

# Temporal Inverted ILM Flap could be a Standard Treatment Methods for Large Macular Holes



*Remzi Avcı (MD, Professor)*  
*Retina Eye Hospital-BURSA*  
[ravci@bursaretina.com](mailto:ravci@bursaretina.com)  
[www.bursaretina.com](http://www.bursaretina.com)

## Financial Disclosure

- Allergan : *Consultant/Advisor, Lecture fees*
- Bayer Healthcare Pharmaceuticals : *Consultant/Advisor, Lecture fees*
- Novartis Pharmaceuticals Corporation : *Consultant/Advisor, Lecture fees*
- DORC International, bv : *Consultant/Advisor, Lecture fees*
- Thea Pharma Laboratoires : *Consultant/Lecture fees*

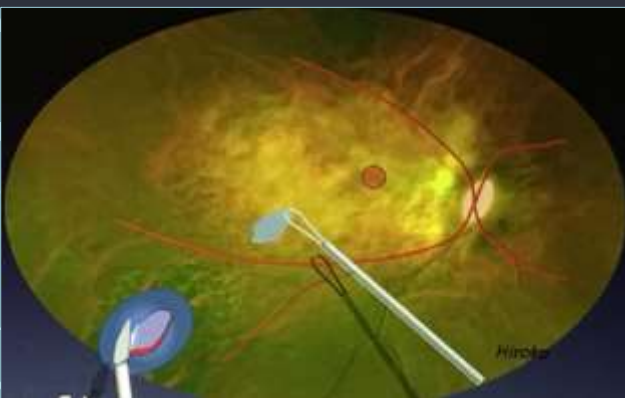
## Big macular holes – Challenging cases

- Large holes
- Myopic holes
- Traumatic holes
- Reoperations
- Pediatric holes
- Chronic holes

Primary anatomic success 50% or less and visual result even poorer

## Alternative approaches for tough cases

- Fluid gas exchange
- Relaxing radial
- Arcuate retinotomy
- RD induced to
- Silicone oil for
- Heavy SO after
- Adjuvants (PRP)



- Neurosensory retinal flab

*Grewal, Mahmoud; JAMA Opht.-2016*

- Amnion membrane graft

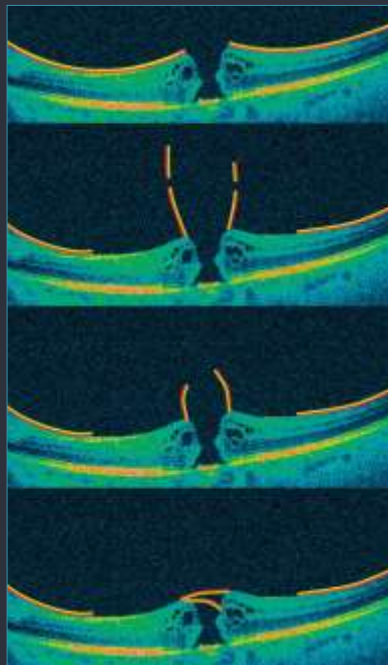
*Rizzo ; AAO 2018*

## ILM inverted flap techniques

### Inverted Internal Limiting Membrane Flap Technique for Large Macular Holes

Zofia Michalewska, MD, PhD,<sup>1</sup> Janusz Michalewski, MD, PhD,<sup>1</sup> Ron A. Adelman, MD, MPH,<sup>2</sup> Jerzy Nawrocki, MD, PhD<sup>1</sup>

Ophthalmology - 2010



### Inverted Internal Limiting Membrane Flap Technique for Large Macular Holes

Zofia Michalewska, MD, PhD,<sup>1</sup> Janusz Michalewski, MD, PhD,<sup>1</sup> Ron A. Adelman, MD, MPH,<sup>2</sup> Jerzy Nawrocki, MD, PhD<sup>1</sup>

Ophthalmology 2010;117:2018-2025 © 2010

Author	Primary Indication	Cases		Closure		BCVA (LogMAR)	
		Classic	Flap	Classic	Flap	Classic	Flap
Michalewska -2010	Large macular holes	51	50	88%	98%	0.77	0.55
Kannan-2018	Large macular holes	28	28	75%	89%	0.69	0.48
Rizzo-2018	Large macular holes	>150	>150	78.6%	95.6%		

