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EOS 1902

In collaboration with: MEACO

Suprachoroidal space injection: An innovative technique for retinal therapeutics delivery

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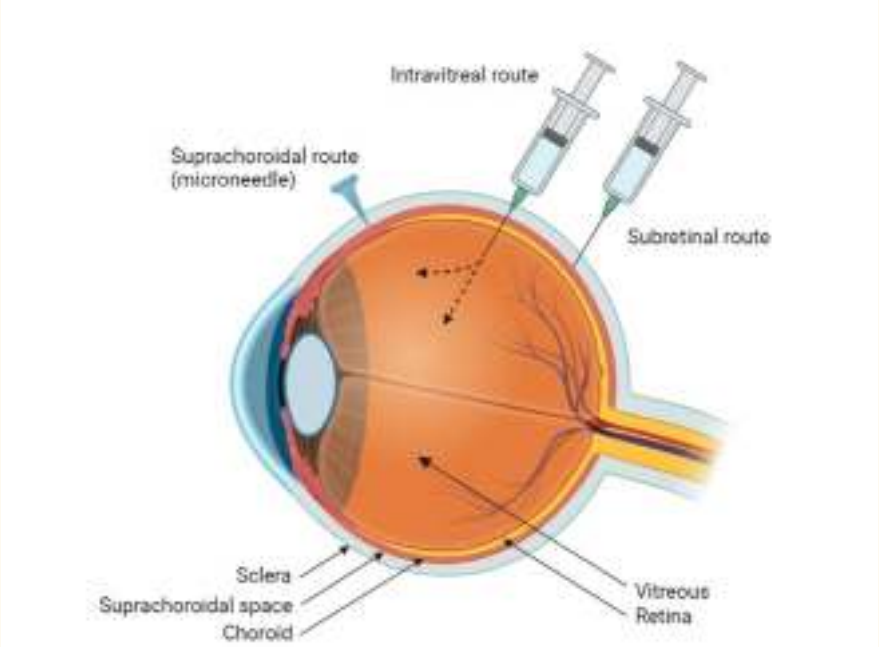
New ocular treatment paradigm :the SCS injection

Ocular drug delivery has evolved considerably in recent years.

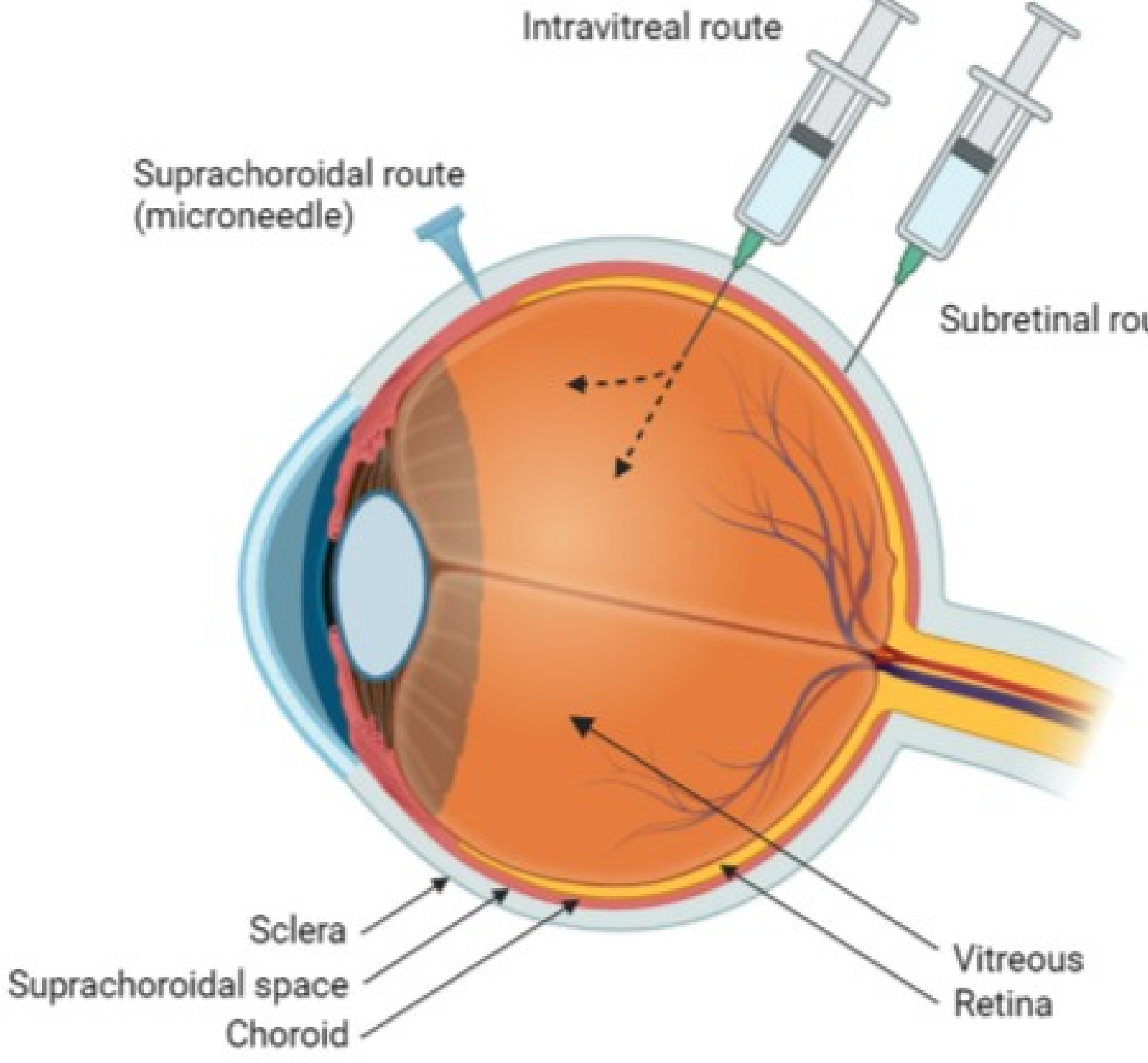
However, treating posterior segment and retinal disease remain challenging obstacles.



New ocular treatment paradigm:

