

IRVINE GASS SYNDROME

MOHSEN ABOU SHOUSA, MD.

IRVINE-GASS SYNDROME

- IRVINE-GASS SYNDROME (PSEUDOPHAKIC CYSTOID MACULAR EDEMA), IS A CYSTOID MACULAR EDEMA THAT DEVELOPS FOLLOWING UNEVENTFUL CATARACT SURGERY.
- IT WAS FIRST DESCRIBED IN 1953 BY IRVINE AND STUDIED USING FLUORESCEIN ANGIOGRAPHY BY GASS AND NORTON IN 1966
- IT IS THE MOST COMMON CAUSE OF DECREASED VISUAL ACUITY AFTER UNEVENTFUL CATARACT SURGERY.

Irvine S.R. A newly defined vitreous syndrome following cataract surgery. *Am. J. Ophthalmol.* 1953;36:599-619.
Gass J.D., Norton E.W. Cystoid macular edema and papilledema following cataract extraction. A fluorescein fundoscopic and angiographic study. *Arch. Ophthalmol.*

PREVALENCE

- SIGNIFICANT CME IMPAIRING PATIENTS' VISION IS FOUND IN 1–2% OF PATIENTS WITH ITS PEAK 6 WEEKS FOLLOWING SURGERY.
- SUBCLINICAL CME CAN BE SEEN IN ABOUT 30% OF PATIENTS IN FA AND UP TO 40% IN OCT

Henderson B.A., Kim J.Y., Ament C.S., Ferrufino-Ponce Z.K., Grabowska A., Cremers S.L. Clinical pseudophakic cystoid macular edema. Risk factors for development and duration after treatment. *J. Cataract Refract. Surg.* 2007;33:1550–1558.

Perente I., Ufline C.A., Ozturker C., Cakir M., Kaya V., Eren H., Kapran Z., Yilmaz O.F. Evaluation of macular changes after uncomplicated phacoemulsification surgery by optical coherence tomography. *Curr. Eye Res.* 2007;32:241–247.

