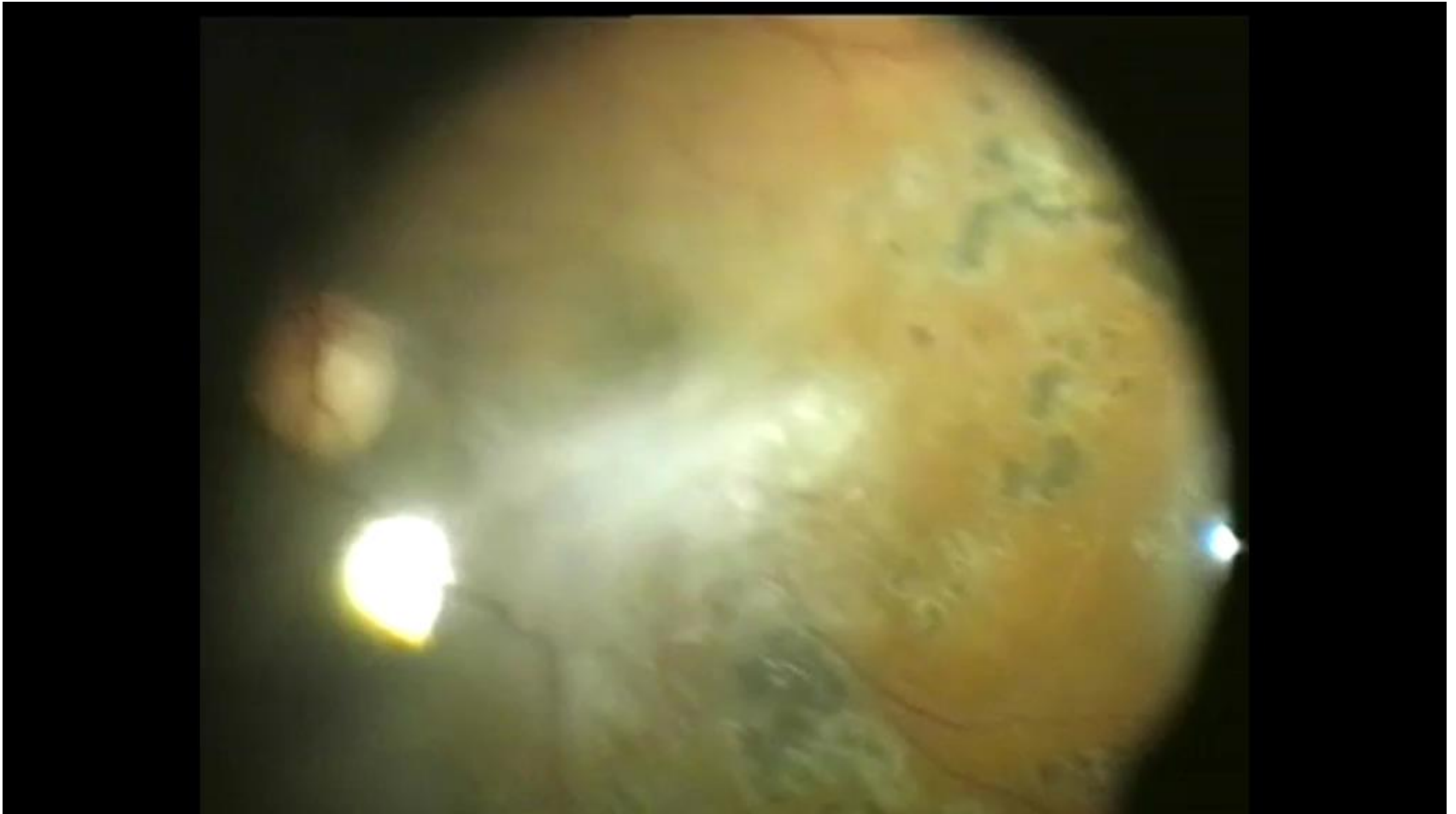




# ILM PEELING FOR DME

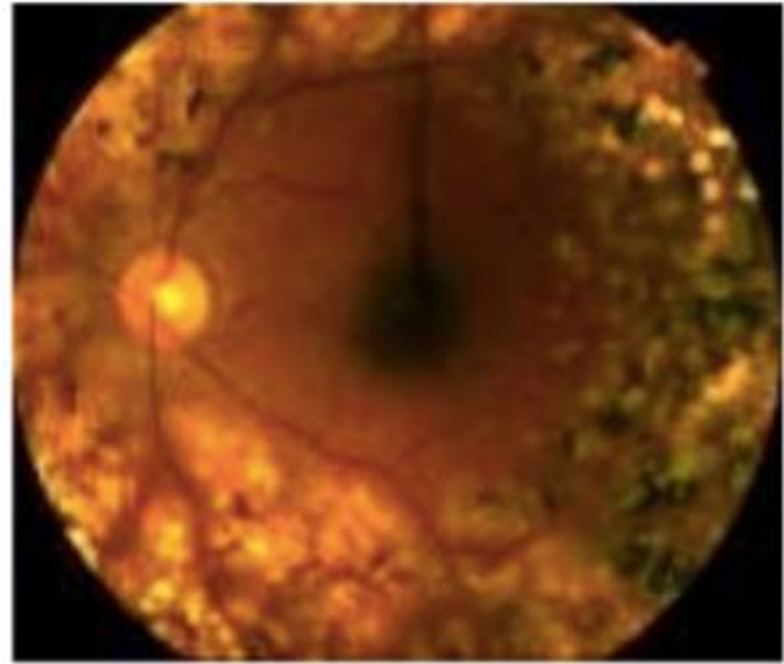
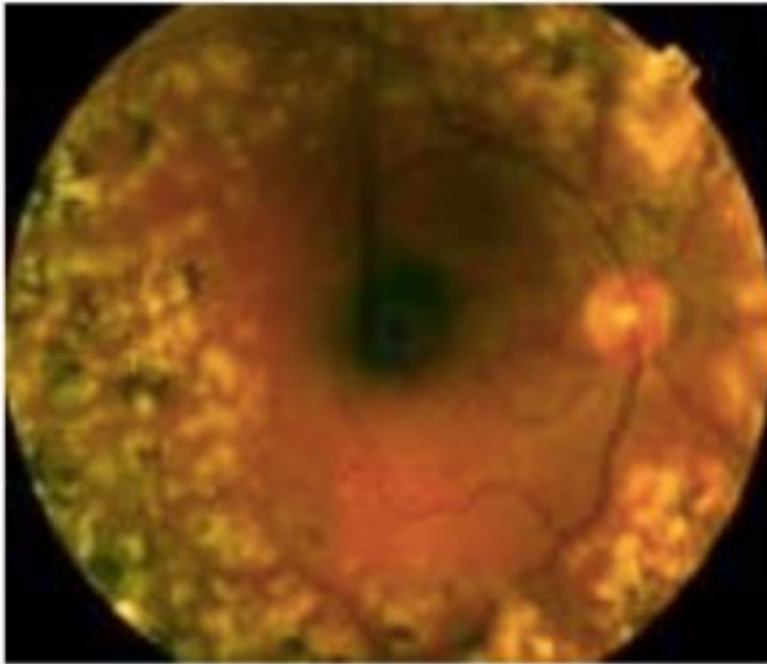


