ILM Peeling Choice of dyes

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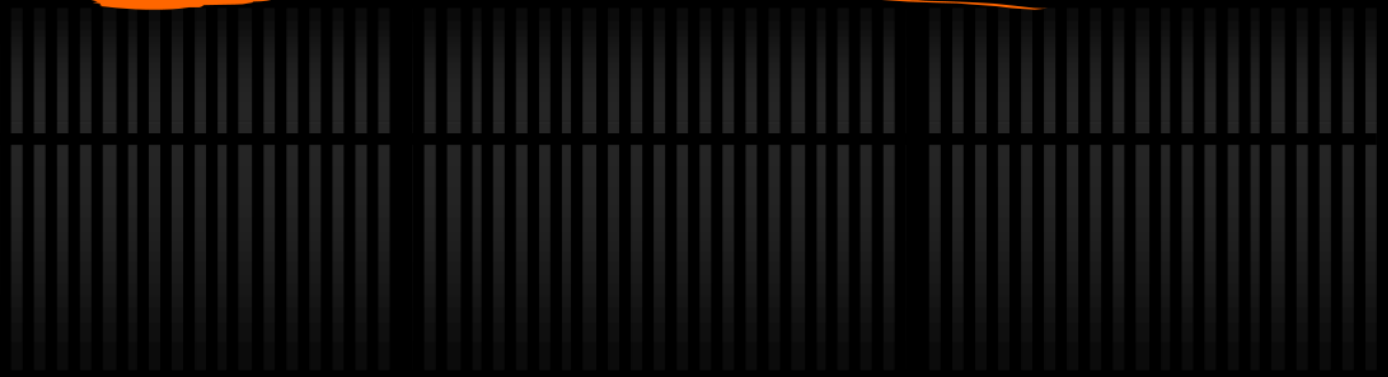
no financial interest in items discussed



Milestone

- ✓ Kelly and Wendel (Arch Ophthalmol 1991), landmark of vitreous surgery to close the hole (anatomic success) and improve visual acuity (functional success)
  - ✓Additional report research and refinements
- ✓The ILM is a very thin and semitransparent basement membrane of 2.5 micron in thickness.
- ✓Such delicate structure may be difficult to identify during vitreoretinal surgery.

Milestone (contd)

✓Successful ILM peeling to treat idiopathic MH first was described in 1997

Eckardt C, Eckardt U, Groos S, Luciano L, Reale E.

Ophthalmologe1997;94:545–551.

✓ After this, closure rates in MH surgeries of approximately 95% were reported, compared with lower closure rates in eyes without ILM peeling.

Rodrigues EB, Meyer CH, Farah ME, Kroll P. Ophthalmologica 2005;219:251–262.

Mester V, Kuhn F. Am J Ophthalmol 2000;129:769 –777.

Chromovitrectomy

- ✓ ~ the use of vital dyes or crystals to improve the visualization of intraocular tissues during vitrectomy
- ✓Arises from difficulty to remove thin transparent tissue (posterior hyaloid and ILM
- ✓ILM is a very thin and semitransparent basement membrane of 25 u in thickness.
- ✓To stain vitreous, ERM or ILM
- ✓Vital (staining living tissue or celss) and non-vital dyes

- ✓The goal of staining is avoiding ocular complications related to ILM peeling, poor removal of the vitreous, and incomplete removal of the ERM.
- ✓ILMP induce gliosis formation, iatrogenic chorioretinopathy, light toxicity

CONTROVERSIES

ILM Peeling

- ✓To peel or not to peel
- ✓When to peel

Dye

- ✓ICG
- ✓Trypan Blue
- ✓Brilliant Blue
- ✓Triamcinolone acetate

Safety

- ✓Illumination

Important issues

- ✓Complete removal of vitreous from posterior pole
  - ✓Staining of the vitreous
- ✓Complete removal of ILM from macular area
  - ✓?how large
- ✓Less injury and to consider the size of lesion/hole

