



CME MEETING



RETINA WORLD CONGRESS  
MARCH 21-24, 2019 | FORT LAUDERDALE MARRIOTT HARBOR BEACH HOTEL

**EVALUATING EFFICACY OF AUTOLOGOUS BONE MARROW DERIVED  
STEM CELLS IN THE TREATMENT OF DRY AGE-RELATED MACULAR  
DEGENERATION**

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ABSTRACT PRESENTATION

## **Financial Disclosures**

- Study funded by Indian Council of Medical Research (ICMR), New Delhi, India.
- No financial interest.



ABSTRACT PRESENTATION

# Stem cells in AMD

	<b>Replacement Therapy</b>	<b>Rescue therapy</b>
<b>Cell type used</b>	Embryonic stem cells Induced Pluripotent stem cells	<b>Bone marrow derived mononuclear cells</b>
<b>Route of injection</b>	Subretinal injection	<b>Intravitreal injection</b>
<b>Main mechanism of action</b>	Replacing dead RPE cells by cellular differentiation.	<b>Paracrine effect on dying RPE cells</b>

10.5005/jp-journals-10020-1021

ORIGINAL ARTICLE

## Assessment of Central Retinal Function after Autologous Bone Marrow Derived Intravitreal Stem Cells Injection in Patients with Retinitis Pigmentosa using Multifocal ERG: A Pilot Study

Atul Kumar, SN Mohan Raj, Thirumalesh Basavaraj Mochi, Sujata Mohanty, Tulika Seth, Rajvardhan Azad

Evaluating role of bone marrow-derived stem cells in dry age-related macular degeneration using multifocal electroretinogram and fundus autofluorescence imaging

IJO

*Atul Kumar<sup>1</sup>, Neha Midha<sup>1</sup>, Sujata Mohanty<sup>2</sup>, Annu Chohan<sup>1</sup>, Tulika Seth<sup>3</sup>, Varun Gogia<sup>1</sup>, Shikha Gupta<sup>1</sup>*



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## **Objective of study**

To study the efficacy of injected intravitreal autologous bone marrow derived stem cells in dry age related macular degeneration using

Vision outcome

Auto fluorescence imaging

Multifocal ERG

Advanced RPE analysis



## ABSTRACT PRESENTATION

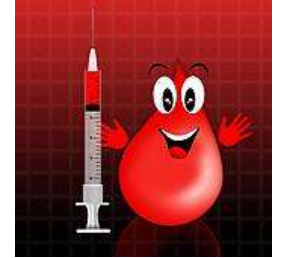
### Methods

- **Study Design** - Prospective interventional study.
- **Place of study**- Dr. R. P. Centre for Ophthalmic Sciences, AIIMS  
Stem Cell Facility, AIIMS  
Haematology Department, AIIMS
- **Funds** - ICMR
- **Sample** – 25 cases and 25 controls.
- All cases underwent intravitreal injection after written informed consent. Controls underwent conservative management.



# Methodology

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HAEMATOLOGY  
DEPT.



Bone marrow aspiration  
(Iliac crest)

Bone marrow aspirate  
(About 25 cc of aspirate taken)







## ABSTRACT PRESENTATION



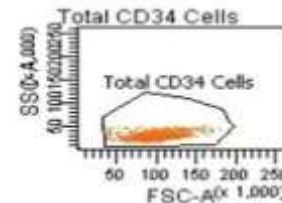
Under laminar flow  
hood sterility

Ficoll cell layering



Centrifugation  
1800 rpm for 30  
min

Flow Cytometry  
( for characterisation  
of BM-MNCs)



