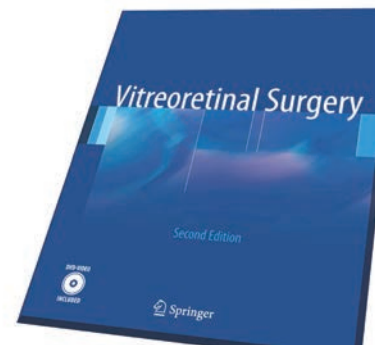
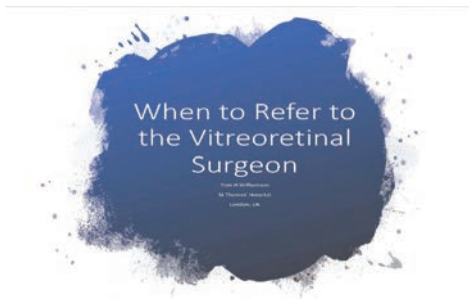


Retinal Update

When to refer to Vitreoretinal Surgeon

Tom Williamson
MBChB FRCS (Glas) FRCOphth MD



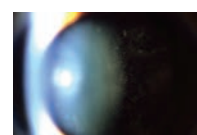


Referral

- What clinical diagnosis need referral?
 - Are there features of the condition that determine need for referral?
- How quickly?
- What is the reason for referral?

