LE GLAUCOME: TECHNIQUES CHIRURGICALES ET DISPOSITIFS MEDICAUX

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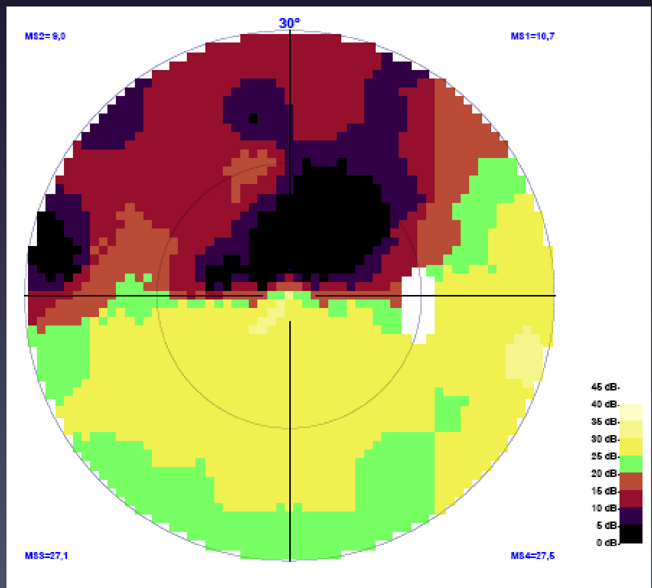
CONFLITS D'INTERETS

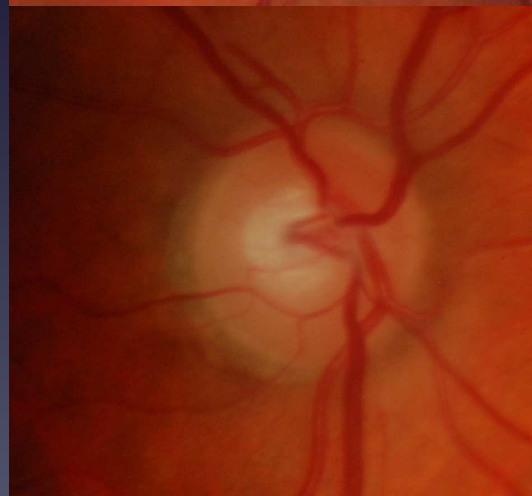
Consultant Alcon, Allergan

DEFINITION

NEUROPATHIE OPTIQUE DEGENERATIVE PROGRESSIVE:

- ALTERATION PROGRESSIVE DU CHAMP VISUEL
- UNE EXCAVATION PAPILLAIRE DU NERF OPTIQUE.
- PRINCIPAL FACTEUR DE RISQUE: PIO





INTRODUCTION

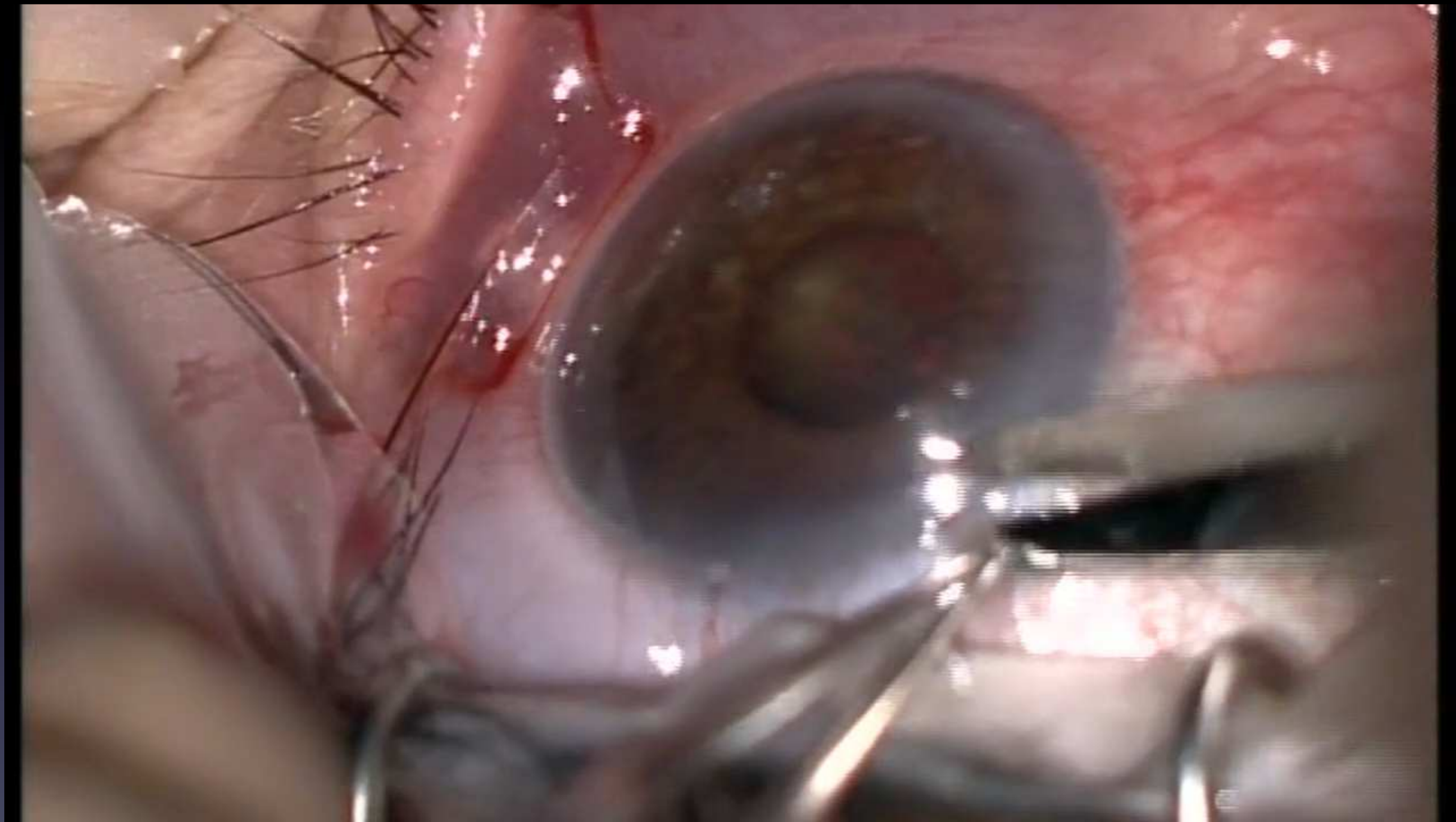
- Maitrise de la Pression intraoculaire restera le standard de prise en charge/ seul facteur modifiable
- Traitement chirurgical: traitement 2e intention après collyres hypotonisants

INTRODUCTION

- 3 approches:
  - Aides succès Chirurgie filtrante conventionnelle
  - Chirurgies mini-invasives du glaucome
  - Affaiblissements du corps ciliaire

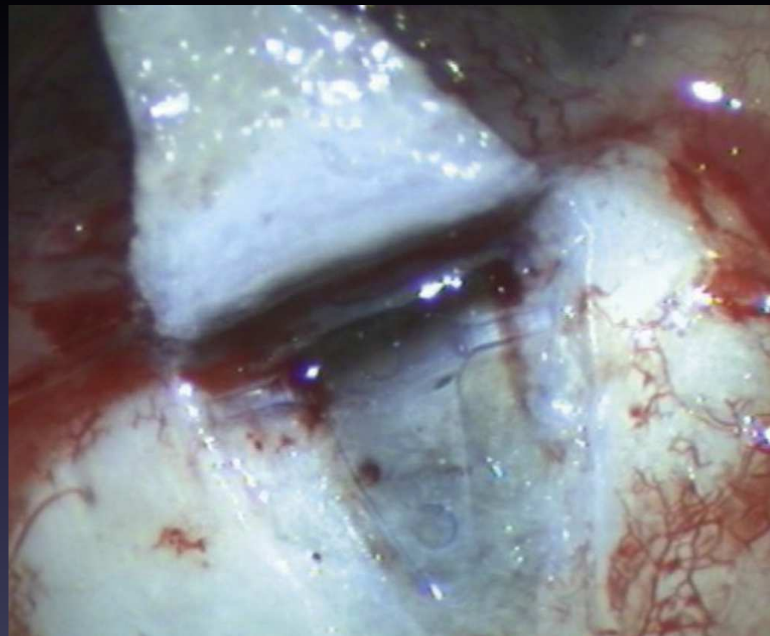
AIDES AU SUCCES
DE
LA CHIRURGIE FILTRANTE