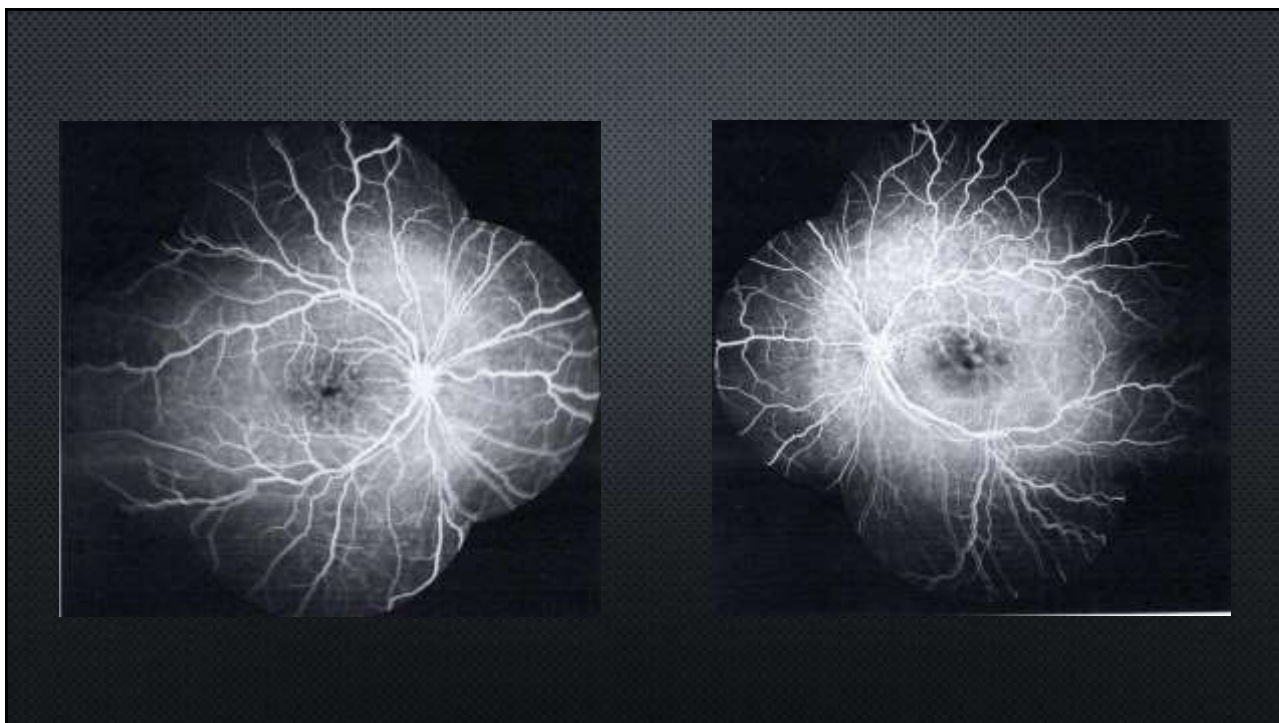
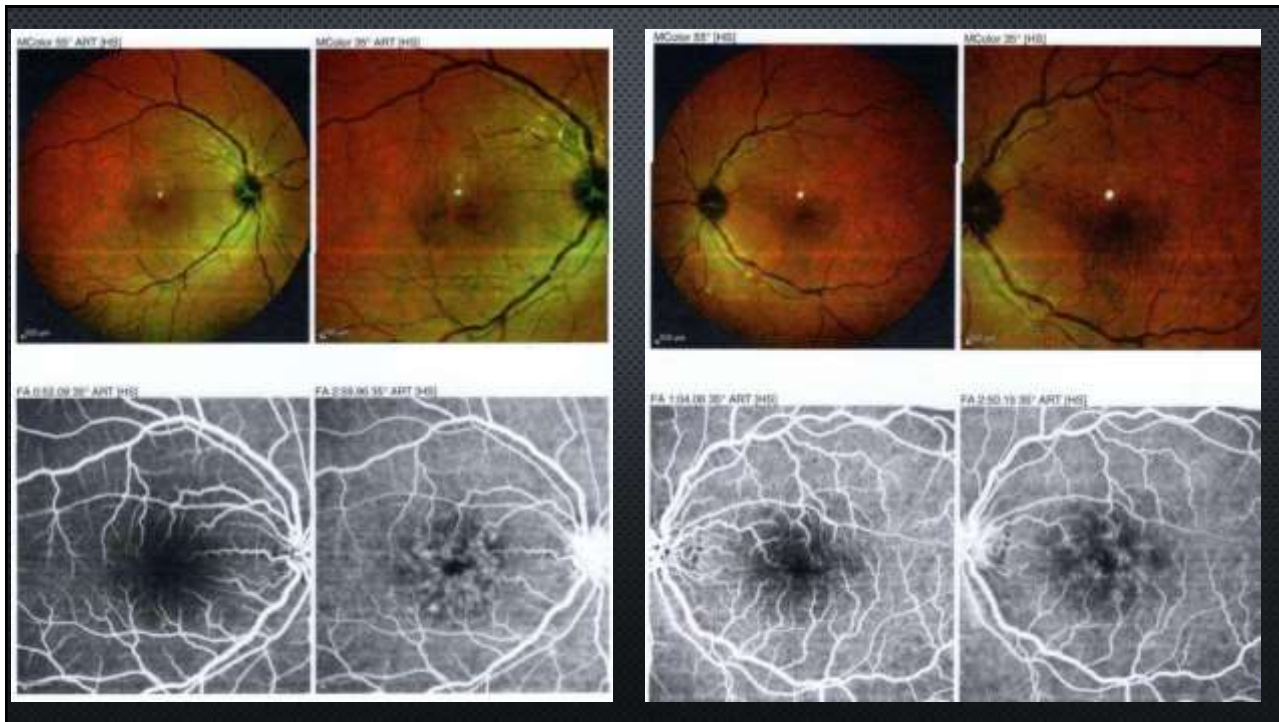
Shelsta H.N., Jampol L.M. Pharmacologic therapy of pseudophakic cystoid macular edema: 2010 update. *Retina.* 2011;31:4–12.

