

# Contribution of Ultrabiomicroscopy in Phacomorphic Glaucoma: A Prospective Study of 25 Eyes

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## Abstract

Phacomorphic glaucoma is the term used for secondary angle-closure glaucoma due to lens intumescence, leading to pupillary block and closure of the irido corneal angle (ICA). This condition presents as an acute glaucoma crisis due to angle closure, which can lead to serious complications.

The aim of our study is to determine the usefulness of ultra biomicroscopic ultrasound (UBM) in the evaluation of the iridocorneal angle before and after cataract surgery in phacomorphic glaucoma. The prospective analytical study included 25 eyes diagnosed with phacomorphic glaucoma. The intraocular pressure, the visual acuity, the UBM parameters including; the Anterior Chamber Depth (ACD), the Trabecular-Iris Angle (AIT), the Angle Opening Distance (AOD500), were assessed preoperatively and postoperatively.

The mean age of our patients was 74.7 years, there was no significant gender preference.

The mean intraocular pressure (IOP) under maximal treatment was reduced from 45.36 5.4 to 25.8 mmHg in our study. With IOP at 17+/-2.5 to 15+/-1.3 after surgery within 1-3 days.

The gonioscopic results were in agreement with the UBM results, which provided more specific angle measurements; all angle parameters are improved after cataract surgery. All eyes had a mean angle of more than 20° in all four quadrants with a mean angle of (37.1+/-4.5), very similar to the angle status of the uninvolved eye.

In conclusion, after an acute attack of angle closure of phacomorphic origin, all parameters of the ICA measured by UBM increased significantly as well as normalization of IOP after cataract surgery.

**Keywords:** Hypertonia, Lens intumescence, Phacomorphic glaucoma, UBM

## Introduction

Phacomorphic glaucoma caused by lens intumescence leads to pupillary block and closure of the irido corneal angle (ICA) by pushing the iris forward. The clinical picture of intumescent cataract complicated by ocular hypertonia due to pupillary blockage is that of an acute crisis of glaucoma due to angle closure. The spontaneous evolution is towards corneal decompensation, irreducible ocular hypertonia and finally towards definitive functional loss due to optic atrophy. It is an emergency that requires preparation for surgery with hypotonisers and anti-inflammatories.

The prognosis of phacomorphic glaucoma has been improved by early surgery. However, there are no official recommendations

concerning the management of this pathology and there are great differences between the care teams [1]. In our study we sought to determine the usefulness of ultra biomicroscopic (UBM) ultrasound in assessing iridocorneal angle (ICA) before and after cataract surgery in phacomorphic glaucoma.

## Materials and Methods

The study we conducted is a prospective analytical study of 25 eyes of 25 patients with angle closure crisis secondary to lens intumescence in whom UBM was performed before and after cataract surgery, in the Ophthalmology Department B of the Hospital of Specialties in Rabat spanning from March 2021 to May 2022, with the aim of obtaining data over a period of 14 months.

We included in this study patients with phacomorphic glaucoma selected on the basis of anamnestic, clinical and ultrasound criteria and a minimum post-treatment follow-up of 6 months.

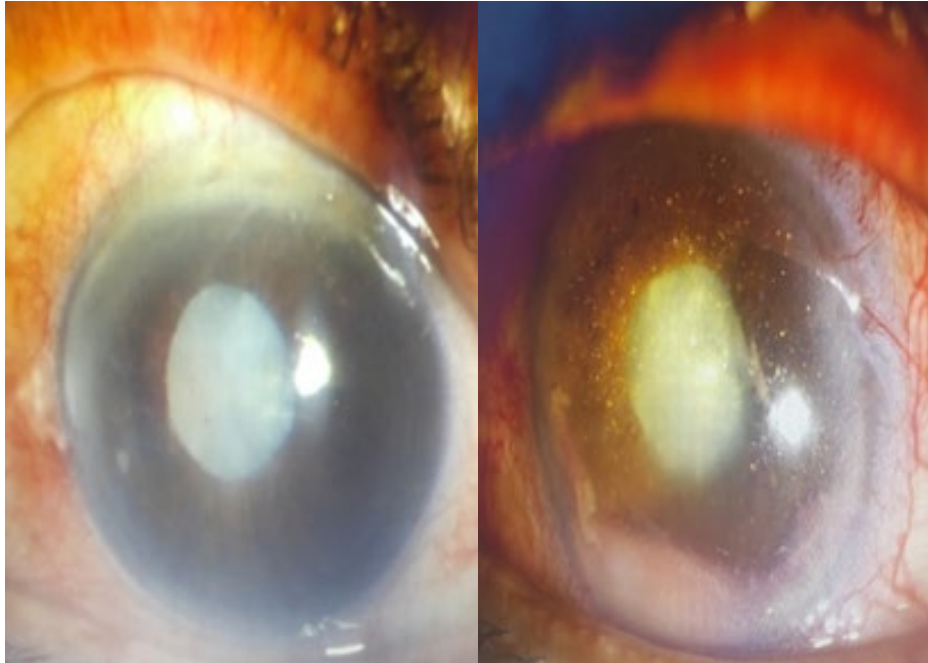
The exclusion criteria were: history of a previous episode of hypertension or inflammatory glaucoma, history of intraocular surgery, known glaucoma patient, patients on antiglaucoma eye drops, any acquired or congenital UBM abnormality, history of ocular trauma or retinal pathology, uncooperative patients, patients with surgical complications (expulsive hemorrhage), patients with a contraindi-