# ILM PEELING FOR DME



# VITRECTOMY FOR PROLIFERATIVE DIABETIC RETINOPATHY

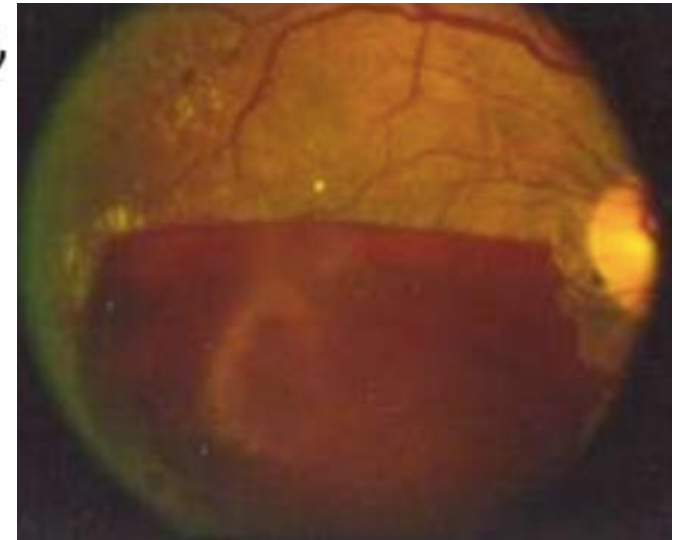
Pan Retinal Photocoagulation  
mainstay of tt of PDR



**Avoids the need of vitrectomy**

# VITREOUS HEMORRHAGE

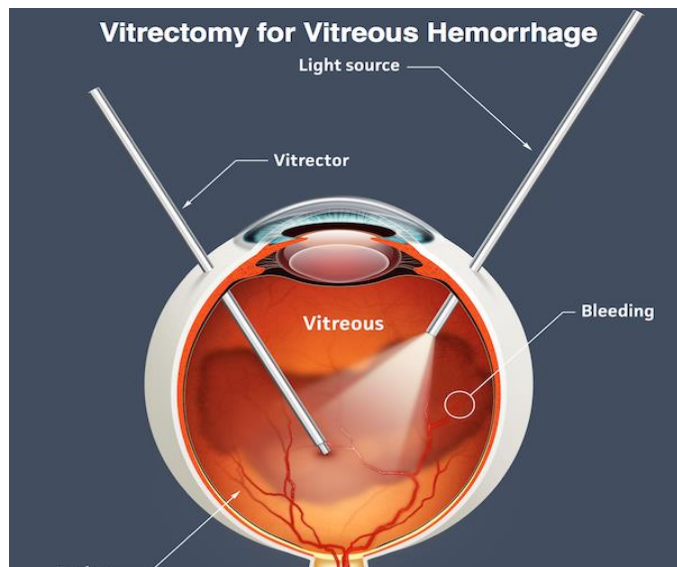
- Early vitrectomy, within 1–4 months from onset, results in earlier recovery of vision and better functional outcome after 2 and 4 years
- Benefit is greater in patients with type 1 diabetes mellitus, compared to type 2.
  - Macular edema is more common in type II
  - PVD more common in type II
- Dense premacular (subhyaloidal) hemorrhage



# VITREOUS HEMORRHAGE

## Timing of vitrectomy

- Duration of hemorrhage,
- Type of diabetes (I or II)
- Severity of retinopathy
- Status of the fellow eye ( Blind or rapidly progressive visual loss)
- Premacular or intragel Hg
- Prior laser treatment (early if no laser done)



## Favorable factors

- Preoperative visual acuity of 5/200 or better.
- Absence of NVI OR NVG.
- Minimal cataract.
- PRP of at least one fourth of the fundus



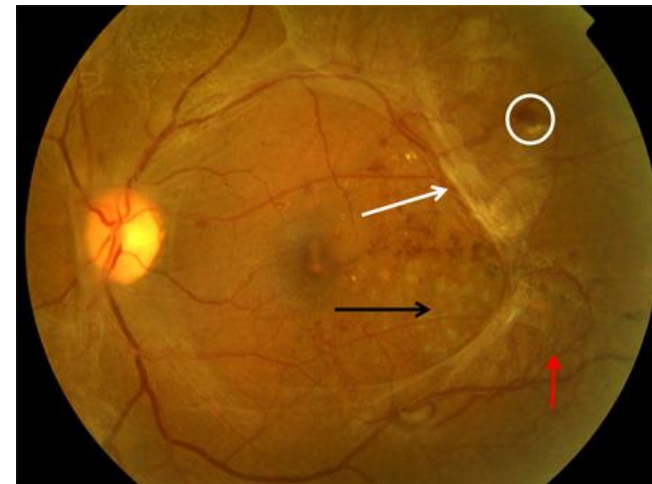
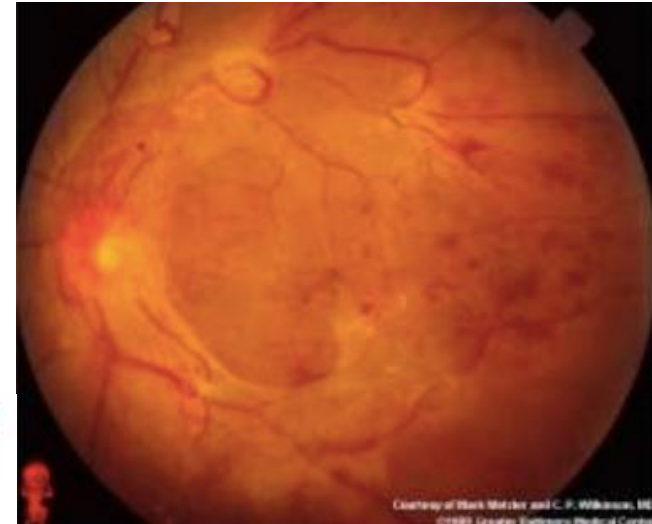
# TRACTIONAL RETINA DETACHMENT

## Indications

- Tractional macular Detachment
- Peripheral tractional detachment threatening macula
- Vitreopapillary traction
- Traction involving Papillomacular bundle

*Visual improvement has been reported in 59 to 80% of cases, but vision equal to or greater than 20/200 is achieved in only 21 to 58%*

- **Charles and Flinn studied the natural history of diabetic **extramacular traction retinal** detachment.**
- **They found a progression to macular detachment in only 13.8% of eyes at 1-year follow-up.**



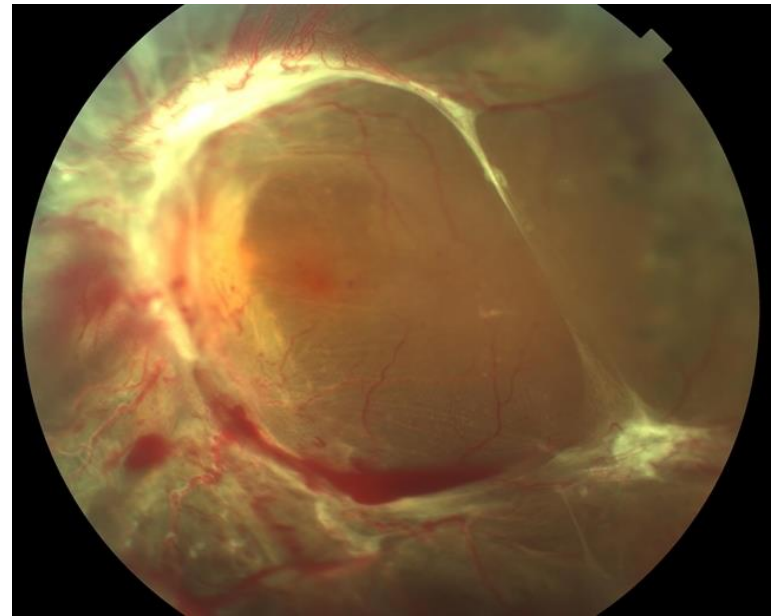
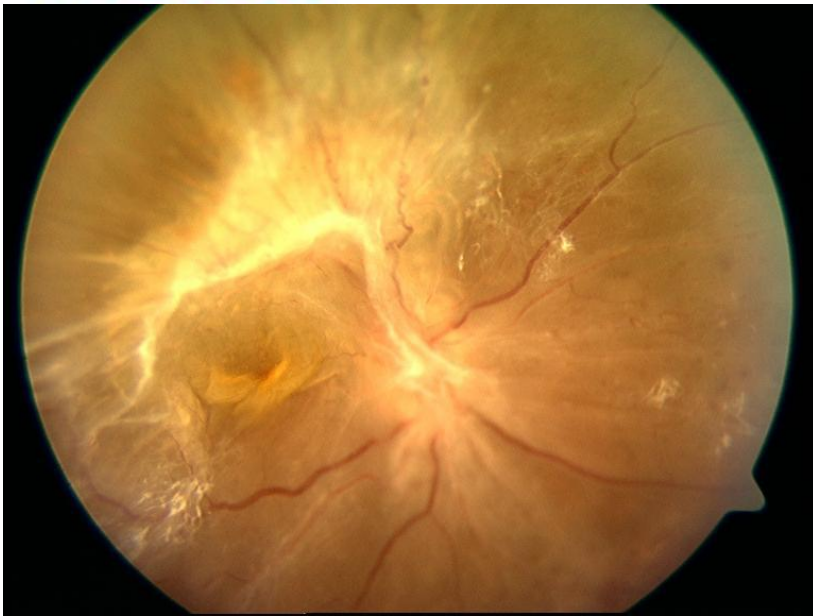
# TRACTIONAL RETINA DETACHMENT

## Favorable factors

- Age <50 years,
- Preoperative panretinal photocoagulation
- Visual acuity >5/200;
- No or few iris neovascularizations or retinal proliferations;
- Macular detachments <30 days, and
- No iatrogenic breaks.<sup>6,25</sup>

# COMBINED TRACTIONAL RHEGMATOGENOUS RETINA DETACHMENT

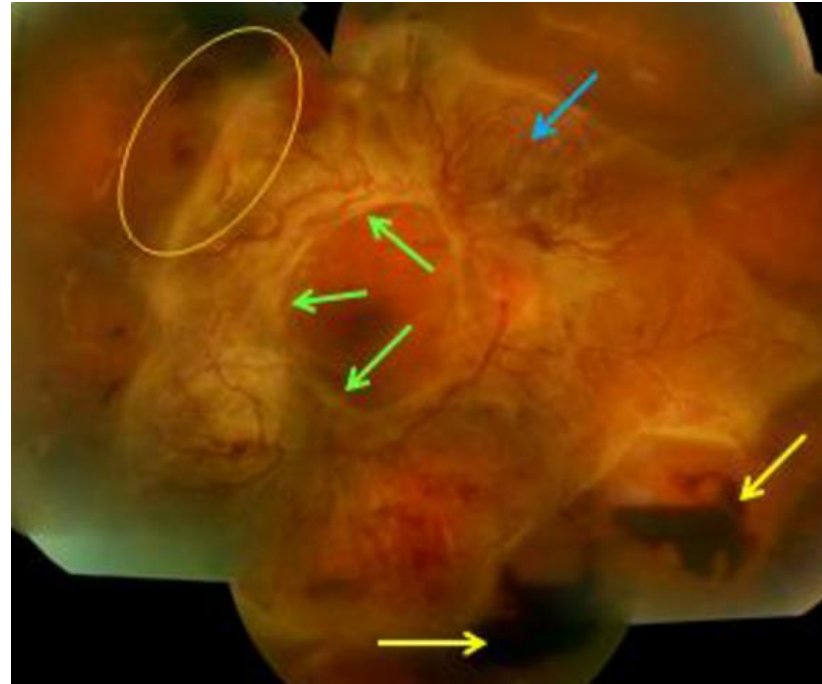
- Extramacular rhegmatogenous detachments **frequently** progress to involve the macula, leading to rapid and severe visual loss.
- **Thus, surgical repair is indicated in combined detachments, whether or not the macula is involved.**





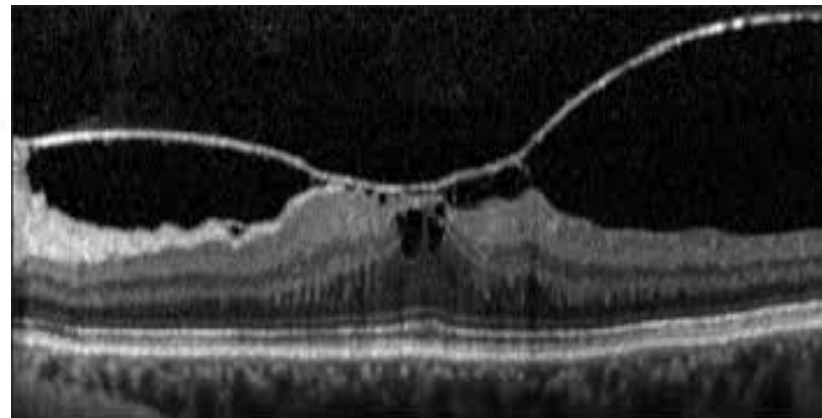
# SEVERE FIBROVASCULAR PROLIFERATION

- Major threat to profound loss of vision
- Early vitrectomy
  - Severe fibrovascular proliferation & moderately severe Neovascularization despite extensive PRP
  - Severe fibrovascular Proliferation
- Stable or improved vision in 78% cases



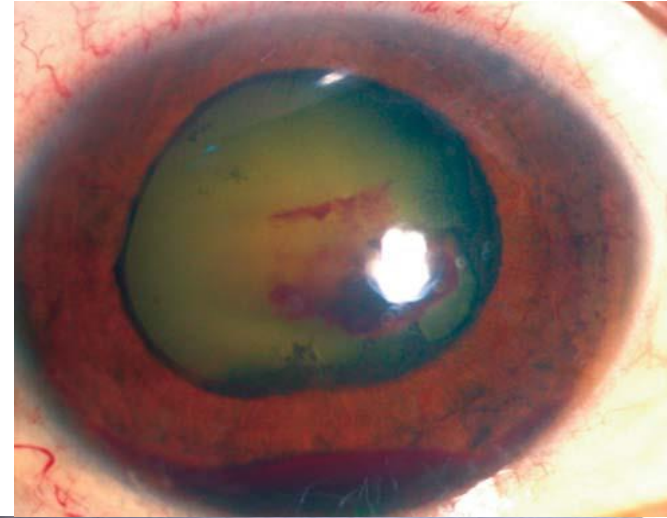
## Macular Edema and Traction

- May occur after extensive PRP or premacular haemorrhage
- Vitreopapillary traction
- Diabetic epiretinal membranes



# NEOVASCULAR GLAUCOMA

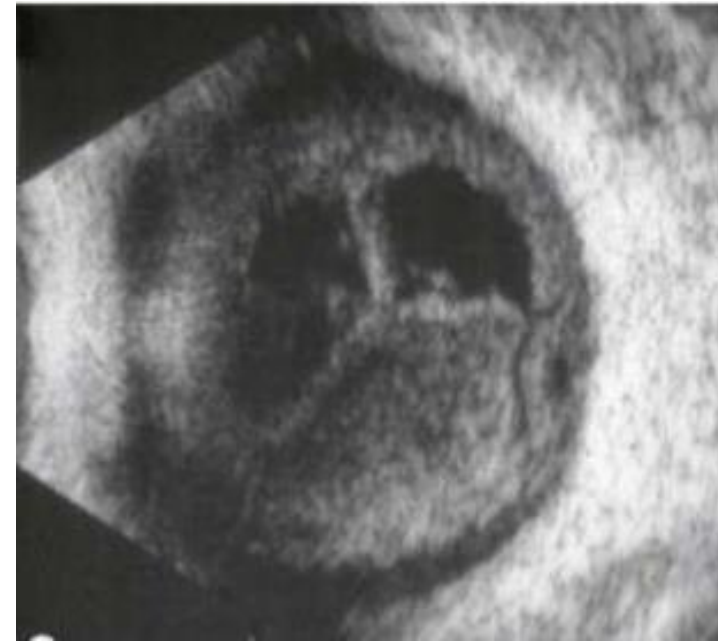
- Extensive PRP or cryotherapy.
- Intravitreal anti- VEGF, may be helpful as short-term adjunct to PRP or when PRP fails to cause regression of rubeosis
- Opaque optical media, as vitreous hemorrhage or cataract, controlled PRP can only be performed after vitrectomy and/or cataract extraction
- Silicone oil tamponade prevents recurrent vitreous hemorrhage and may induce regression of rubeosis





# PREOPERATIVE EVALUATION

- Optimal blood glucose management
- Possible Adjustment of medication
- Anticoagulant, Antiplatelet Medication
- Dialysis Patient – Surgery between Sessions
- Correlate VA with Anatomic Changes
- B Scan – Opaque Media (cat, VH, ICH)
- Relevant Information for Prognosis and – VR adhesions, vitreoschisis, RD and Opacities
- Preoperative Anti VEGF – reduce intraop bleeding, rubiosis with NVG effective 4-7 days (Timing is critical otherwise rapid progression FVM contraction to RRD + RRD)



# CATARACT AND RETINA DETACHEMENT

- Cataract extraction alone or with primary lens implantation, followed by vitrectomy
- Combined operation in single procedure
- Advantage is much better intraoperative access to the vitreous base
- Procedure of choice is phacoemulsification
- All three sclerotomies are performed and trocars inserted before cataract surgery to avoid pressure changes



## Table 3: Objectives of Vitrectomy for Severe Diabetic Retinopathy

- Removal of axial opacities
- Relief of anteroposterior and tangential traction
- Segmenting or peeling of epiretinal membranes
- Endolaser treatment
- Effecting hemostasis
- Closure of all retinal breaks
- Treatment and prophylaxis of complications

## Instruments

1. 3-4 Port trocar
2. 120D lens , for peeling: 60D front lens
3. Vitreous cutter
4. Fluid needle
5. Eckardt forceps
6. horizontal scissors or vertical scissors
7. Membrane pic or knob spatula
8. Endodiathermy
9. Laser therapy
10. Scleral depressor

## Dye

Triamcinolone or Trypan blue or BBG

## Tamponade

air, 12–14% C3F8 or silicone oil





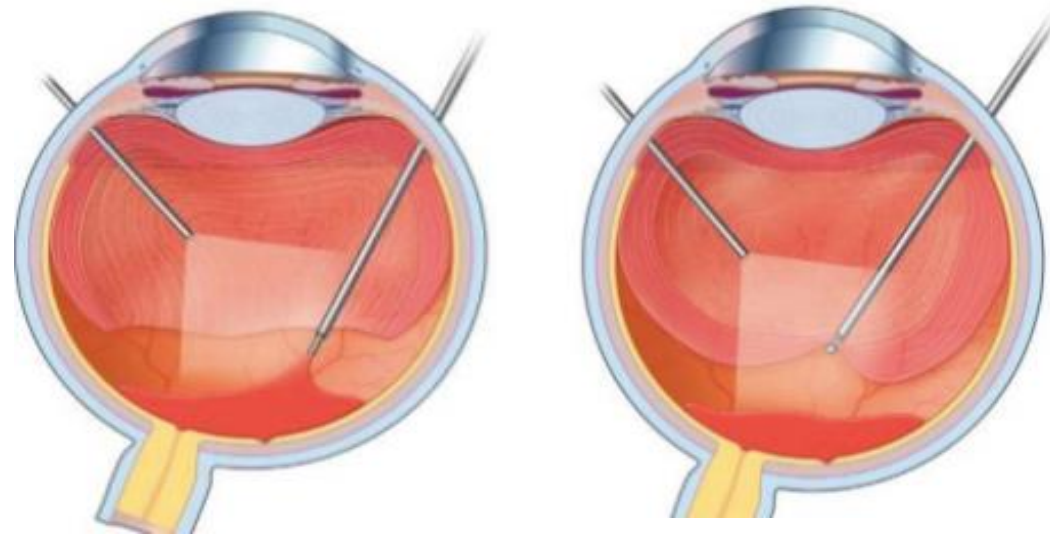
# SURGICAL STEPS

## Vitreous Haemorrhage

1. 3-Port system
2. Core vitrectomy
3. Posterior vitreous detachment and peripheral vitrectomy
4. Endodiathermy
5. Panretinal photocoagulation
6. Tamponade
7. Removal of the trocar cannulas

## Tractional Detachment

1. 4-Port system
2. Core vitrectomy
3. Peripheral vitreous rhexis
4. Bimanual dissection of tractional membranes
5. Apply PRP
6. Tamponade
7. Removal of the trocars

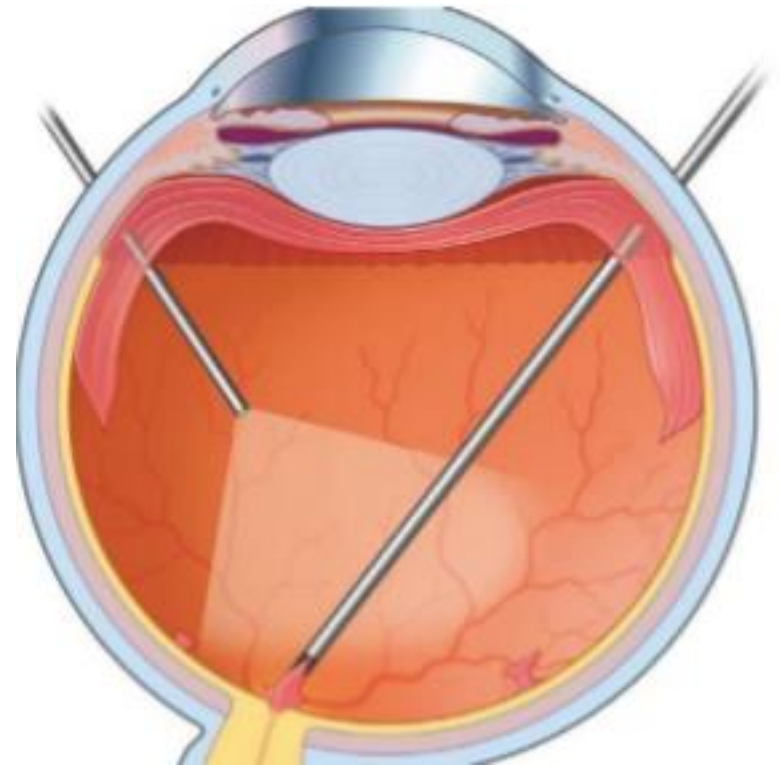




# Membrane Dissection

## Commonly used:

- (1) segmentation,
- (2) delamination,
- (3) “en bloc” dissection,
- (4) combined.



# MEMBRANE DISSECTION

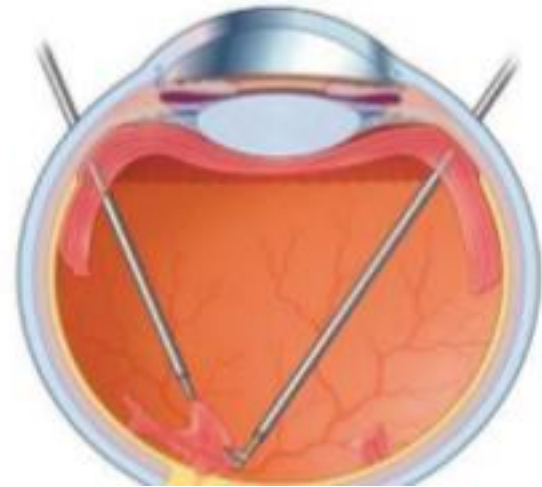
- **Segmentation**

- Membrane is segmented by cutting bridging tissue between foci of fibrovascular adhesion



- **Delamination**

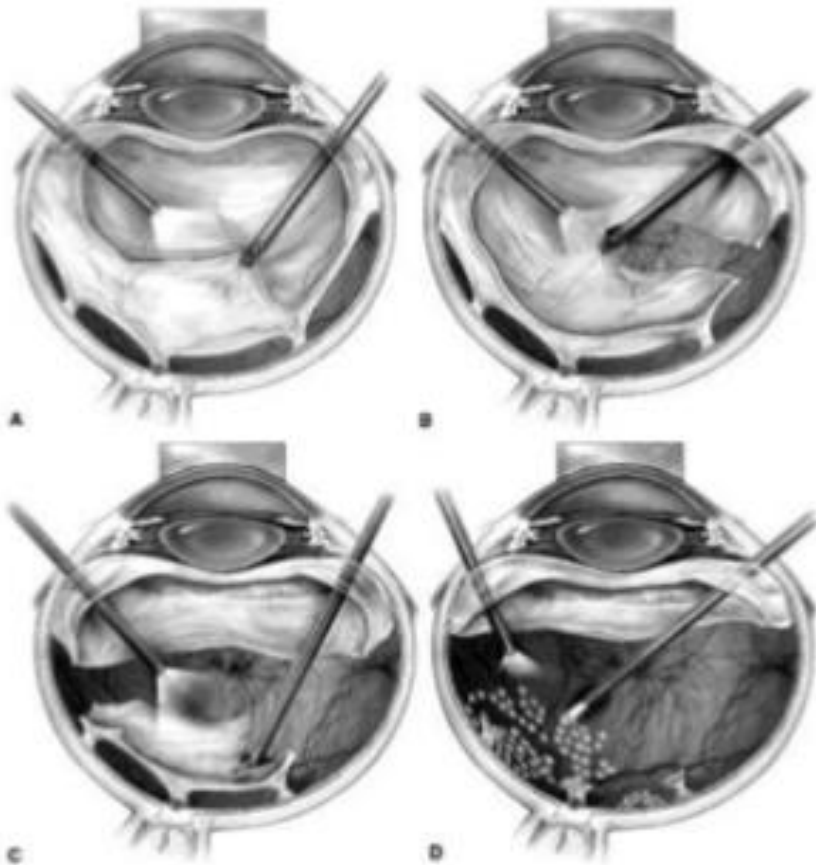
- Connections between the posterior hyaloid and fibrovascular tissue and the internal limiting membrane are cut



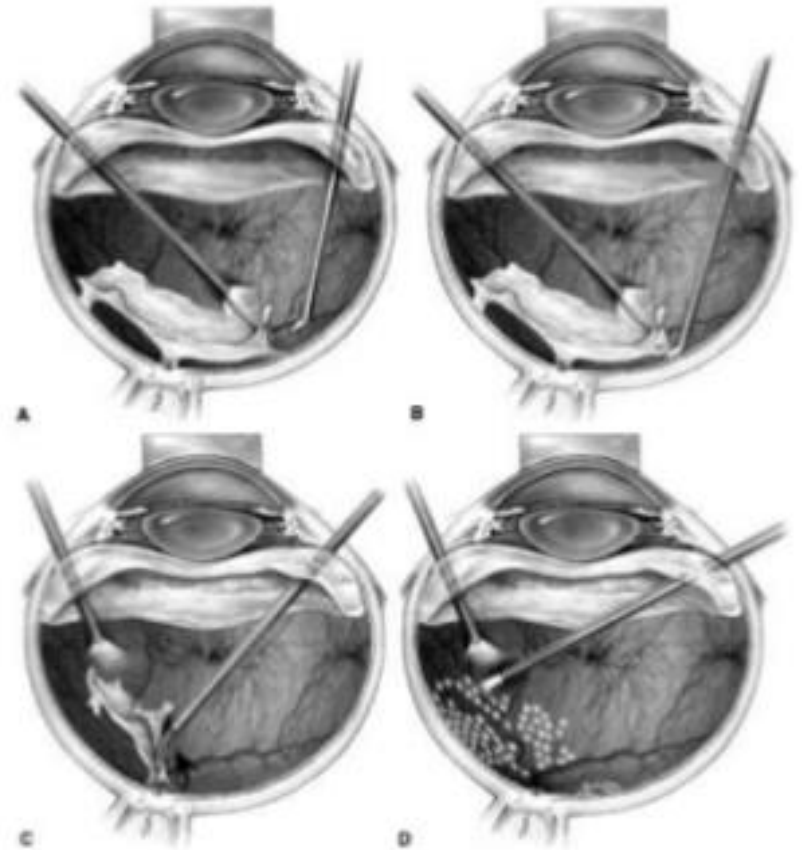
Fibrovascular tissue that is firmly attached to the disc is reduced with the vitreous cutter

# SURGICAL TECHNIQUE

## Segmentation



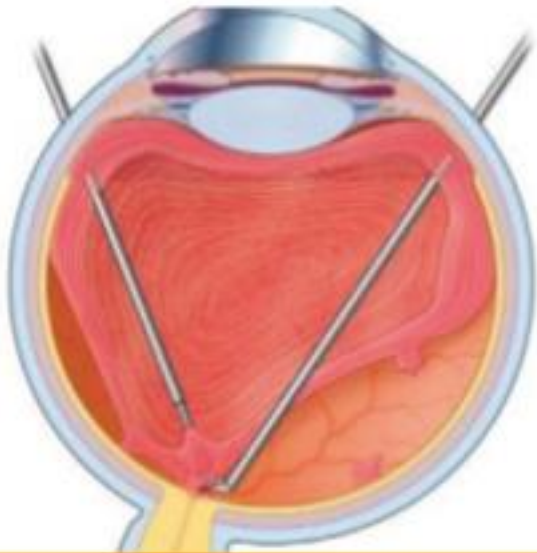
## Delamination



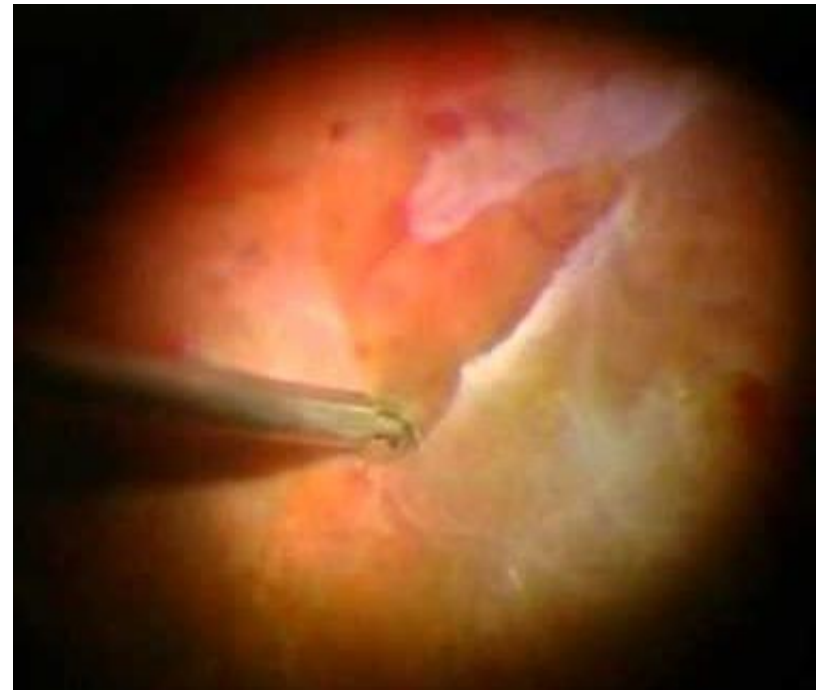
# SURGICAL TECHNIQUE

## Membrane Dissection

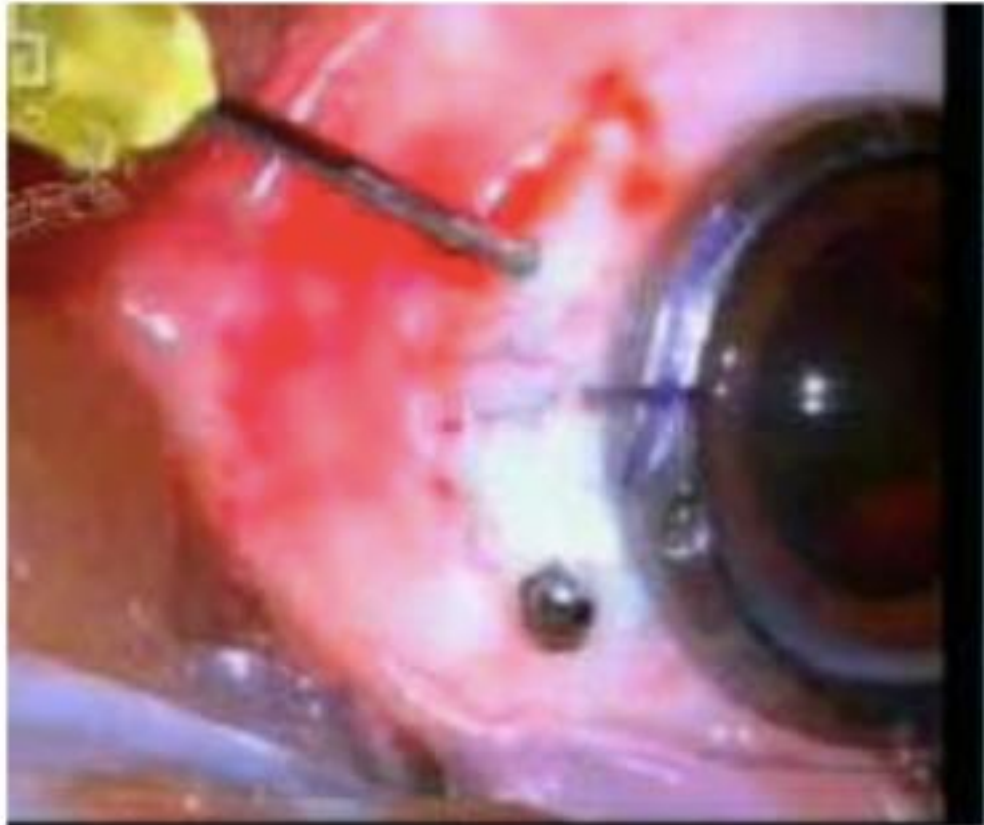
- “En bloc” technique  
removal of the vitreous  
and associated  
vitreoretinal membranes  
as a single unit



- Combination technique



# Bimanual Membrane Surgery



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# Tamponades

- Prolonged tamponade in cases of retinal breaks with traction, retinal detachments or diffuse hemorrhage
- Gases as SF<sub>6</sub>, C<sub>2</sub>F<sub>6</sub>, or C<sub>3</sub>F<sub>8</sub>
- Silicone oil is of choice in reoperations or severe cases, if a longer tamponade is required,

# COMPLICATION

- Intraoperative

- Corneal edema
- Lens touch
- Pupillary constriction
- Intraocular haemorrhage
- Retinal break or detachment
- Subretinal PFCL or Silicone oil

- Postoperative

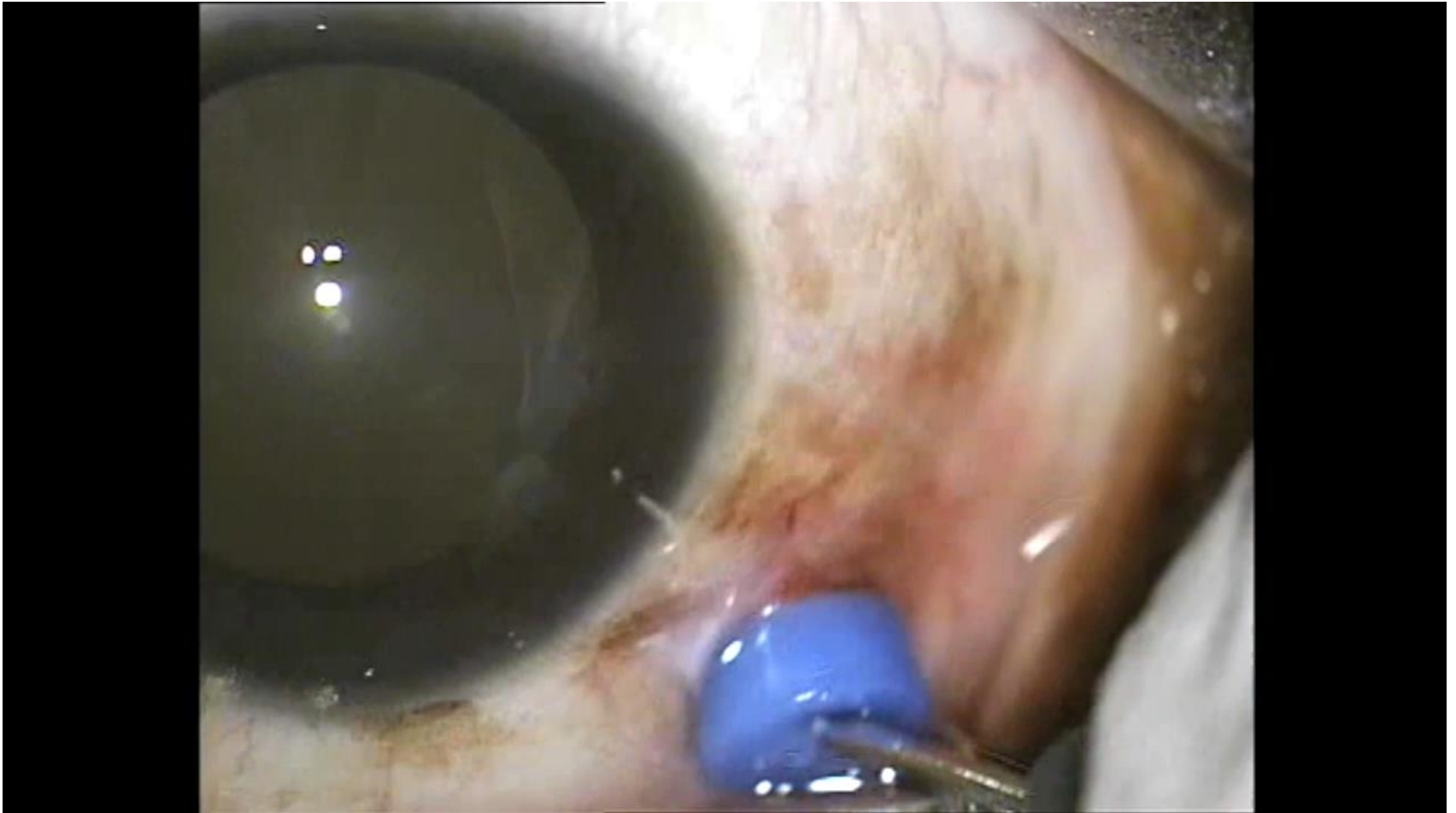
- NVI and NVG
- Cataract
- Fibrinoid Syndrome
- Postoperative Vitreous cavity haemorrhage
- Anterior Hyaloidal fibrovascular proliferation