## Modified inverted flap techniques

### Classic (multilayer 360 ILM flap)

*Michalewska; Ophthalmology -2010*  
*Kuriyama; AJO-2013*

### Insertion

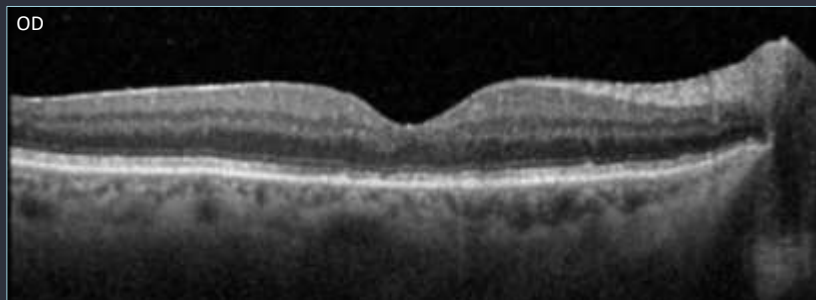
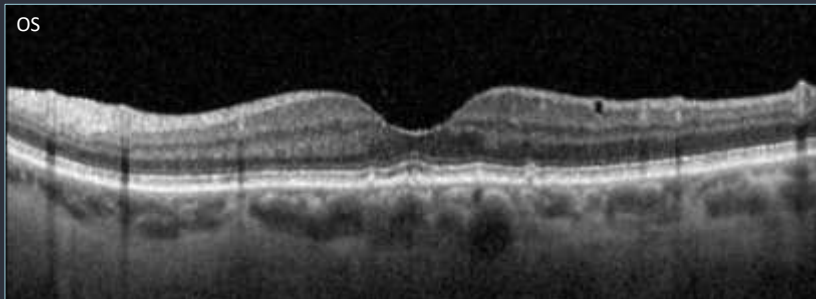
*Chen; AJO – 2015*  
*Olenik; Retina – 2016*  
*Tehodossiadis; AJO – 2016*  
*Rossi; Graefes - 2017*

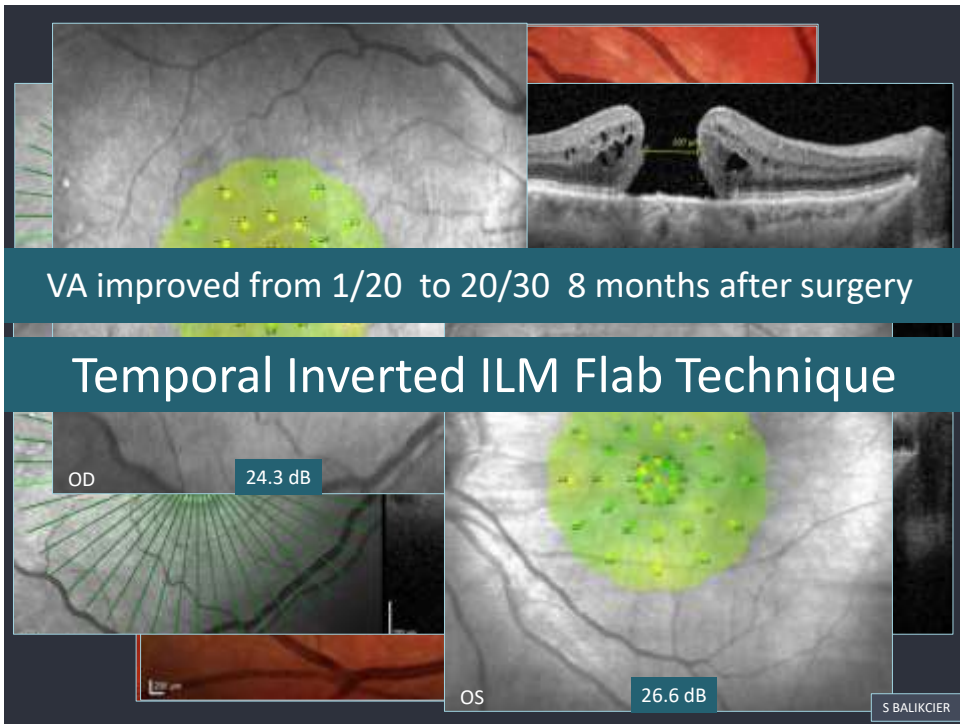
### Single layer

#### - Temporal Flap

- Inferior flap
- Superior flap
- Pedicle flap

*Michalewska; Retina – 2015*  
*Ho; Acta – 2017*  
*Song; Jophthalmol - 2015*  
*Choi; Retina - 2017*  
*Chen; Graefes – 2017*  
*Ekka; OSLIR- 2015*