*Regenerate and Rejuvenate*



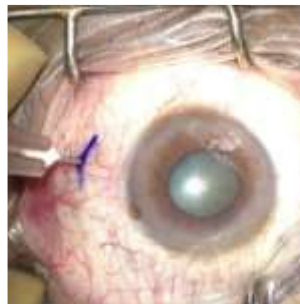


## ABSTRACT PRESENTATION



Sterile transport to  
R P centre OT complex

Stem cell injection  
8million/0.1 ml



Intra vitreal injection



ABSTRACT PRESENTATION

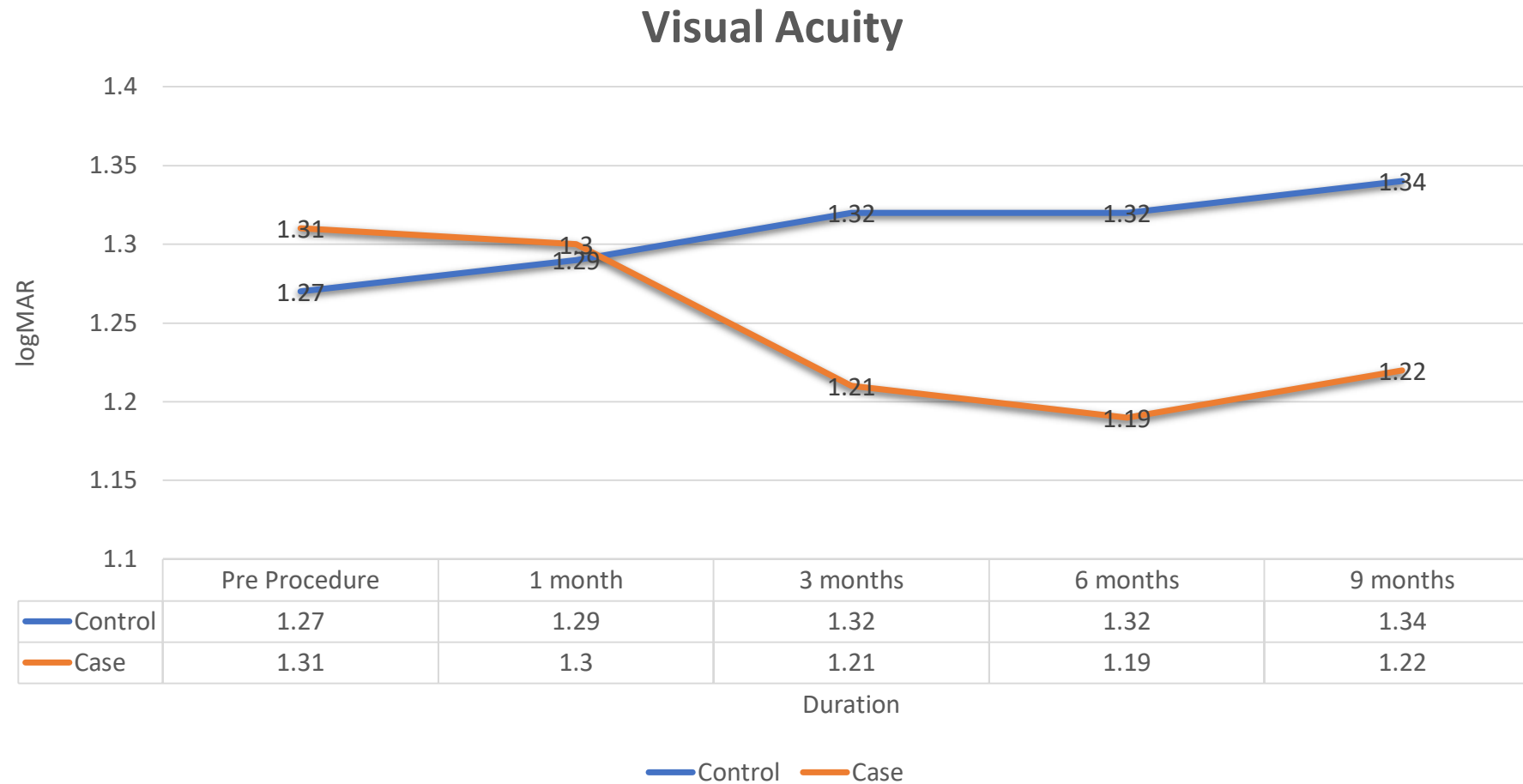
## **Safety parameters**

- High Intraocular pressure was recorded in 2 patients out of 25.  
(adequately managed with antiglaucoma medications)
- No patient had severe intraocular inflammation or endophthalmitis.
- No patient developed choroidal neovascularisation (CNV) during the course.



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# Best corrected Visual Acuity





# Mf-ERG

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**Amplitude**(median values in nanovolts)

**Implicit time**(median values in milliseconds)

Ring	Group	Pre Procedure	1 month	3 months	6 months	9 months	P value
<2°	Control	447.2	257.2	355.8	452	421.5	0.45
	Case	438.6	238.9	364.3	324	344	0.23
2-5°	Control	372.4	258	388.4	346.3	312.2	0.15
	Case	317	243	364.3	376.8	444	<b>0.05</b>
5-10°	Control	387.2	322.5	161.9	276.6	311	0.23
	Case	211.5	287	283.5	293	361	<b>0.02</b>
10-15°	Control	397.8	174.7	223.8	259.6	187	0.134
	Case	360.3	363.2	314	328.5	317	0.38
>15°	Control	255.7	264.1	169	210.5	161.7	0.37
	Case	232.5	193	218.2	198	176	0.31

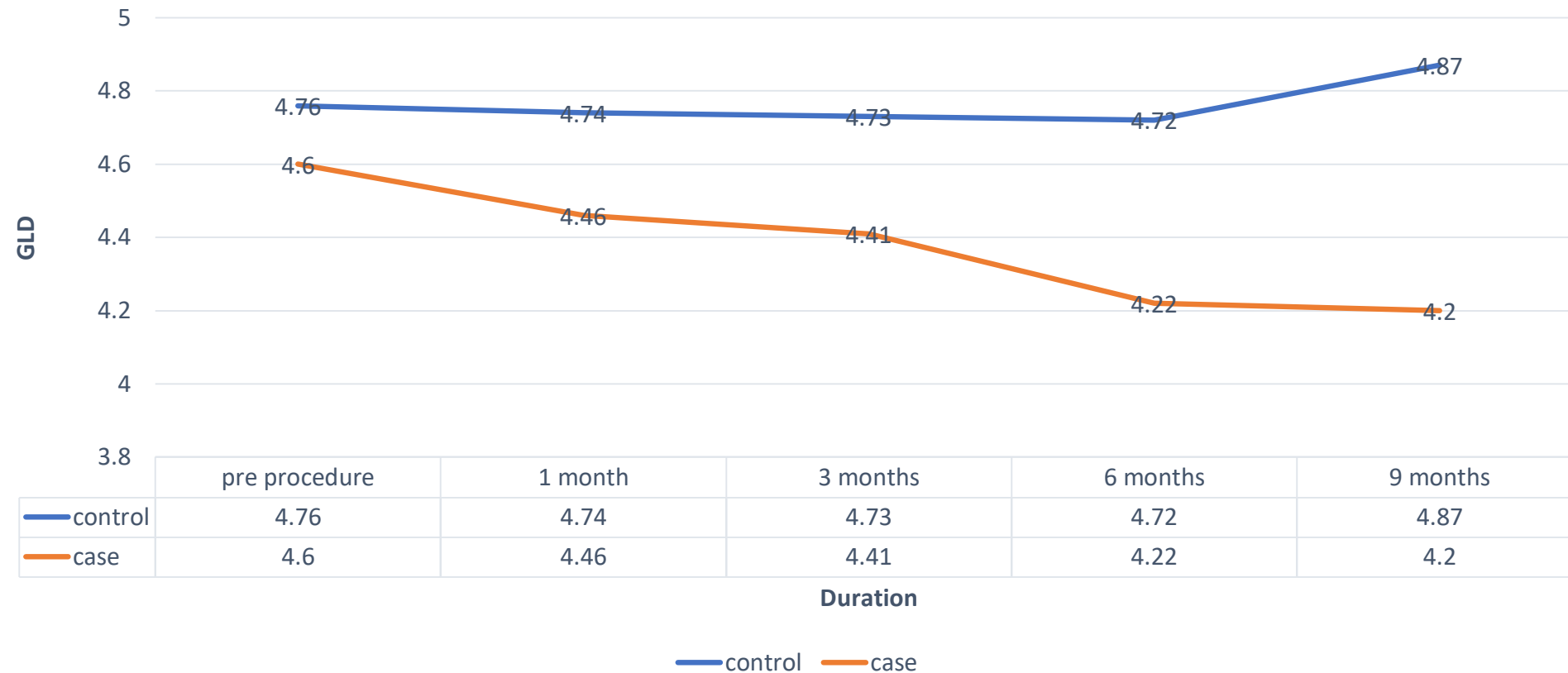
Ring	Group	Pre Procedure	1 month	3 months	6 months	9 months	P value
<2°	Control	42.6	41.4	41	38.4	46.2	<b>0.012</b>
	Case	46.0	46.9	38.4	38.75	36.5	<b>0.03</b>
2-5°	Control	50.5	42.8	43.6	45.9	44.8	<b>0.04</b>
	Case	43.0	44.2	43.9	42.8	41.4	<b>0.049</b>
5-10°	Control	57.3	52.7	47.4	52.1	49.4	0.14
	Case	48.6	49.2	52.77	50.4	52.1	0.55
10-15°	Control	47.9	53.6	55.8	48.2	45.9	0.62
	Case	49.3	56.8	43.7	50.7	46.4	0.509
>15°	Control	45.8	45.5	42.7	45.5	43.1	0.652
	Case	48.5	47.1	44.5	45.8	48.1	0.446