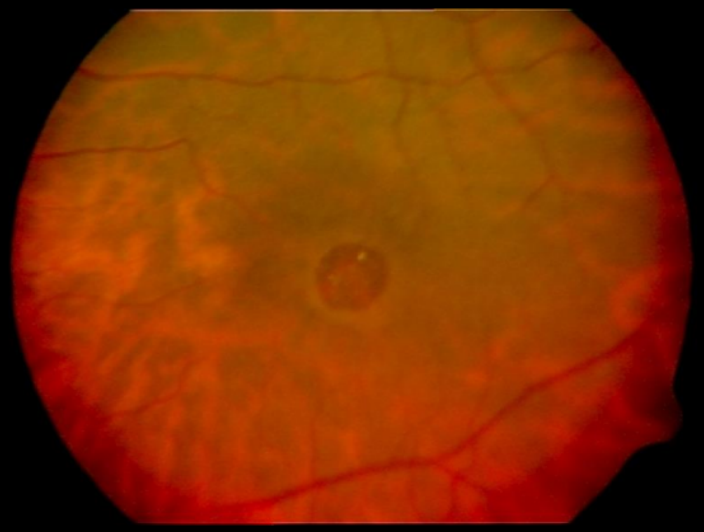


Table 1. Concentration and properties of dyes

Substance	Dilution/Osmolarity	Affinity for Intraocular Structures	Avoiding RPE/Retinal Toxicity	High Cost	Chemical Properties
Triamcinolone acetonide 40 mg/ml 4%	No dilution	Vitreous	Use a preservative-free solution	+	Triamcinolone is a synthetic nonsoluble steroid (C24H31FO6; 434 daltons)
Trypan blue 1.2 mg/ml 0.12%	No dilution or mix with glucose 1.2 mg/ml (0.12%)/310 mOsm	ERM	Use with no dilution or mix 0.3 ml with 0.1 ml glucose 5% for better ERM identification	+	Trypan blue is an anionic hydrophilic azo dye (C34H24N6Na4O14S4; 960 daltons)
Patent blue 2.5 mg/ml 0.25%	No dilution or mix with glucose 2.5 mg/ml (0.25%)/290 mOsm	ERM	Use with no dilution or mix 0.3 ml with 0.1 ml glucose 5% for better ERM identification	++	Patent blue is a triarylmethane dye (C27H31N2NaO6S2; 582 daltons)
Brilliant blue 0.25 mg/ml 0.025%	No dilution/280 mOsm	ILM	Use with dilution	+++	Brilliant blue is a blue anionic aminotriarylmethane compound (C47H48N3S2O7Na; 854 daltons)
Indocyanine green 5 mg, 0.5%; 25 mg, 2.5%; 50 mg, 5.0%	Less than 0.5 mg/ml (0.05%) Dissolve in small amount of distilled water. Dilution: use large amount of BSS	ILM	Add 1 ml distilled water to 1 vial 5 mg Take 0.1 ml of the solution and mix with 0.9 ml BSS	++++	Indocyanine green is a tricarbocyanine dye (C43H47N2NaO6S2; 775 daltons) and contains 3% to 5% iodine
Infracyanine green 5 mg, 0.5%, 25 mg, 2.5%	Less than 0.5 mg/ml (0.05%) Dissolve in glucose 5%/290 mOsm	ILM	Add 1 or 2 ml glucose 5% to 1 vial of 5 mg	+++++	Infracyanine green has the same chemical formula as ICG but contains no sodium iodine

BSS = balanced salt solution; ERM = epiretinal membrane; ICG = indocyanine green; ILM = internal limiting membrane; RPE = retinal pigment epithelium.