1. What
2. How
3. Why

Condition	Referral	Referral	Referral
Macular hole	Duration < 6 weeks	1-2 weeks	Macular hole repair
Macular hole	Duration > 6 weeks	2-3 weeks	Macular hole repair
Macular hole	Duration > 12 weeks	3-4 weeks	Macular hole repair
Macular hole	Duration > 18 weeks	4-5 weeks	Macular hole repair
Macular hole	Duration > 24 weeks	5-6 weeks	Macular hole repair
Macular hole	Duration > 30 weeks	6-7 weeks	Macular hole repair
Macular hole	Duration > 36 weeks	7-8 weeks	Macular hole repair
Macular hole	Duration > 42 weeks	8-9 weeks	Macular hole repair
Macular hole	Duration > 48 weeks	9-10 weeks	Macular hole repair
Macular hole	Duration > 54 weeks	10-11 weeks	Macular hole repair
Macular hole	Duration > 60 weeks	11-12 weeks	Macular hole repair
Macular hole	Duration > 66 weeks	12-13 weeks	Macular hole repair
Macular hole	Duration > 72 weeks	13-14 weeks	Macular hole repair
Macular hole	Duration > 78 weeks	14-15 weeks	Macular hole repair
Macular hole	Duration > 84 weeks	15-16 weeks	Macular hole repair
Macular hole	Duration > 90 weeks	16-17 weeks	Macular hole repair
Macular hole	Duration > 96 weeks	17-18 weeks	Macular hole repair
Macular hole	Duration > 102 weeks	18-19 weeks	Macular hole repair
Macular hole	Duration > 108 weeks	19-20 weeks	Macular hole repair
Macular hole	Duration > 114 weeks	20-21 weeks	Macular hole repair
Macular hole	Duration > 120 weeks	21-22 weeks	Macular hole repair
Macular hole	Duration > 126 weeks	22-23 weeks	Macular hole repair
Macular hole	Duration > 132 weeks	23-24 weeks	Macular hole repair
Macular hole	Duration > 138 weeks	24-25 weeks	Macular hole repair
Macular hole	Duration > 144 weeks	25-26 weeks	Macular hole repair
Macular hole	Duration > 150 weeks	26-27 weeks	Macular hole repair
Macular hole	Duration > 156 weeks	27-28 weeks	Macular hole repair
Macular hole	Duration > 162 weeks	28-29 weeks	Macular hole repair
Macular hole	Duration > 168 weeks	29-30 weeks	Macular hole repair
Macular hole	Duration > 174 weeks	30-31 weeks	Macular hole repair
Macular hole	Duration > 180 weeks	31-32 weeks	Macular hole repair
Macular hole	Duration > 186 weeks	32-33 weeks	Macular hole repair
Macular hole	Duration > 192 weeks	33-34 weeks	Macular hole repair
Macular hole	Duration > 198 weeks	34-35 weeks	Macular hole repair
Macular hole	Duration > 204 weeks	35-36 weeks	Macular hole repair
Macular hole	Duration > 210 weeks	36-37 weeks	Macular hole repair
Macular hole	Duration > 216 weeks	37-38 weeks	Macular hole repair
Macular hole	Duration > 222 weeks	38-39 weeks	Macular hole repair
Macular hole	Duration > 228 weeks	39-40 weeks	Macular hole repair
Macular hole	Duration > 234 weeks	40-41 weeks	Macular hole repair
Macular hole	Duration > 240 weeks	41-42 weeks	Macular hole repair
Macular hole	Duration > 246 weeks	42-43 weeks	Macular hole repair
Macular hole	Duration > 252 weeks	43-44 weeks	Macular hole repair
Macular hole	Duration > 258 weeks	44-45 weeks	Macular hole repair
Macular hole	Duration > 264 weeks	45-46 weeks	Macular hole repair
Macular hole	Duration > 270 weeks	46-47 weeks	Macular hole repair
Macular hole	Duration > 276 weeks	47-48 weeks	Macular hole repair
Macular hole	Duration > 282 weeks	48-49 weeks	Macular hole repair
Macular hole	Duration > 288 weeks	49-50 weeks	Macular hole repair
Macular hole	Duration > 294 weeks	50-51 weeks	Macular hole repair
Macular hole	Duration > 300 weeks	51-52 weeks	Macular hole repair
Macular hole	Duration > 306 weeks	52-53 weeks	Macular hole repair
Macular hole	Duration > 312 weeks	53-54 weeks	Macular hole repair
Macular hole	Duration > 318 weeks	54-55 weeks	Macular hole repair
Macular hole	Duration > 324 weeks	55-56 weeks	Macular hole repair
Macular hole	Duration > 330 weeks	56-57 weeks	Macular hole repair
Macular hole	Duration > 336 weeks	57-58 weeks	Macular hole repair
Macular hole	Duration > 342 weeks	58-59 weeks	Macular hole repair
Macular hole	Duration > 348 weeks	59-60 weeks	Macular hole repair
Macular hole	Duration > 354 weeks	60-61 weeks	Macular hole repair
Macular hole	Duration > 360 weeks	61-62 weeks	Macular hole repair
Macular hole	Duration > 366 weeks	62-63 weeks	Macular hole repair
Macular hole	Duration > 372 weeks	63-64 weeks	Macular hole repair
Macular hole	Duration > 378 weeks	64-65 weeks	Macular hole repair
Macular hole	Duration > 384 weeks	65-66 weeks	Macular hole repair
Macular hole	Duration > 390 weeks	66-67 weeks	Macular hole repair
Macular hole	Duration > 396 weeks	67-68 weeks	Macular hole repair
Macular hole	Duration > 402 weeks	68-69 weeks	Macular hole repair
Macular hole	Duration > 408 weeks	69-70 weeks	Macular hole repair
Macular hole	Duration > 414 weeks	70-71 weeks	Macular hole repair
Macular hole	Duration > 420 weeks	71-72 weeks	Macular hole repair
Macular hole	Duration > 426 weeks	72-73 weeks	Macular hole repair
Macular hole	Duration > 432 weeks	73-74 weeks	Macular hole repair
Macular hole	Duration > 438 weeks	74-75 weeks	Macular hole repair
Macular hole	Duration > 444 weeks	75-76 weeks	Macular hole repair
Macular hole	Duration > 450 weeks	76-77 weeks	Macular hole repair
Macular hole	Duration > 456 weeks	77-78 weeks	Macular hole repair
Macular hole	Duration > 462 weeks	78-79 weeks	Macular hole repair
Macular hole	Duration > 468 weeks	79-80 weeks	Macular hole repair
Macular hole	Duration > 474 weeks	80-81 weeks	Macular hole repair
Macular hole	Duration > 480 weeks	81-82 weeks	Macular hole repair
Macular hole	Duration > 486 weeks	82-83 weeks	Macular hole repair
Macular hole	Duration > 492 weeks	83-84 weeks	Macular hole repair
Macular hole	Duration > 498 weeks	84-85 weeks	Macular hole repair
Macular hole	Duration > 504 weeks	85-86 weeks	Macular hole repair
Macular hole	Duration > 510 weeks	86-87 weeks	Macular hole repair
Macular hole	Duration > 516 weeks	87-88 weeks	Macular hole repair
Macular hole	Duration > 522 weeks	88-89 weeks	Macular hole repair
Macular hole	Duration > 528 weeks	89-90 weeks	Macular hole repair
Macular hole	Duration > 534 weeks	90-91 weeks	Macular hole repair
Macular hole	Duration > 540 weeks	91-92 weeks	Macular hole repair
Macular hole	Duration > 546 weeks	92-93 weeks	Macular hole repair
Macular hole	Duration > 552 weeks	93-94 weeks	Macular hole repair
Macular hole	Duration > 558 weeks	94-95 weeks	Macular hole repair
Macular hole	Duration > 564 weeks	95-96 weeks	Macular hole repair
Macular hole	Duration > 570 weeks	96-97 weeks	Macular hole repair
Macular hole	Duration > 576 weeks	97-98 weeks	Macular hole repair
Macular hole	Duration > 582 weeks	98-99 weeks	Macular hole repair
Macular hole	Duration > 588 weeks	99-100 weeks	Macular hole repair



Hollands et alHollands, H., D. Johnson, A. C. Brox, D. Almeida, D. L. Simel and S. Sharma (2009). "Acute-onset floaters and flashes: Is this patient at risk for retinal detachment?" *JAMA* 302(20): 2243-2249.