### Preoperative findings

*11 eyes of 11 patients*

Male /Female  $\Rightarrow$  4 / 7

Age  $\Rightarrow$  64.8 ( 44 to 72)

#### *Ethiology*

Idiopathic  $\Rightarrow$  10

Trauma  $\Rightarrow$  1

## Preoperative findings



### *Macular hole diameter*

Minimum hole diameter	⇒	631 (405-933) μ
Base hole diameter	⇒	1169 (597-1460) μ

### *Other parameters*

EZ defect size	⇒	1171 (606 – 1679) μ
ELM defect size	⇒	1324 (635 – 1968) μ

## Anatomic results

*Mean Follow up* ⇒ 9.8 (3-30) months

### *Macular hole closure*

Primary surgery	⇒	10 eyes (91%)
Reoperation	⇒	11 eyes (100%)

## Visual results

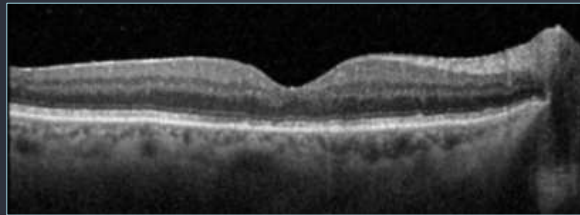
Case	Visual Acuity	
	Preop	Postop
1	0.05	0.65
2	0.1	0.50
3	0.2	0.90
4	0.1	0.95
5	0.05	0.70
6	0.05	0.65
7	0.05	0.25
8	0.05	0.45
9	0.1	0.50
10	0.05	0.20
11	0.1	0.45
Mean	0.085	0.65

## Final BCVA

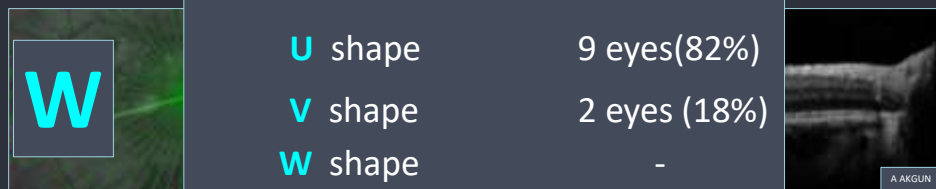
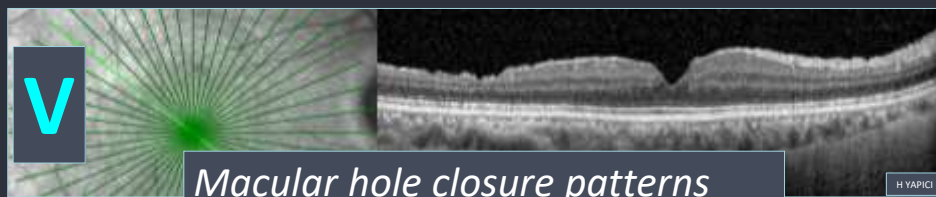
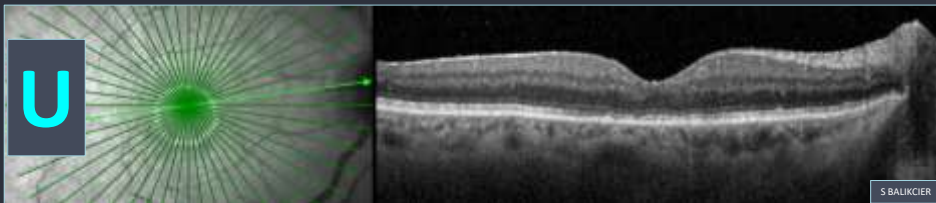
$\geq 0.5$   $\Rightarrow$  7 eyes (64%)

