WGC-SUB 1312

Ultrasound Cyclo Plasty in surgery naïve Open Angle Glaucoma patients. Interim month-18 results of a prospective Multicenter Clinical Trial.

Luís Abegão Pinto[1], Shlomo Melamed[2], Marco Nardi[3], Ingeborg Stalmans[4]

1 – Santa Maria Hospital, Ophthalmology Department, Lisboa, Portugal
2 – Tel-Aviv University Medical School, The Sam Rothberg Glaucoma Center, Tel-Hashomer, Israel
3 – University of Pisa, Department of Surgical, Medical, Molecular Pathology and Critical Area, Pisa, Italy
4 – University Hospitals of UZ Leuven, Ophthalmology Department, Belgium

PURPOSE

Studies of Ultrasound Cyclo Plasty (UCP) procedure using High Intensity Focused Ultrasound (HIFU) have been performed in patients with glaucoma refractory to filtering surgery [1-5]. The aim of this study is to evaluate the efficacy and safety of the UCP procedure in patients with open angle glaucoma naïve of previous filtering surgery (trabeculectomy or deep-sclerectomy).

METHODS

Ultrasound Cyclo Plasty, utilizing EyeOP1 device (EYE TECH CARE – France) and its novel ring-shaped miniature probe with 6 piezoceramic transducers emitting ultrasound energy focused in the ciliary body and processes.

The device is described in Figure 1.

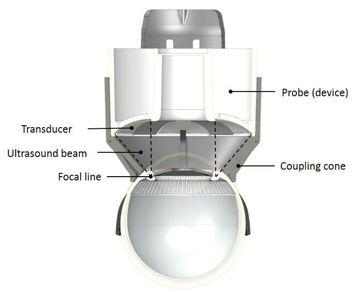


Figure 1: HIFU Device is composed on 2 parts (Probe + Coupling Cone): the ultrasound beam focuses on the ciliary body (dotted lines).

The six transducers were placed at regular intervals on the circumference of the ring and oriented in order to create a focal zone consisting of 6 elliptic cylinders regularly disposed in a 11, 12 and 13 mm diameter circle superimposed on the ciliary body.

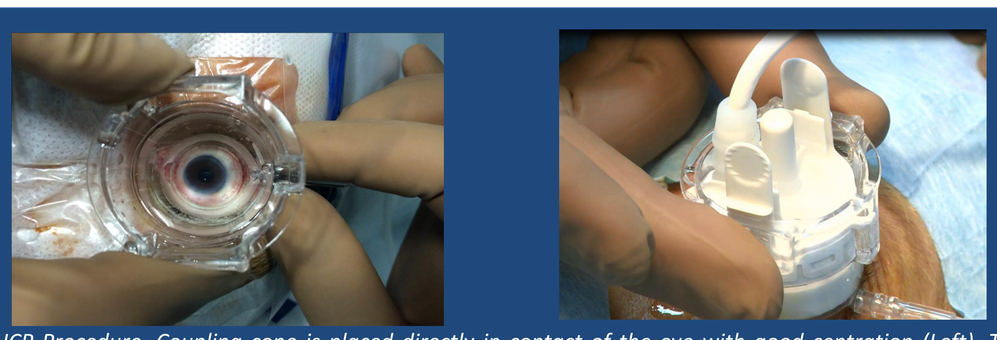


Figure 2: UCP Procedure. Coupling cone is placed directly in contact of the eye with good centration (Left). The ring shaped is inserted into the coupling cone and the cavity is filled with saline solution before starting the treatment (Right). The 6 transducers are activated with 8-seconds exposure time for each shot.

- Prospective, multicenter, open-label clinical study ongoing in 4 University Hospitals of 4 countries (ClinicalTrials.gov: NCT027893) in moderate Open-Angle Glaucoma (OAG) patients.
- Sixty-six eyes of 59 patients were treated between April 2016 and October 2017 with a 8 seconds exposure time per transducer.
- Ultrasound Biomicroscopy (UBM) and/or Anterior Segment Optical Coherence Tomography (OCT) exams were performed on all patients before the procedure to determine the size of the probe to be used (3 sizes available: 11, 12 and 13 mm).

Table 1: Keys inclusion & exclusion criteria

Inclusion criteria	Exclusion criteria
Open-Angle Glaucoma including Primary Open-Angle (POAG), Pigmentary (PG) and Exfoliative (PXF) Glaucoma.	Angle closure glaucoma or normal tension glaucoma
No previous glaucoma filtering surgery	Ocular or retrobulbar tumor
IOP > 21 mmHg and not adequately controlled with glaucoma medication	Ocular infection within 14 days prior to UCP procedure
Age > 18 years	Clinically significant macular edema, choroidal detachment, proliferative diabetic retinopathy

- The main assessment criteria were efficacy and safety, measured by intraocular pressure (IOP) reduction and incidence of complications. Ophthalmic examination were performed before treatment, and during follow-up visits at D1, M1, M3, M6, M12, M18, M24.
- Primary Success (responder patient) was defined as IOP reduction from baseline ≥ 20% and IOP > 5 mmHg without hypotensive medication adjunction.