SURGICAL TECHNIQUE

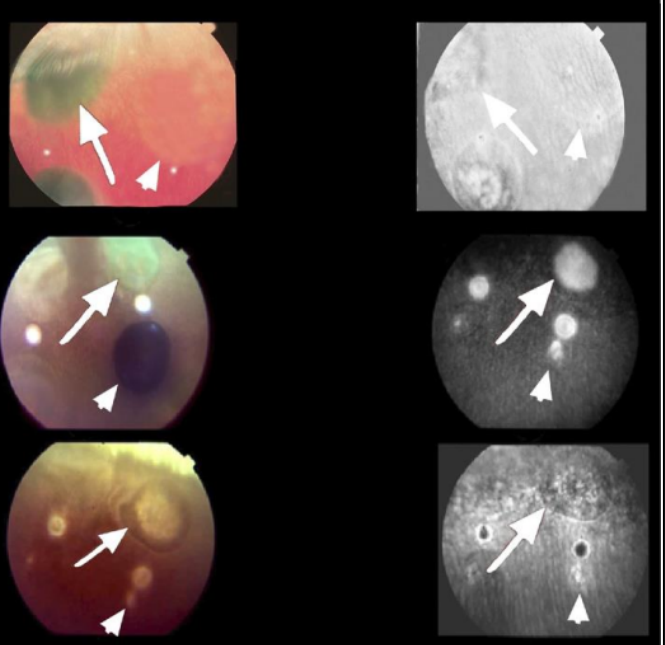
TA : The surgical technique reported so far [2] for TA application consists in a simple injection of 0.1 IN 0.5 ml BSS of the agent at a concentration of 10 OR 40 mg/ml (4%) [2] into the vitreous cavity directed toward the area to be visualized.

Alternative of vitreous staining : ICG, TB, and sodium fluorescein

Contd.

ICG with light exposure caused a significant increase in the biomechanical stiffness of the ILM, thereby facilitating its peeling. (+ TTT)

- can remain intravitreally or can deposit persistently on the optic disc after MH surgery.
- can diffuse to the subretinal space through the MH, causing RPE damage



Ophthalmology 2007;114:899–908

the presumed safer infracyanine green profile may represent an alternative for ICG use during ILM peeling in chromovitrectomy because of the lack of sodium iodine in its formulation and physiologic osmolarity.

Penha FM, Maia M, Farah ME, et al.
J Ocul Pharmacol Ther 2008;24:52– 61.