## ABSTRACT PRESENTATION

# Fundus autofluorescence

### Change in Greatest Linear Dimension (GLD)

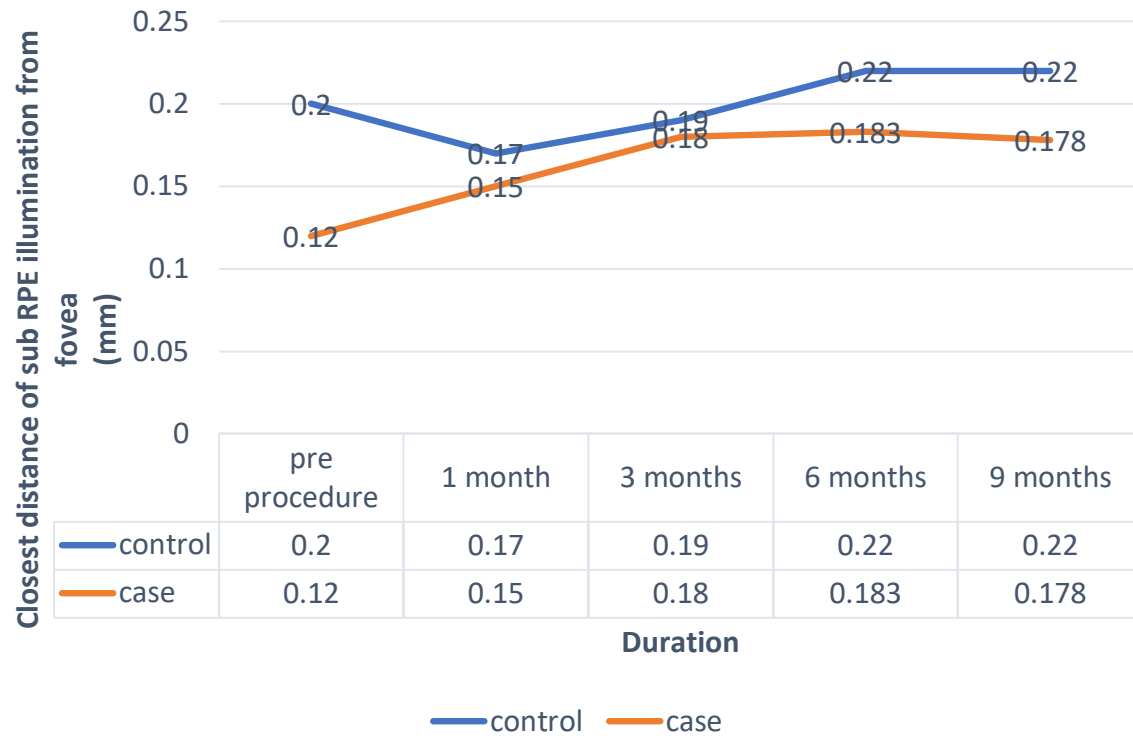