CHIRURGIE FILTRANTE GLAUCOME

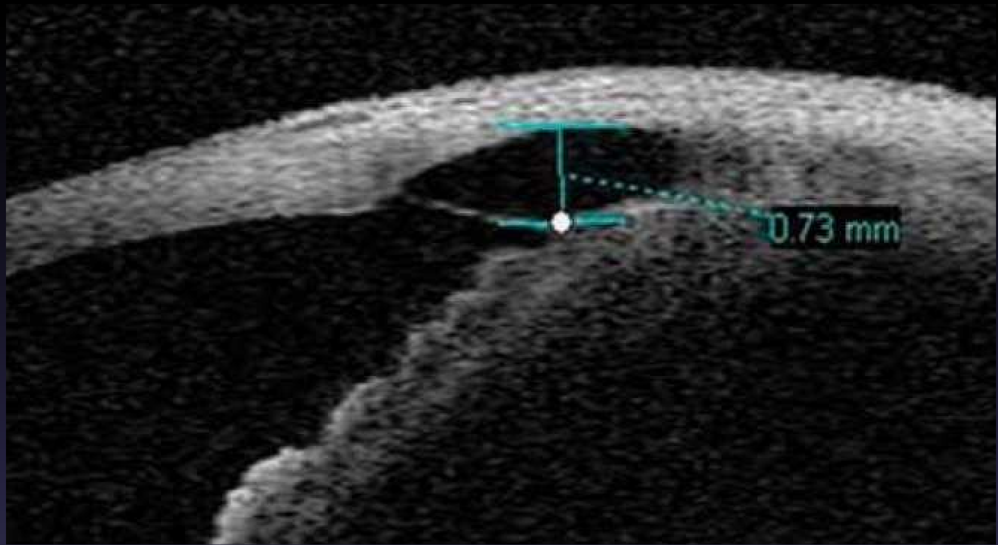


IMPLANTS DE DRAINAGE VOLET SCLERAL

- Drainage actif de l'humeur aqueuse après sclérectomie
- Divers implants:
  - Matrices collagène
  - Matrices glycosaminoglycanes
- Augmentation théorique débit de filtration



IMPLANTS DE DRAINAGE VOLET SCLERAL



A comparison of intrascleral bleb height by anterior segment OCT using three different implants in deep sclerectomy

Fernandez-Buenaga et al. Eye 2012

Comparaison de 3 implants de drainage
Hauteur de la bulle sclérale non significativement différente
Corrélation hauteur de la bulle et diminution PIO
Limite: pas de groupe témoin

IMPLANTS DE DRAINAGE TRABECULAIRE

- Facilitent drainage humeur aqueuse

- Limitent les fluctuations pressionnelles per et post-opératoires

Ahmed et al.

IMPLANTS DE DRAINAGE TRABECULAIRE

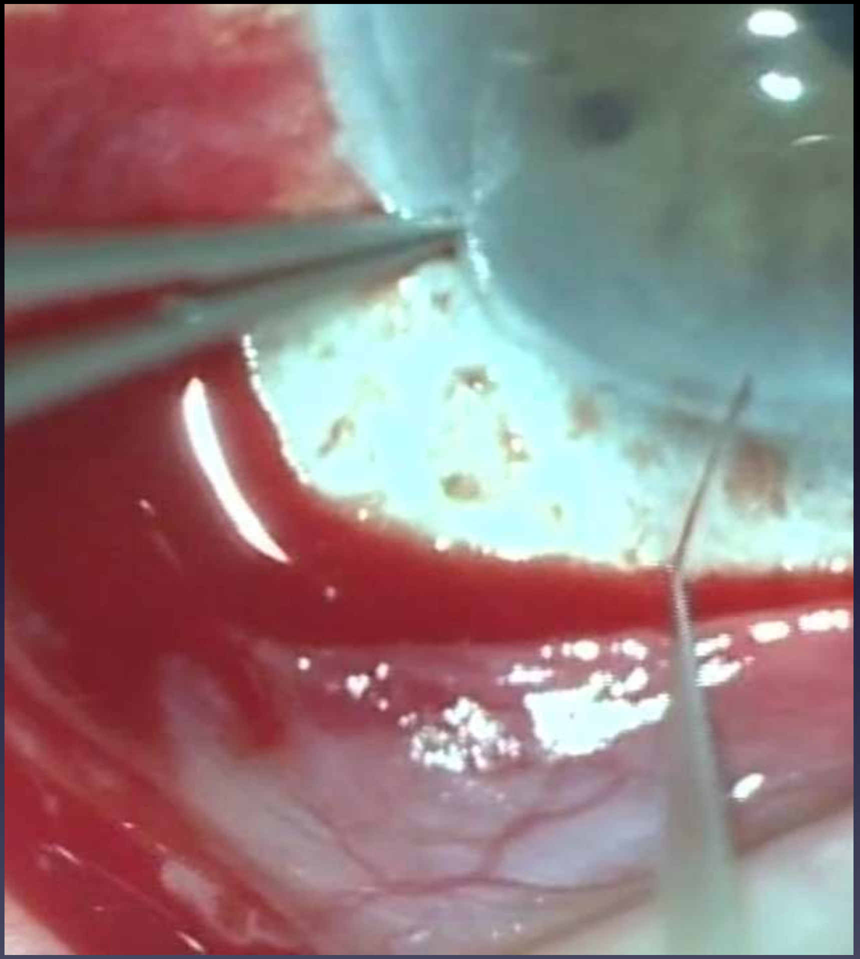
Author, year of publication (Year)	Study Design	No. of Eyes (E/T) [ExPRESS model]	No. Combined with Cataract Surgery (E/T)	F/U	Definition of Success	Success Rate(%)		p
						ExPRESS	Trabulectomy	
Maris et al (2007)[14]	Retrospective	50/50 [R-50]	15/15	mean, 11 mos	5–21 mm Hg ± meds	90	92	>0.999
Good et al (2011)[9]	Retrospective	35/35 [P-50]	0/0	mean, 28 mos	5–18 mm Hg no meds	77.1	74.3	1.0
					with meds	82.9	82.9	0.99
Sugiyama et al (2011)[20]	Retrospective	10/11 [P-50]	3/3	1 yr	5–21 mm Hg ± meds	100	81.8	0.167
Seider et al (2011)[18]	Retrospective	36/57 [R-50 or X-50]	12/18	1 yr	6–21 mm Hg no meds	48	45	NS
					with meds	91	85	NS
de Jong et al (2011)[7]	Prospective	39/39 [R-50]	0/0	5 yrs	≤18 mm Hg no meds	59.0	46.2	0.25
					with meds	97.4	100	0.49
					≤15 mm Hg no meds	59.0	46.2	0.26
					with meds	92.1	94.9	0.32

ETUDES COMPARATIVES TRABECULECTOMIE vs DRAIN EXPRESS (Alcon)
PAS DE DIFFERENCE TAUX DE SUCCES (SUIVI DE 1 à 5 ANS)
EXPRESS: MOINS DE COMPLICATIONS HYPOTONIE (32% vs 4%) OU DECOLLEMENT CHOROIDIENS (38% VS 8%)

Maris et al. J. Glaucoma 2007
Buys et al. Surv. Ophthalmol. 2012

SCLERECTOMIE ASSISTEE AU LASER

- Laser CO_2 (IOPTima):
  - Effet photo-ablatif & coagulation
  - Réalisation chambre évacuation sous volet scléral
  - Ouverture du canal de Schlemm
- Intérêt:
  - Chirurgie mini-invasive
  - Courbe apprentissage
  - Reproductibilité
  - Coagulation



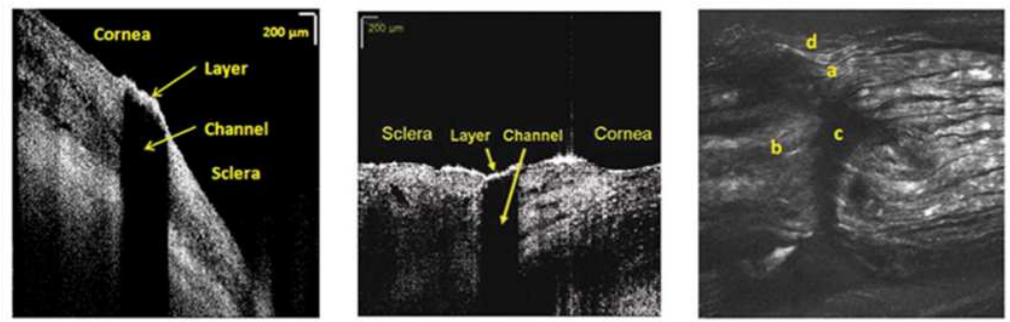
SCLERECTOMIE ASSISTEE AU LASER FEMTOSECONDE

IN VIVO FEMTOSECOND LASER SUBSURFACE SCLERAL TREATMENT IN RABBIT EYES

Dongyul Chai, PhD[1], **Gautam Chaudhary, PhD**[1,3], **Eric Mikula, MS**[2], **Hui Sun, PhD**[1], **Ron Kurtz, MD**[1], and **Tibor Juhasz, PhD**[1,2]