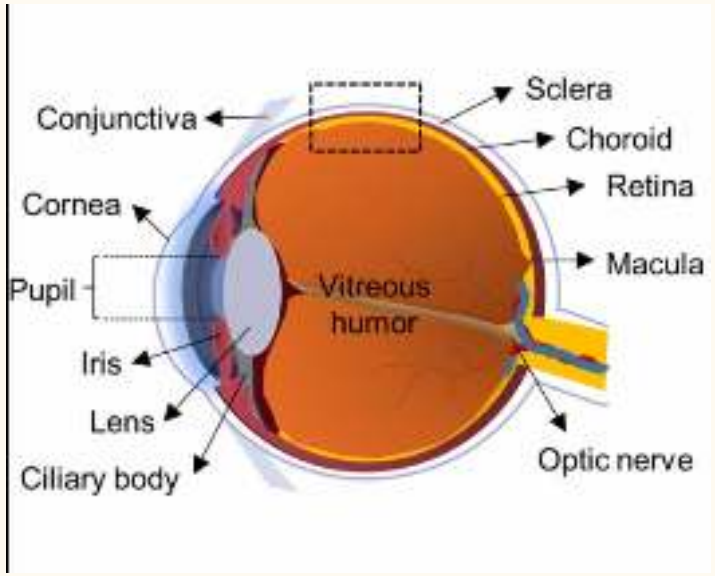
the SCS injection

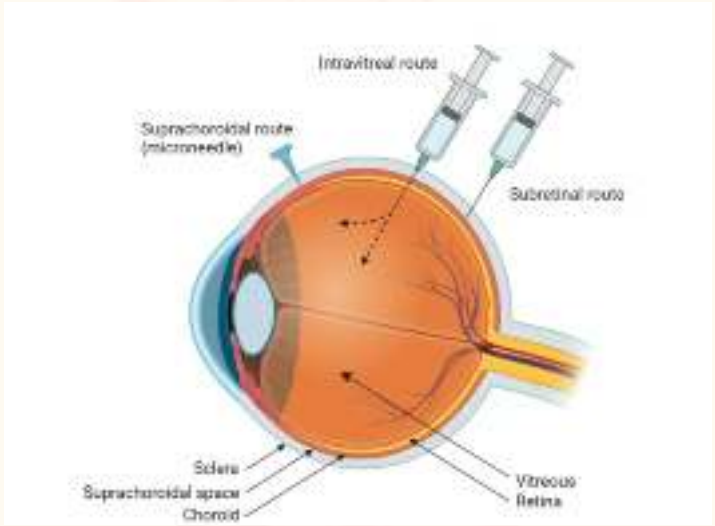
Intravitreal delivery of medication has revolutionized the treatment for a variety of potentially blinding retinal diseases such as age-related macular degeneration (AMD) and diabetic macular edema (DME)



New ocular treatment paradigm :the SCS injection

- However, this modality exposes the lens, ciliary body, and anterior segment to unintended drug exposures
- requires frequent injections for chronic conditions ,leading to increased healthcare costs and potential side effects



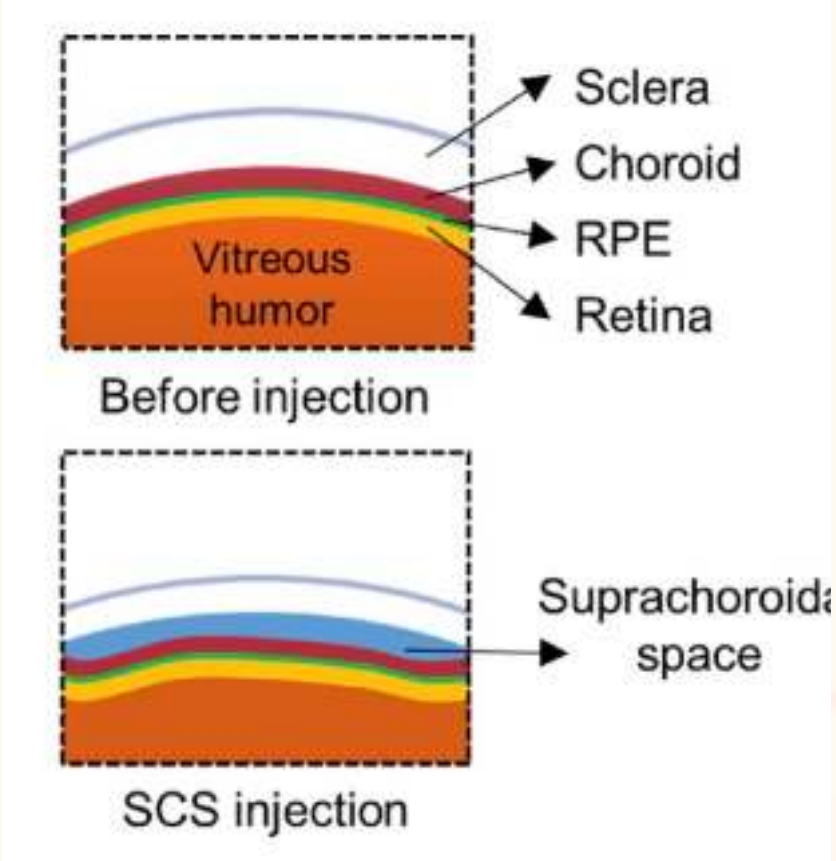


New ocular treatment paradigm :the SCS injection

- Also ,an intact blood retinal barrier can also imped the trasnsport of the drugs from the vitreous to the choroid and retinal pigment epithelium.

New ocular treatment paradigm :the SCS injection

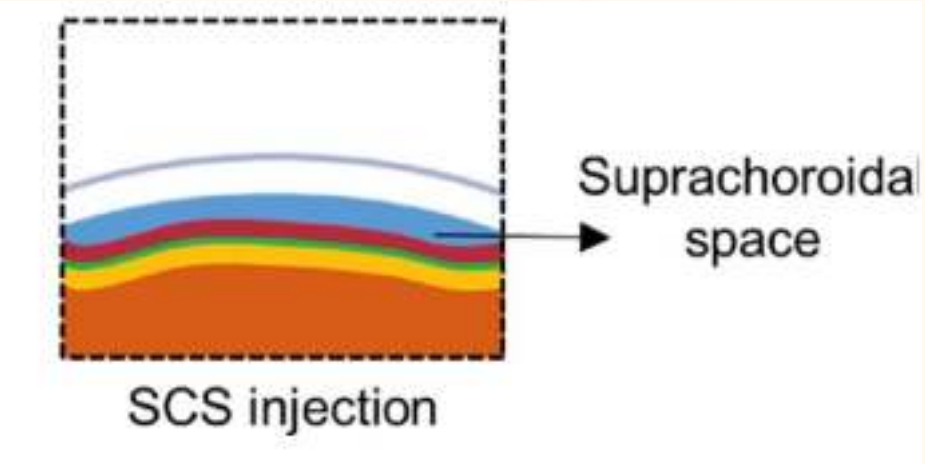
- Recently, suprachoroidal space (SCS) injection has emerged as a novel strategy for targeted drug delivery to the posterior segment of the eye, offering an innovative approach to address these challenges



Historical perspective

Supra choroidal space (SCS) was first described by poole (1986)