	Odds ratio for detection of a retinal break	95% Confidence interval
Subjective vision reduction	5.0	3.1-8.1
Vitreous haemorrhage	10	5.1-20
Absence of vitreous pigmentation	0.23	0.12-0.43

'When to refer to Vitreoretinal Surgeon' (slides 1-8)

Tom Williamson
MBChB FRCS (Glas) FRCOphth MD

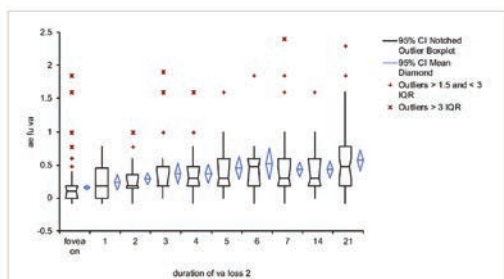
PVD

Condition	Characteristics	Referral	Why
Symptomatic PVD	Symptoms less than 6 weeks	Immediate	Risk of retinal breaks
	Symptoms more than 6 weeks	Routine	Risk of retinal breaks leading to RRD is low

Rhegmatogenous retinal detachment

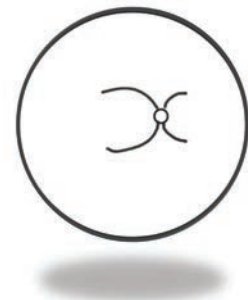
Achieving success in RRD

- ① Case mix
 - Early referral and surgery
 - Avoiding PVR
- ② Surgical skill
 - Find the breaks
 - Uncomplicated surgery

Duration of VA loss Williamson, T. H., M. Shunmugam, I. Rodrigues, M. Dogramaci and E. Lee (2013). "Characteristics of rhegmatogenous retinal detachment and their relationship to visual outcome." *Eye (London)* 27(9): 1063-1069.

Case mix

- Total RRD
- PVR
- Position of break
 - Superotemporal
 - Inferior at 6 o'clock



Ability to fix retina with one operation



Visual acuity recovery

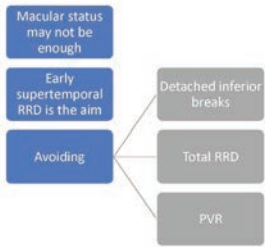
	20/30 or better with variable %	20/30 or better without variable %	Relative risk	95% confidence interval	P value
Primary success of surgery	70.15	39.09	2.04	1.69-2.46	<0.0001
Presence of PVR	32.50	71.66	0.42	0.35-0.50	<0.0001
Quadrants of RRD 3 or 4	47.94	78.30	0.42	0.32-0.51	<0.0001
Visual acuity at presentation of 20/30 or better	87.25	51.01	3.84	2.88-5.12	<0.0001

'When to refer to Vitreoretinal Surgeon'

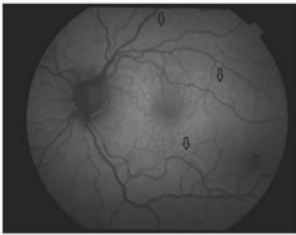
(slides 9-24)

Tom Williamson
MBChB FRCS (Glas) FRCOphth MD

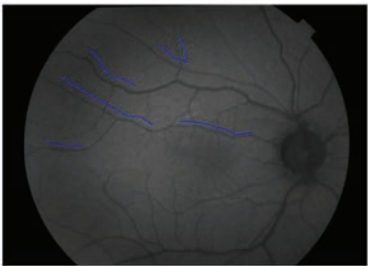
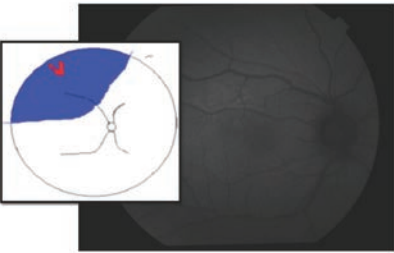
Conclusions



Macula off RRD



Macula on RRD



RRD

Condition	Characteristics	Referral	Why
RRD with PVD	Macula on	Immediate	Prevent macula detaching
	Macula off less than 1 week	1-3 days	Macula should recover fully
	Macula off 1-2 weeks	1 week	Macula should recover well
	Macula off 2-6 weeks	1-2 weeks	Macula will show moderate recovery
	Macula off > 6 weeks	2-3 weeks	Macula unlikely to recover well
RRD without PVD		1 week	Slow progression

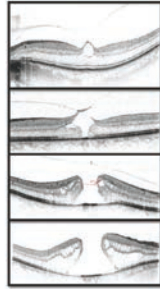
Macular disorders

Macular Hole

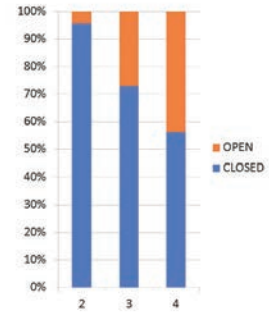
Gass grading

Gass, J. D. (1988). "Idiopathic senile macular hole: its early stages and pathogenesis." *Arch Ophthalmol* 106(5): 629-639.