0.1-0.5  $\Rightarrow$  4 eyes (36%)

$< 0.1$   $\Rightarrow$  -



## Postoperative foveal contour



## Macular hole closure patterns

U shape 9 eyes (82%)

V shape 2 eyes (18%)

W shape -

## Anatomic results

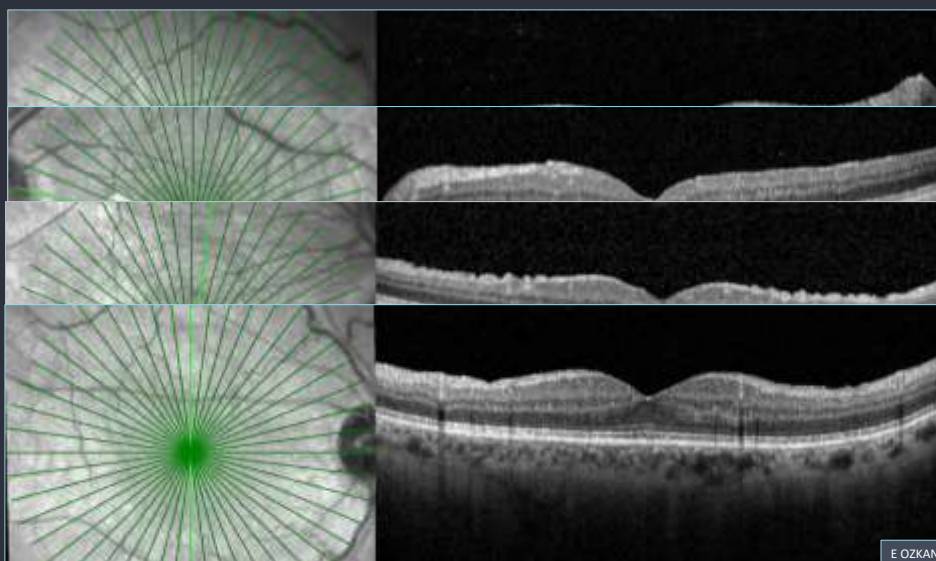
### *Recovery of macular morphology*

	Preop	Postop
EZ defect size	1171 (606-1679) $\mu$	167 (340-470) $\mu$
ELM defect size	1324 (635-1968) $\mu$	222 (310-690) $\mu$

### *Complete recovery of particular retinal layers*

EZ  $\Rightarrow$  7 eyes (64%)  
ELM  $\Rightarrow$  7 eyes (64%)

## Complete recovery of retinal layers and U shape closure

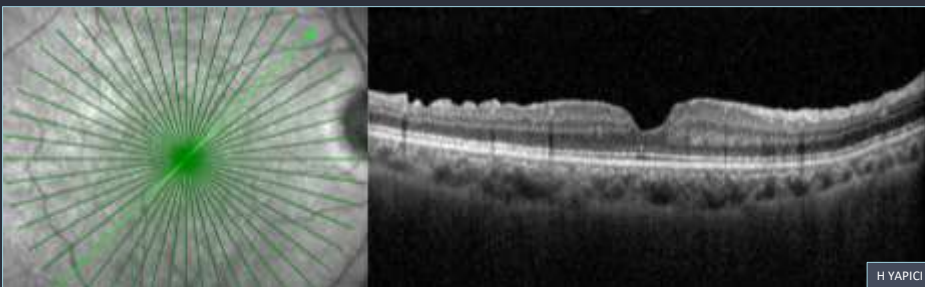
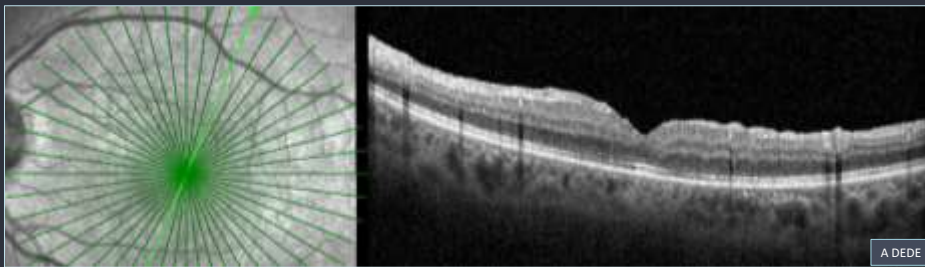