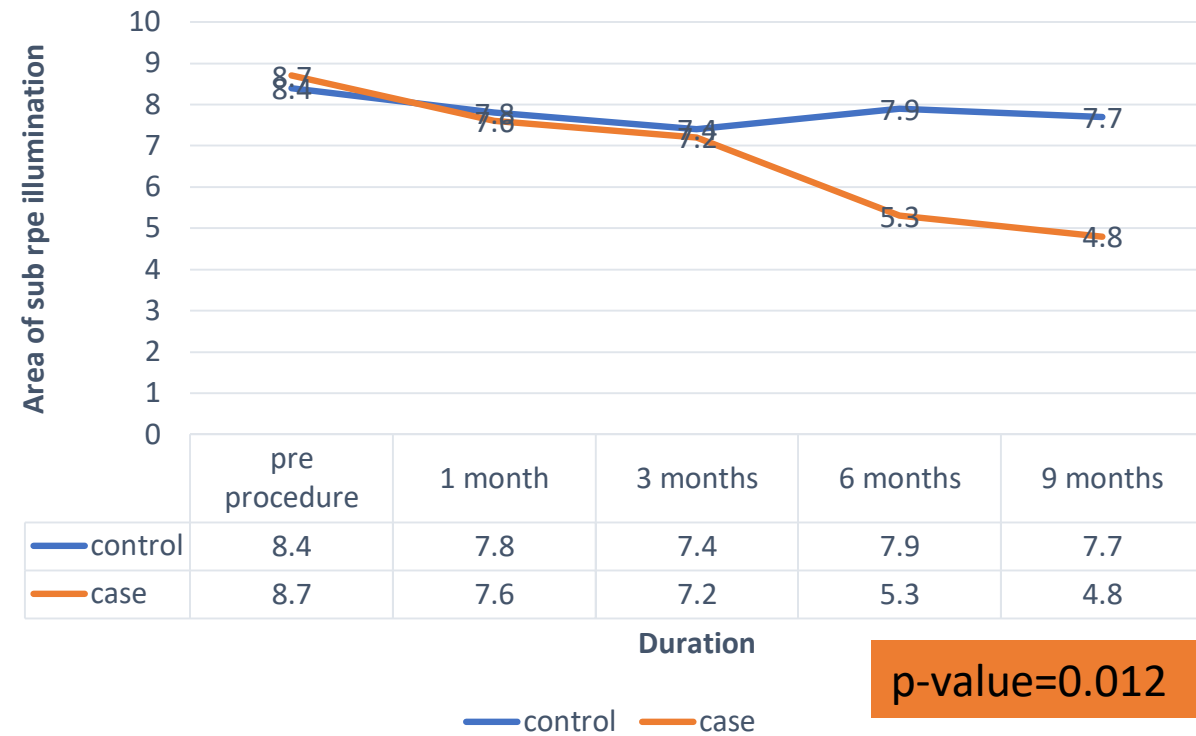
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# Advanced RPE analysis

### Sub RPE slab



### Sub RPE slab



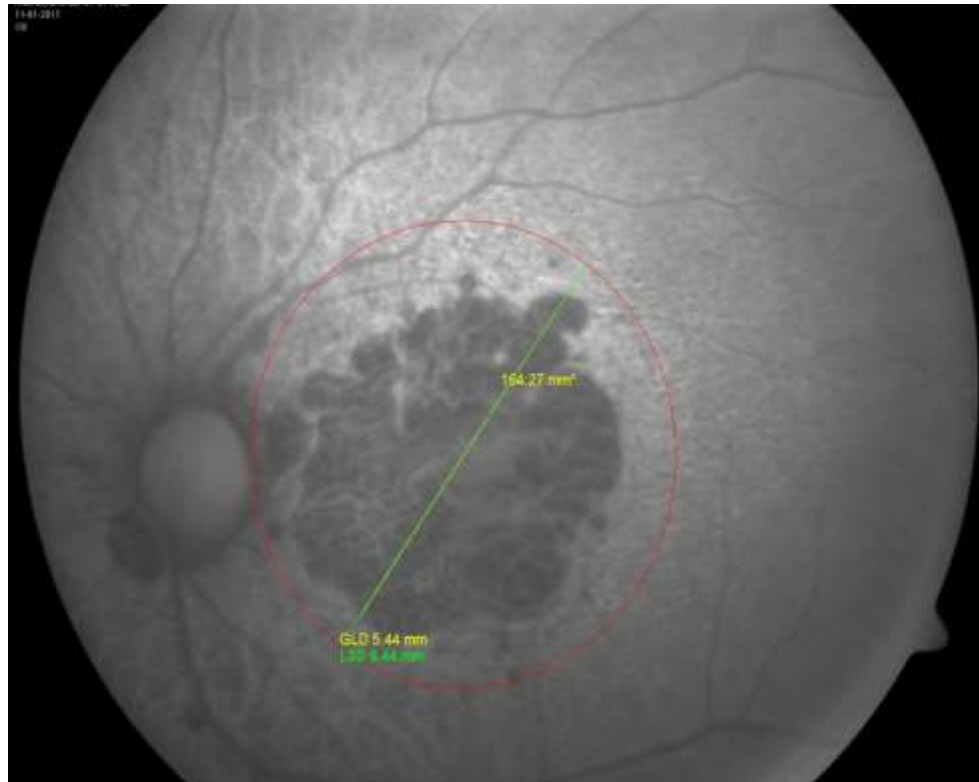
p-value=0.012



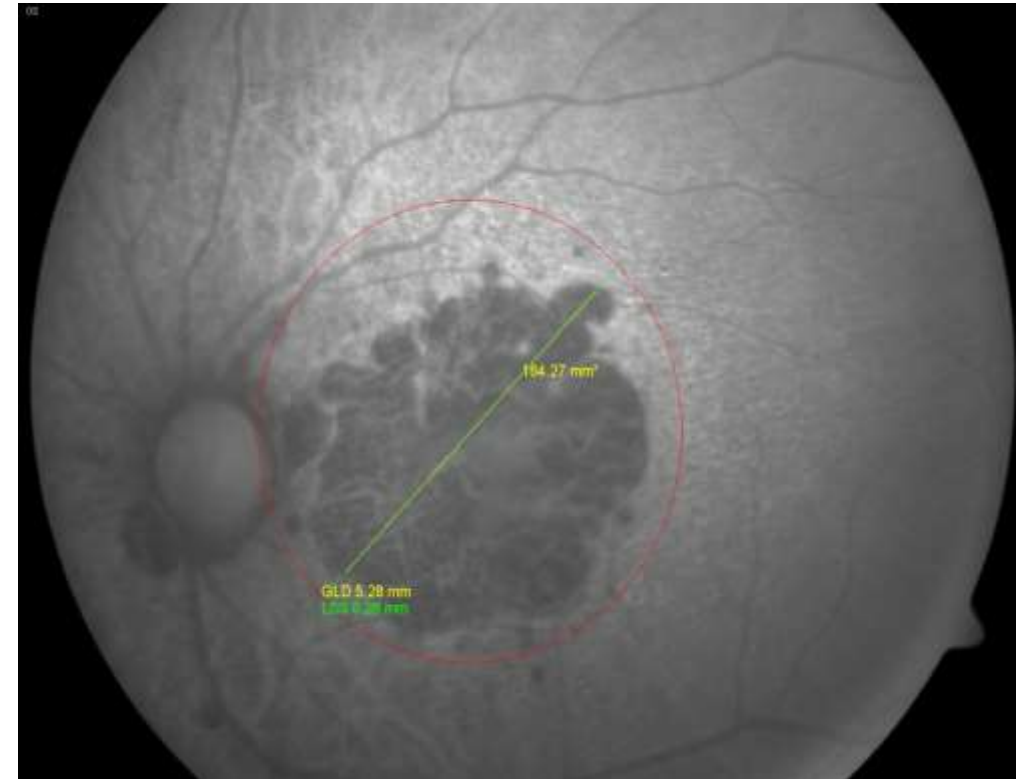
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# Case 1 - Fundus Autofluorescence

Baseline



Post-injection 9 months







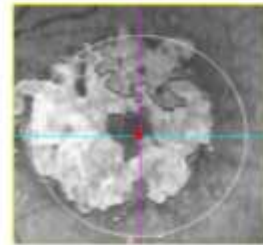
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Advanced RPE Analysis : Macular Cube 512x128

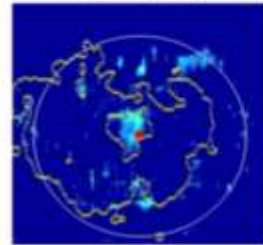
OD ○

● OS

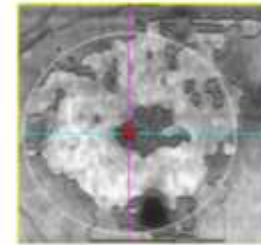
**Current Visit**



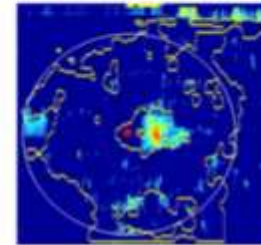
30% Transparency



**Prior Visit**



30% Transparency



Sub-RPE Slab

RPE Profile™

\*The calculated difference does not consider test-retest variability.

RPE Elevations	Current	Prior	Difference*	% Change
Area in 3 mm Circle (mm <sup>2</sup> )	0.8	1.1	0.3	37.5%
Area in 5 mm Circle (mm <sup>2</sup> )	1.7	2.0	0.3	17.6%
Volume in 3 mm Circle (mm <sup>3</sup> )	0.02	0.04	0.02	100.0%
Volume in 5 mm Circle (mm <sup>3</sup> )	0.05	0.07	0.02	40.0%
Sub-RPE Illumination	Current	Prior	Difference*	% Change
Area in 5 mm Circle (mm <sup>2</sup> )	10.6	14.2	3.6	34.0%
Closest distance to Fovea (mm)	0.0	0.2	0.2	Infinity



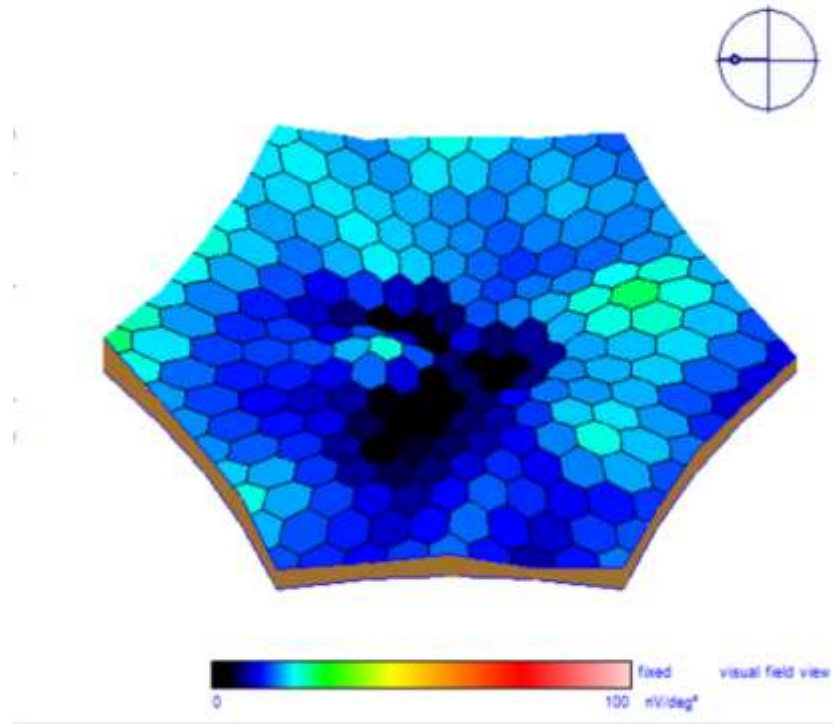
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# Multifocal Electroretinogram

Baseline

MERG61B  
LE stimulated

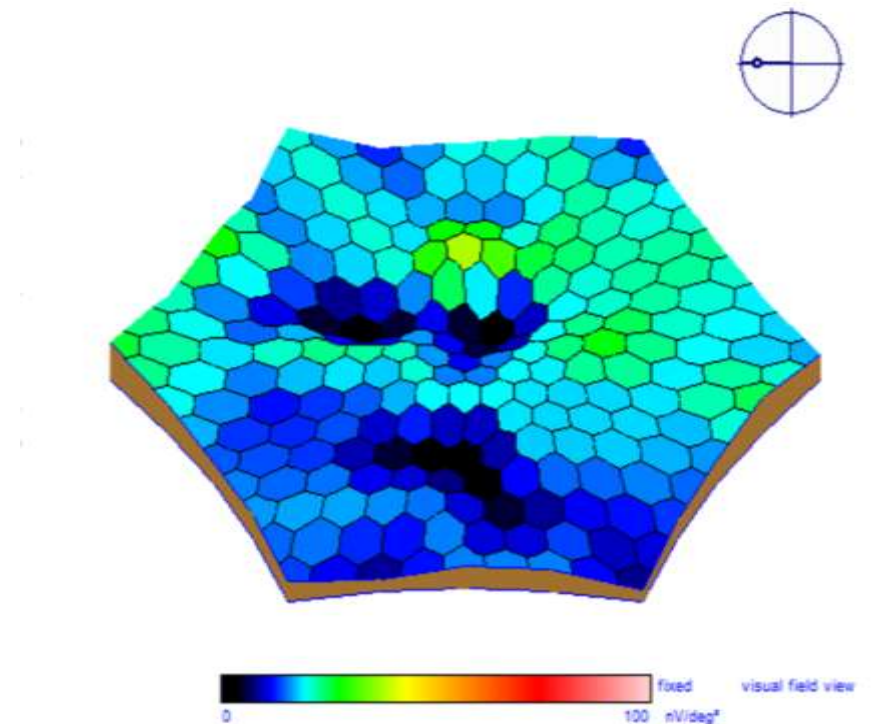
MAP OF P1 WAVE AMPLITUDES



Post-injection 9 months

MERG61B  
LE stimulated

MAP OF P1 WAVE AMPLITUDES





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## **Limitation**

- Long term effect needs to be studied.
- Study conducted for advanced disease.
- Survival and homing of subretinal stem cells not evaluated.



## ABSTRACT PRESENTATION

- Intravitreal autologous bone marrow derived stem cells injection may have a promising outcome in Dry AMD.
- Further studies are required to determine the **stage of disease** at which the maximal benefit can be achieved and to **standardize the dose and frequency** of stem cell injection.



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**Thank you**