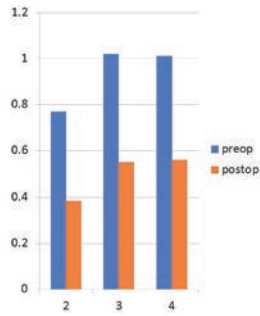
- 1 foveal cyst
- 2 <400 microns
- 3 >400 microns
- 4 PVD



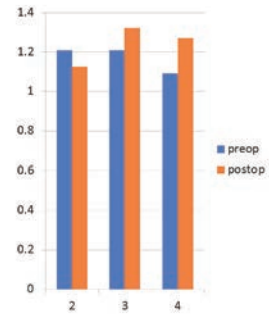
Closure rate by grade (n=351) Williamson, T. H. and E. Lee (2013). "Idiopathic macular hole: analysis of visual outcomes and the use of indocyanine green or brilliant blue for internal limiting membrane peel." *Graefes Arch Clin Exp Ophthalmol*.



Closed holes and VA ($p < 0.0001$)



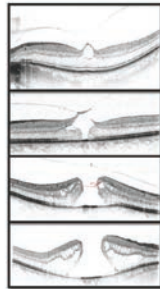
Unclosed holes and VA (no significant difference)



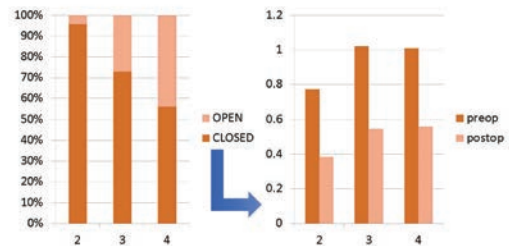
mean duration of symptoms (n=351)

Williamson, T. H. and E. Lee (2013). "Idiopathic macular hole: analysis of visual outcomes and the use of indocyanine green or brilliant blue for internal limiting membrane peel." *Graefes Arch Clin Exp Ophthalmol*.

- grade 2, 0.53 years (SD 0.43)
- grade 3, 0.79 years (SD 0.68)
- grade 4, 1.20 years (SD 1.26) ($p = 0.0002$)



Is it worth referring grade 4?



Macula

Condition	Characteristics	Referral	Why
Macular hole	Duration < 12 months	Refer routinely (1-2 months)	Good surgical results
	Duration > 12 months	Discuss poor prognosis and refer if requested	Poor surgical results

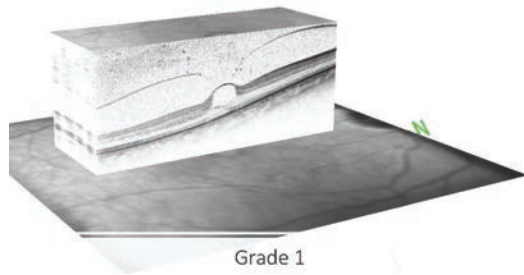
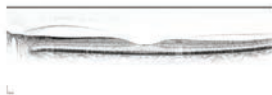
Macular hole Grade 0



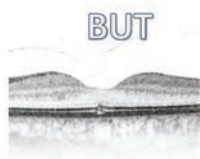
'When to refer to Vitreoretinal Surgeon' (slides 25-40)

Tom Williamson
MBChB FRCS (Glas) FRCOphth MD

• In the fellow eye of a macular hole patient 40% chance of progression
• ? Treat with ocriplasmin
• However, as a coincidental finding progression is uncertain and probably low



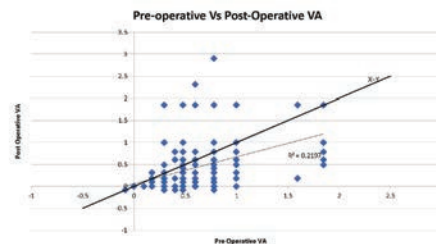
- Observe for spontaneous separation 50%
- ? Treat with ocriplasmin (doubles the chance of separation of the vitreous over saline injection)



Incidence of ERM

- Refer all patients?
- Incidence is 4-29% over the age of 45 years
- Symptomatic
 - Blur
 - Distortion
 - Aniseikonia