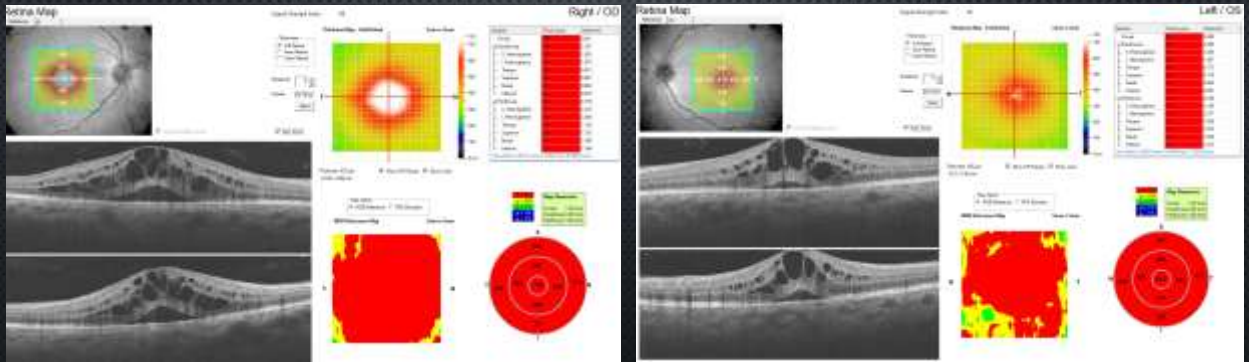
PATHOPHYSIOLOGY

MULTIFACTORIAL INFLAMMATORY ORIGIN.

- SURGICAL MANIPULATION CAUSES SIGNIFICANT RELEASE OF INFLAMMATORY MEDIATORS, INCLUDING ARACHIDONIC ACID, CYTOKINES, LYSOZYME, AND VASCULAR ENDOTHELIAL GROWTH FACTOR.
- THE INFLAMMATORY CASCADE IMPAIRS THE BLOOD–AQUEOUS AND BLOOD–RETINAL BARRIERS AND PROMOTES VASCULAR PERMEABILITY.
- FLUID ACCUMULATES IN THE OUTER PLEXIFORM AND INNER NUCLEAR LAYERS, CREATING CYSTIC INTRARETINAL SPACES THAT COALESCE TO LARGER FLUID CAVITIES.
- PROLONGED CME MAY CAUSE LAMELLAR HOLES AND PERSISTENT SUBRETINAL FLUID.

Benitah N.R., Arroyo J.G. Pseudophakic cystoid macular edema. *Int. Ophthalmol. Clin.* 2010;50:139–153.





RISK FACTORS

SURGICAL COMPLICATIONS

- VITREOUS LOSS
- VITREOUS TRACTION AT INCISION SITES
- VITRECTOMY FOR RETAINED LENS FRAGMENTS
- IRIS TRAUMA
- POSTERIOR CAPSULE RUPTURE
- INTRAOCULAR LENS DISLOCATION
- EARLY POSTOPERATIVE CAPSULOTOMY
- IRIS-FIXATED INTRAOCULAR LENSES
- ANTERIOR CHAMBER INTRAOCULAR LENSES