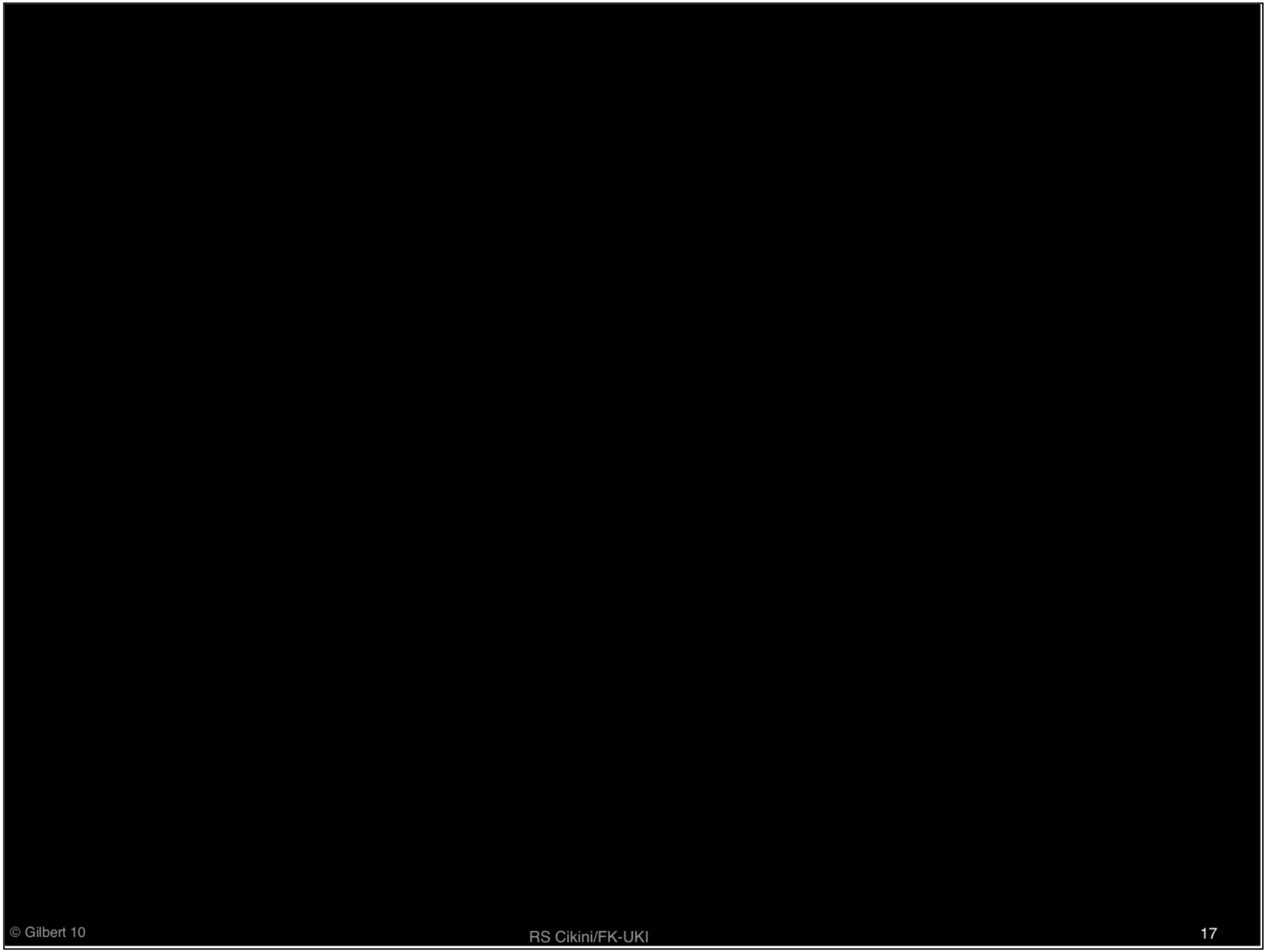
✓ Other dyes

Blood

- Personal experience
- Genuine *vs* me-too

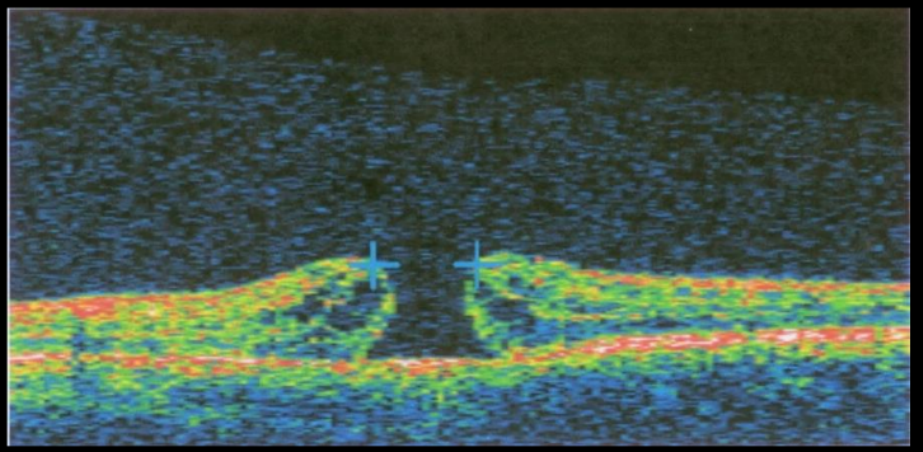
Double staining in M Hole Surgery

Sutureless 20-G and 26-G

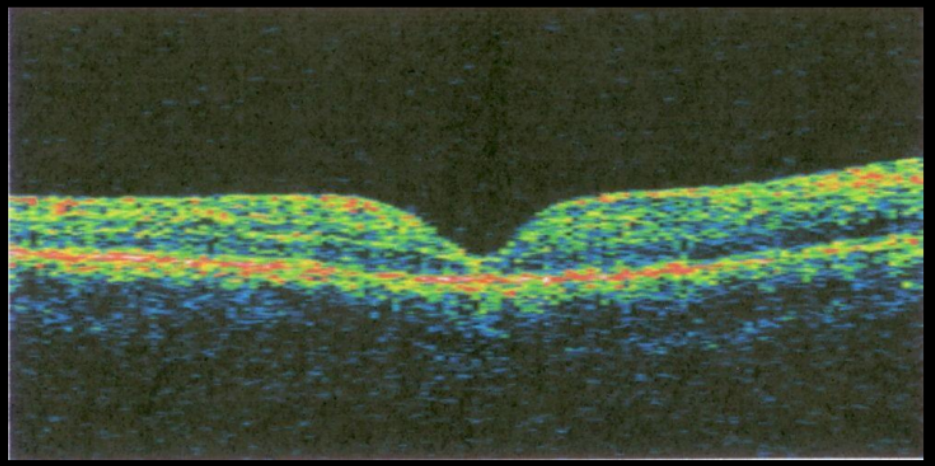


H/O DOV 6 mos

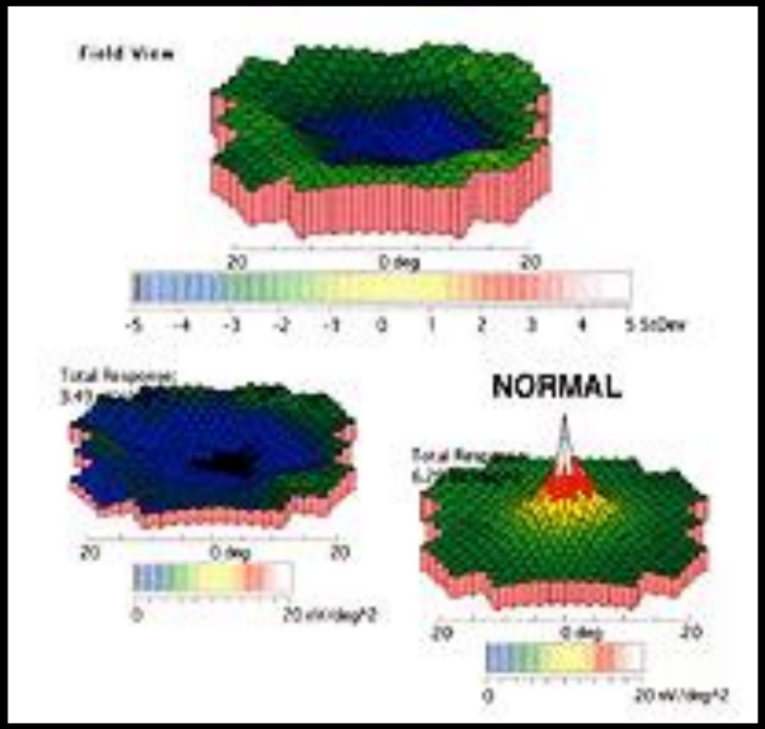
Preop-REVA 20/200

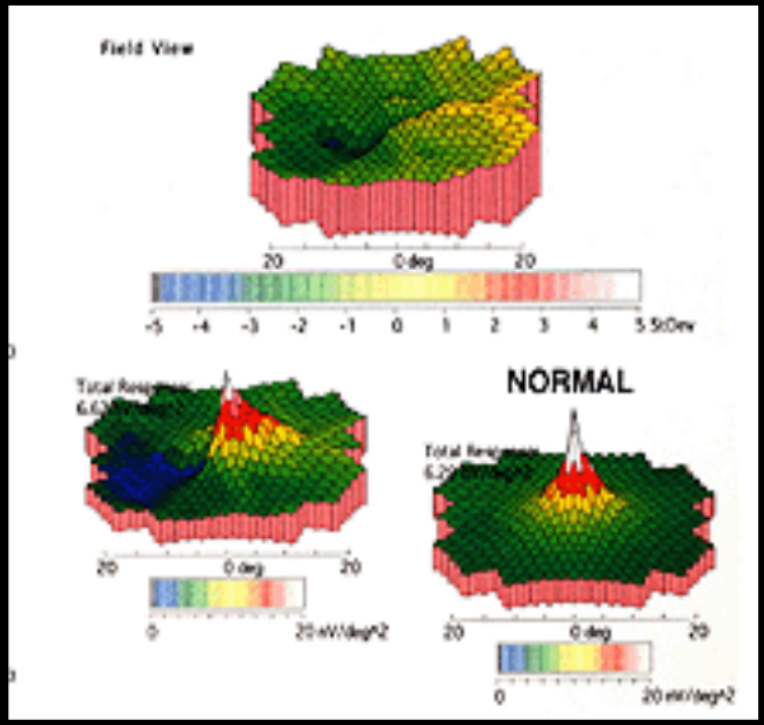


Postop-REVA 20/40