Prevalence and Risk Factors for Epiretinal Membranes in a Multi-Ethnic United States Population <https://doi.org/10.1016/j.ophtha.2017.11.014>



Macula

Pre-operative VA ranges	Number of cases, n (%)	Median pre-operative VA, LogMAR	Median post-operative VA, LogMAR	Patients with VA improvement >0.3, n (%)
VA 0.5 or better	111 (46.8)	0.48 (0.30-0.48)	0.18 (0.14-0.3)	15 out of 111 (13.5%)
VA 0.6-0.9	90 (40.0)	0.60 (0.60-0.78)	0.48 (0.18-0.60)	43 out of 90 (47.8%)
VA 1.0 or worse	36 (15.2)	1.0 (1.0-1.85)	0.69 (0.30-1.0)	23 out of 36 (63.8%)

Condition	Characteristics	Referral	Why
Macular pucker	Duration < 24 months	Refer routinely	Good surgical results
	Duration > 24 months	Discuss poor prognosis and refer if requested	Poor surgical results

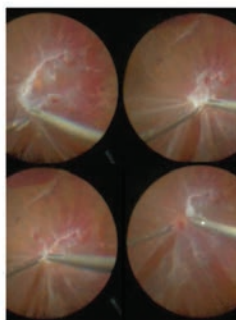
ERM v macular hole

- | | |
|--|--|
| <ul style="list-style-type: none"> • ERM • Common • Asymptomatic • Variable progression • Variable clinical features • Unpredictable surgical outcome • Early surgery does better | <ul style="list-style-type: none"> • Macular hole • Uncommon • Symptomatic • Progressive • Predictable clinical features • Predictable surgical outcome • Early surgery does better |
|--|--|

Complications of diabetic retinopathy

Potential candidates

1. Non clearing vitreous haemorrhage
2. Tractional retinal detachment
3. Combined tractional and rhegmatogenous retinal detachment
4. Uncontrolled neovascularisation
5. Macular traction
6. Macular oedema



Diabetic

Condition	Characteristics	Referral	Why
Diabetic			
	Vitreous haemorrhage with PRP	Routine referral	Stable
	Tractional RD with PRP	Routine referral	Stable
	Vitreous haemorrhage without PRP	2-3 weeks	Risk of progression
	Tractional RD without PRP	2-3 weeks	Risk of progression
	Combined RRD /TRD	1 week	RRD prognosis

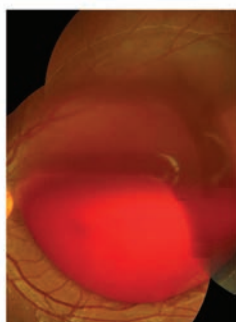
Vitreous haemorrhage other causes

Vitreous haemorrhage causes

- | | |
|--|--|
| <ul style="list-style-type: none"> • Branch retinal vein occlusion • Retinal tear and rhegmatogenous retinal detachment • Choroidal neovascular membrane • Macro-aneurysm • Posterior vitreous detachment • Trauma | <ul style="list-style-type: none"> • Sickle cell retinopathy • Central retinal vein occlusion • Terson's syndrome • Retinal vasculitis • Intermediate uveitis • Retinoschisis • Needle stick injury • Tumour |
|--|--|

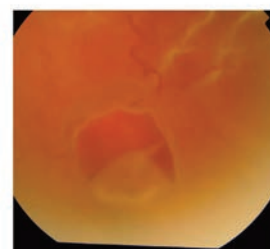
How do we differentiate?

- History
- Examination
- Investigation



The big question

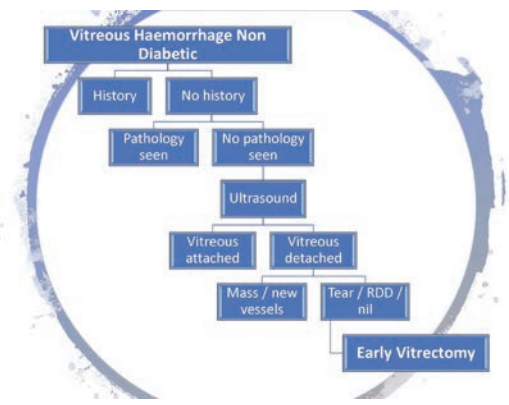
- Do you have a retinal tear?
 - Can you wait?
 - Do you need to operate soon?
- You cannot afford to miss the threat of a retinal detachment.
 - Tear going on to RRD
 - Risk of proliferative vitreoretinopathy in RRD with VH



'When to refer to Vitreoretinal Surgeon'

(slides 41-56)

Tom Williamson
MBChB FRCS (Glas) FRCOphth MD



When WILL THE VR SURGEON operate.