POPULATION

Table 2: Demographic characteristics

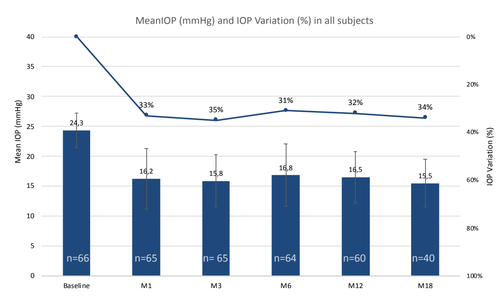
Characteristics	Total (n=66)
Mean Age (years): mean (SD) [range]	70.4 (11.4) [42-90]
Gender (male/female) (%)	32 / 34 (48.5/51.5)
Previous Laser trabeculoplasty (n=)	10
Mean preoperative IOP (mmHg) [range]	24.3 ±2.9 [21- 30]
Mean number of preoperative hypotensive medications (SD) [range]	2.3 (1.1) [0-5]
Preoperative hypotensive medications by systemic carbonic anhydrase inhibitors (n)	8

EFFICACY

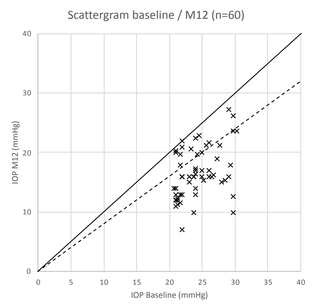
Table 3: Intraocular pressure & glaucoma medication

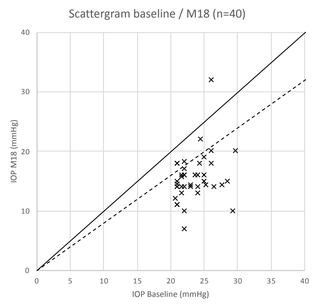
	All population				Responder patients			
	Mean IOP (mmHg)	No. of eyes	Relative IOP reduction	Mean number of Glaucoma medications	Mean IOP (mmHg)	No. of eyes	Relative IOP reduction	Mean number of Glaucoma medications
Baseline	24.3 ± 2.9	66	-	2.3	24.3 ± 2.9	66	-	2.3
Day 1	13.6 ± 4.9	65 [1]	44%	2.3	12.9 ± 4.0	61	47%	2.3
Month-1	16.2 ± 5.1	65 [1]	33%	2.2	14.3 ± 3.4	50	41%	2.4
Month-3	15.8 ± 4.4	65 [1]	35%	2.3	14.5 ± 3.2	53	40%	2.3
Month-6	16.8 ± 5.2	64 [2]	31%	2.2	14.9 ± 3.4	47	38%	2.2
Month-12	16.5 ± 4.3	60 [3]	32%	2.2	15.0 ± 3.4	45	38%	2.3
Month-18	15.5 ± 4.0	40 [4]	34%	2.2	14.5 ± 2.9	32	39%	2.4

[1] 1 patient visit not done
[2] 2 patients exit of study (considered as failure - filtering surgery done)
[3] 4 patients exit of the study and 2 patients with M12 visit not done.
[4] 5 patients exit of the study, 1 death, and 20 patients with M18 visit not done yet



M1 /M3 -> 1 visit not done
M6 -> 2 patients exit of study (considered as failure - filtering surgery done)
M12 -> 4 patients exit of the study and 2 patients with M12 visit not done.
M18 -> 5 patients exit of the study, 1 death, and 20 patients with visit not done yet





- IOP was significantly reduced after one UCP procedure ($p<0.05$), from a mean preoperative value of 24.3 ± 2.9 mmHg to a mean value of 15.5 ± 4.0 mmHg at month-18 corresponding of mean IOP reduction of 8.8 mmHg (34% IOP reduction).
- Success rate (as defined by IOP decrease > 20%) was achieved in 70% (32/46 patients) of eyes at month-18, with a mean IOP decrease of 39% and no increase of medication.

Table 4: Surgical success without hypotensive medication adjunction

Post Operative IOP	Month-3	Month-6	Month-12	Month-18
IOP lowering > 20%	80%	71%	65%	70%
IOP < 21 mmHg	89%	80%	77%	70%
IOP < 18 mmHg	71%	72%	61%	59%

SAFETY

- Clinical examinations showed signs of ocular inflammation in the early post-operative period.
- Transient hypotony (IOP< 6 mmHg) was recorded in 3 patients between day-1 and month-1 and completely resolved at month-6 visit. There was no case of phthisis.
- Two macular edema were observed at month-1 and completely resolved at month-3.
- Visual acuity loss of more than two lines was observed in 3 patients, progressing of pre-existing cataract was noted in 1 of these 3 patients.
- Mean best corrected visual acuity remained statistically unchanged (LogMar BCVA = 0,220 in baseline and 0,301 at M12).

Table 5: Complications

Adverse events	n = 66
Anterior Chamber Inflammation (< 1 month)	52 (79%)
Conjunctival Hyperemia (<1 month)	25 (38%)
Transient Mild Mydriasis*	12 (18%)
Superficial Punctate Keratitis	9 (14%)
Transient Hypotony (IOP < 6 mmHg)	3 (5%)
Pupil Peak	3 (5%)
Ocular Pain (<24h)	3 (5%)
Conjunctival Hemorrhage	2 (3%)
Macular Edema	2 (3%)
Corneal edema	2 (3%)
Phthisis	-

[*] Including miosuria

CONCLUSION

- UCP procedure with 2nd generation probe is an effective and well-tolerated method to reduce intraocular pressure in open-angle glaucoma patients without previous filtering surgery.
- After one UCP procedure, a successful IOP lowering effect was obtained in 70% of patients at M18, with an average IOP reduction of 39% in the responder group, 34% in the total group.

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