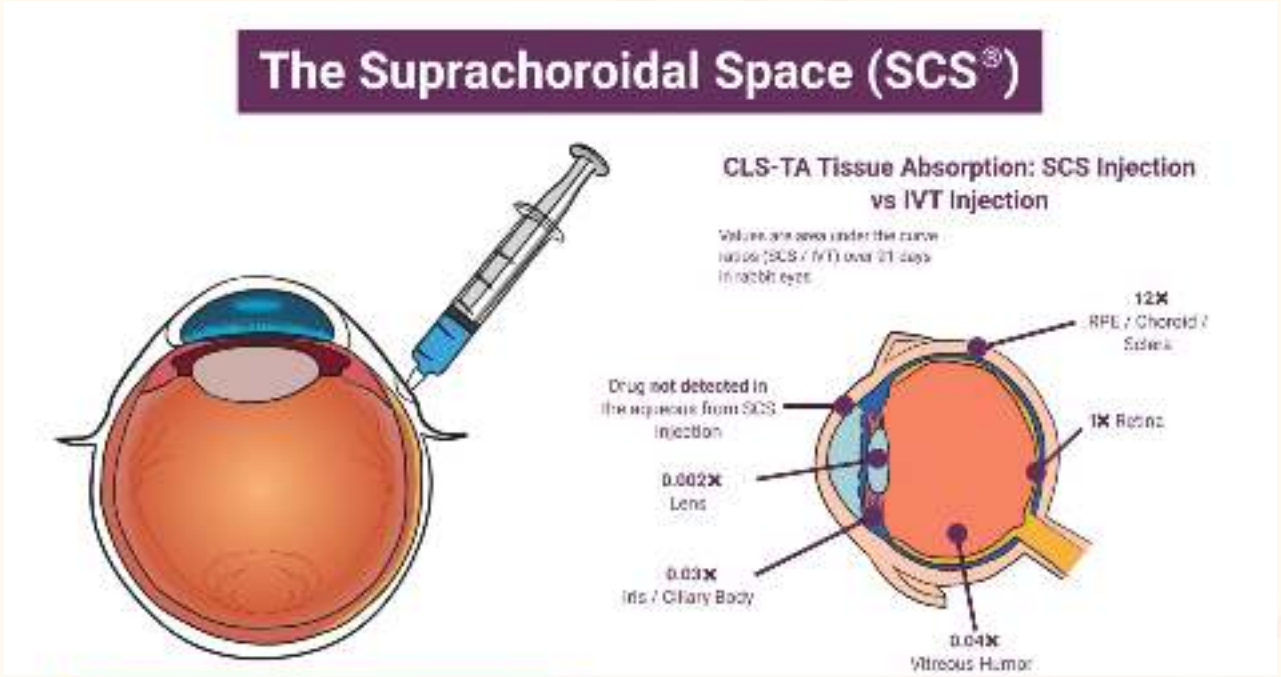
Eimahl(2002) and olsen (2006) made this path popular .



THE SUPRACHOROIDAL SPASE (SCS)

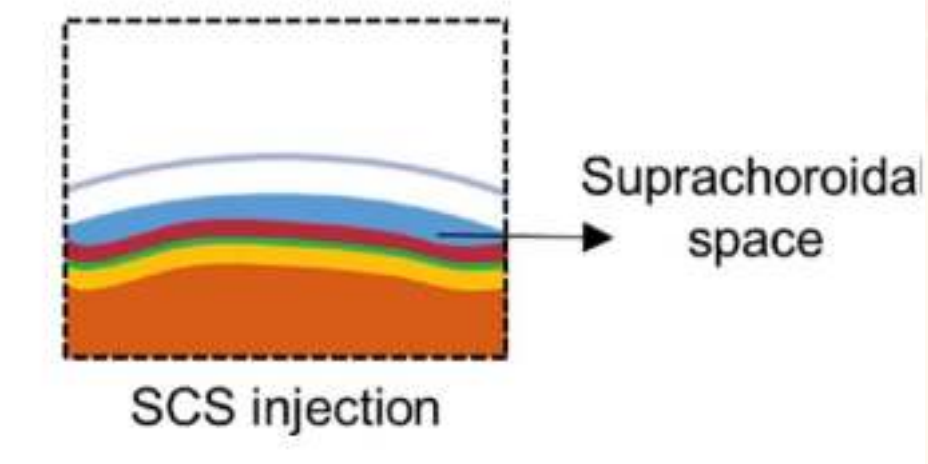
Definetion

- The SCS is A potential space between the sclera and choroid,
- Which are typically close in touch due to intraocular pressure (IOP) and connecting fibers .
- The differing mechanical properties and lack of strong physical bonds between the sclera and the choroid allow the SCS to expand whether through fluid injections or mechanical cannulation.

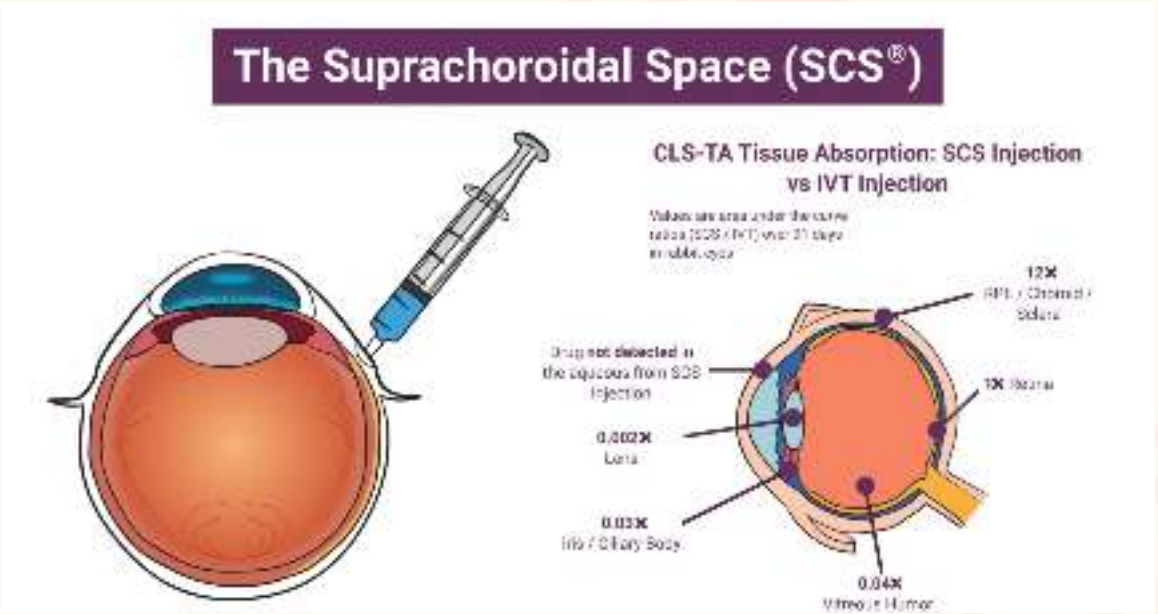


THE SUPRACHOROIDAL SPASE (SCS)

Expansion



- The SCS has shown considerable expansion following the injection of certain drugs in this area.
- a notable increase in mean SCS width, from 9.9 µm to 75.1 µm
- However, the increase was temporary, with the SCS width returning to approximately 14.9 µm a month after the final injection, revealing no lasting impact on the SCS's anatomy (Lampen ;et.al 2018).



THE SUPRACHOROIDAL SPASE (SCS)

Location

The SCS also has distinct anatomical boundaries.

Anteriorly is limited by the scleral spur, where the sclera adheres to the ciliary body,

Posteriorly extends to the optic nerve and short ciliary arteries

THE SUPRACHOROIDAL SPASE (SCS)

Imaging

The SCS can be visualized with swept-source OCT (SS-OCT), which allows for deeper tissue penetration,

and enhanced depth imaging OCT (EDI-OCT), which allows for greater depth of field

The combination of both methods, EDI SS-OCT is considered to be the most accurate modality to in vivo visualize the SCS

ADVANTAGES OF SUPRACHOROIDAL INJECTION

Targeted drug delivery

- Unique compartmentalization of the posterior segment.
- Minimization of the risk of exposure of the anterior segment.
- Minimization of systemic exposure.