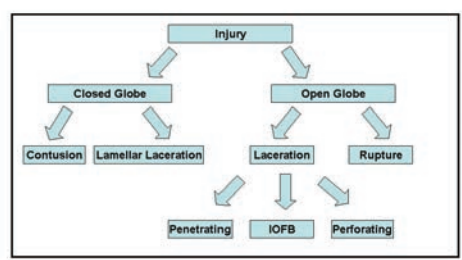
- NPL can be reversed
- Cosmesis, prevent phthisis
- Younger patients
- Closed funnel RRD
- Risk of sympathetic ophthalmia



Non Diabetic VH

Condition	Characteristics	Referral	Why
Non diabetic vitreous haemorrhage	PVD	Within 1 week	High risk of retinal tear
	No PVD	2-3 weeks	Low risk of retinal tear
	Subretinal blood	2-3 weeks	Another aetiology

Classification
 Kuhn, F., R. Marink, L. Marink, V. Metter, R. Morris and C. D. Witherspoon (2002). "The Ocular Trauma Score (OTS)." *Ophthalmol Clin North Am* 15(2): 163-165.



Trauma

Condition	Characteristics	Referral	Why
Trauma	Rupture	1-2 weeks	After primary repair and antibiotics
	Penetrating	1-2 weeks	After primary repair and antibiotics
	Penetrating with IOFB	Immediate	For antibiotics then IOFB removal
Contusion		1-2 weeks	

Anterior segment complications

- Dropped nucleus
- Endophthalmitis
- Choroidal haemorrhage
- Dislocated IOL



Management of Aphakia Options

- IOL in the bag
- IOL in the sulcus
- Sutured IOLs
 - Iris (MacCannell)
- Haptic capture IOLs
 - Scleral (Scharioth)
- Open loop AC IOLs
- Iris clip IOLs



Should the VR surgeon be involved?

- Anatomy
- Patient
- Surgery
- Complications



Complications of cataract surgery

Condition	Characteristics	Referral	Why
Dropped nucleus	All	1 week	
Complicated Cataract Operation		Routine referral for assessment	Risk of RRD
Endophthalmitis		Immediate intravitreal antibiotics then refer	Clearance of debris



Conclusions

Categories (n=8263 patients)

Rhegmatogenous retinal detachment	43% 224, 412
Diabetes and allied disorders	20% 409, 139
Macular disease	18% 649, 318
Uveitis	5% 20, 42
Trauma	3% 65, 35
Complications of anterior segment surgery	3% 30, 16
Other	8% 123, 341

'When to refer to Vitreoretinal Surgeon'

(slides 57-72)

Tom Williamson
MBChB FRCS (Glas) FRCOphth MD



Retinal Update

Macular Degeneration

Lucia Pelosini
MD, MRCSEd, FRCOphth



Macular Degeneration

Miss Lucia Pelosini
MD, MRCSEd, FRCOphth



AMD

- AMD is a genetic disorder- not mendelian
- Other environmental factors affect expression: age, smoking, sunlight, ethnicity, diet, BMI
- AR maculopathy: >40
- AR macular degeneration: >70 years
- Gene ApoE Apolipoprotein (6 genotypes)
- E4 heart attacks, dementia, stroke
- E2-3 increase the risk
- E4 protective

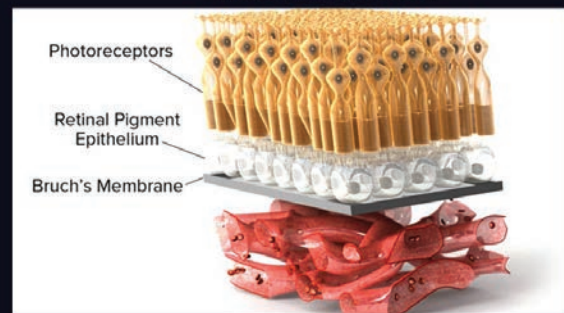


AMD

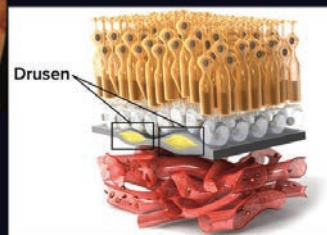
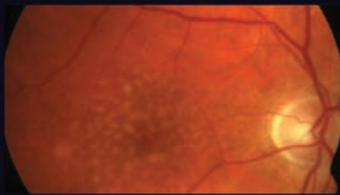
- 2005: complement factor H, 3 genotypes
- Protects from infections but it may attack RPE cells - Chromosome 6 and 2
- ARMS 2, mitochondria protein
- Systemic eculizumab for GA-IV infusion-no diff
- Lampalizumab (anti factor D) Roche-Intravitreal injections monthly for 18 months-not published yet
- Genetic test: mouth swab/blood test