RISK FACTORS

DIABETIC MACULAR EDEMA

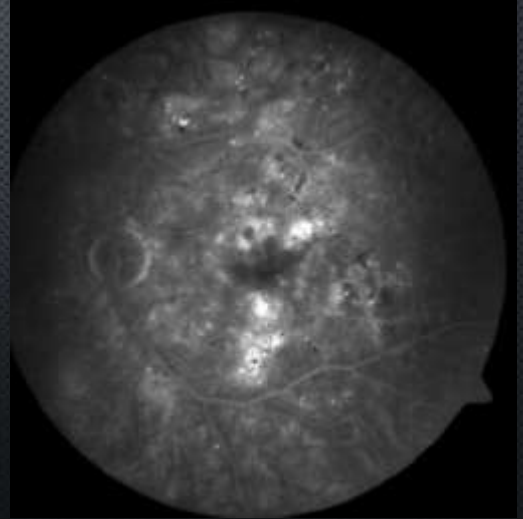
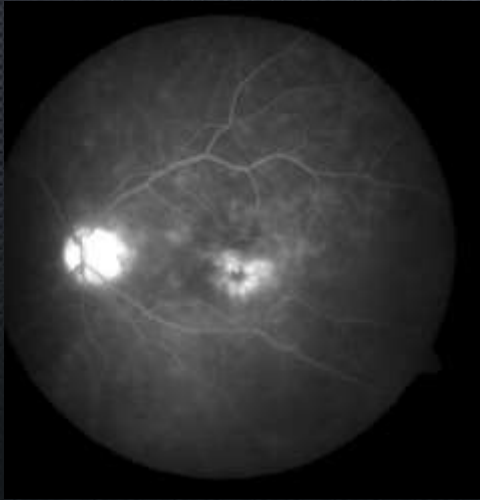
- POSTOPERATIVE MACULAR EDEMA USUALLY DEVELOPS IN THOSE WITH A PRIOR HISTORY OF DME.
- IF THE PATIENT ACTIVELY HAD DME AT THE TIME OF SURGERY, IT RARELY RESOLVES ON ITS OWN, EVEN IN EYES WITH PRIOR VITRECTOMY.

FOR THESE REASONS,

- DME AND SEVERE DR SHOULD BE STABILIZED BEFORE UNDERGOING CATARACT EXTRACTION.

DD WITH DME

	IGS	DME
Microaneurysms/Hemorrhages	no	present
Exudates	no	present
FA: Macular leakage	Typically petaloid	May be focal or diffuse
FA: late disc hyperfluorescence	present	absent



RISK FACTORS

UVEITIS

- BELAIR AND KIM *ET AL.* DEMONSTRATED THAT INCIDENCE OF PSEUDOPHAKIC CME ON OCT AT 1 MONTH POST-OPERATIVELY WAS 12% FOR EYES WITH UVEITIS AND 4% FOR CONTROLS ($P = .2$), AND 8% AND 0%, RESPECTIVELY, AT 3 MONTHS ($P = .08$).
- EYES TREATED PERIOPERATIVELY WITH ORAL CORTICOSTEROIDS HAD A 7-FOLD REDUCTION IN CME ($P = .05$).
- WHILE THOSE WITH ACTIVE INFLAMMATION WITHIN 3 MONTHS OF SURGERY HAD A 6 FOLD INCREASED RISK OF DEVELOPING CME ($P = .04$).
- SUCH STUDIES INDICATE THAT ADEQUATE PREOPERATIVE AND POSTOPERATIVE CONTROL OF INFLAMMATION IS PARAMOUNT FOR SUCCESSFUL CATARACT EXTRACTION.

RISK FACTORS

- GLAUCOMA MEDICATIONS (LATANOPROST)

Panteleontidis V, Detorakis ET, Pallikaris IG, Tsilimbaris MK. Latanoprost-Dependent Cystoid Macular Edema Following Uncomplicated Cataract Surgery in Pseudoexfoliative Eyes. *Ophthalmic Surg Lasers Imaging* 2010;1-5.

PROPHYLAXIS

- NSAIDS FOR PROPHYLAXIS OF CME IN ROUTINE CATARACT SURGERY
- 1-3 DAYS PRE-OPERATIVE
- 1 MONTH POST OPERATIVE

Kim A, Stark WJ. Are topical NSAIDs needed for routine cataract surgery? *Am J Ophthalmol* 2008 Oct; 146(4): 483-485.