ADVANTAGES OF SUPRACHOROIDAL INJECTION

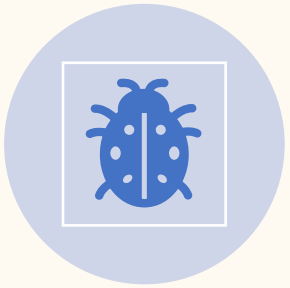
Reduced injection freqency

- SUSTAINED THERAOEUTIC LEVELS .
- IMPROVED PATIENT COMPLIACNE .

ADVANTAGES OF SUPRACHOROIDAL INJECTION

SAFETY PROFILE

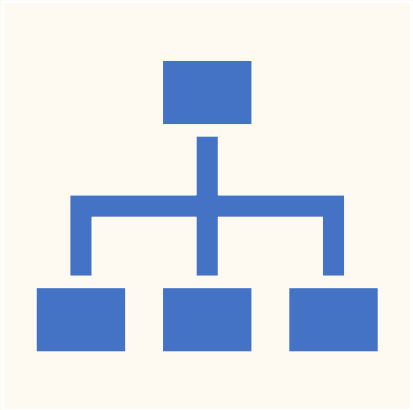
Low risk of cataract formation and intaocular pressure elevation.



Minimally invasive nature.

ADVANTAGES OF SUPRACHOROIDAL INJECTION

Office based procedure

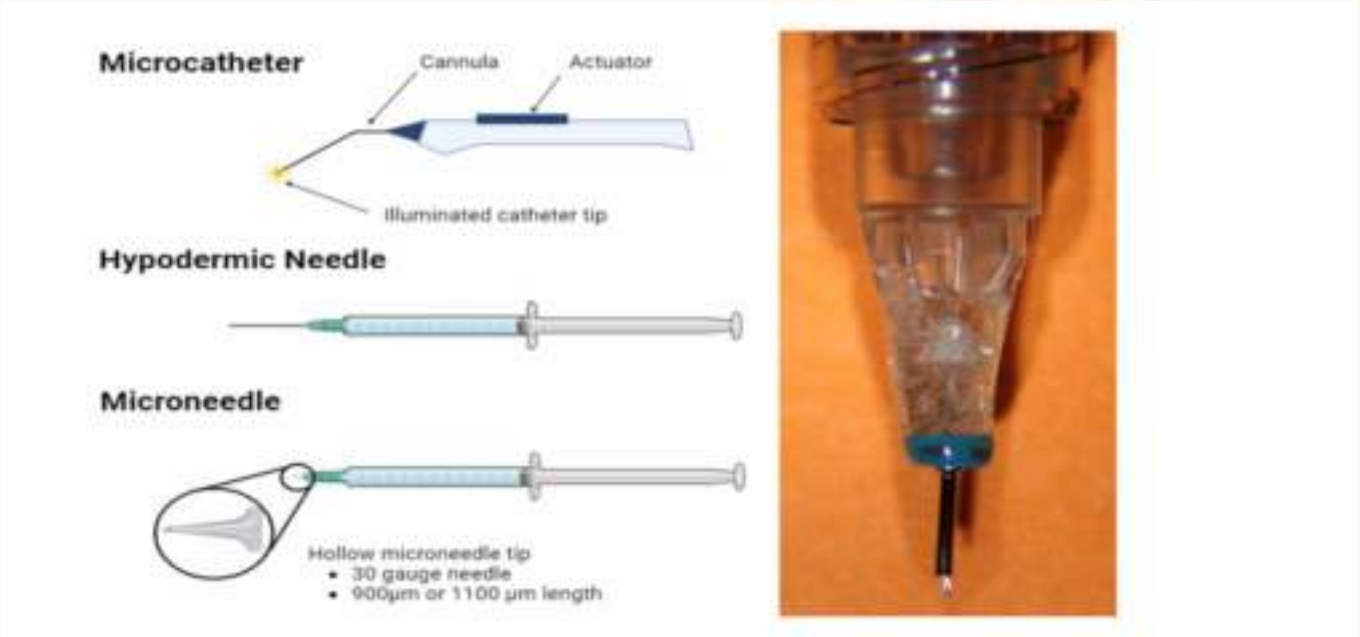


Simplified administration.

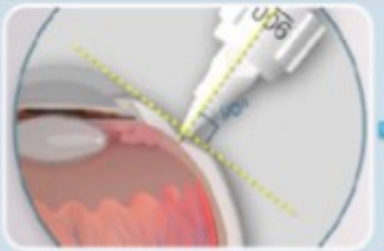
Reduced need for surgical settings.

Drug delivery to the suprachoidal space

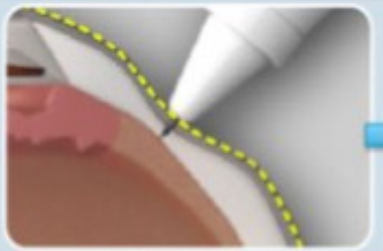
- 1.Microcatheters
- 2.Hypodermic Needles
- 3.Micrneedles



MAINTAIN DURING INJECTION



Hold the syringe **perpendicular** to the ocular surface, and insert the needle



Ensure **firm contact** with hub of the needle and the conjunctiva, **creating a dimple** on the ocular surface

Gently press on the white plunger handle and slowly inject over **5 – 10 seconds**

Chen-reWan ;etal

CHALLANGES AND COMPLICATIONS

TECHNICAL CHALLANGES

PRECISION IN ACCESSING SCS.

VARIABILITY IN SCLERAL THICKNESS.

CHALLANGES AND COMPLICATIONS

POTENTIAL COMPLICATION

- Suprachoroidal Hemorrage.
- Inflammation Or Infection

CHALLANGES AND COMPLICATIONS

Drug formulation constraints.

Particle size and suspension stability.

Compatibility and delivery devices.

CASE STUDIES

- **SCS TA INJECTION IN PATIENTS WITH REFRACTORY DIABETIC MACULAR EDEMA**

Changes in Optical Coherence Tomography Angiography after Suprachoroidal Triamcinolone Acetonide injection in Diabetic patients

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ABSTRACT

Background: Diabetic macular edema (DME) is a leading cause for loss of central vision in diabetics with retinopathy. Treatment approaches for DME have shifted away from Laser therapy as the first line of therapy for DME.

Aim and objectives: to investigate the changes in Optical coherence tomography angiography (OCT-A) after suprachoroidal injection of triamcinolone acetonide (SCTA) in patients with diabetic macular edema.

Patients and Methods: This a prospective case series study that was conducted on twenty eyes with refractory diabetic macular edema who treated with single suprachoroidal injection of triamcinolone acetonide. All patients underwent history taking, ocular examination and optical coherence tomography angiography (OCT-Angiography).

Results: there was no statistically significant difference between the studied groups as regard (Relation between baseline, third month and sixth month LogMAR BCVA), (Relation between baseline, third month and sixth month CFT (Central foveal thickness)), (Relation between baseline, third month, sixth month SVD (superficial vessel density) and sixth month DVD (Deep vessel density)), (Relation between baseline, third month and sixth month FAZ (Foveal avascular zone) in mm) and (Correlation between BCVA at six month and (CFT, SVD, DVD, FAZ) at six months).

Conclusion: our findings suggest that SCTA may be an effective treatment option for diabetic macular edema, improving visual outcomes and reducing retinal thickness.

Key words: Optical Coherence Tomography Angiography, Suprachoroidal Triamcinolone Acetonide injection, Diabetic patients.