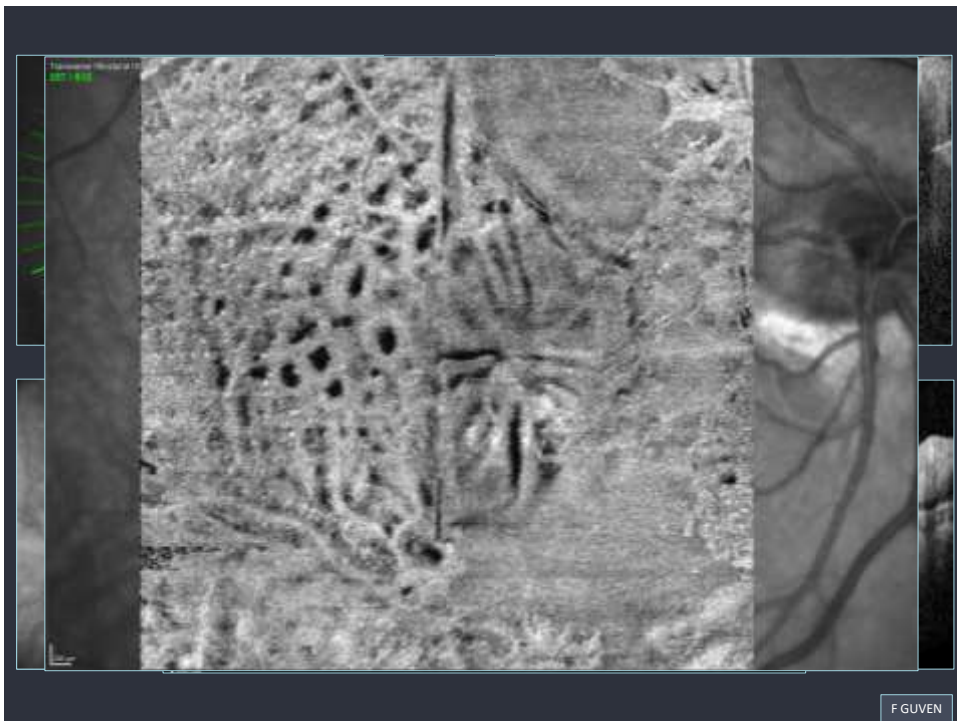
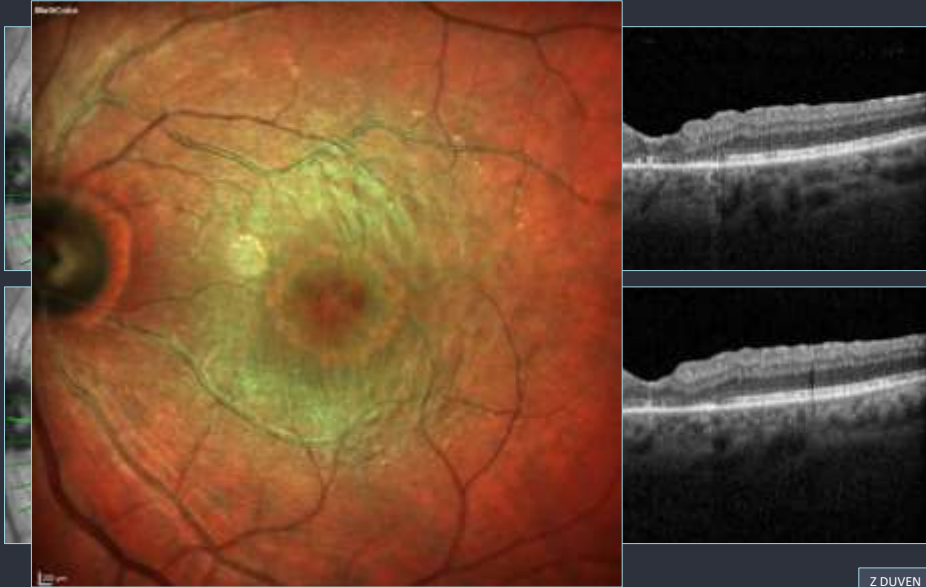
## Macular hole closure patterns & Recovery of macular morphology