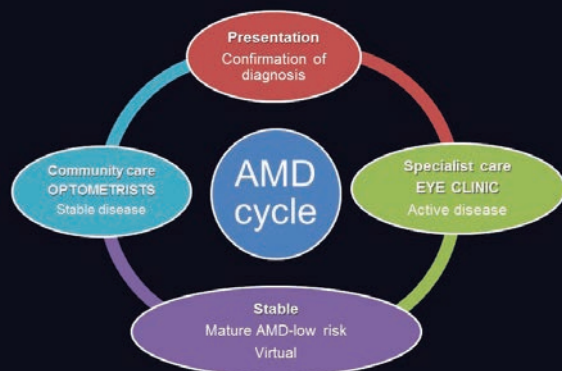
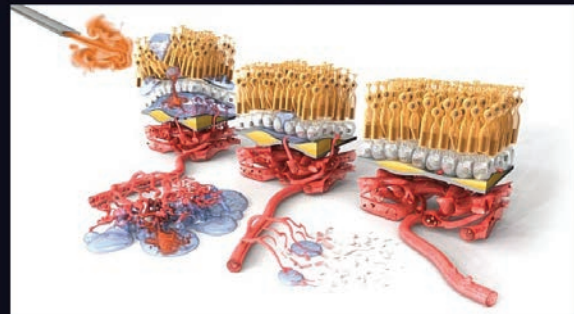
Normal Retina



Age related maculopathy



Wet AMD



AMD Questions asked by patients

- How many injections will I need?
- How long will it take for the AMD to become stable?
- Will I go blind?
- How much will it cost?



'Macular Degeneration'

(slides 1-8)

Lucia Pelosini
MD, MRCSEd, FRCOphth

What is available?



Molecular Structures

VEGF INHIBITOR	STRUCTURE	MOLECULAR WEIGHT	MOLECULAR CHARACTERISTICS
Ranibizumab ^a	Fab	48 kDa	Fab fragment (no Fc portion*)
Aflibercept [†]	Fc portion	115 kDa	Fusion protein (Fc-containing)
Bevacizumab [‡]	Fc portion	149 kDa	Full-length monoclonal antibody (Fc-containing)

* Responsible for recycling via the FcRn receptor

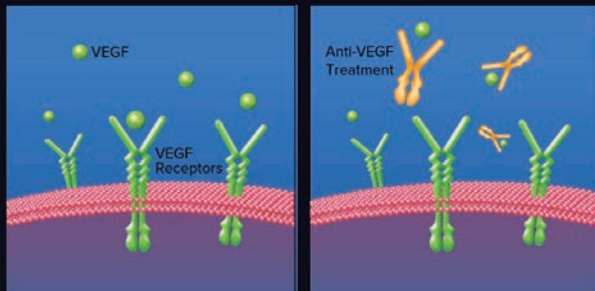
† NB: Bevacizumab is not indicated for intravitreal use

VEGF, vascular endothelial growth factor; Fab, antigen binding fragment; Fc, fragment crystallizable region; FcRn, the neonatal Fc receptor for IgG; kDa, kilodalton

1. Highlights of prescribing information. <http://www.gene.com/gene/products/information/pdf/lucetis-prescribing.pdf>. Accessed May 30, 2012.

2. Highlights of prescribing information. <http://www.regeneron.com/Eylea/efeo-fpi.pdf>. Accessed May 30, 2012.

Molecular Structures



How many injections?

- Injections in 1st year: 8.4 intravitreal injections (Lucentis)
- Year 2: 7.4 intravitreal injections
- 50% need 7 injections
- 50% less than 7 injections
- 48% <3; 15% >6; 36% 4-5 injections



Risks of intravitreal injections

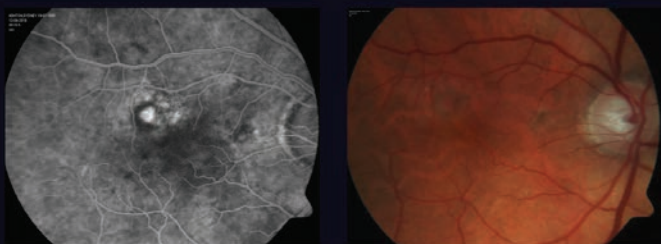
Adverse event	Key ocular serious adverse events					
	MARINA (2 years)		ANCHOR (2 years)		PIER (1 year)	
	LUCENTIS (n=477)	Sham (n=236)	LUCENTIS (n=277)	Verteporfin PDT (n=143)	LUCENTIS (n=120)	Sham (n=62)
Endophthalmitis	1.0%	0	1.1%	0	0	0
Uveitis	1.3%	0	0.4%	0	0	0
Rhegmatogenous retinal detachment	0	0.4%	0.7%	0.7%	0	0
Retinal tear	0.4%	0	0.4%	0	0	0
Vitreous hemorrhage	0.4%	0.8%	0.7%	0	0	0
Cataract	0	0	0	0	0	0



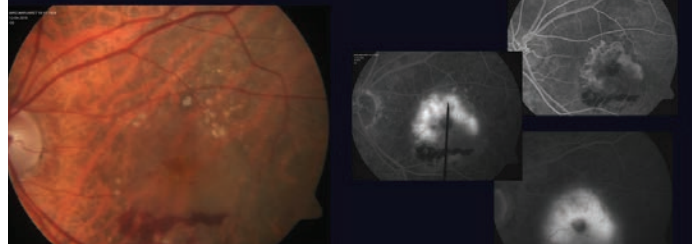
Dry AMD



Extra foveal CNVM



Sub-foveal CNVM



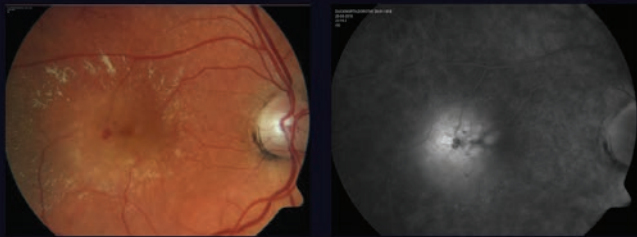
'Macular Degeneration'

(slides 9-24)

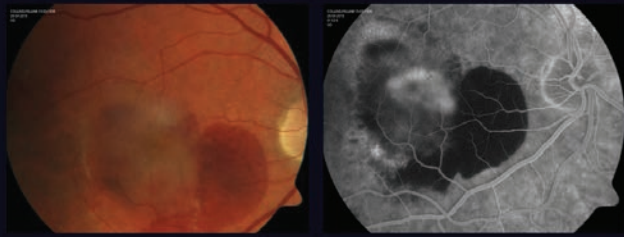
Lucia Pelosini

MD, MRCEd, FRCOphth

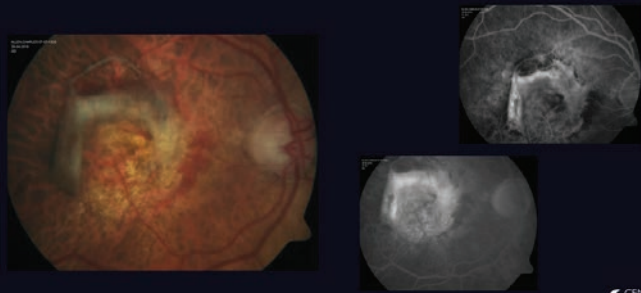
Wet AMD



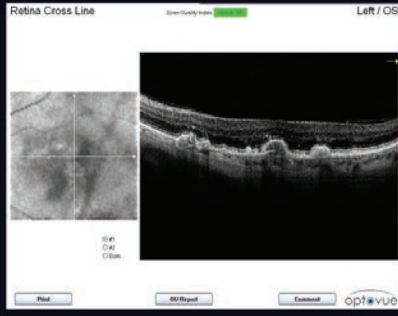
Sub-foveal Bleeding



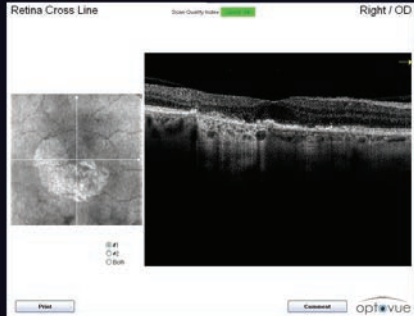
Disciform Scar-RPE Rip



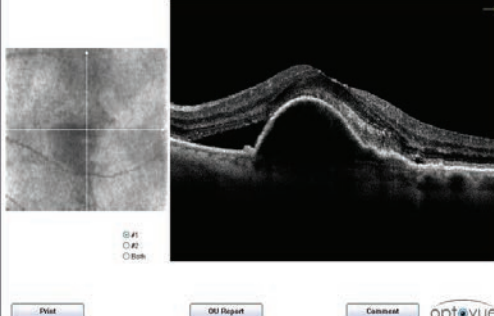
OCT: Drusen



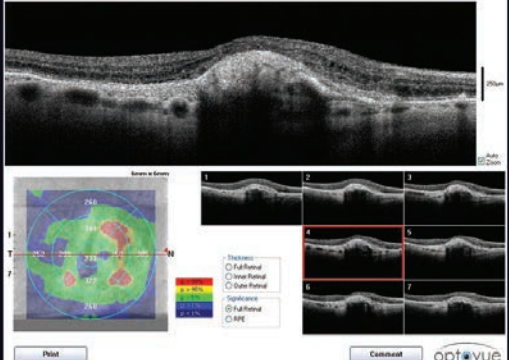
OCT: Dry AMD



Retina Cross Line



Retina Map



OCT: WetAMD