mfERG Findings





Anatomic and VA result

First author	M Hole closed (%)	VA change (line)	Better ≥ 2 lines (%)
Kelly (1991)	30/52 (58)	+3.5	22/52 (42)
Wendel (1993)	125/127 (73%)	NR	95/170 (56)
Glaser (1992)	11/11 (100)	NR	10/11 (91)
Lansing (1993)	22/23 (95.7)	+3.8	19/23 (83)
Orrelana (1993)	7/12 (58)	NR	8/12 (67)
Smiddy (1993)	53/58 (91)	NR	NR
Thompson (1994)	85/90 (94)	+2.6	NR
Ryan (1994)	36/48 (75)	NR	25/46 (54)
Liggett (1995)	11/11 (100)	+4.7	11/11 (100)
Korobelnik (1996)	7/8 (88)	NR	4/8 (50)
Thompson (1996)	84/120 (70)	+1.5	53/120 (44)
RS Cikini (2009,IMH)	*10/10 (100)*	*NR*	*9/10 (90)*

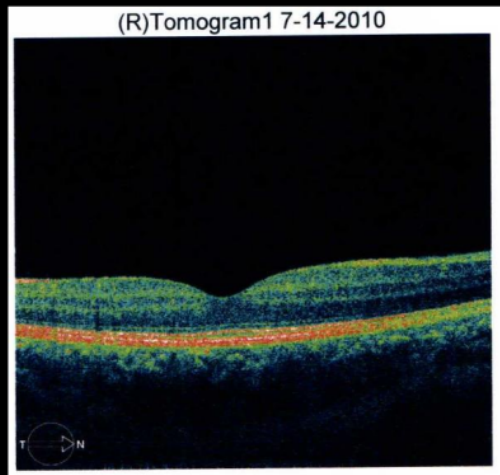
Unclear questions

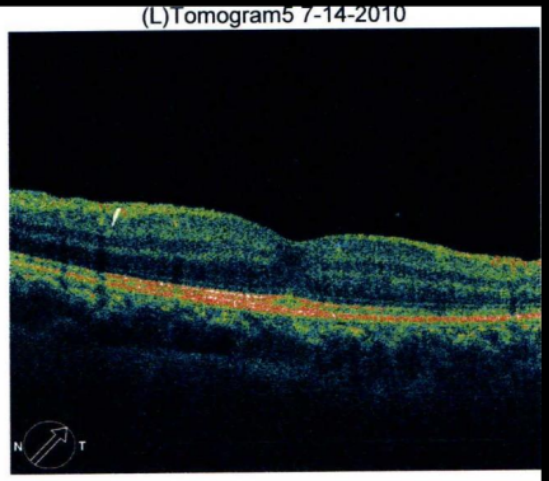
- ✓ ?Is it due to toxicity
- ✓?What is the result of peeling without any dye(s)