Author	Follow-up (month)	U shape closure (%)	C. EZ recovery (%)	C. ELM recovery (%)	RNFL defect (%)
Michalevska-2015	12	71	43	75	64
Choi- 2015 (Superior flap)	5.8	83	26	72	-
Curent study	9.9	82	64	64	64

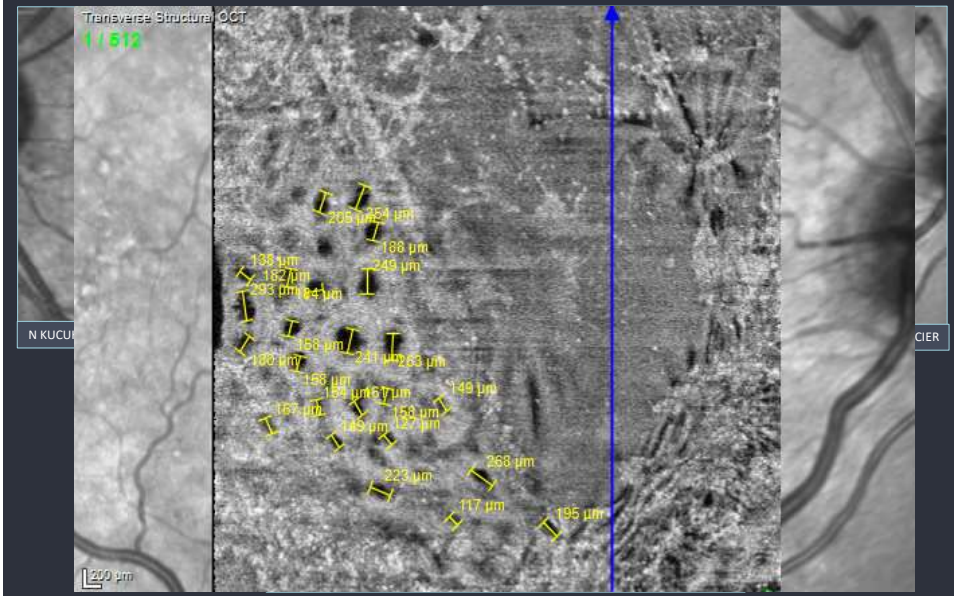
## Dissociated optic nerve fiber layer (DONFL)



## Dissociated optic nerve fiber layer (DONFL)



## Dissociated optic nerve fiber layer (DONFL)



## Anatomic results

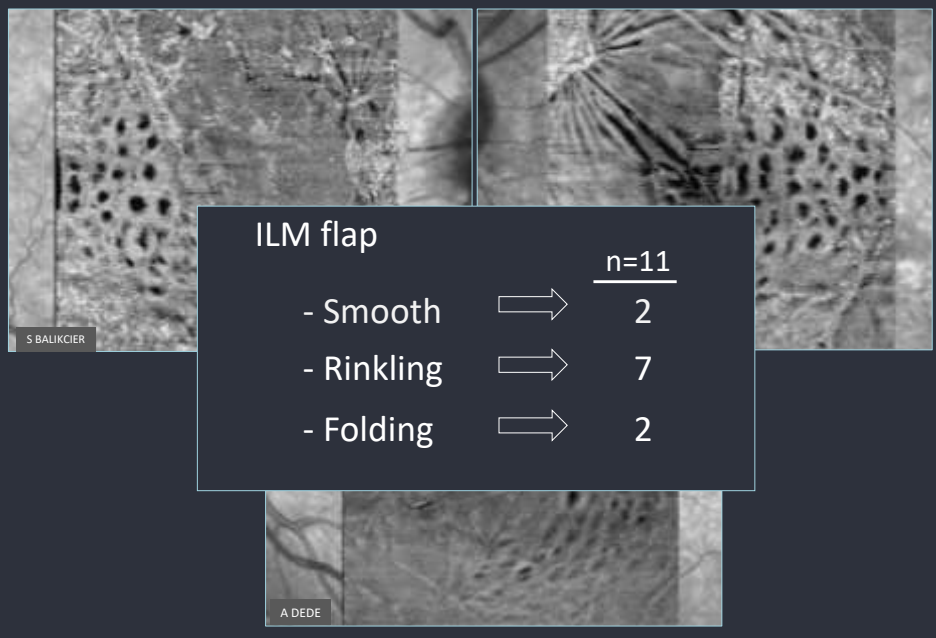
*DONFL*  $\implies$  7 eyes (64%)