cation to cataract surgery; patients with preoperative hypertonia resistant to medical treatment.

### Results

Our study is based on a sample of 25 eyes of 25 patients who presented a crisis of angle closure following a lens intumescence, 3 patients were excluded from the study (lost of sight after the cataract surgery).

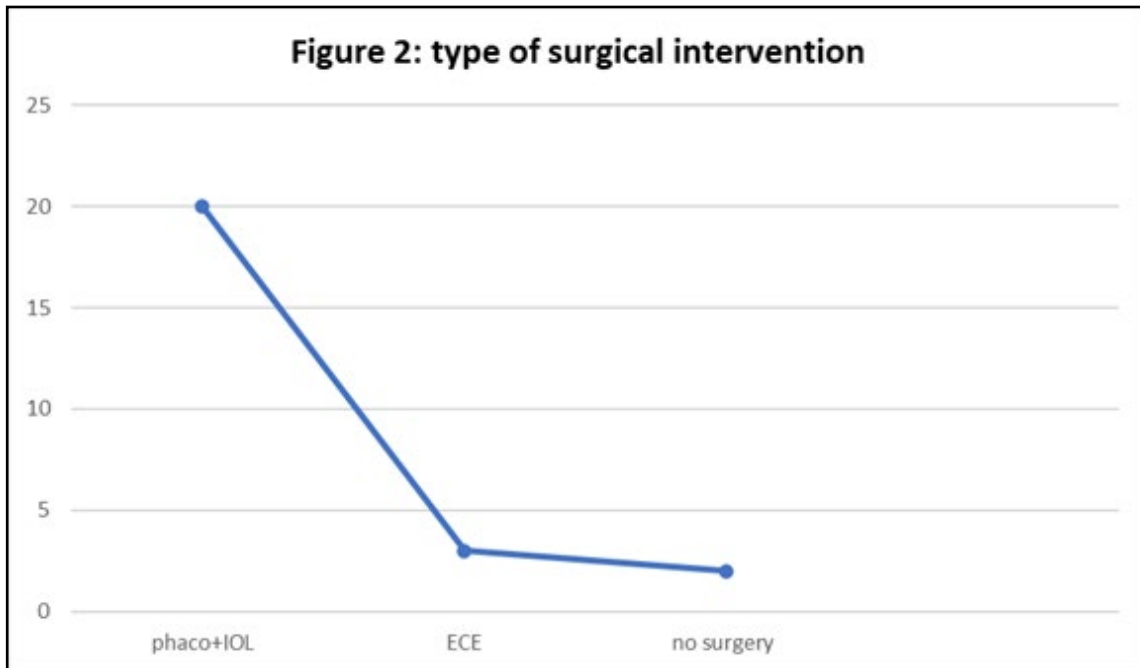
The average age of our patients was 75 years with extremes between 56 and 90 years, without gender predominance.