OCT after ILMP without dye

LEVA FC 1m

REVA 1.0

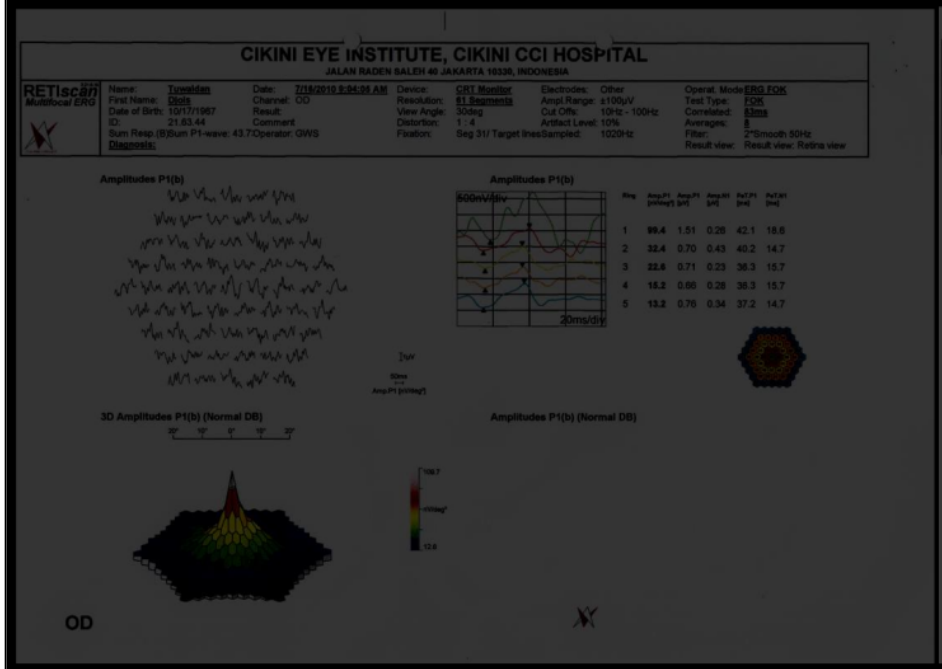


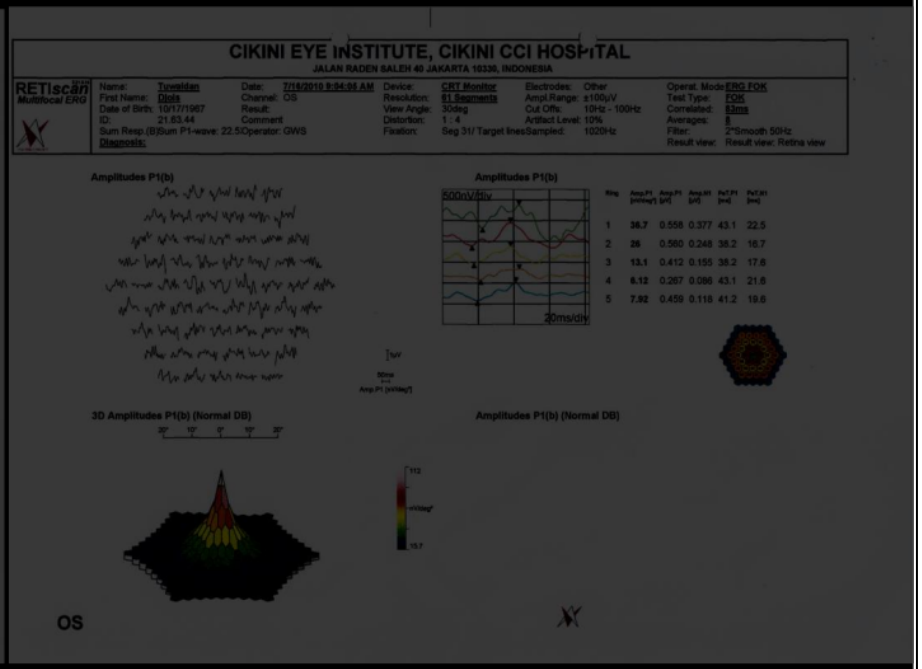


LEVA 1.0

After 2 wks

ERG after ILM without dyes





REVA 1.0

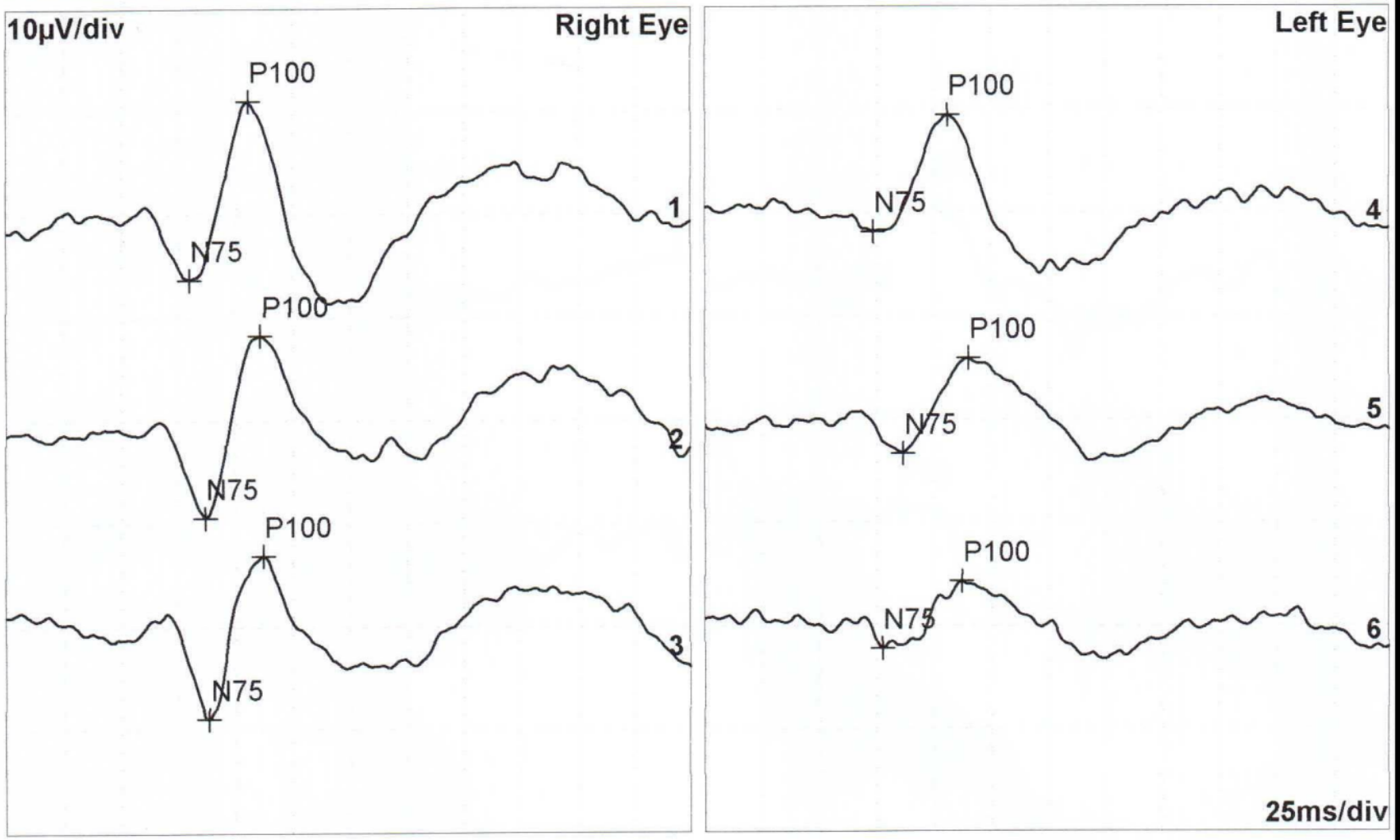
LEVA 1.0

RETIport32

CIKINI EYE INSTITUTE, CIKINI CCI HOSPITAL
JALAN RADEN SALEH 40 JAKARTA 10330, INDONESIA

Patient:	[redacted]			Electrode:	EEG-GoldCup
Tested:	7/16/2010 7:36:24 AM	Sex/Age:	M/42	Pupil Size:	nondil.
ID:	21.63.44	Operator:	Dr. Gilbert WS Simanjuntak		

Pattern-VEP



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