INTRODUCTION

Diabetic macular edema (DME) occurs due to chronic hyperglycemia, poor glycemic control is one of the major risk factors of DME. The incidence of DME over a 10 years period is 20% in patients with younger onset diabetes versus approximately 40% in patients with older onset diabetes. Its risk factors are duration of Diabetes Mellitus (DM) poor control with prolonged elevated hemoglobin A1C (HbA1c), Hypertension, Hyperlipidemia and Kidney disease **[1]**.

Anti-vascular endothelial growth factor (anti-VEGF) agents have demonstrated remarkable efficacy in several pivotal clinical trials for control of centre-involving DME, and have become the gold standard

Optical coherence tomography angiography (OCT-A) is a new diagnostic non-invasive method by which the vascular structures of the retina and choroid can be visualized three-dimensionally without need for using fluorescence dyes or mydriasis. The technology of OCT-A is an advancement of the OCT. By means of more powerful software and hardware used for OCT-A not only morphological but also retinal and choroidal vascular perfusion analyses can be performed **[5]**.

This new technology allows the in situ, high-resolution visualization of the individual vascular layers. In contrast to fundus fluorescein angiography (FFA), which displays only the superficial capill-

Scs injection of TA

- 20 Eyes with refractory diabetic macular edema with retinal thickness of 300 microns or more .
- BCVA of base line 15 letters or more (ETDRS) LETTERS.
- Patients recevived 4 mg. (0.1 ml of 40 mg/ml.). triamcinolone acetonide.
- BCVA and central macular thickness by oct are measured for 6 months post operative.

27G hypodermic needle custamized for SCS INJECTION

Reduction of the CMT Of about 155 microns from base line CMT

Table (3) Relation between baseline, third month and sixth month CFT(Central foveal thickness).

	Baseline Mean ±SD	Third month Mean±SD	Sixth month	F.test	P.value	LSD	Mean change betweensix month and baseline
CFT(μm)	558± 189	317.80± 68.36	274.50± 66.23	1270.947	.000	P1=0.000 P2=0.000 P3=0.049	-283.5

CFT=Central foveal thickness, F.test= statistical test with F-distribution, LSD= Least significant difference
P1 between Baseline and Third month, p2 between Baseline and Sixth month, p3 between Third month and Sixth month.

Clinicaly signficant improvement in BCVA at 6 month SCS TA Injection from base line BCVA

Table (1) Demographic data among the studied cases.

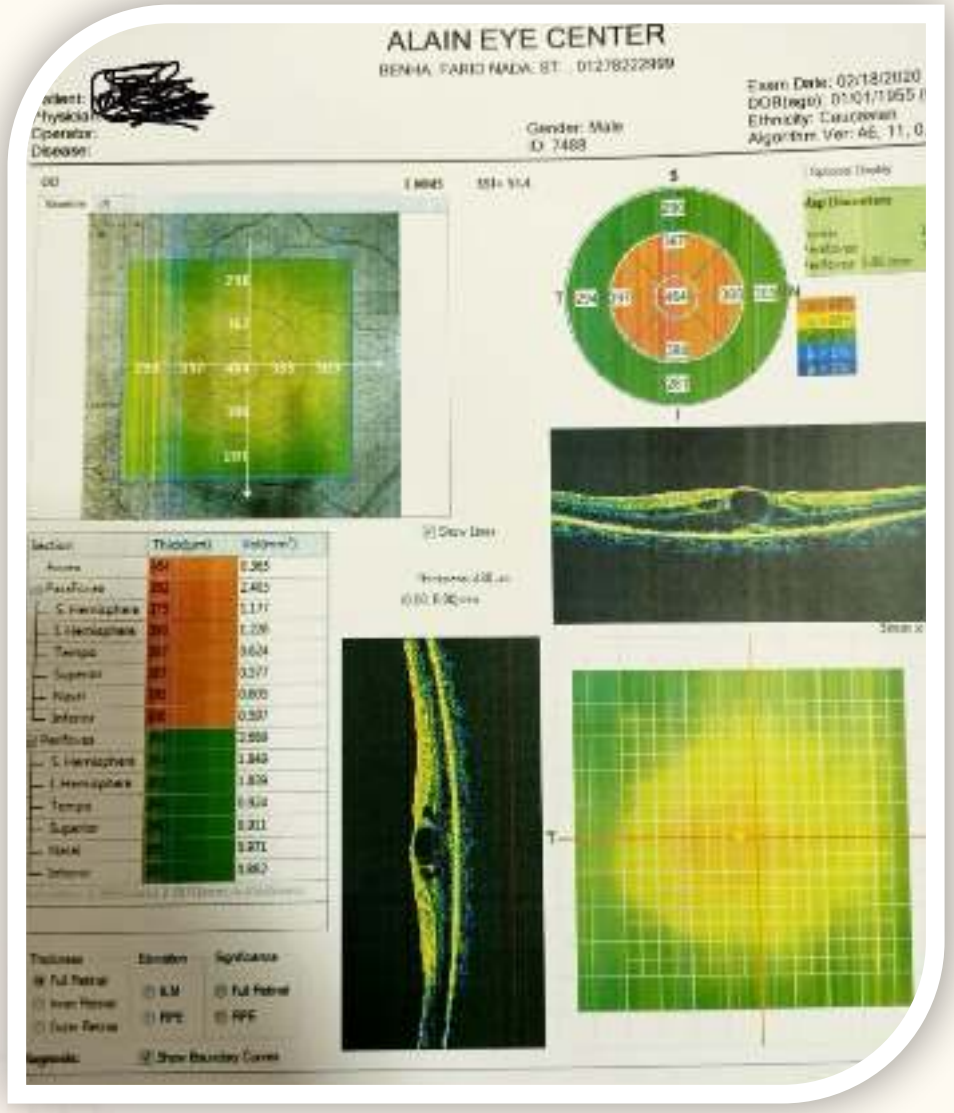
		Mean ± SD
Age (years)		50.60± 5.86
		No.	**%**
Sex	**Female**	15	75.0
	Male	5	25.0