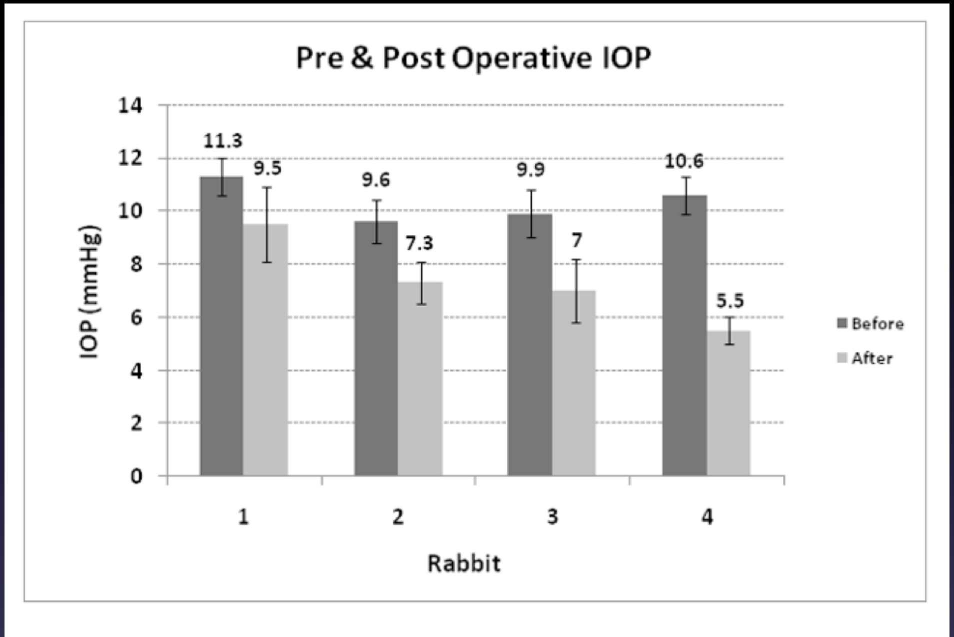
Lasers surg med. 2010

1. Aide à la création volet scléral
2. Création de canaux collecteurs intra scléraux+++



(A) (B) (C)

SCLERECTOMIE ASSISTEE AU LASER FEMTOSECONDE



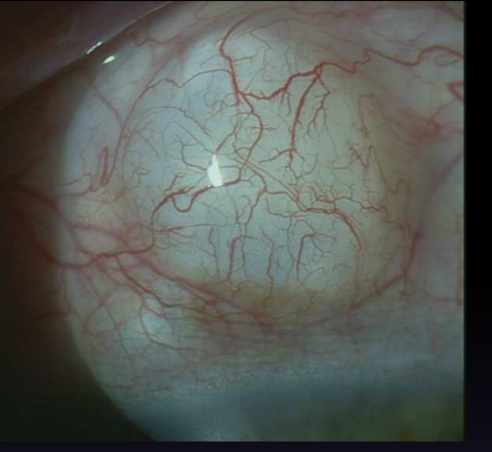
Baisse PIO 3 à 5 mmHg

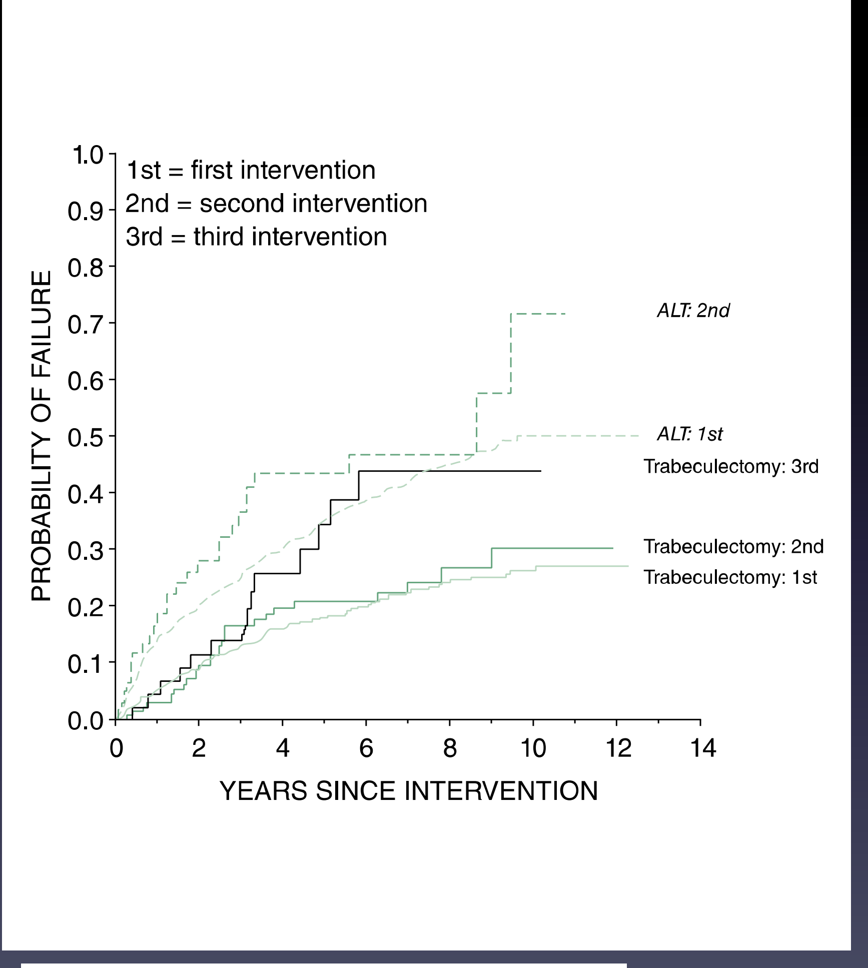
Limites actuelles:

- Nécessité système imagerie associé
- Passage au travers tissu scléral (longueur onde): faible pénétrance

CHIRURGIES MINI-INVASIVES DU GLAUCOME?

