

Introduction

- Elevated intraocular pressure (IOP) is a major risk factor for glaucoma progression.
- Cyclodestruction is generally considered a last-option intervention to lower IOP due to its unfavorable safety profile.
- High-intensity focused ultrasound (HIFU) cyclocoagulation is a new treatment modality aiming to provide an improved safety profile by selectively targeting the ciliary body (CB).¹

Purpose

To evaluate safety and efficacy of HIFU in reducing IOP in patients with advanced refractory glaucoma.

Methods

- Fifteen glaucoma patients underwent IOP-lowering treatment with HIFU EyeOP1 (EyeTechCare, Rillieux la-Pape, France) in a prospective manner. Anterior segment imaging using Visante OCT was performed on all patients before treatment to determine the size of the probe to be used (3 sizes were available: 11, 12, and 13mm).
- Patients were treated in an ambulatory procedure. All interventions were performed under general anesthesia.
- Success was defined as an IOP reduction of >20% from baseline.
- Efficacy of HIFU treatment was evaluated at 6 and 12 months. Complete success ("Responders") was defined as IOP reduction > 20%, without medications.

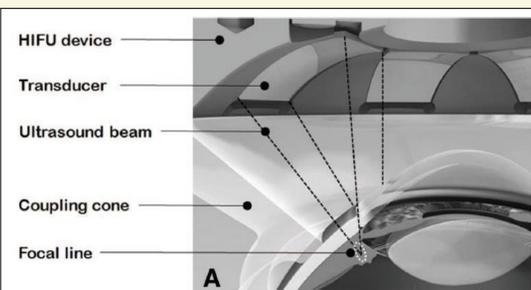


Figure 1. Schematic representation of HIFU device.

Results

- Mean age of study population was 42 ± 10.2 years (67% women).
- Main diagnosis was neovascular glaucoma (n=5), followed by primary open angle glaucoma (n=4) and different forms of secondary glaucoma (n=6).
- No serious adverse events were recorded. Two patients encountered an IOP spike in the postoperative period. Minor postoperative complications were hyperemia (n=3) and transitory pain (n=4).
- Baseline IOP was 31.6 ± 5.7 mmHg. After HIFU treatment, IOP was 25.2 ± 6.5 mmHg, 22.0 ± 9.4 mmHg, 20.9 ± 6.3 mmHg, 24.2 ± 11.5 mmHg and 23.3 ± 11.7 mmHg at day 1, week 1, month 1, month 6 and 1 year, respectively.
- The average IOP reduction from baseline was **-29%** (p=0.003).

	IOP Variation					
	D1	D7	M1	M3	M6	M12
Mean	-20%	-33%	-30%	-17%	-23%	-29%
SD	13%	23%	20%	25%	31%	30%
Min	-40%	-69%	-57%	-54%	-67%	-68%
Max	0%	0%	0%	32%	26%	14%

Figure 2. IOP change from baseline after HIFU treatment

- Data from 9 out of 15 patients were available at the 1-year follow-up visit. Among these, 5 (56%) were considered complete success.

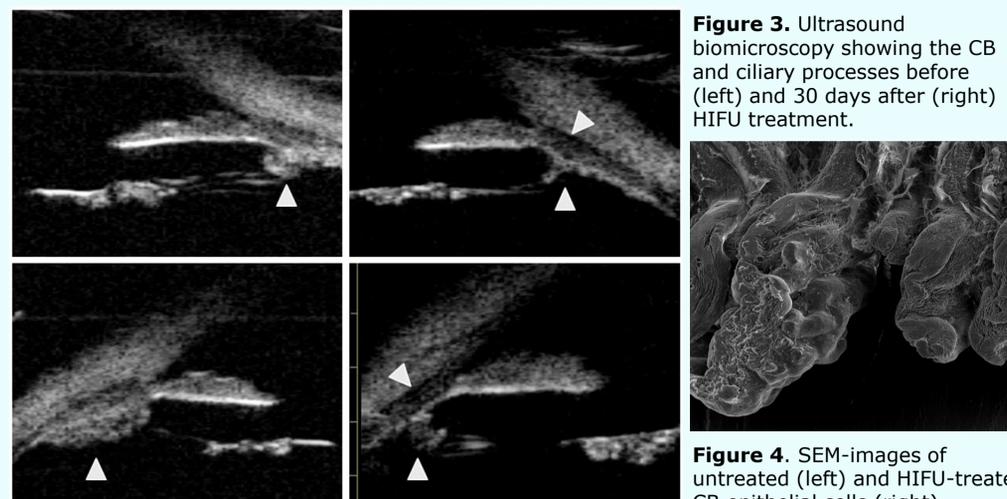


Figure 3. Ultrasound biomicroscopy showing the CB and ciliary processes before (left) and 30 days after (right) HIFU treatment.

Figure 4. SEM-images of untreated (left) and HIFU-treated CB epithelial cells (right)

Discussion

- Our results confirm recent studies of HIFU in refractory glaucoma.
- Previously, Aptel et al.² demonstrated a mean 26% IOP reduction in 28 patients with primary open-angle glaucoma who were refractory to filtering surgery but with preserved visual acuity and visual fields. They reported a qualified success of 68% with an average IOP reduction of 45% in successful eyes.
- Denis et al.³ treated 52 patients with refractory glaucoma in a multicenter study. They showed that HIFU reduced IOP from 37.9 ± 10.7 to 26.3 ± 5.1 mmHg at 6 months and 24.7 ± 8.5 mmHg at the last follow-up visit (33.9% IOP reduction).
- A limitation of our study is the small sample size and loss to follow-up, with data of 9 of the original 15 patients available at the 12-month visit.

Conclusions

- HIFU seems to be an efficient and safe treatment for eyes with refractory glaucoma.
- Currently, it is not well understood why some eyes do not seem to respond to the treatment. One hypothesis is due to deficiencies in calculation of CB dimensions and choice of HIFU probe size.
- Longer term follow-up is needed to evaluate the role of HIFU in the treatment armamentarium of glaucoma patients.

REFERENCES:

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