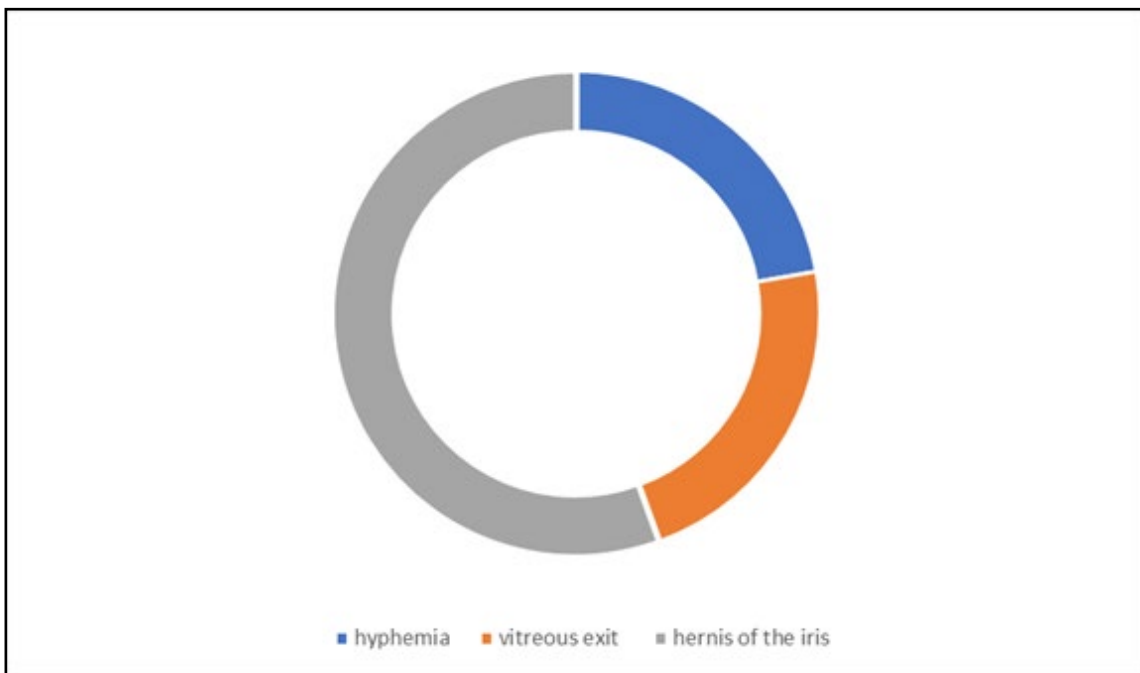
**Figure 1:** Intumescent cataract in our patients

Therapeutically, all our patients received an intravenous infusion of mannitol in combination with oral acetazolamide, hypotonizing eye drops (Beta-blocker associated with Dorzolamide) and anti-inflammatory eye drops to prepare them for surgical treatment.

Regarding surgical treatment, 20 patients underwent phacoemulsification with implantation while 3 patients underwent manual extra capsular extraction of the lens (ECE) without implantation, 2 of our patients did not undergo any surgical procedure (Figure 2).



The main intraoperative complications were vitreous exit in 2 cases, hyphemia in 2 patients and iris hernia in 5 cases (Figure 3).



**Figure 3:** Intraoperative complications

In terms of evolution, normalization of IOP was obtained in 91.4% of cases after surgical treatment alone, while the rest of the patients required adjuvant hypotonizing treatment. Postoperatively, 34.2% of patients had a final corrected visual acuity  $> 1/10$  while initially all patients had a collapsed visual acuity lower than  $1/10$ .

Table 1 presents a summary of the preoperative and 3-month post-

operative measurements of the iridocorneal angles and anterior chamber parameters.

The increase in [AOD] 250, AOD 500, AOD750, trabecular-iris area [TIA]), anterior chamber parameters was statistically significant, however, there was no significant difference in the iris parameters.

**Table 1: Parameters of the UBM**

PARAMETRES	Pre operative	Post operative
AOD500	0.022± 0.01	0.445± 0.20
AOD 750	0.028± 0.02	0.658± 0.1
TIA 500	0.007± 0.03	0.145± 0.03
TIA 750	0.016± 0.02	0.286± 0.06
ACD	1,43+- 0.03	3.619± 0.36
ILCD	1.03±0.27	0.86±0.19

Gonioscopy examination three months after cataract extraction showed an open angle in all eyes with a mean Shaffer grading of (3.1 +/-1.0) with 30% of cases having PAS. The gonioscopic findings were in agreement with the UBM findings that provided more specific angle measurements, all eyes had a mean angle of more than 20° in all four quadrants with a mean angle of (37.1+/-4.5), very similar to the angle status of the uninvolved adelphe eye.

All contralateral eyes in our series had open angles.

### Discussion

The mean age of patients with phacomorphic glaucoma was 59.27 ± 8.77 years, Prajna and al in their study objectified that the mean age at presentation was 62 ± 10 years (extremes 43-85) for phacomorphic glaucoma [2]. This is consistent with our study.

Our study showed a mean reduction in mean IOP under maximum medication from 45.36 ± 5.4 to 25.8 ± mmHg. With an IOP of 17+/-2.5 to 15+/-1.3 after surgery. A decrease in IOP from 18.2±4.1 to 14.3±2.7 mmHg following cataract surgery was documented by Nonaka and al.

They demonstrated that reducing pupillary block and lens volume during cataract surgery, as well as attenuating the anterior placement of the ciliary processes, all contributed to the postoperative angle widening [3].

Zhuo and al reported a significant decrease in IOP postoperatively up to 6 months after cataract extraction. They proposed that some of the loose peripheral anterior synechiae (PAS) could be relieved by cataract surgery [4].

While some researchers explained this on a preliminary PAS over-estimation via indentation gonioscopy.

The percentage of patients with PAS was consistent with that reported in a previous retrospective study, around 30%, but the extent of PAS was significantly lower [5].

Previous studies have established that longer duration of phacomorphic angle closure was associated with poorer visual outcome and greater extent of PAS [6].