TRABECULECTOMIE/ SCLERECTOMIE



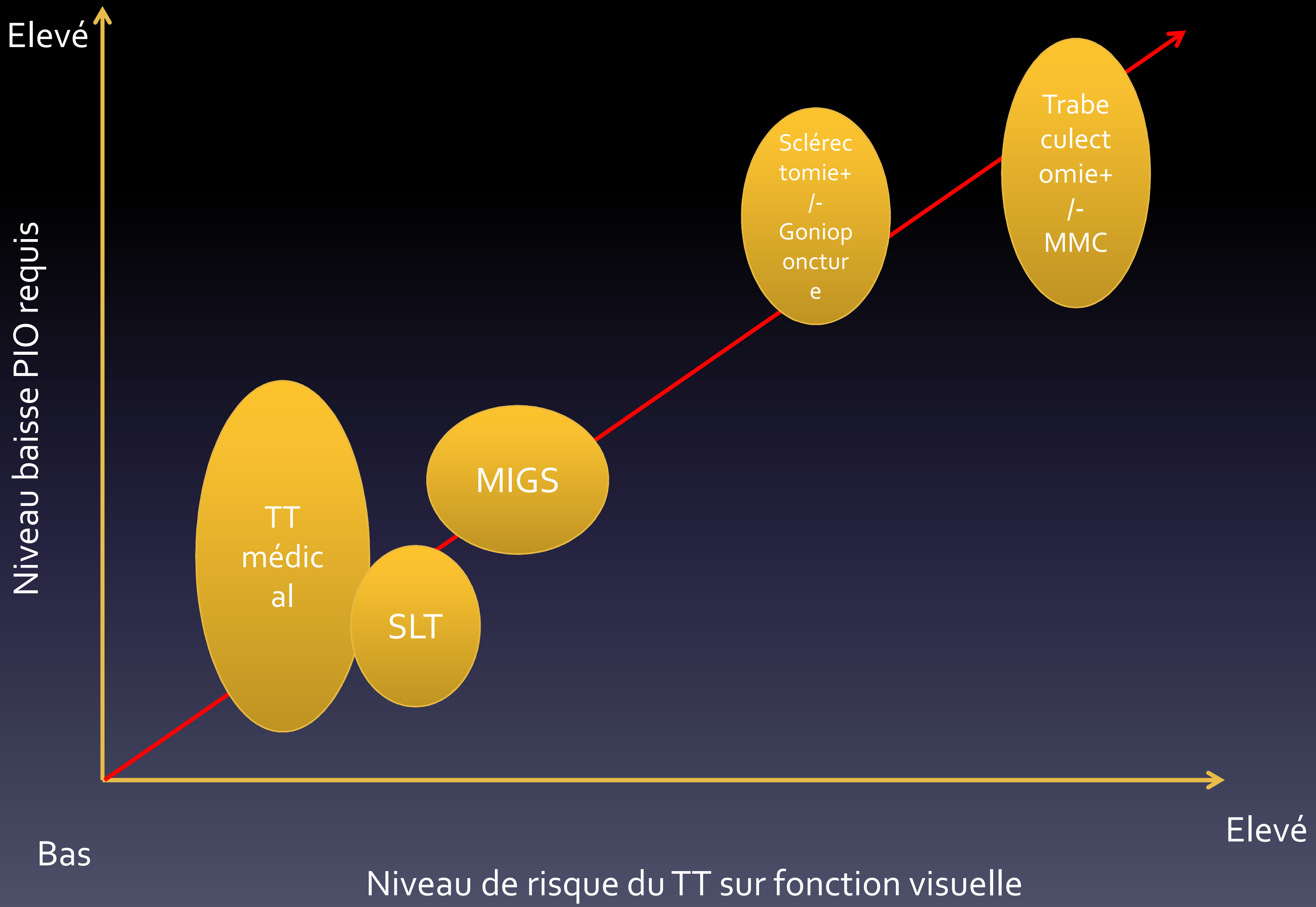


The AGIS Investigators. The Advanced Glaucoma Intervention Study (AGIS): 11. Risk factors for failure of trabeculectomy and argon laser trabeculoplasty. *Am J Ophthalmol* 2002; **134**: 481–98.

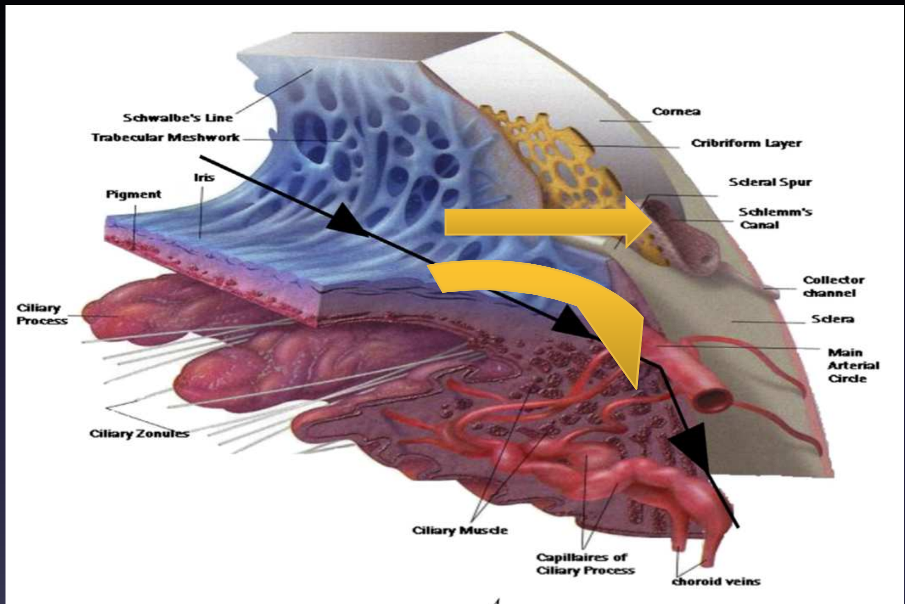
- Taux échec variable en fonction nombre intervention réalisé
- Baisse PIO: 48%

IMPORTANCE EPARGNE CONJONCTIVALE
&
CONSIDERER PRISE EN CHARGE PATIENT SUR LONG TERME

STRATEGIE THERAPEUTIQUE



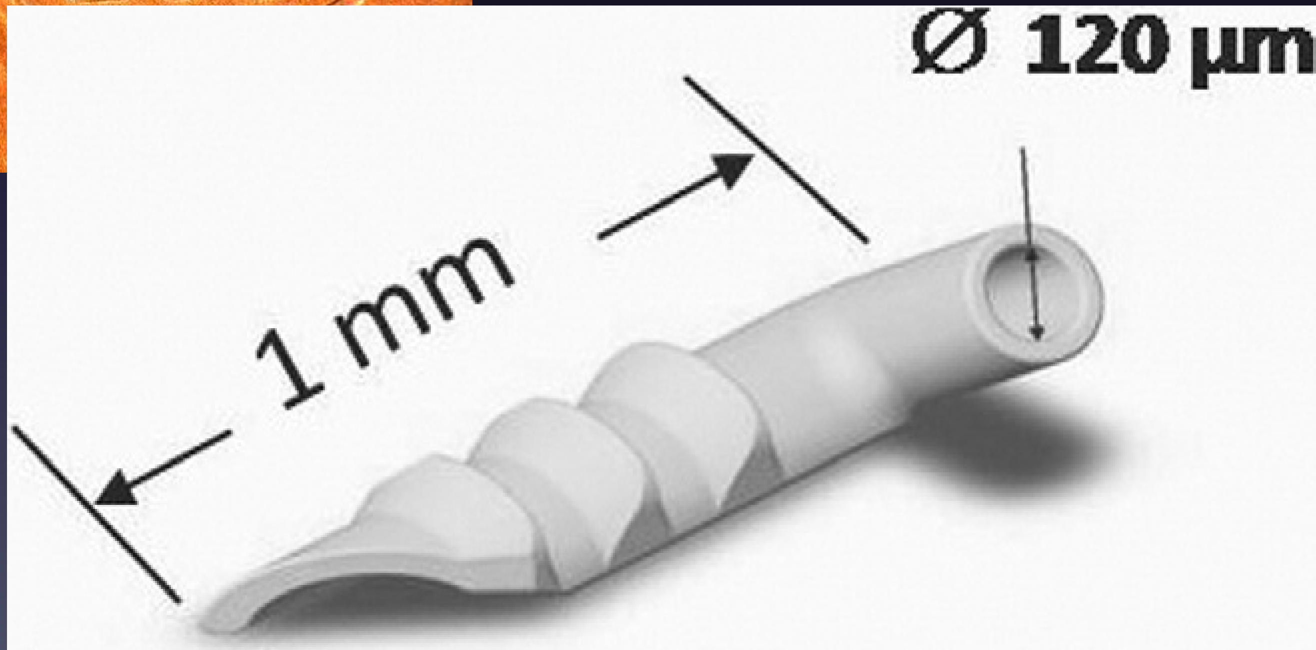
RATIONNEL
CHIRURGIES MINI-INVASIVES



- Améliorer filtration + épargne conjonctivale
  - Voie Trabéculaire « ab-interno »
    - Lève résistance écoulement HA (trabeculum juxta canaliculaire)
    - Amélioration évacuation par vaisseaux collecteurs
  - Voie supra choroïdienne (ab-interno/ ab-externo)
    - Rendre fonctionnelle voie accessoire (efficacité démontrée par PG)
    - Effet PIO potentiellement Important= Gradient pression négatif+ voie transclérale+ capacité résorption Vx choroïdiens

STENTS TRABECULAIRES AB-INTERNO

I-STENTS (Glaukos)