Distribution  $\implies$  Limited to the ILM peeled area

Depth  $\implies$   $8.3 \pm 3.1 \mu\text{m}$  (3-13  $\mu\text{m}$ )  
Limited to the RNFL

Diameter  $\implies$   $206 \pm 37 \mu\text{m}$

## En-face OCT-A – Flap configuration



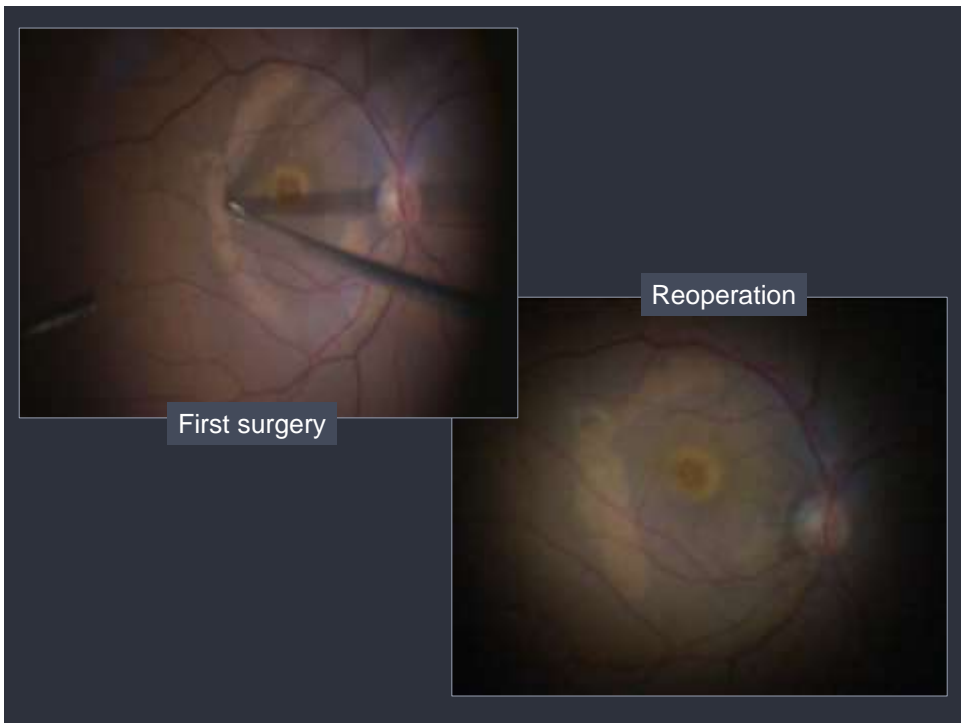
## Reoperation in failed cases

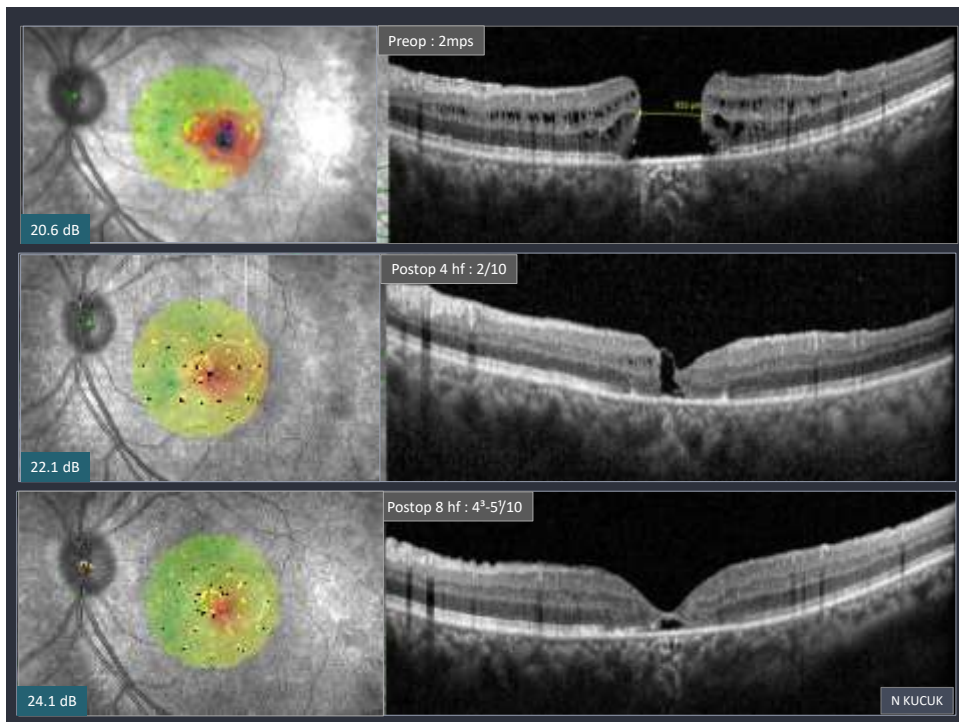
Surgical failures are caused by retroversion of ILM flap to its original position