Unlike primary acute angle closure where PAS correlated with presenting IOP, we found that there was no correlation between de-

grees of ICA closure on UBM and presenting IOP at three months. In order to start therapy early, biometric investigations of phacomorphic glaucoma can offer insight into the pathogenesis and reveal which eyes are more susceptible to develop glaucoma.

Classic biometric findings in the acute angle closure crisis include [7]:

\*Thicker lens nucleus with anterior lens positioning, positive lens factor, shorter axial length, and anterior rotation of the ciliary processes.

\*UBM has confirmed that each of these causes contributes to the common anterior segment crowding.

\* Several authors have assessed the intraobserver repeatability of the UBM measurements and concluded that it is good for practically all variables.

The standardization of the examination procedure and physiological conditions also confer credibility and reproducibility to the comparative studies (all images in our study were therefore acquired and interpreted by experienced observers) [7].

This is probably the first prospective case series using UBM to objectively evaluate the different parameters of the UBM before and after cataract surgery associated with an acute angle closure crisis of lens origin. In our prospective series versus a retrospective series 82% of our cases had open angles on gonioscopy and UBM versus only 49.2% previously reported by gonioscopy [8].

We attribute these significant improvements in angle configuration not only to a more accurate assessment with UBM but mainly to the improved management of phacomorphic angle closure over the years, not only in the initial lowering of IOP, but also in the more rapid removal of intumescent cataract preventing trabecular-iris angle closure and SAP formation. In the past, it was not uncommon to wait a week or more after the IOP decrease before cataract extraction. This resulted in a closed angle and significant SAP formation despite cataract extraction.

In our study we found that the faster the extraction after IOP normalization, the better the clinical and biometric improvement after cataract surgery.

In our series, the presentation time to cataract extraction was almost three times shorter than in a previous retrospective study.

After cataract surgery, the UBM parameters exhibit a considerable

variation. The mean ACD on UBM increased by 1.43 mm in our study. This represents a 75.6% increase above the mean preoperative value. Moreover, the number of TIAs following surgery increased by about 3 times.

The iris diaphragm may have moved backward away from the inner surface of the cornea, and the convex iris may have flattened as a result of pressure equalization between the anterior and posterior chambers. The inhibition of contact between the lens and the iris may be a contributing factor. The iris-IOL contact does not contribute to pupillary blockage because the volume of the IOL is much smaller than the lens.

Another study by Guo and colleagues revealed that the greater the postoperative values, the smaller the preoperative angle [9].

By using Scheimpflug video photography, Hayashi and colleagues were able to demonstrate quantitative deepening of the anterior chamber and opening of anterior chamber angles in eyes with primary angle closure glaucoma after phacoemulsification.

As a result, in the postoperative period, these people's chamber depths were comparable to both patients with and without open angle glaucoma. Moreover, they showed that patients with narrow angles had a considerably larger increase in ACD [10].

A significant increase in the opening angle in terms of AOD250, AOD500, and TIA after phacoemulsification were reported by Kurimoto et al. in their study of the impact of small incision cataract surgery on anterior segment configuration using UBM. In addition, they noted a strong link between preoperative and postoperative values: the postoperative opening was larger when the angle was smaller [11].

## Conclusion

In conclusion, after an acute angle closure crisis of phacomorphic origin, all parameters of the iridocorneal angle measured by UBM increased significantly after cataract surgery.

IOP normalized after cataract extraction performed two days after IOP control with medical treatment or peripheral iridoplasty. The gonioscopic results were in agreement with the UBM which provided more specific angle measurements.

Thus, given the interesting results of our study, we may suggest conducting a study on the value of clear lens extraction in chronic angle closure glaucoma documented by UBM and comparing the results of phacoemulsification and trabeculectomy in primary angle closure glaucoma based on UBM.

## Competing Interests

Authors have declared that no competing interests exist.

## Authors' Contributions

All authors read and approved the final manuscript.

## Consent (Where Ever Applicable)

The patient has given their informed consent for the case report to be published.

## References

1. Pavlin CJ, Harasiewicz K, Sherar MD, Foster FS (1991) Clinical use of ultrasound biomicroscopy. *Ophthalmology* 98: 287-295.
2. Prajna NV, Ramakrishnan R, Krishnadas R, Manoharan N (1996) Lens induced glaucomas - visual results and risk factors for final visual acuity. *Indian J Ophthalmol* 44: 149-155.
3. Nonaka A, Kondo T, Kikuchi M, Yamashiro K, Fujihara M, et al. (2006) Angle widening and alteration of ciliary process configuration after cataract surgery for primary angle closure. *Ophthalmology* 113: 437-441.
4. WD Stamer, ST Braakman, EH Zhou, CR Ethier, Fredberg JJ, et al. (2015) