



Grand Round: A complication of surgery



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Case history

- 65 year-old Chinese lady
- First presented to us on the 2nd of July 2004
- C/o blurred vision Right eye for the past year



History

- Medical history
 - Hypertension
 - No DM
- No family history of eye diseases



Eye examination

- VA 6/120 6/9-2
with PH No improvement
- IOP 11.5 13.0
- Conjunctiva Nasal pterygium
bilaterally
- Cornea Clear bilaterally

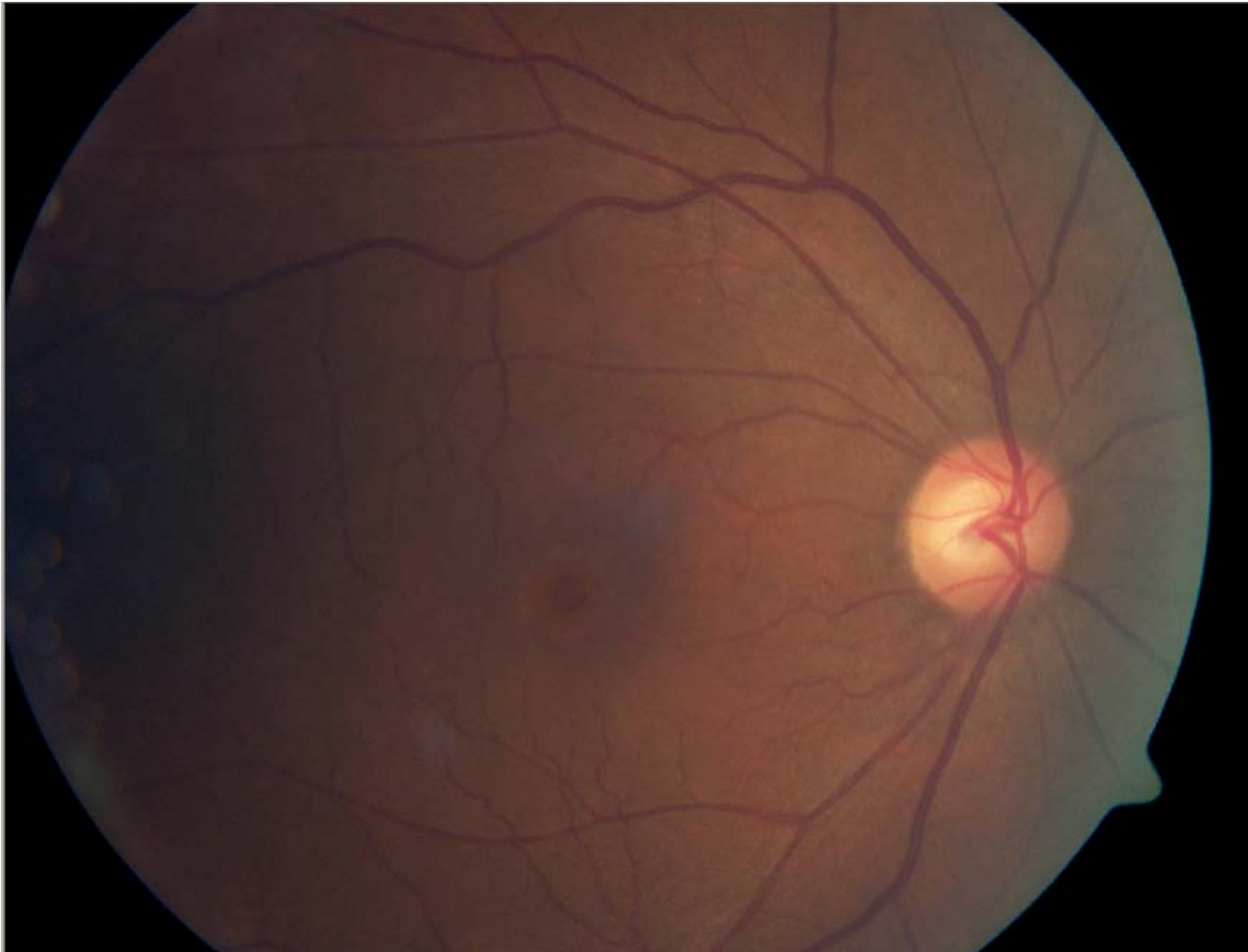


Eye examination

- Anterior chamber Deep & quiet bilaterally
- Iris Normal Superior iris atrophy
- Pupils Round, reactive bilaterally
- Lens Cataract PCIOL
- Fundus (Photo) Normal



Right fundus





What is the diagnosis?



What is the diagnosis?

- Full-thickness macular hole



Diagnostic tests?

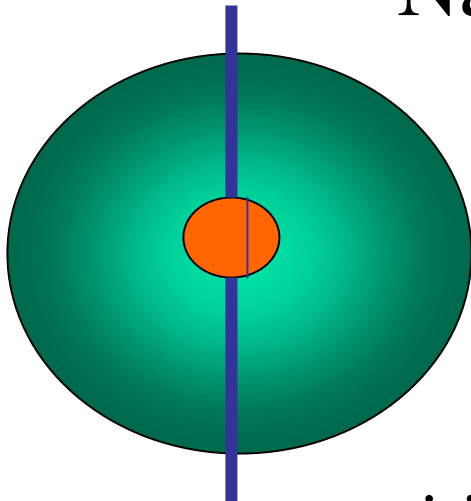
- Watzke-Allen test
- Laser aiming beam test
- FA
- OCT



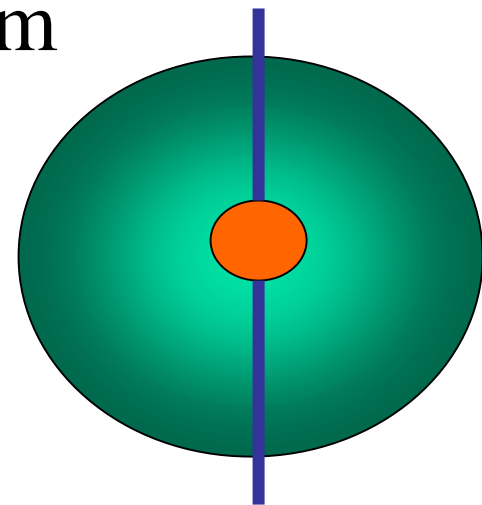
Watzke-Allen test

- 90D or 78D lens

Narrow slit beam



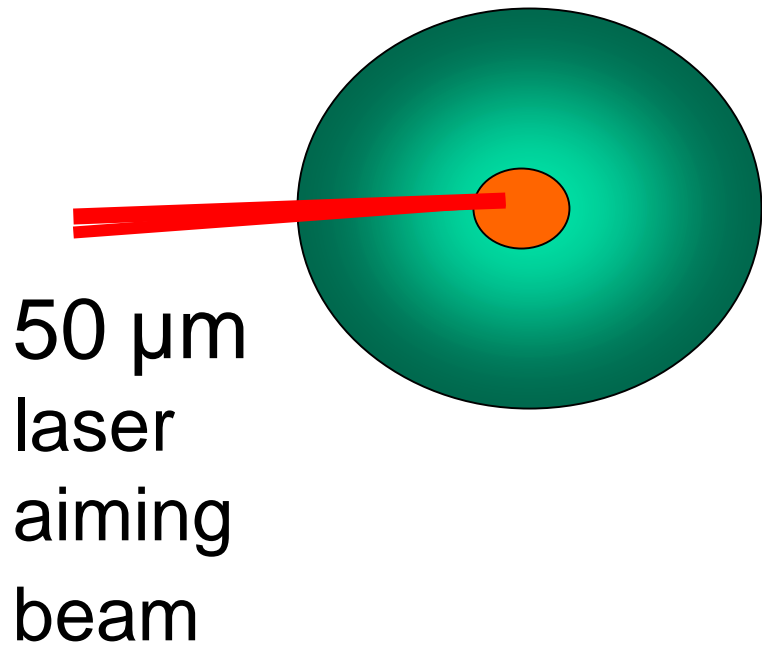
sensitivity 100 %
specificity 86%



specificity 100%
sensitivity 75%



Laser aiming beam test



sensitivity 100%
specificity 93%



Macular holes

- Stage 1
 - Impending macular hole
 - Rarely seen clinically
 - Decreased or absent foveal depression
 - Small, round, yellow spot in centre of fovea
 - Mild decrease in VA
 - Metamorphopsia

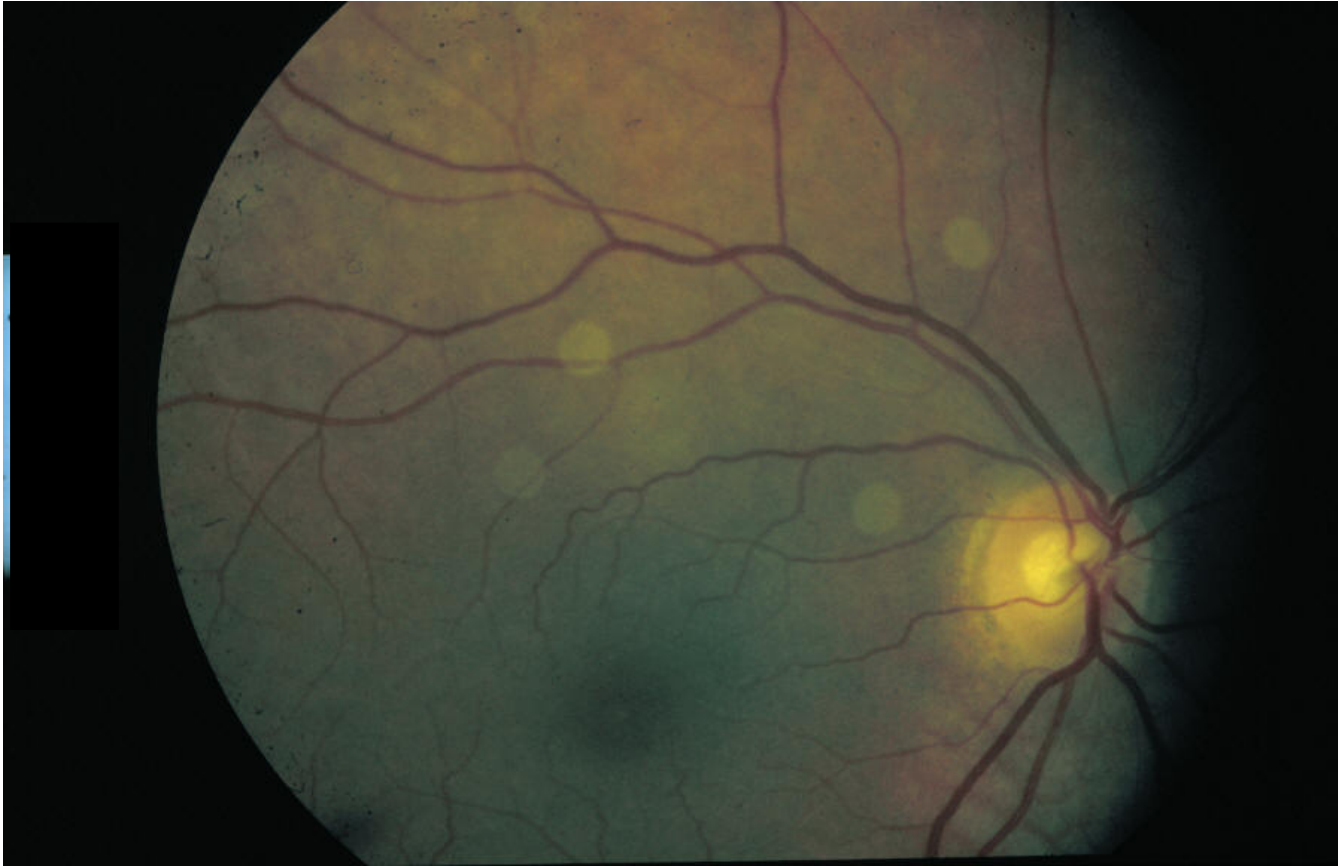


Macular holes

- Stage 1a
 - Impending macular hole
 - Yellow spot (intrafoveal cyst)
- Stage 1b
 - Impending or occult hole
 - Yellow ring



Stage 1





Macular holes

- Stage 2
 - Early macular hole
 - Enlargement of yellow ring
 - Tangential tear at one edge of fovea – eccentric, oval, crescentic or horseshoe-shaped retinal defect < 400 μm diameter
 - +/- pseudo-operculum

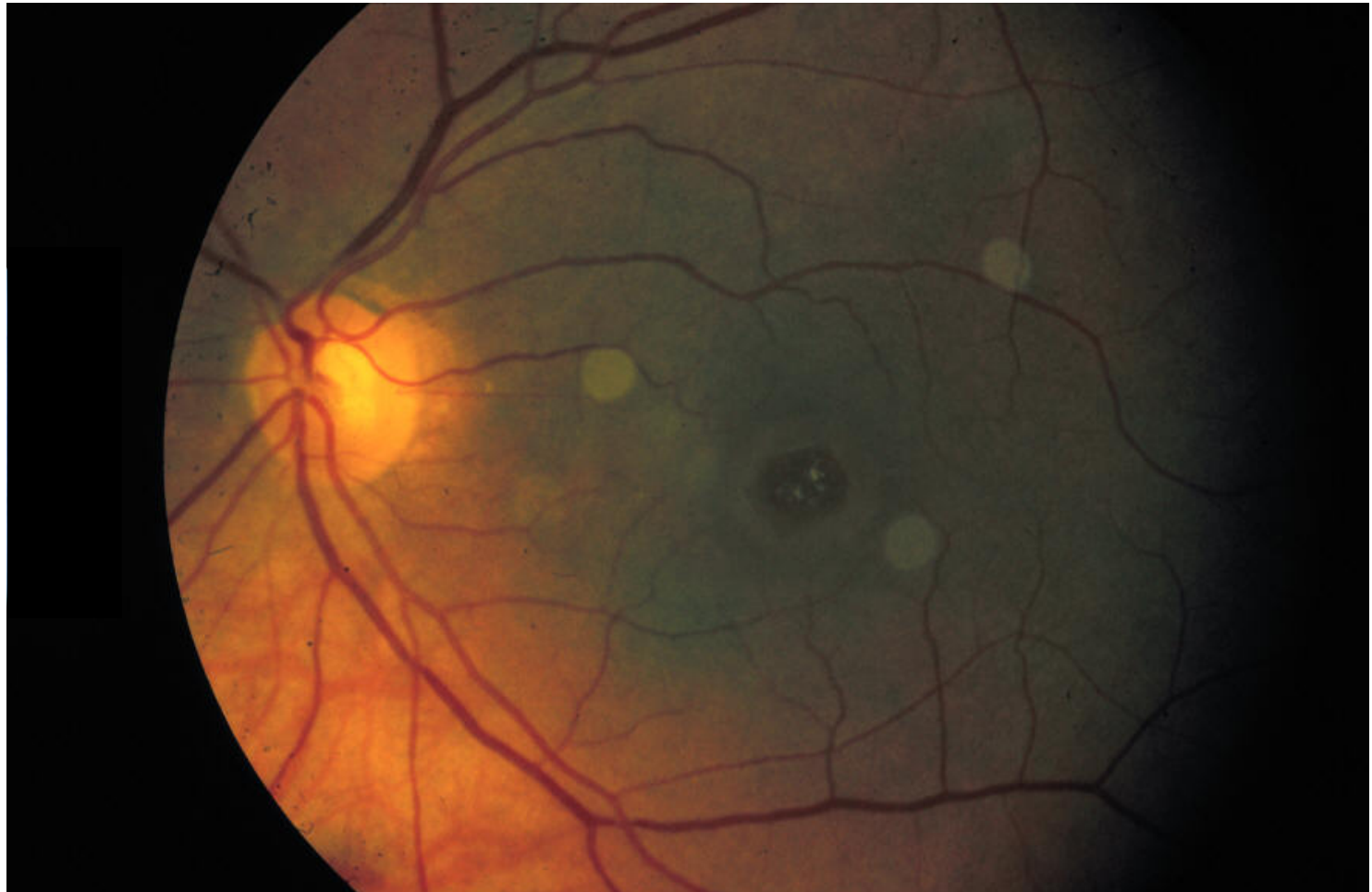


Macular holes

- Stage 3
 - Fully developed macular hole
 - Round punched-out area > 400 μm diameter
 - Surrounded by a halo of retinal detachment
 - Multiple yellow deposits at the level of RPE
 - Pseudo-operculum
 - No PVD



Stage 3

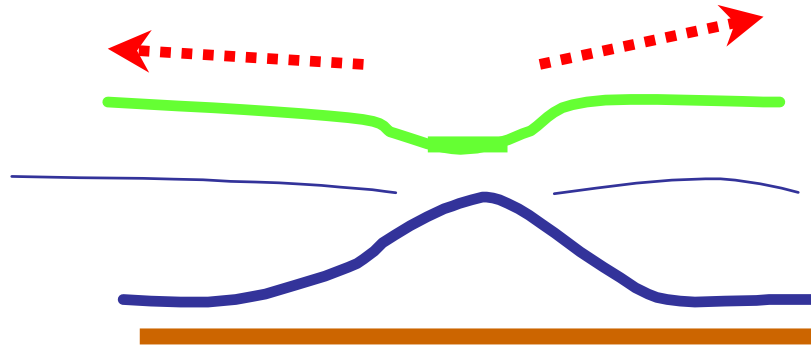




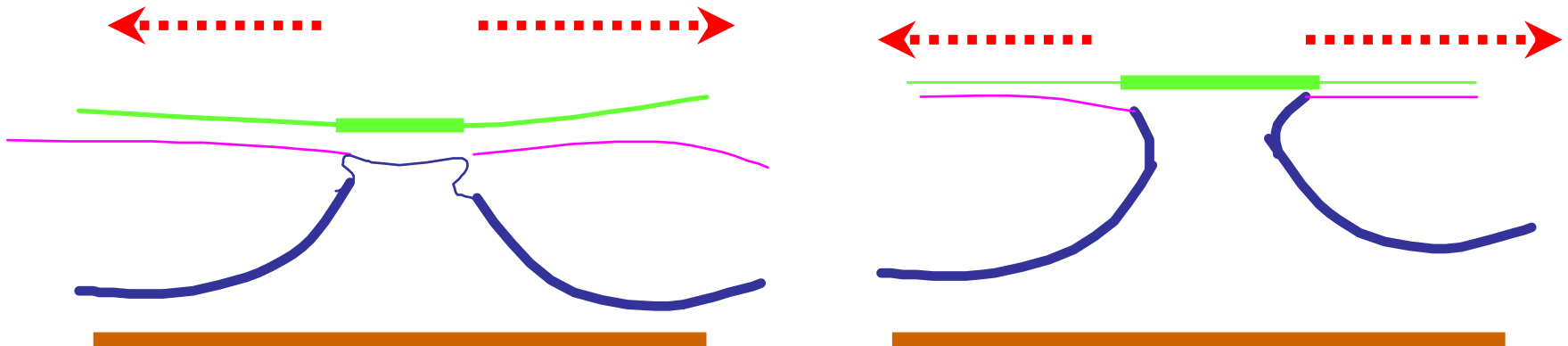
Macular holes

- Stage 4
 - Hole with pseudo-operculum
 - SRF surrounding hole
 - Tiny yellowish deposits at base
 - PVD present (Weiss ring)

Tangential vitreous traction



Stage 1 A (Impending hole) - Yellow spot

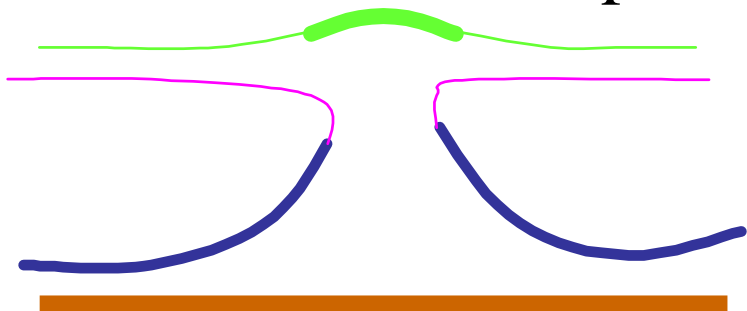


Stage 1 B
(Impending hole)

Stage 1 B
(Occult hole)

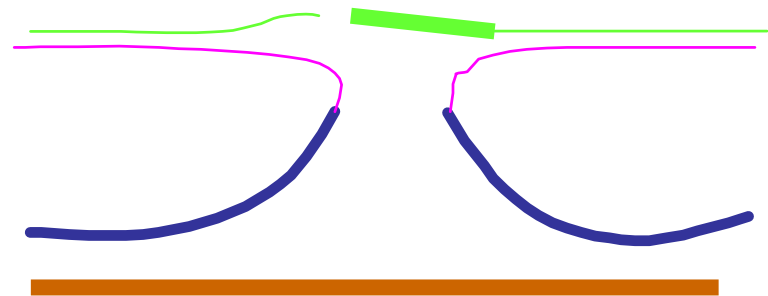
Yellow ring

Separation of condensed vitreous cortex - Pseudooperculum

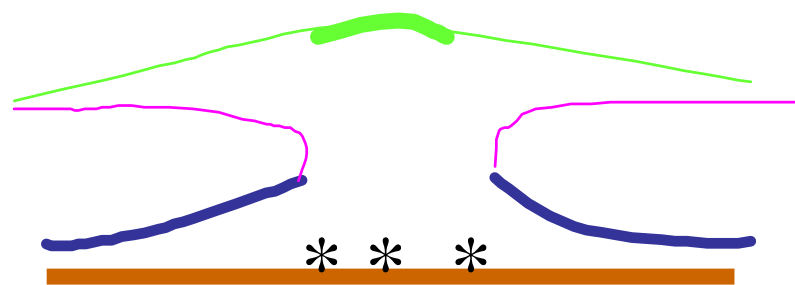
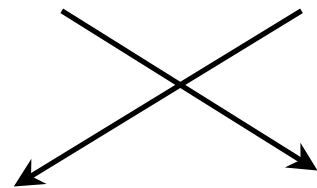


Stage 2

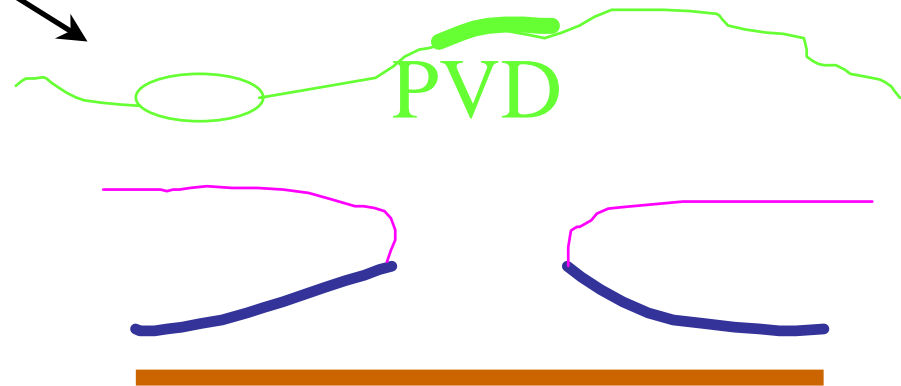
Tear in prefoveolar vitreous cortex at edge of hole



Stage 2



Stage 3
> 400 λ



Stage 4



- In Stage 1 A, spontaneous tangential traction of the prefoveal cortical vitreous causes the foveolar to detach to the level of the surrounding perifoveal retina . The yellow colour is due to the intraretinal xanthophyll pigment.
- Continued centrifugal traction elongates the foveal retina around the umbo causing a doughnut shaped yellow ring. Eventually, it leads to a dehiscence of the retinal receptor layer at the umbo. Detection may be precluded by the semitransparent prefoveal vitreous condensation bridging the macular hole.



- Spontaneous vitreofoveal separation may then occur creating a prefoveal pseudo-operculum. (*Pseudo-opercula are composed of vitreous condensation and reactive glial proliferation*). Presumably, because of relief of prefoveolar traction the yellow ring disappears. The first biomicroscopically identifiable full thickness hole is a stage 2 hole. It is less than $400\mu\text{m}$.
- These generally enlarge to stage 3 holes $> 400 \mu\text{m}$ and about half will demonstrate nodular yellow deposits on the surface of the RPE. Nearly all will demonstrate a shallow surrounding neurosensory detachment.
- Stage 3 holes may then evolve to stage 4 holes when there is complete vitreous separation from the macular surface and optic disc



Macular holes

- Only occasionally cause RD (high myopia)
- RD secondary to macular hole
 - Tends not to reach ora
 - Usually confined to posterior fundus
 - Usually shallow



Macular hole - aetiology

- Idiopathic
 - Postmenopausal women
 - Bilateral in 10%
- Severe myopia
 - Associated with posterior staphyloma
- Trauma



Macular hole - aetiology

- Solar retinopathy
 - Phototoxicity
 - Small lamellar hole or cyst
 - Develops 2 weeks after exposure to sun



Case history

- Noted to have a Right macular hole a year ago and advised for surgery
- Sought a second opinion later and referred to AH.



What can be done?



Macular hole - management

- Before 1980s – no treatment
- 1991 - Kelley and Wendel
 - TPPV - removal of cortical vitreous
 - A-F-G exchange & face down position
- 58% holes closed
- 42% VA improved 2 Snellen lines



Macular hole - management

- Natural history
 - Spontaneous closure of FTMH in 11.5%
 - Little or no change in overall acuity levels in 24 months
- Surgery
 - 80.6% closure rate
 - 45% achieved Snellen acuity of 20/40 or better

Ezra E, Gregor ZJ; Moorfields Macular Hole Study Group Report No. 1. Surgery for idiopathic FTMH: 2-year results of a randomized clinical trial comparing natural history, vitrectomy, and vitrectomy plus autologous serum. *Arch Ophthalmol* 2004 Feb;122(2):224-36



Macular hole - management

- Subsequently - TPPV
 - gas
 - adjuvant tissue glues
 - membrane peel
 - post op positioning

improved anatomical and functional success



Adjuvants

	Adjunctive substances	Closure of FTMH
Kelly & Wendel	-	52%
Glaser	Bovine TGF - β	100%
Thompson	Recombinant TGF - β	77%
Liggett	Autologous serum	89%
Iwaski	Autologous fibrin	84%
Gaudic	Autologous platelet	95% *

Vote VJ, Membrey WL, Casswell AG. Autologous platelets for macular hole surgery: the Sussex Eye Hospital experience. *Clin Experiment Ophthalmol.* 2004 Oct;32(5):472-7.



Adjuvants

- Autologous serum
 - No significant difference

Ezra E, Gregor ZJ; Moorfields Macular Hole Study Group Report No. 1. Surgery for idiopathic FTMH: 2-year results of a randomized clinical trial comparing natural history, vitrectomy, and vitrectomy plus autologous serum. *Arch Ophthalmol* 2004 Feb;122(2):224-36



ILM peeling

- High closure rates (from 81% to 92%)
- Lower reopening rates (from 7% to 0.6%)
- Beneficial in older holes
- Limited in larger holes
- Does not significantly improve VA

Kumagai K, Furukawa M, Ogino N et al. Vitreous surgery with and without ILM peeling for macular hole repair. *Retina* 2004 Oct;24(5):721-7



ILM peeling

- ICG

- ? Possible retinal toxicity

Ando F et al, Gandorfer A et al, Sippy BD et al, Haritoglou C et al

- Good outcome

Fletcher EC et al

- Concentration – 0.5 mg/ml or lower

- TA – facilitates ILM peeling

Shah GK, Rosenblatt BJ, Smith M. ILM peeling using triamcinolone acetonide:histopathologic confirmation. *Am J Ophthalmol.* 2004 Oct;138(4):656-7



ILM peeling

- Trypan blue
 - No decrease in cell viability at 1.5mg/ml concentration.

Gale JS, Proulx AA, Gonder JR et al. Comparison of the in vitro toxicity of ICG to that of trypan blue in human RPE cell cultures. *Am J Ophthalmol* 2004;138:64-69.



Gas

- Air - gas exchange
- Nonexpansile concentration of a long-acting gas

Octafluoropropane (C₃ F₈) - 12- 16 %

Sulfahexafluoride (SF₆) -20 - 25%



Indications for surgery

- Ideal surgical candidate
 - Recent onset
 - <1 year
 - Small Stage 2 FTMH
 - Up to Stage 3
 - Symptomatic - Progressive loss of vision
 - VA worse than 6/18
 - No problems positioning postop



Indications for surgery

- Duration

- <1 year – 94.0% closure rate
- >1 year – 47.4% closure rate

Jaycock PD, Bunce C, Xing W et al. Outcomes of macular hole surgery: implications for surgical management and clinical governance. *Eye advance online publication*, 24 September 2004.

- Small Stage 2 FTMH

- Up to Stage 3
- Best result in Stage 2

Oz O, Fudemberg SJ, Cakir B et al. Predictors of success in macular hole surgery with emphasis on the ILM and ILM peeling. *Ophthalmic Surg Lasers Imaging*. 2004 May-Jun;35(3):207-14.



Indications for surgery

- Very small or questionable FTMH with good stable vision
 - surgery deferred till evidence of progression
- Long standing FTMH
 - risks vs benefits



Contraindications for surgery

- Unable to posture postop - relative
- Anticoagulant therapy - caution
- 2 previous failed surgeries



Complications

- Elevated IOP
- Flat chamber
- Endophthalmitis
- Cataract
- Retinal tears & RD
- Choroidal neovascularisation
- Visual field loss



Complications

- Endophthalmitis – 1%
- Peripheral retinal break – 3%
- RD from peripheral retinal break – 14%
- RPE loss under hole – 1%
- Photic toxicity – 1%



Complications

- Failure to close
- Increased size of hole
 - 2%

Park SS, Marcus DM, Duker JS et al. Posterior segment complications after vitrectomy for macular hole. *Ophthalmology* 1995 May;102(5):775-81

- Late reopening
 - 2 - 9.5%
 - Causes of reopening
 - Cataract surgery
 - Epiretinal membrane



Management

- Surgery done on 12/8/04.



Surgical procedure

- Phacoemulsification with intraocular lens implantation
- Three-port pars plana vitrectomy
- Trypan blue (Membrane Blue®[®], DORC, The Netherlands)–aided internal limiting membrane (ILM) peeling



Surgical procedure

- Endolaser surrounding an area of strong vitreo-retinal adhesion inferior to the infero-temporal arcade, and
- 16% perfluoropropane:air mixture injection



Postop management

- Gutt Chloramphenicol q 3H RE
- Gutt Pred Forte q 3H RE
- Gutt Atropine 1% bd RE

- T Diamox 250 mg tds x 5 days
- T Ponstan 250 mg tds x 3 days
- T Antacid tds x 3 days

- Posture face down



Postop Day 1

- VA RE - CF closely
- PCIOL stable
- Fundus – good gas fill
- IOP 34 mm Hg



Postop Day 1 management

- Aqueous released
- Added Gutt Timolol 0.5% bd RE
- Added Gutt Bimatoprost 0.03% on RE



Postop D3

- IOP 19
- Good gas fill



2 weeks Postop

- VA CF closely 6/12
- IOP 11.0 12.0
- Fundus Gas 60%

- Not posturing well

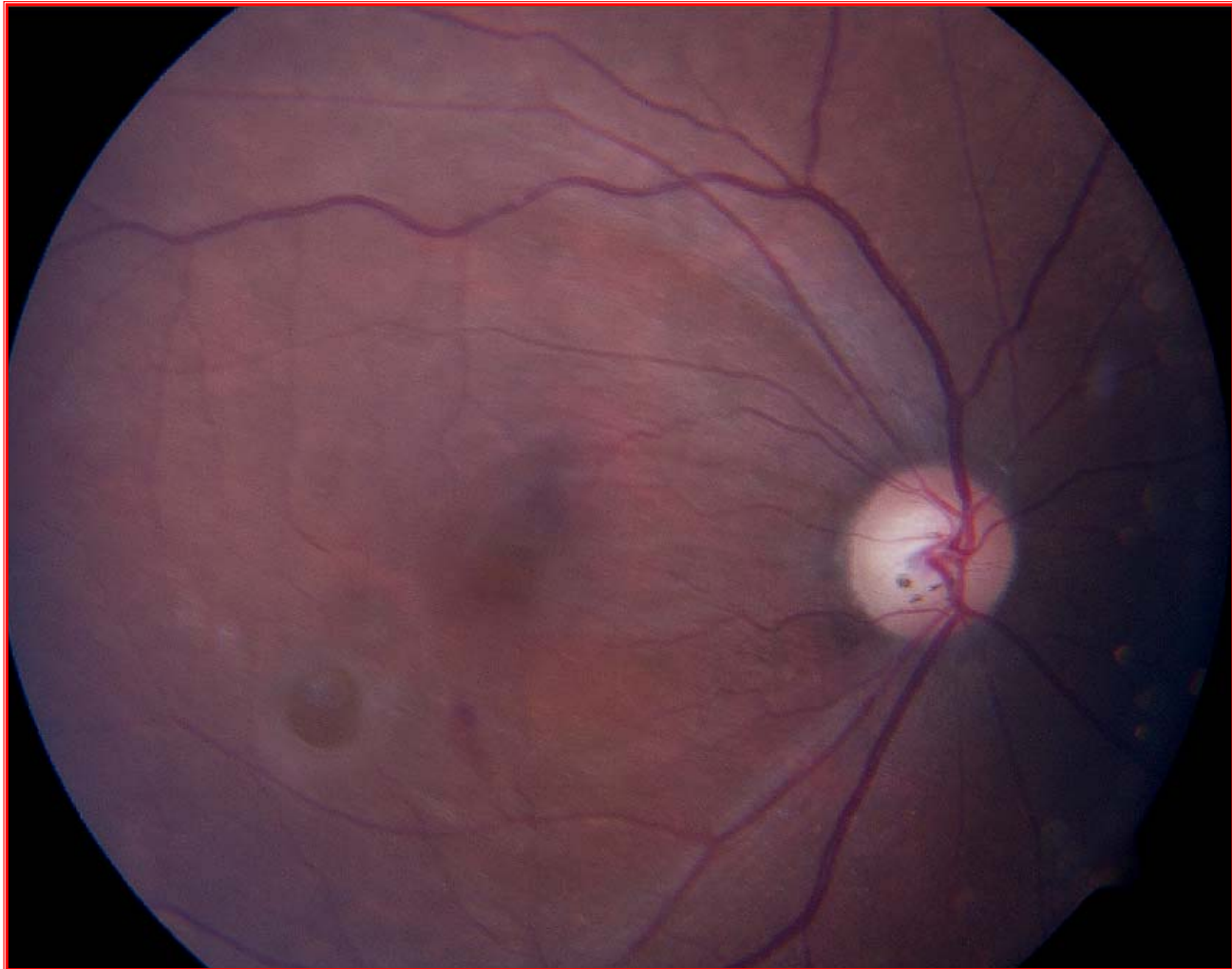


5 weeks Postop

- VA 6/120 6/15
 - IOP 14.3 12.0
 - Fundus Macular hole closed
-
- Patient was not compliant with face-down positioning - postured only partially during the first 4 days after surgery



11 weeks Postop - Fundus





What is the diagnosis?



What investigation
would you like to do?



What investigation would you like to do?

- FFA
- OCT

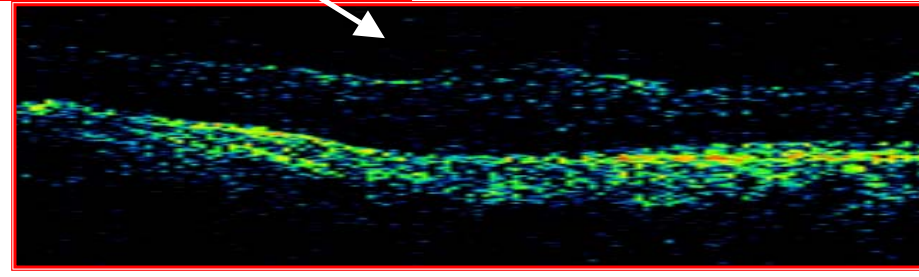
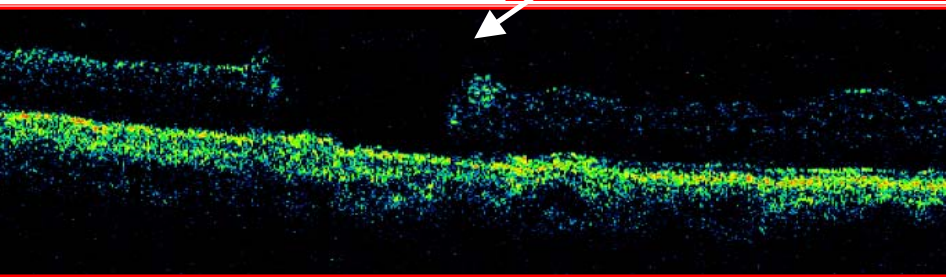
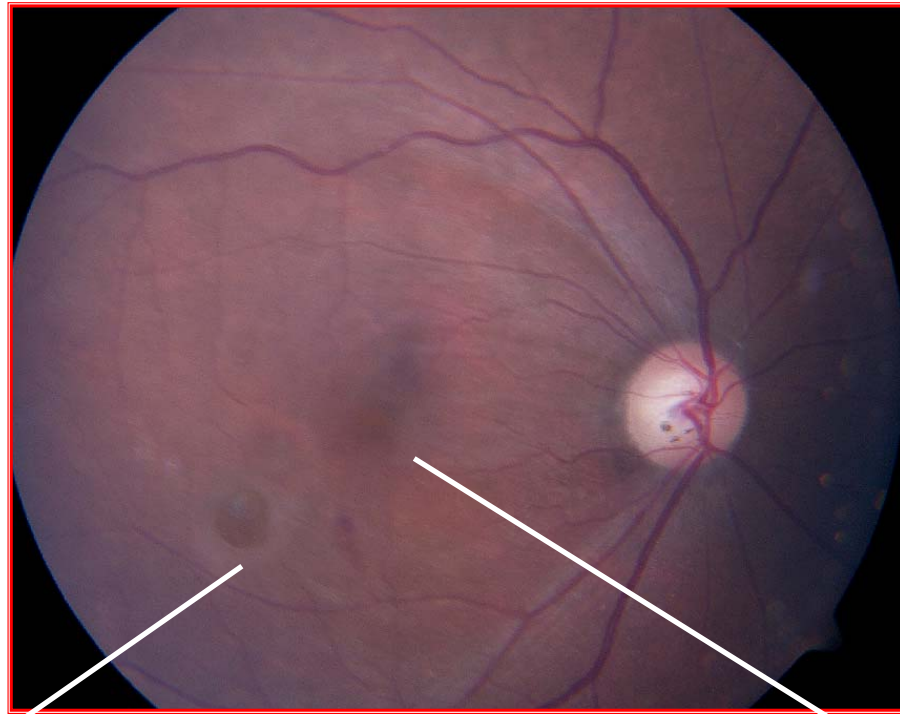


FFA





OCT





OCT

- Confirmed
 - Closure of original hole
 - Full-thickness nature of new hole



What is the diagnosis?

- A new full-thickness eccentric macular hole in the same eye
- Position – 2.9mm away from, and at 7 o'clock relative to the geometric center of the FAZ
- Edges of new hole apposed
- No subretinal fluid or traction



What is the
management for this?



24 weeks postop

- Asymptomatic
- VA 6/30-1 6/24-1
- Fundus Macula still flat



Iatrogenic eccentric FTMH

- Unreported till very recently – Rubinstein A, Bates R, Benjamin L et al. in Eye 2004 Nov 12 [Epub ahead of print]
- Location of holes believed to represent initial site of ILM elevation
- Asymptomatic
- Do not require treatment and no complications in up to 6 years of follow-up.



Iatrogenic eccentric FTMH

- Rare
- Should not be mistaken as failure of surgery. Otherwise, surgeons may be misled into unnecessarily performing a repeat operation.

THANK YOU