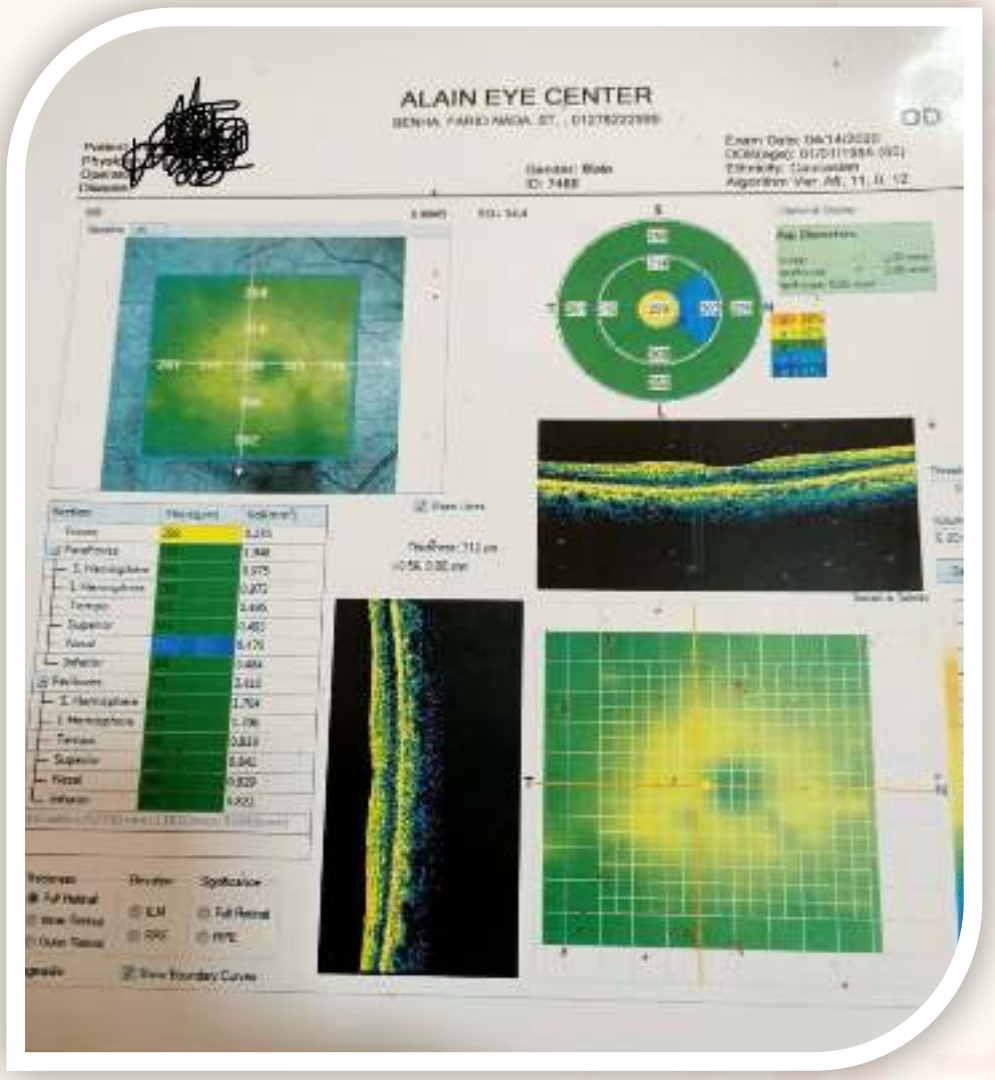
Table (2) Relation between baseline, third month and sixth monthLogMAR BCVA.

	Baseline Mean±SD	**Third month** Mean±SD	**Sixth month**	**F.test**	**P. value**	**LSD**	**Mean changesbetween six month and baseline**
BCVA	.184± .164	.131± .106	.097± .059	32.804	.000	P1=0.232 P2=0.032 P3=0.218	-0.087

BCVA=Best corrected visual acuity, F.test= statistical test with F-distribution, LSD= Least significant difference

P1 between Baseline and Third month, p2 between Baseline and Sixth month, p3 between Third month and Sixth month.





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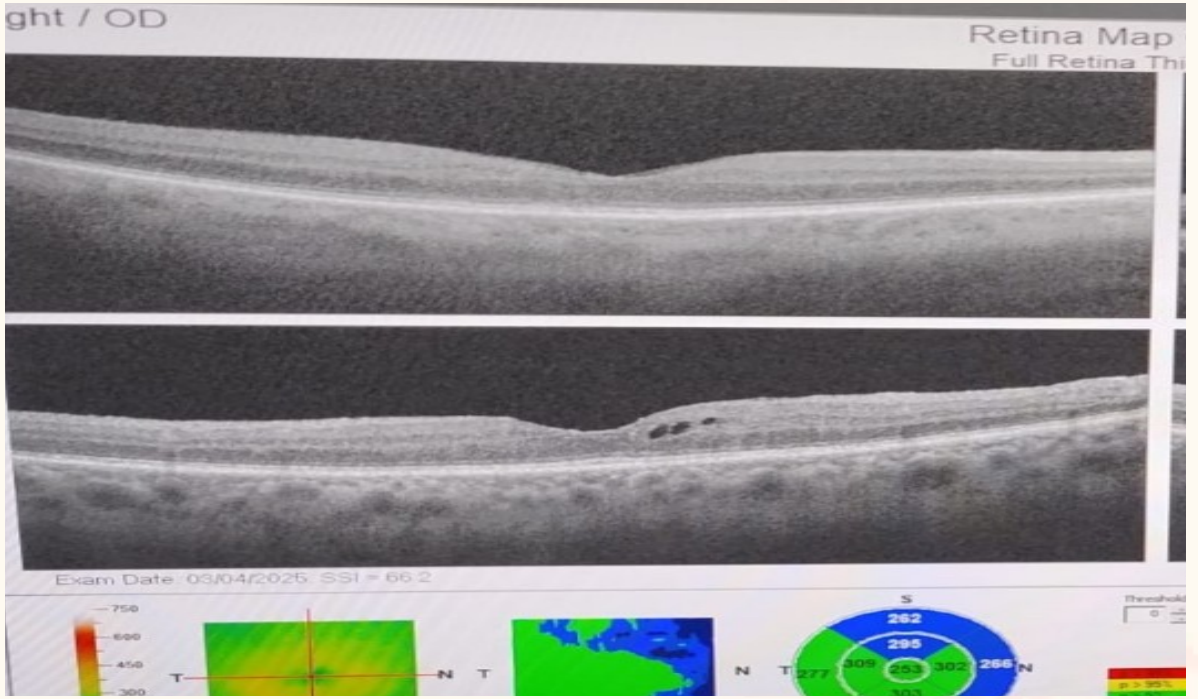

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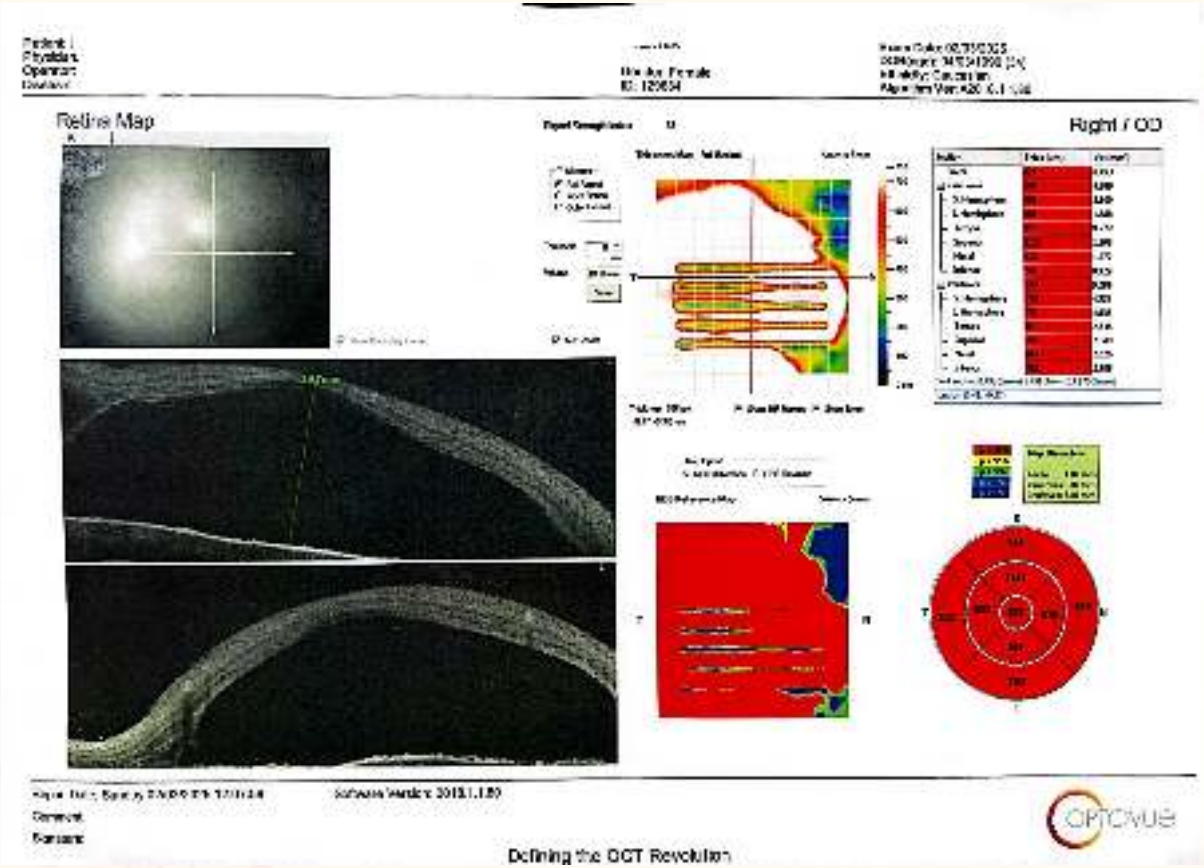
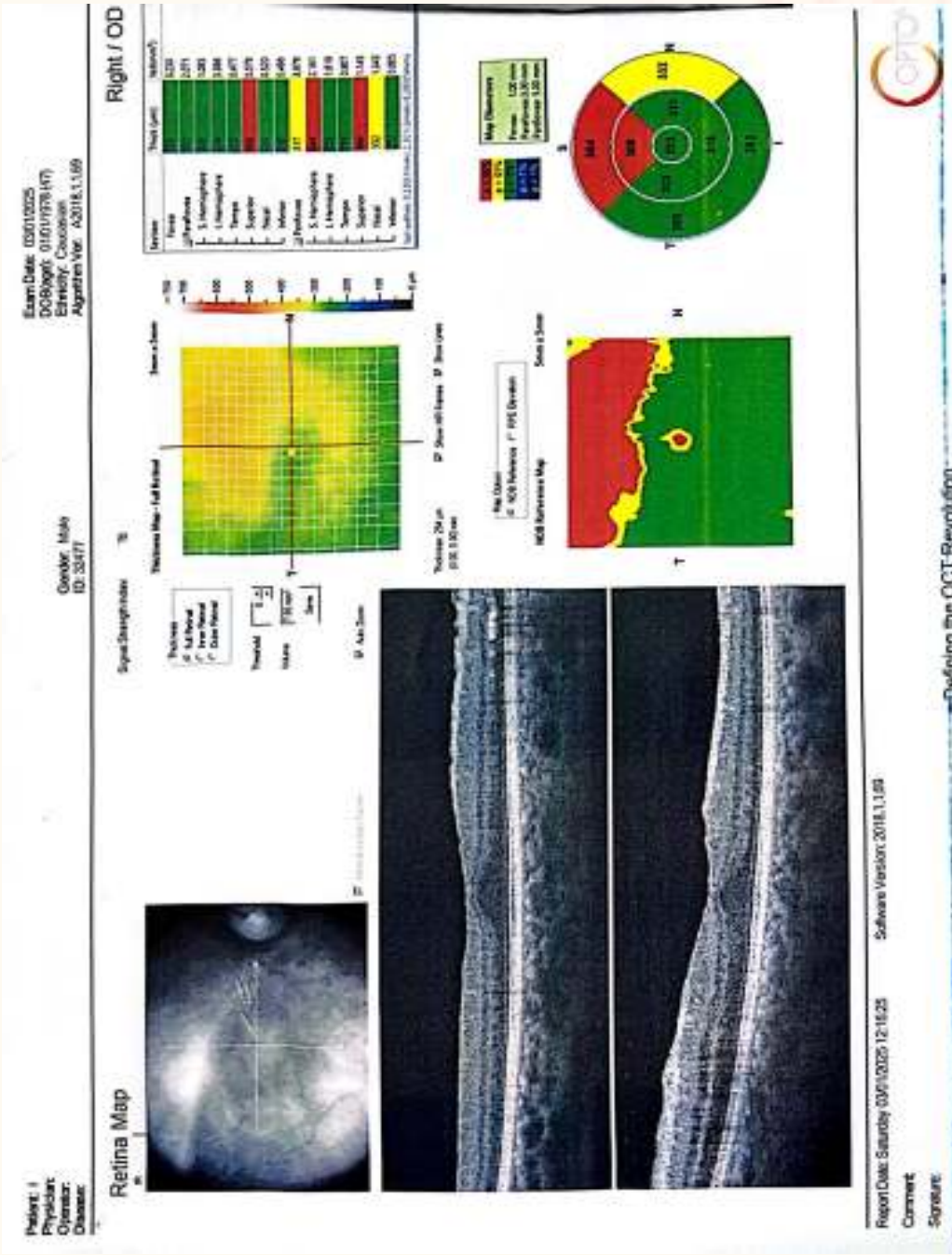
CASE STUDIES

- **PATIENTS WITH UVEITIC MACULAR EDEMA**

SCS Injection of TA in Harada disease





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FUTURE PERSPECTIVES

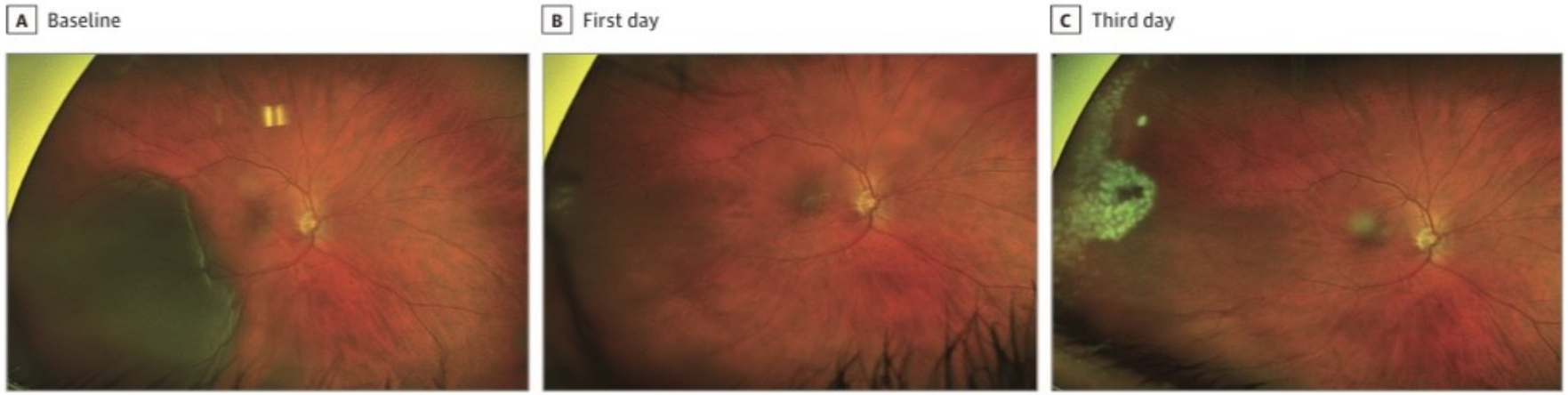
Personalized Medicine

Tailoring treatment based on patient specific factrors.

Biomarkers driven approaches.

In office suprachoroidal space visopexy for rheugmatogenous retinal detachment

Figure 1. Longitudinal Progression of the Retinal Detachment on Ultrawide-Field Photographs



Longitudinal ultrawide-field photographs of a man in his 50s with pseudophakia presenting with a rhegmatogenous retinal detachment (RRD) in the right eye. A, Baseline image demonstrating a fovea-involving inferotemporal RRD from 6 to 10 o'clock, with no definitive causative retinal break. B, First-day post-suprachoroidal viscopexy (SCVEXY) demonstrating substantial resolution of the retinal detachment with some initial spots of laser retinopexy that were applied to the temporal periphery. A small localized temporal hemorrhage was noted near the injection site. C, Third-day post-SCVEXY demonstrating complete laser retinopexy barricade in the suspected region of the causative retinal break.

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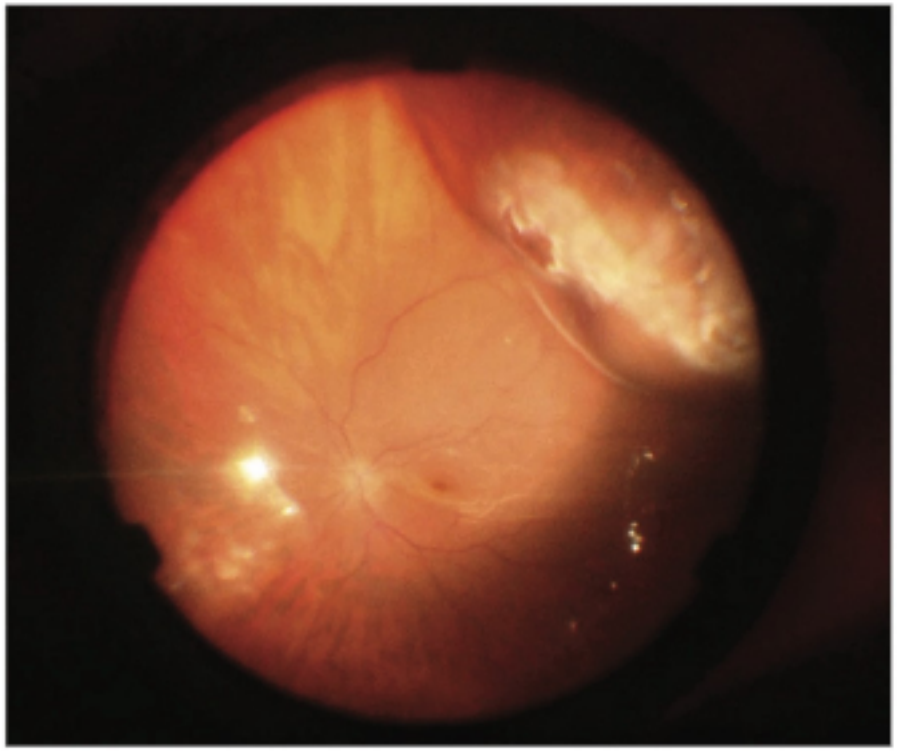
In office suprachoroidal space visopexy for rheugmatogenous retinal detachment

Figure 2. Choroidal Indentation After Intraoperative Suprachoroidal Viscopexy (SCVEXY)



Final appearance of the choroidal convexity formed after SCVEXY.

Figure 3. Longitudinal Reabsorption of the Suprachoroidal Viscoelastic

Longitudinal vertical swept-source optical coherence tomography was performed at the viscopexy injection site, demonstrating the progressive reabsorption of the suprachoroidal viscoelastic (hyporeflective space between the choroid and sclera indicated by the arrowheads) from postoperative day 1 (A) to postoperative day 5 (B).

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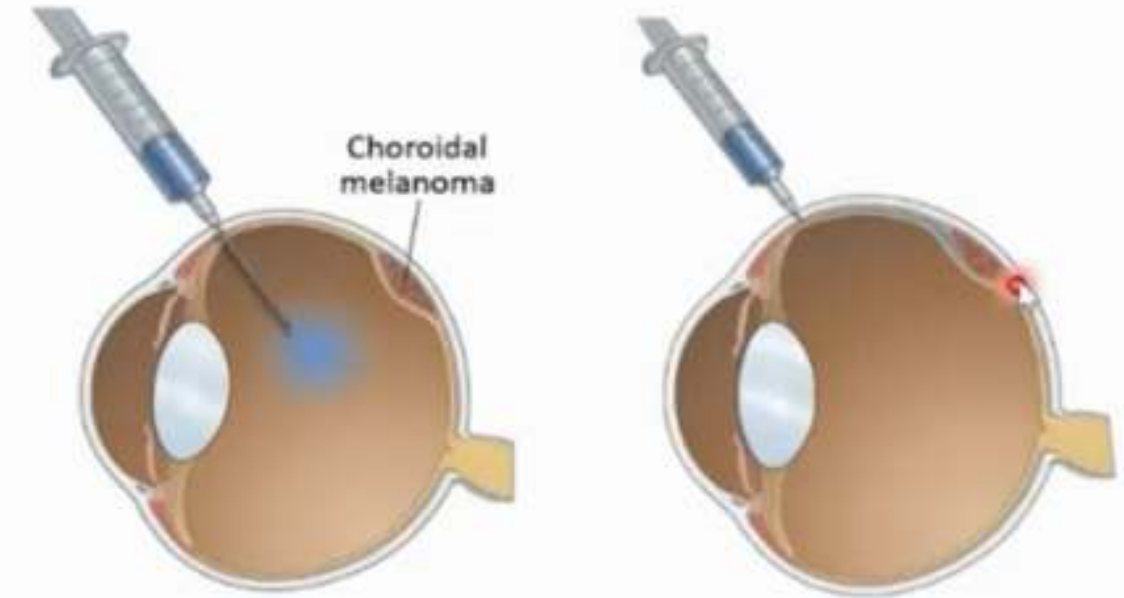
FUTURE PERSPECTIVES EXPANDING INDICATIONS

SCS injection for choroidal melanoma



Delivery to the suprachoroidal may optimize AU-011's therapeutic index based on:

- **Higher tumor drug exposure**
- **Lower vitreous exposure which may lower risk of vitreous inflammation**
- **Optimized treatment parameters (shorten the time between injection and laser)**

FUTURE PERSPECTIVES
EXPANDING INDICATIONS

- EXPLORATION IN GLAUCOMA MANAGEMENT
- POTENTIAL IN GENE THERAPY.

FUTURE PERSPECTIVES

TECHNICAL INNOVATIONS

Advanced Microneedle Design .

Smart Drug Delivery Systems.

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Take home message

- Suprachoroidal (SC) space injections have emerged as a promising alternative for targeted drug delivery to the posterior segment
- Recent advancements in imaging technologies and the development of specialized delivery devices have further supported the clinical adoption of SCS injections.

THANK YOU

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