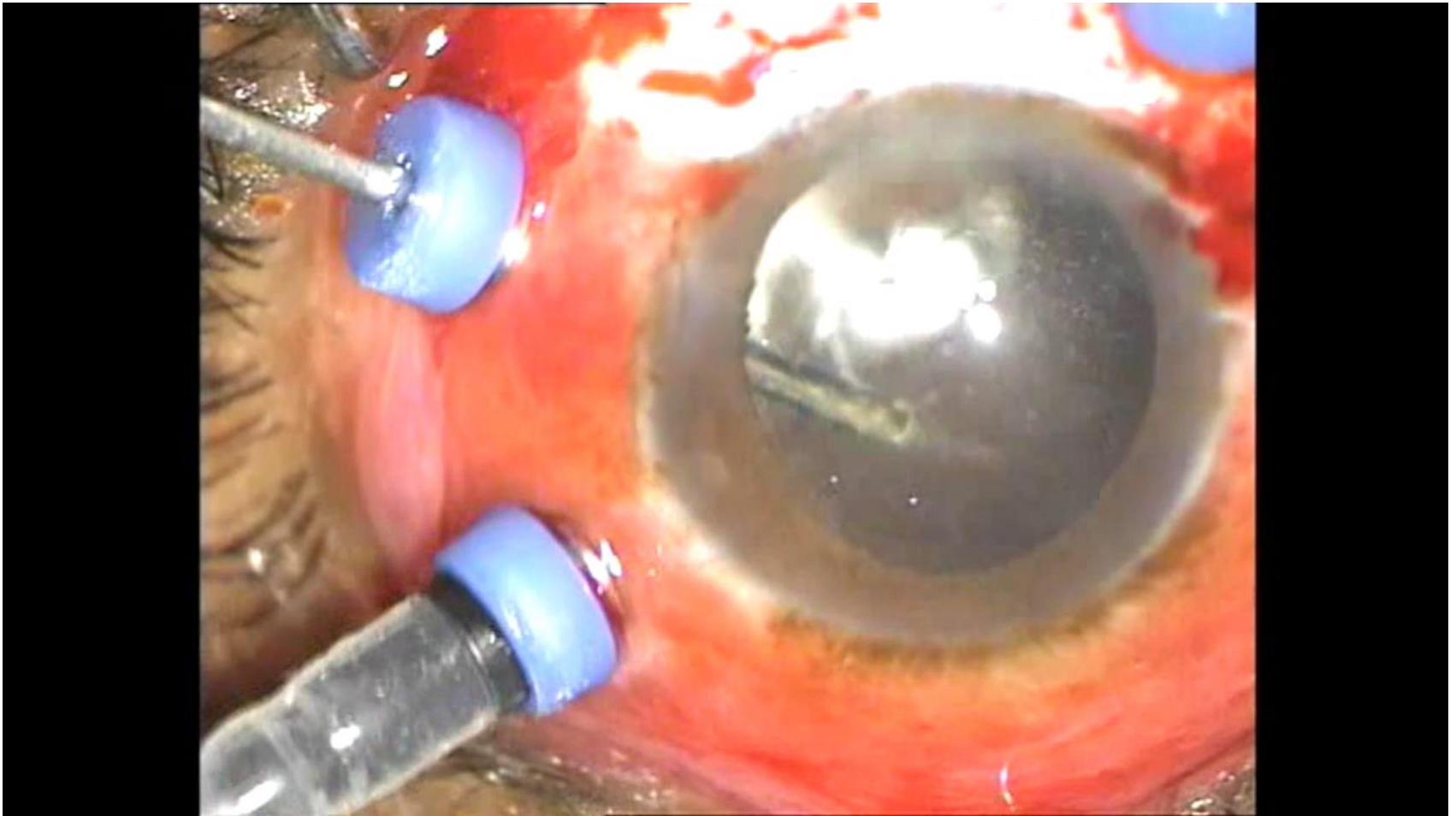
## Post vitrectomy Vitreous Hg

- Recent study suggest decrease from 75% in 1980 to 30% today
- Early POVH in 1<sup>st</sup> 4 weeks postoperatively
- Late POVH > 4 weeks

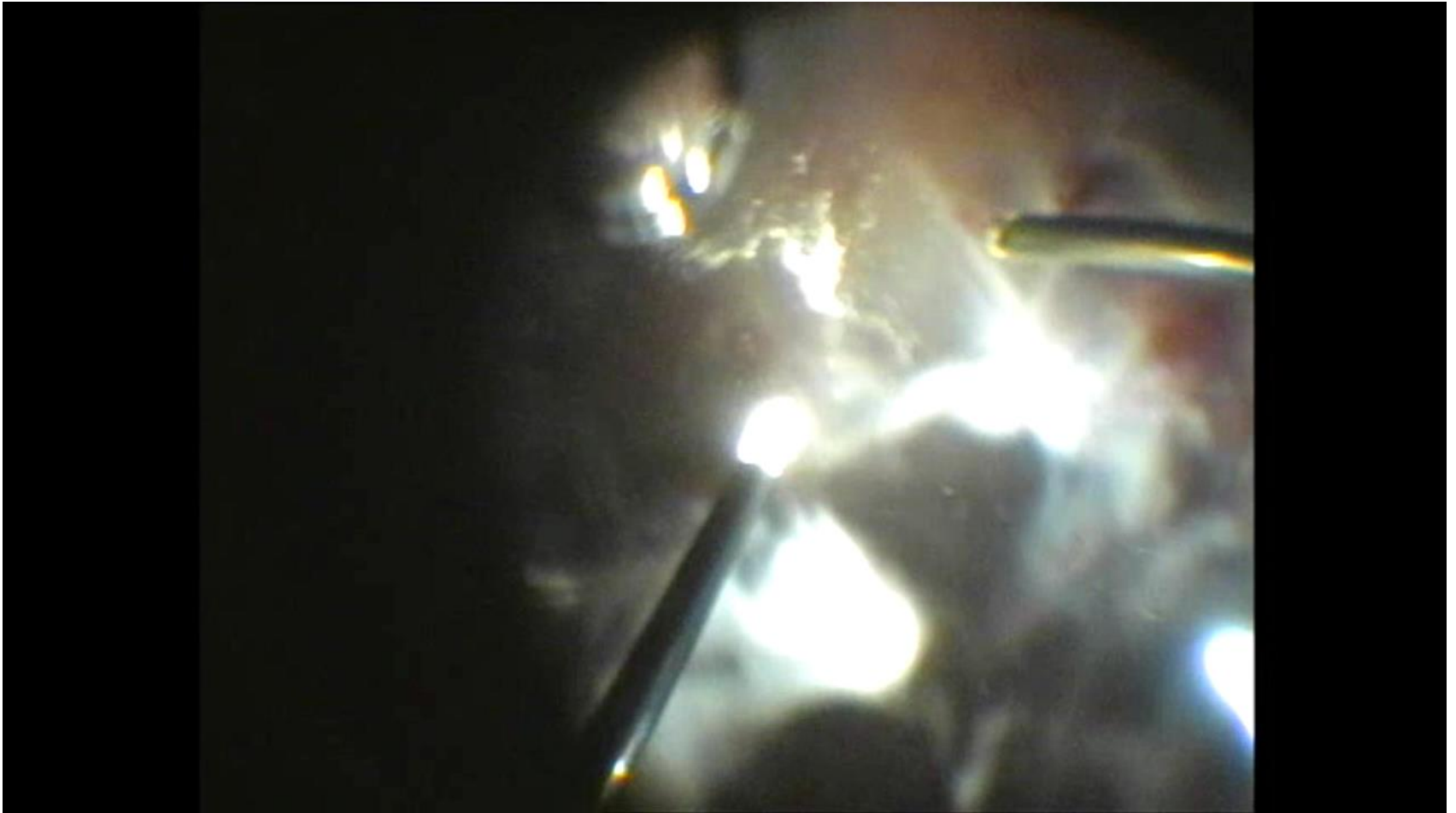
# CASE 1: ILM for DME



# CASE 2: ILM for DME



# CASE 3: ILM for DME





# Recent Advances



High Cutting Rate  
 Good Fluidics  
 All in One

- Xenon/LED light
- Laser
- Cautery
- Injection System:  
SIO, Gas
- Pressureless  
Machines

Good Viewing System  
 Microscope with WVS  
 Cordless  
 Xenon/LED  
 Quality Lenses  
 Adaptability

Vitrectomy  
 Accessories  
 Laser Accessories  
 Vitrectomy  
 Instruments

Heavy Liquids  
 Staining Agents  
 – Trypan Blue,  
 BB, TA etc  
 Tamponade –  
 SIO, HSiO

# STUDY - EVIDENCE

## DRVS GROUP 1 (VH)

- Severe VH (VA  $\leq$  2/200)
- 616 patients
- Early Vit (1-6/12) vrs Late 3yrs (conventional, but vity when  $>$  1 year or RRD).
- Final Results: VA  $\geq$  20/40 = Early 25% and Late 15%

No difference between Type 1 or 2

- Early Vity Remains advantageous after 4 years follow up

## DRVS GROUP 2 (FVP)

- Severe FVP with VA 10/200
- 381 patients recruited
- Vitrectomy or Conventional Mx, (PRP when indicated But Vity sever VH after 6/12 or RD involving Centre of Macular
- Results: Final VA  $\geq$  20/40 was 44% vity Group vrs 28 Conventional Group, with 4vyear follow up

# Conclusion

- Most patients will regain or retain useful vision after diabetic vitrectomy, although the visual outcome remains unpredictable.
- Diabetic vitrectomy has been demonstrated to significantly improve vision-related quality of life.
- Early vitrectomy for diabetic vitreous haemorrhage has also been shown to be a highly cost-effective intervention.
- Surgical outcome after diabetic vitrectomy has continued to steadily improve with advances in vitreoretinal surgical instrumentation and technique.
- Development of adjunctive pharmacotherapy should enable further improvements in the future