This gives all patients a chance of reoperation, similar to the original surgery

### Reoperation

ILM flap is reinverted to cover the hole





## Possible mechanism

Single layer coating of ILM flap over the macular hole, may provide the closest morphologic configuration to the natural macular shape by determining the front limits of the glial proliferation underneath

## Single layer inverted flap

### Surgical Technique \_\_\_\_\_ Edited by George A. Williams

#### **Perfluoro-n-Octane-Assisted Single-Layered Inverted Internal Limiting Membrane Flap Technique for Macular Hole Surgery**

MIN KYU SHIN, MD\*\*  
KEUN HEUNG PARK, MD\*\*  
SUNG WHO PARK, MD\*\*  
JK SOO BYON, MD\*\*  
JI EUN LEE, MD, PhD\*\*

RETINA-2014

Remove the peripheral vitreous while confirming the absence of retinal breaks or detachment.  
Exchange the fluid with air slowly, allowing enough time for the fluid to migrate posteriorly. Place the tip of the aspiration needle at several places in the periphery.  
Remove the remnant fluid as completely as possible before removing the PFO.  
Flush air gently for 3 minutes for PFO to evaporate.  
Aspirate fluid on the disk continually.  
Finish the operation, as the vitreous cavity filled with air, and maintain postoperative facedown position for the day after the operation in case of uncomplicated surgery.

Two cases of closure after the second operation indicated that our cases would have been closed with a standard operation. However, compared with previous studies,<sup>10,11</sup> on an inverted flap using remnant ILM after circumferential ILM peeling, our **single-layered inverted ILM flap showed more normal configuration of fovea without folded membrane**. Although more delicate procedures were required, we demonstrated that this alternative method is a definite technique for making a single-layered inverted ILM flap. Furthermore, short postoperative facedown positioning and air tam-

Single layer inverted flap show more normal configuration of the fovea without folded membrane

## Summary

### *Single layer temporal inverted ILM flap technique*

Achieves satisfactory anatomical, morphological and functional results comparing the classic inverted flap technique

Eliminates the risk of surgical trauma in the area of papillomacular bundle

Provides a chance of reoperation to the patient and surgeon

This techniques can be a standard treatment method in large macular holes or even in all eyes which need of ILM peeling

# Temporal Inverted ILM Flap could be a Standard Treatment Methods for Large Macular Holes



Remzi Avcı (MD, Professor)  
Retina Eye Hospital-BURSA  
[ravci@bursaretina.com](mailto:ravci@bursaretina.com)  
[www.bursaretina.com](http://www.bursaretina.com)

## Postoperative foveal contour

Author	Follow-up (Months)	U shape closure (%)	EZ defects (%)	ELM defects (%)	RNFL Defects (%)
Michalevska-2015	12	71	57	25	64
Current Study	9.9	82	36	45	64



## Sonuç

### *Temporal inverted ILM fleb yöntemi ile*

Geniş makula deliklerinin kapanmasında klasik yöntemle kıyasla daha başarılı morfolojik ve görsel sonuçlar elde edildi

Papillo-makuler bölgede cerrahi travma riskini ortadan kaldırmakta

Provides a chance of reoperation to the patient and surgeon

This method can be a standard treatment method in large or even in standart macular holes