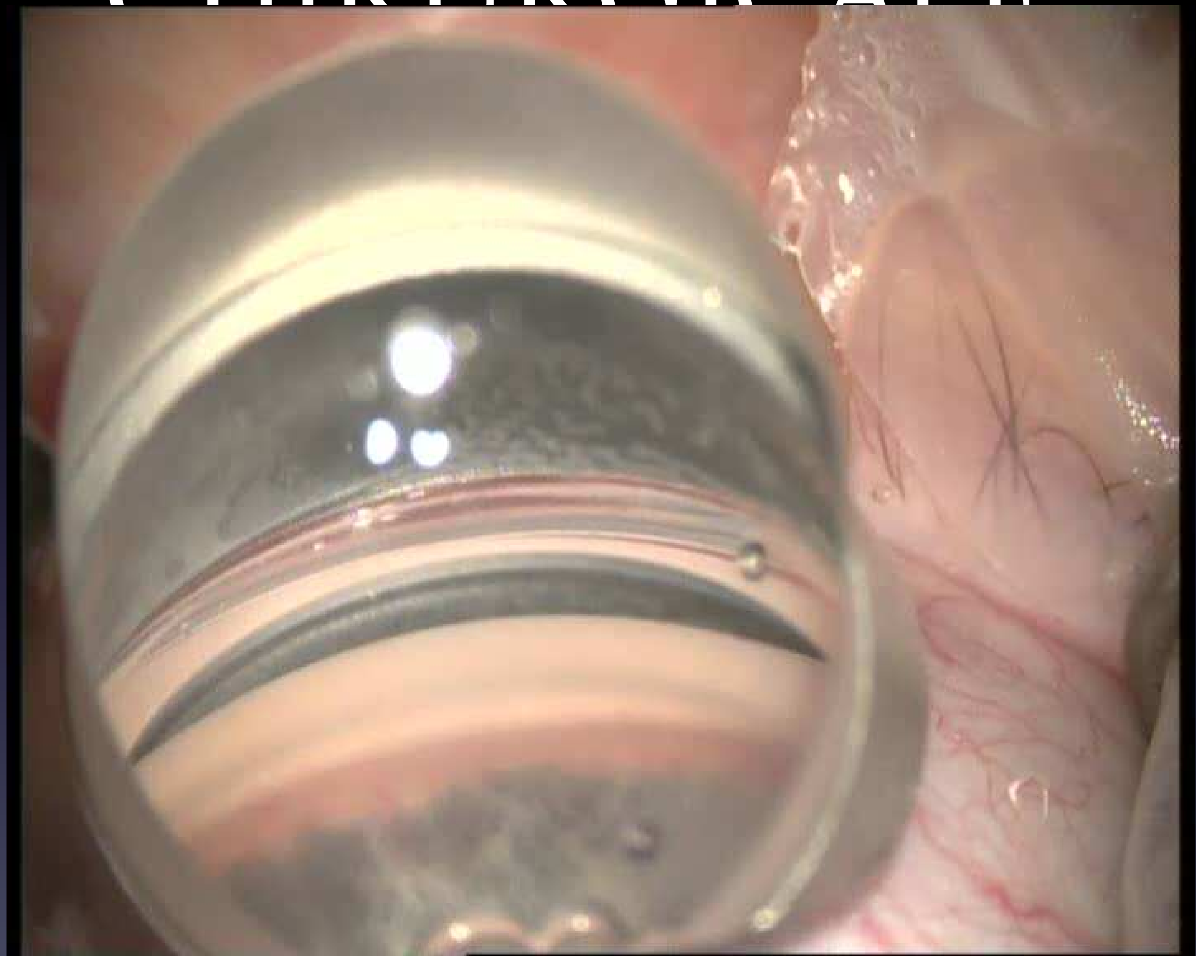
Titane non-ferromagnétique

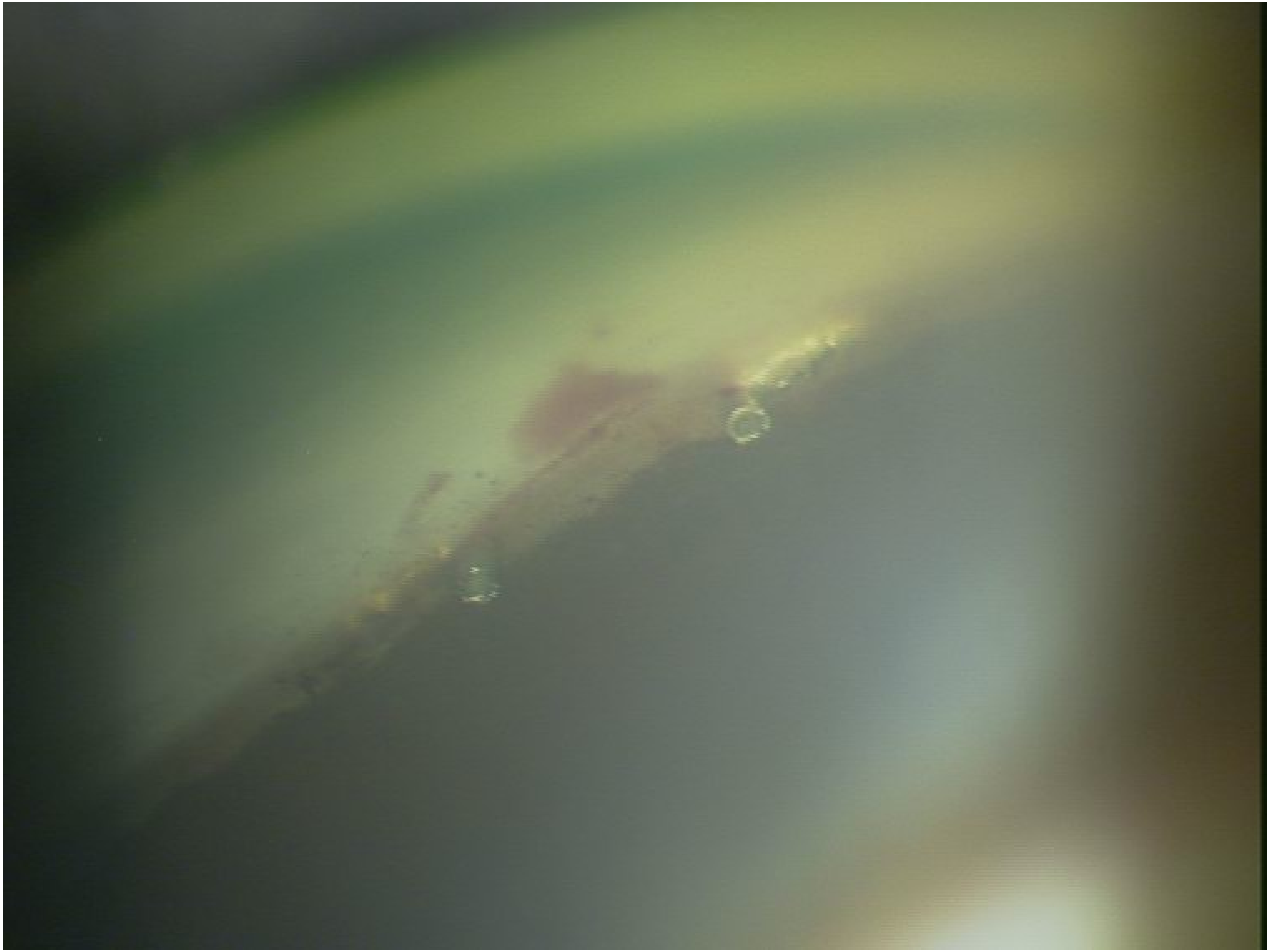
I-STENTS 2^{e} GENERATION

Radcliff et al. JCRS 2014

TECHNIQUE

TECHNIQUE CHIRURGICALE





RESULTATS

Randomized Evaluation of the Trabecular Micro-Bypass Stent with Phacoemulsification in Patients with Glaucoma and Cataract

*Thomas W. Samuelson, MD,[1] L. Jay Katz, MD,[2] Jeffrey M. Wells, PharmD,[3] Yi-Jing Duh, PhD,[4] Jane Ellen Giamporcaro, BS,[3] for the US iStent Study Group**

ETUDE FDA PROSPECTIVE RANDOMISEE
PKE VS PKE+I-STENT
240 yeux
Suivi 24 mois

RESULTATS

- 1 AN:
  - Baisse PIO 4-6 mmHg
  - % patients sans traitement à 1 an: 72% vs 50% (p<0.001)
  - Baisse PIO>20% à 1 an: 66% vs 48% (p<0.001)
  - Nombre de traitement à 1 an: 1.4 vs 1.0 (p>0.05)
- 2 ans:
  - Maintien effet

Effectiveness	Cataract Surgery with iStent® n/N (%) (95% CI)	Cataract Surgery Only n/N (%) (95% CI)	*P* Value*
	Difference (95% CI)		
IOP ≤ 21 mm Hg without anti-glaucoma medications at 24 months	97/162 (60%)	57/123 (46%)	
	(52%, 67%)	(38%, 55%)	
	14% (2%, 25%)		.023
IOP reduction ≥ 20% without anti-glaucoma medications at 24 months	86/162 (53%)	49/123 (40%)	
	(45%, 61%)	(31%, 48%)	
	13% (2%, 25%)		.027

*Two-sided Z-test.

SECURITE?

Table 3. Frequently Reported Postoperative Ocular Complications (≥2%) through Month 12

Complication	iStent with Cataract Surgery N = 111	Cataract Surgery Only N = 122
Anticipated early postoperative event	14 (13%)	15 (12%)
Stent obstruction by iris, vitreous, fibrous overgrowth, fibrin, blood, and so forth	4 (4%)	0 (0%)
Posterior capsular opacification	3 (3%)	8 (7%)
Stent malposition	3 (3%)	0 (0%)
Subconjunctival hemorrhage	2 (2%)	2 (2%)
Elevated IOP, other	2 (2%)	1 (1%)
Epiretinal membrane	2 (2%)	1 (1%)
Iris atrophy	2 (2%)	0 (0%)
Blurry vision or visual disturbance	1 (1%)	6 (5%)
Iritis	1 (1%)	6 (5%)
Dry eye	1 (1%)	2 (2%)
Elevated IOP requiring treatment with oral or intravenous medications or with surgical intervention	1 (1%)	2 (2%)
Macular edema	1 (1%)	2 (2%)
Foreign body sensation	0 (0%)	3 (2%)
Allergic conjunctivitis	0 (0%)	2 (2%)
Mild pain	0 (0%)	2 (2%)
Rebound inflammation from tapering steroids	0 (0%)	2 (2%)

IOP = intraocular pressure.
"Anticipated, early postoperative events" included transient events such as corneal edema, trace folds, trace striae, transient hypotony at 5–7 hrs, inflammation, epithelial defect, and discomfort as expected after cataract surgery.

Table 4. Secondary Surgical Interventions (n and %) through Month 12

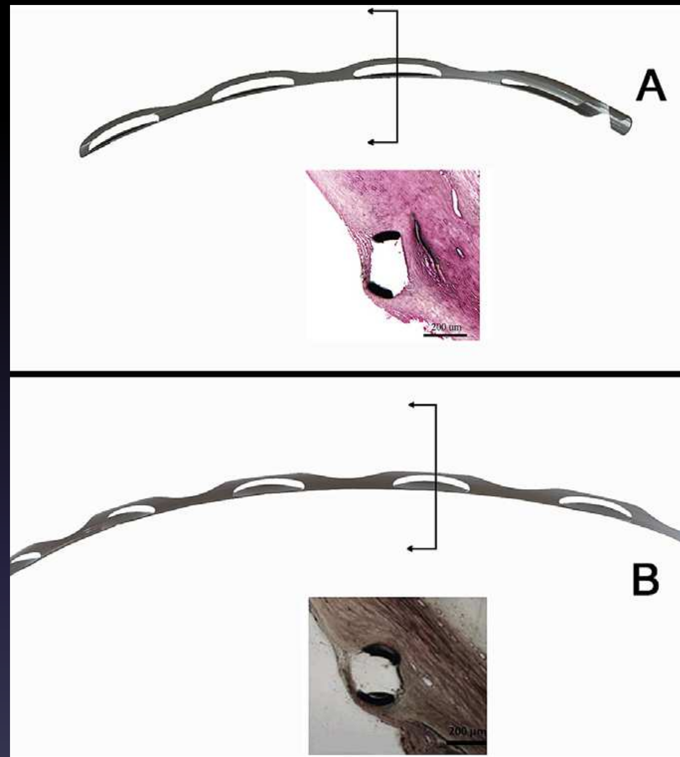
Secondary Surgical Intervention	iStent with Cataract Surgery N = 111	Cataract Surgery Only N = 122
Paracentesis	31 (28%)	33 (27%)
Nd:YAG laser capsulotomy	4 (4%)	7 (6%)
Stent repositioning	3 (3%)	0 (0%)
Punctal cautery/punctual plugs	1 (1%)	2 (2%)
Focal argon laser photocoagulation	1 (1%)	0 (0%)
Nd:YAG laser for stent obstruction	1 (1%)	0 (0%)
Stent removal and replacement	1 (1%)	0 (0%)
Trabeculoplasty	0 (0%)	2 (2%)
Deep sclerectomy/sclerostomy	0 (0%)	1 (1%)
IOL removal and replacement	0 (0%)	1 (1%)
LASIK	0 (0%)	1 (1%)
Pupilloplasty	0 (0%)	1 (1%)
Vitrectomy	0 (0%)	1 (1%)
Wound resuture due to wound leak	0 (0%)	1 (1%)

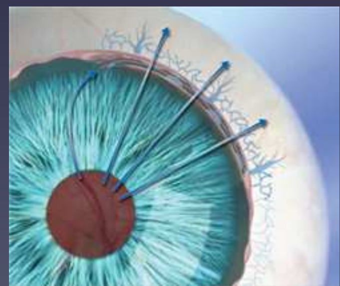
IOL = intraocular lens; LASIK = laser-assisted in situ keratomileusis; Nd:YAG = neodymium-doped yttrium aluminum garnet.

4% obstruction
3 repositionnements
1 ablation
1 iridoplastie

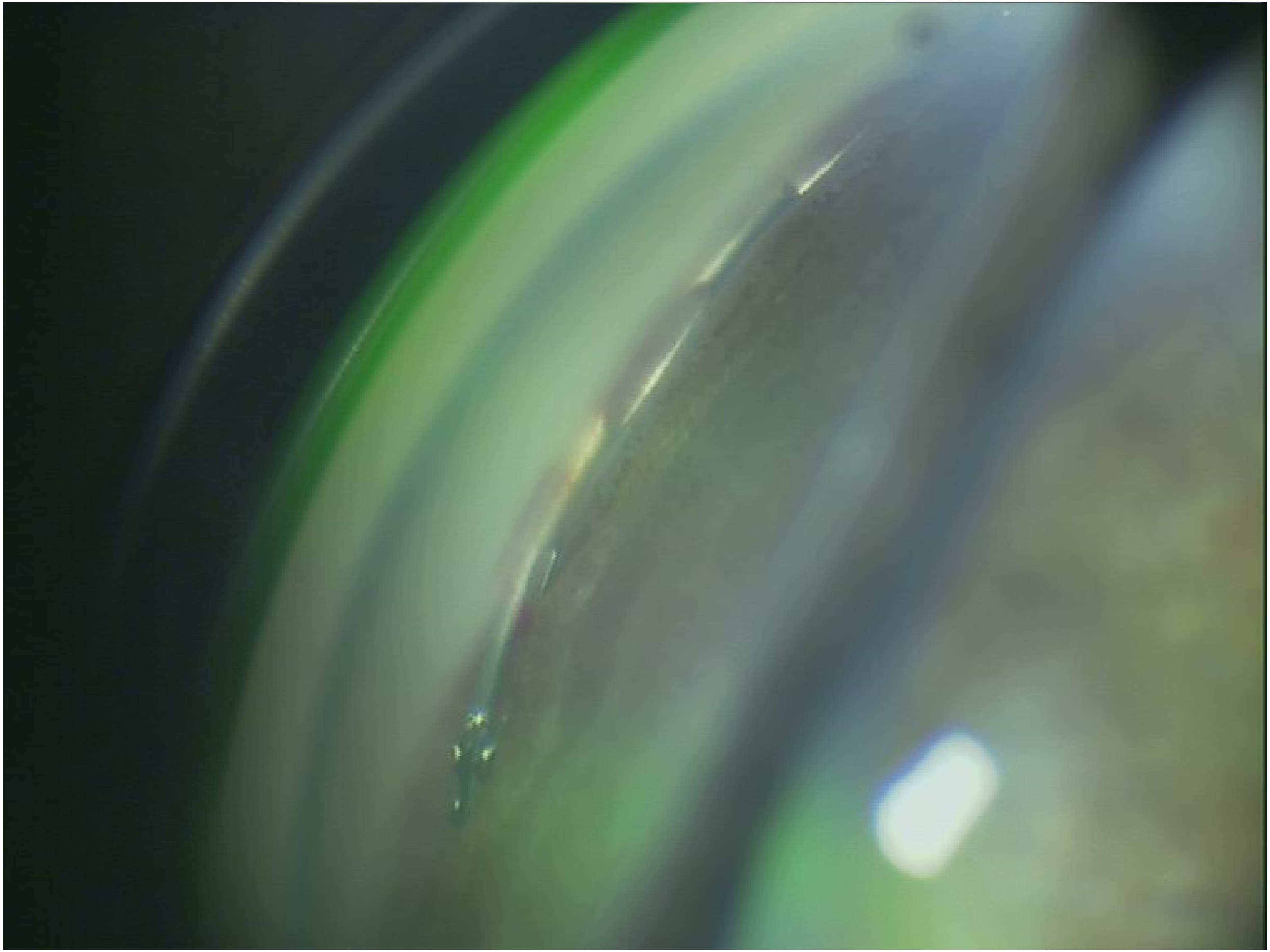
HYDRUS (Ivantis)

- Nickel et titane (souple, biocompatible)
- Ab interno
- Élargit Canal Schlemm, 3 orifices internes, 1 externe au canal
- Etudes en cours





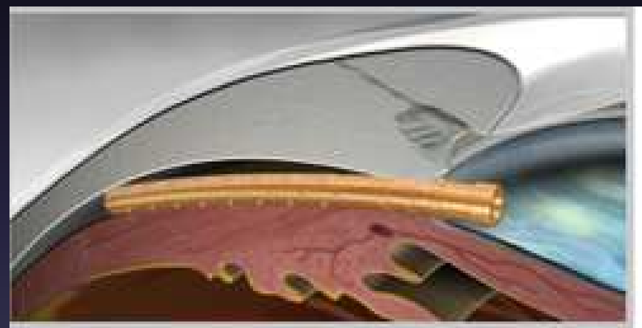
Johnstone et al. Exp eye res. 2013



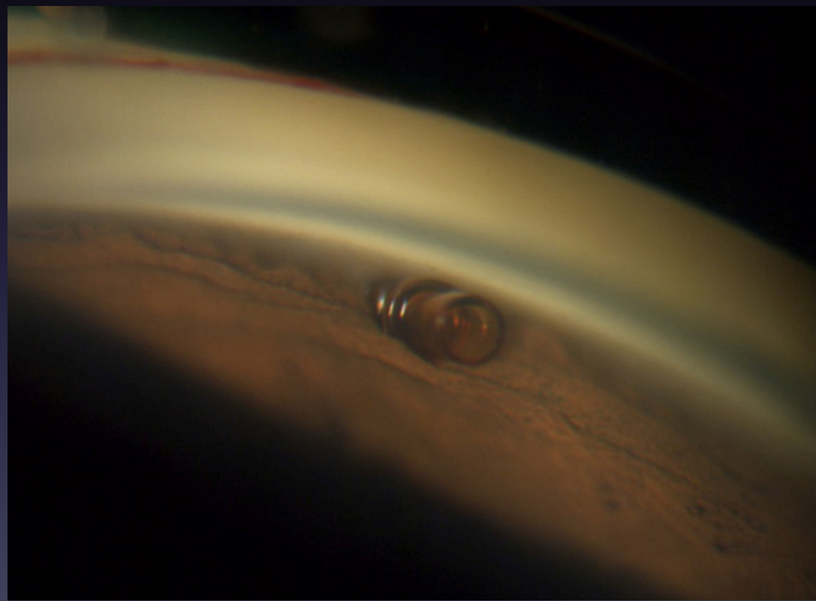
STENTS SUPRACHOROIDIENS

CYPASS® (transcend medical, USA)

- Matériau Polyamide
- 6.35mmX 540µm
- Espace supra choroïdien



Saheb et al. BJO 2014



Hoeh. Et al. JCRS 2013:

6MOIS:
- Baisse PIO 37%
- Diminution TT médical 50%

Complications:
- 13.8% hypotonie transitoire
- 4.4% inflammation
- 10.5% HTO transitoire
- 1 repositionnement

Suivi long terme?: persistance effet PIO, comportement cornée

AUTRES CHIRURGIES MINI-INVASIVES

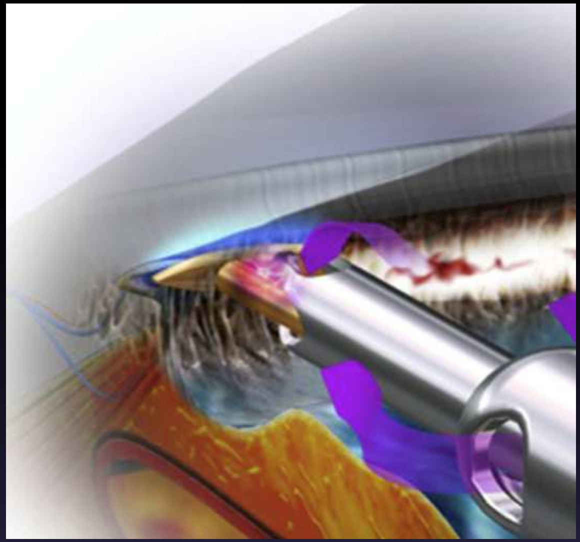
AQUESYS® (Aquesys, USA)

- Collagène
- Diamètre interne 0.65 mm
- Insertion ab-interno jusqu'à espace sous-conjonctival
- Baisse PIO: 22.4 à 15.4/ TT: 2.5 à 0.9 (1 an suivi)

Sheybani et al. JCRS 2015

TRABECTOME (Neomedix USA)

- Ablation paroi interne trabeculum/ 90°
- Mosaed et al. (clin surg oph. 2010):
  - Baisse PIO 31% (combiné trabectome-PKE) vs 18% (pke seule)
- Complications:
  - Francis et al. (JCRS 2010): 79% reflux sg et hyphéma transitoire



Bailey et al. JCRS 2014

TECHNIQUES CYCLOAFFAIBLISSEMENT

CYCLOAFFAIBLISSEMENT AUX ULTRASONS DE HAUTE FREQUENCE

- Affaiblissement sécrétion par US haute fréquence/ 6 transducteurs (HIFU, eyetechcare)
- Taille sonde déterminée par Echographie UBM
- Anneau de succion (b) / Sonde de traitement (a)

CYCLOAFFAIBLISSEMENT AUX ULTRASONS DE HAUTE FREQUENCE

Clinical Trials

Cyclocoagulation of the Ciliary Bodies by High-Intensity Focused Ultrasound: A 12-Month Multicenter Study

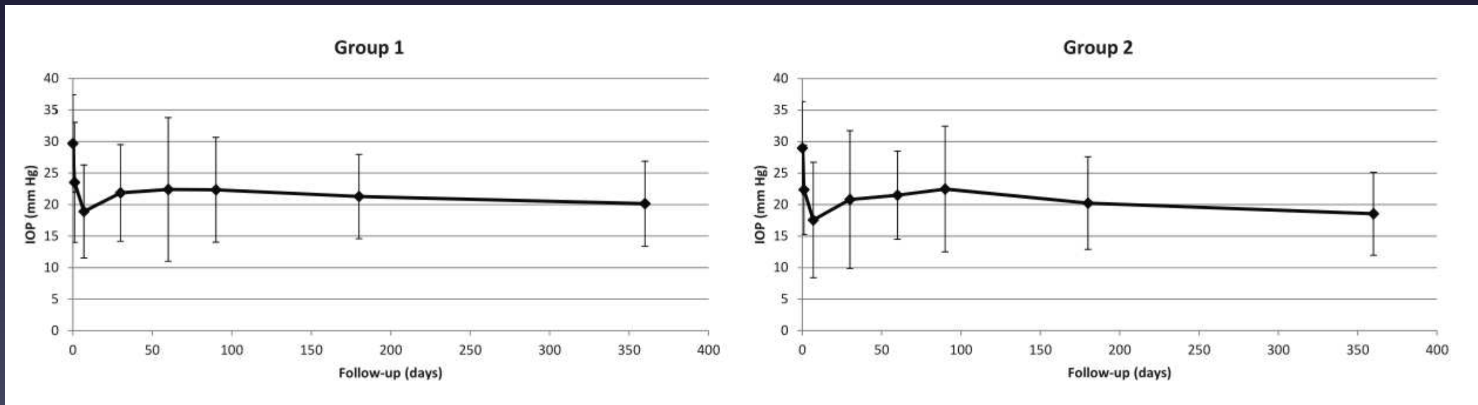
Philippe Denis,[1] Florent Aptel,[2] Jean-François Rouland,[3] Jean-Philippe Nordmann,[4] Yves Lachkar,[5] Jean-Paul Renard,[6] Eric Sellem,[7] Christophe Baudouin,[8] and Alain Bron[9]

Denis et al. IOVS 2015

Etude Prospective multicentrique
52 yeux de 52 patients
Glaucome réfractaire (1 à 3 chirurgies)
Comparaison de 2 durée de traitement US
Suivi à un an

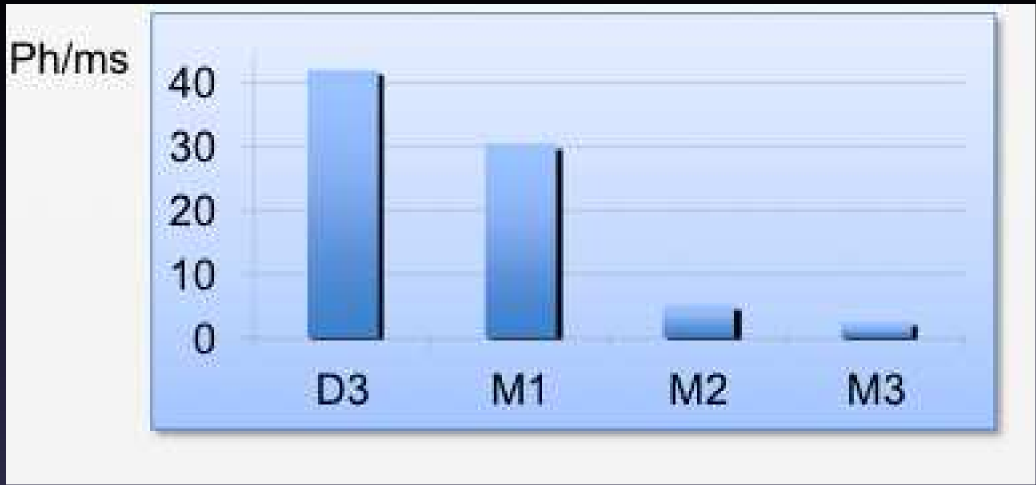
CYCLOAFFAIBLISSEMENT AUX ULTRASONS DE HAUTE FREQUENCE

	Group 1, *n* = 24				Group 2, *n* = 28				
	Mean IOP (No. of Patients)* [Mean No. of Glaucoma Medications]	Relative IOP Reduction, %	Patients Re-Treated, *n*†	Success Rate, %	Mean IOP (No. Of Patients)‡ [Mean No. of Glaucoma Medications]	Relative IOP Reduction, %	Patients Re-Treated, *n*†	Success Rate, %	*P* Value§
Baseline	29.7 ± 7.7 (24) [3.5]	-	-	-	29.0 ± 7.4 (28) [3.3]	-	-	-	0.73
D 1	23.5 ± 9.5 (24) [3.4]	20.7	-	54.2	22.4 ± 7.1 (28) [3.4]	22.8	-	64.3	0.62
D 7	18.9 ± 7.4 (24) [3.4]	36.3	-	70.8	17.6 ± 9.2 (28) [3.4]	39.4	-	85.7	0.56
Mo 1	21.8 ± 7.7 (24) [3.4]	26.4	-	66.7	20.8 ± 10.9 (27) [3.4]	28.2	-	66.7	0.69
Mo 2	22.4 ± 11.4 (21) [3.5]	24.5	-	66.7	21.5 ± 7.0 (25) [3.4]	25.8	1	61.5	0.75
Mo 3	22.4 ± 8.3 (21) [3.5]	24.7	1	54.5	22.5 ± 10.0 (24) [3.5]	22.4	-	68.0	0.96
Mo 6	21.3 ± 6.7 (19) [3.5]	28.3	2	61.9	20.2 ± 7.4 (22) [3.4]	30.2	2	65.4	0.64
Mo 12	20.1 ± 6.7 (17) [3.2]	32.2	5	57.1	18.5 ± 6.6 (17) [3.5]	36.0	3	48.0	0.49



Abaissement PIO 26.4-28.2 (M1) et 32.2-36.6 (M12)

CYCLOAFFAIBLISSEMENT AUX ULTRASONS DE HAUTE FREQUENCE

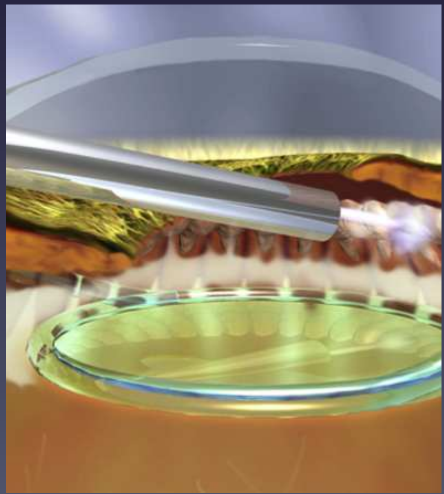


Peu inflammation postopératoire de chambre antérieure

Schweitzer et al.

PHOTOCOAGULATION CORPS CILIAIRE VOIE ENDOSCOPIQUE

- Laser diode (Endoptics)
- Voie endoscopique (Pars plana ou antérieure)
- yeux aphaque ou pseudophaque/ combinés PKE-Endophotocoagulation



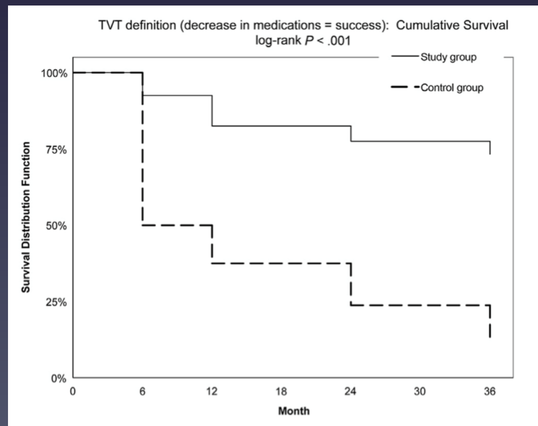
PHOTOCOAGULATION CORPS CILIAIRE VOIE ENDOSCOPIQUE

Postop decrease (%)			
6 mo			
Mean ± SD	12.4 ± 16.7	0.7 ± 13.1	<.001
P value (from baseline)*	<.001	NS	
12 mo			
Mean ± SD	10.2 ± 17.1	2.7 ± 16.2	.005
P value (from baseline)*	<.001	NS	
24 mo			
Mean ± SD	10.1 ± 18.7	0.8 ± 12	.02
P value (from baseline)*	<.001	NS	
36 mo			
Mean ± SD	13.6 ± 15.1	5.1 ± 10.4	.003
P value (from baseline)*	<.001	.01	

Postop			
6 mo			
Mean ± SD	0.3 ± 0.7	1.5 ± 1.2	<.001
Median	0	1	
12 mo			
Mean ± SD	0.4 ± 0.7	1.8 ± 1.2	<.001
Median	0	2	
24 mo			
Mean ± SD	0.4 ± 0.7	2.0 ± 1.0	
Median	0	2	<.001
36 mo			
Mean ± SD	0.4 ± 0.7	2.3 ± 1.0	<.001
Median	0	2	

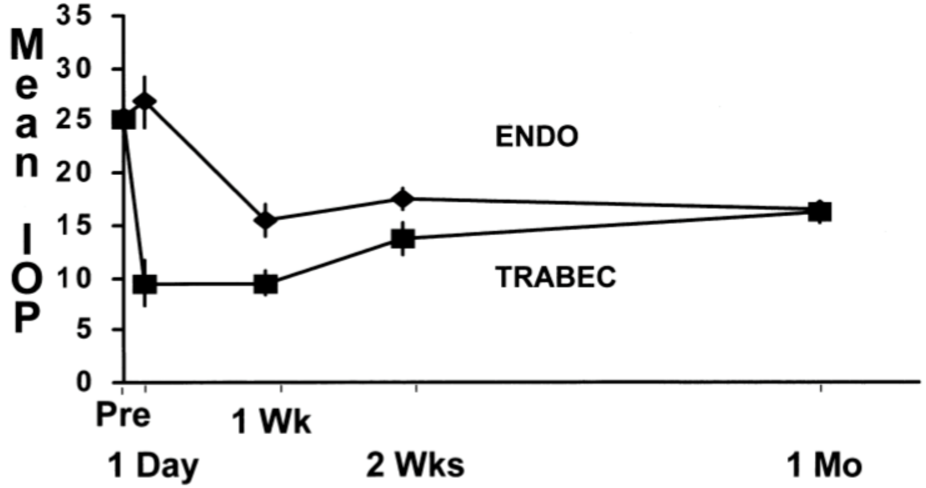
PKE vs PKE+ endophotocoagulation
80yx ds chaque groupe

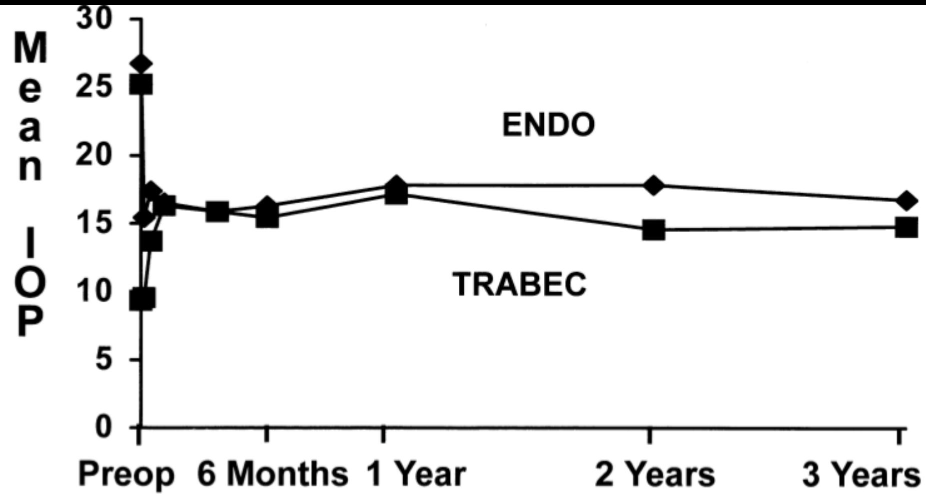
Baisse PIO 13.6 vs 5.1% (36 mois)
Nombre TT: 0.4 vs 2.3 (36 mois)
Taux succès: 73.3 vs 11.9% (36 mois)



Francis et al.

PHOTOCOAGULATION CORPS CILIAIRE VOIE ENDOSCOPIQUE





Gaynor et al. JCRS 1999

Etude prospective randomisée 58 yx de 58 patients
PKE-endophotocoagulation vs PKE-trabeculectomie
Suivi à 3 ans

Abaissement PIO: 28.8% vs 31.9%
Traitement postop: 40% vs 30%

CONCLUSION

- Chirurgie filtrante reste référence
- Innovations++ chirurgie glaucome
- Elargissement de l'arsenal thérapeutique pour améliorer problèmes observance ou pour mieux atteindre PIO cible
- Place reste à définir par les sociétés savantes:
  - nécessité études randomisées
  - suivi prolongé pour maladie évoluant toute la vie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