MANAGEMENT

- TOPICAL NSAIDS
- TOPICAL STEROIDS
- SYSTEMIC CARBONIC ANHYDRASE INHIBITORS
- PERIOCCULAR STEROIDS
- INTRAVITREAL STEROIDS
- INTRAVITREAL ANTI-VEGF
- SUBTHRESHOLD LASER

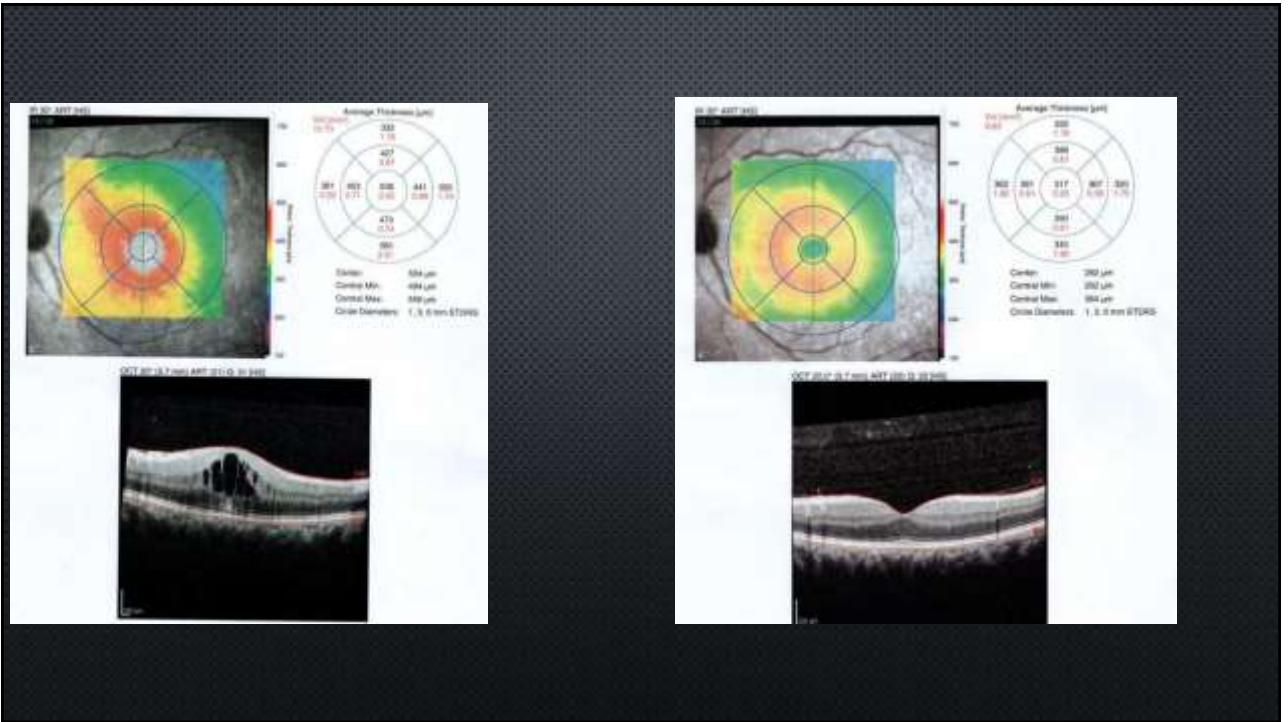
NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAID)

- ALL THE STUDIES SHOW FUNCTIONAL AND MORPHOLOGICAL IMPROVEMENT.
- HOWEVER, SOME PATIENTS STILL PRESENT SOME VISUAL DEFICIT AT THE END OF THE TREATMENT.
- THE LATEST STUDIES FAVOR TOPICAL NEPAFENAC COMPARED TO OTHER NSAID EYE DROPS.
- NO SIGNIFICANT ADVERSE EVENTS ASSOCIATED WITH THE USE OF NSAIDS WERE REPORTED IN ANY OF THE STUDIES.

Giarmoukakis A.K., Blazaki S.V., Bontzos G.C., Plaka A.D., Seliniotakis K.N., Ioannidi L.D., Tsilimbaris M.K. Efficacy of topical nepafenac 0.3% in the management of postoperative cystoid macular edema. *Ther. Clin. Risk Manag.* 2020;16:1067–1074.

Yüksel B., Uzunel U.D., Kerci S.G., Sağban L., Kusbeci T., Örsel T. Comparison of subtenon triamcinolone acetonide injection with topical nepafenac for the treatment of pseudophakic cystoid macular edema. *Ocul. Immunol. Inflamm.* 2016;25:513–519. doi: 10.3109/09273948.2016.1147587.

Guclu H., Gurlu V.P. Comparison of topical nepafenac 0.1% with intravitreal dexamethasone implant for the treatment of Irvine-Gass syndrome. *Int. J. Ophthalmol.* 2019;12:258–267. doi: 10.18240/ijo.2019.02.12. [



TOPICAL PREDNISOLONE

TWO RCL WITH TWO DIFFERENT RESULTS

- COMBINATION THERAPY (TOPICAL NSAIDS + TOPICAL PREDNISOLONE) APPEARS TO OFFER BENEFITS OVER MONOTHERAPY WITH EITHER AGENT ALONE.
- NO STATISTICALLY SIGNIFICANT DIFFERENCE WAS FOUND IN THE OUTCOME BETWEEN PATIENTS WHO RECEIVED KETOROLAC AND THOSE WHO RECEIVED KETOROLAC PLUS PREDNISOLONE FOR ACUTE OR CHRONIC CME.

Heier J.S., Topping T.M., Baumann W., Dirks M.S., Chern S. Ketorolac versus prednisolone versus combination therapy in the treatment of acute pseudophakic cystoid macular edema. *Ophthalmology*. 2000;107:2034–2038.

Singal N., Hopkins J. Pseudophakic cystoid macular edema: Ketorolac alone vs. ketorolac plus prednisolone. *Can. J. Ophthalmol*.

SYSTEMIC CARBONIC ANHYDRASE INHIBITORS

- ADDITIONAL EFFECT OF 250–500 MG OF ORAL ACETAZOLAMIDE COMPARED TO THAT FROM TOPICAL NSAIDS OR CORTICOSTEROIDS ALONE. BETTER FUNCTIONAL AND MORPHOLOGICAL RESULTS OF NSAID WITH OR WITHOUT TOPICAL STEROIDS IF COMBINED WITH CAI.

Curković T., Vukojević N., Bućan K. Treatment of pseudophakic cystoid macular oedema. *Coll. Antropol.* 2005;103–105.

Catier A., Tadayoni R., Massin P., Gaudric A. Intérêt de l'acétazolamide associé aux anti-inflammatoires dans le traitement de l'œdème maculaire postopératoire (Advantages of acetazolamide associated with anti-inflammatory medications in postoperative treatment of macular edema) *J. Fr. Ophthalmol.* 2005;28:1027–1031. doi: 10.1016/S0181-5512(05)81134-9.

PERIOCCULAR CORTICOSTEROIDS

- PERIOCCULAR 40MG TA SHOWED SIGNIFICANT IMPROVEMENT OF MEAN BCVA AND SIGNIFICANT REDUCTION OF CMT AT 1,3,AND 6 MONTHS OF FOLLOW UP.
- COMPARING IV TA 2 MG TO PERIOCCULAR 40MG TA SHOWED SIGNIFICANT BETTER RESULTS FOR IV TA GROUP AT 1 MONTH. HOWEVER NO SIGNIFICANT DIFFERENCE BETWEEN 2 GROUPS AT 3 AND 6 MONTHS.

Erden B., Çakır A., Aslan A.C., Bülükbaşı S., Elçioğlu M.N. The efficacy of posterior subtenon triamcinolone acetonide injection in treatment of Irvine-gass syndrome. *Ocul. Immunol. Inflamm.* 2019;27:1235–1241.

Tsai M.-J., Yang C.-M., Hsieh Y.-T. Posterior subtenon injection of triamcinolone acetonide for pseudophakic cystoid macular oedema. *Acta Ophthalmol.* 2016;96:e891–e893.

Kuley B., Storey P.P., Wibbelsman T.D., Pancholy M., Zhang Q., Sharpe J., Bello N., Obeid A., Regillo C., Kaiser R.S., et al. Resolution of pseudophakic cystoid macular edema: 2 mg intravitreal triamcinolone acetonide versus 40 mg posterior sub-tenon triamcinolone acetonide. *Curr. Eye Res.* 2021:1–7.

INTRAVITREAL DEXAMETHASONE IMPLANT

- SIGNIFICANT IMPROVEMENT OF MEAN BCVA AND SIGNIFICANT REDUCTION OF MEAN CMT EVEN IN CASES RESISTANT TO TOPICAL STEROIDS, NSAIDS TREATMENT.

Altintas A.G.K., Ilhan C. Intravitreal dexamethasone implantation in intravitreal bevacizumab treatment-resistant pseudophakic cystoid macular edema. *Korean J. Ophthalmol.* 2019;33:259–266.

Belloq D., Pierre-Kahn V., Matonti F., Burillon C., Voirin N., Dot C., Akesbi J., Milazzo S., Baillif S., Soler V., et al. Effectiveness and safety of dexamethasone implants for postsurgical macular oedema including Irvine–Gass syndrome: The EPISODIC-2 study. *Br. J. Ophthalmol.* 2016;101:333–341.

INTRAVITREAL ANTIVEGF

- ALL THE THREE ANTIVEGF SHOWED SIGNIFICANT FUNCTIONAL AND ANATOMICAL IMPROVEMENT IN CASES OF IGS.

Akay F., Isik M.U., Akmaz B. Comparison of intravitreal anti-vascular endothelial growth factor agents and treatment results in Irvine-Gass syndrome. *Int. J. Ophthalmol.* 2020;13:1586–1591.

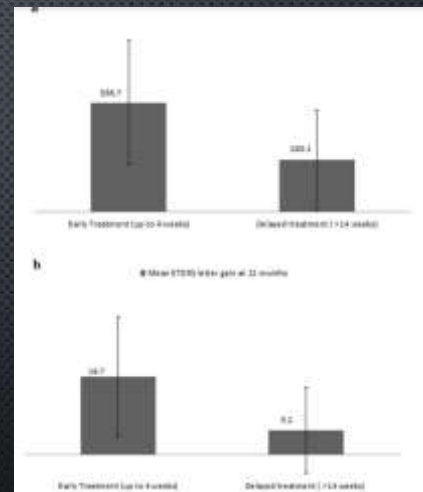
SUBTHRESHOLD MICROPULSE LASER

- SINGLE SMALL NUMBER STUDY IN 2020 SHOWED THE BENEFICIAL EFFECT OF SML IN CASES OF IGS (FULL SCATTER MACULAR PAINTING 5% DUTY CYCLE)

Verdina T., D'Aloisio R., Lazzarini A., Ferrari C., Valerio E., Mastropasqua R., Cavallini G.M. The role of subthreshold micropulse yellow laser as an alternative option for the treatment of refractory postoperative cystoid macular edema. *J. Clin. Med.* 2020;9:1066.

TIMING

- EYES THAT WERE TREATED EARLY (UP TO 4 WEEKS) HAD A SIGNIFICANT ($P = 0.0054$) REDUCTION IN THE MACULAR THICKNESS COMPARED TO THE EYES WHICH WERE TREATED LATE (14 WEEKS).
- ON THE SAME LINE, LETTER GAIN WAS SIGNIFICANTLY MORE ($P = 0.0047$) IN THE EYES TREATED EARLY COMPARED TO THE EYES TREATED LATE.



Sharma A., Bandello F., Loewenstein A., Kuppermann B.D., Lanzetta P., Zur D., Hilely A., Iglicki M., Veritti D., Wang A., et al. Current role of intravitreal injections in Irvine Gass syndrome-CRIIG study. *Int. Ophthalmol.* 2020;40:3067–3075.

• THANK U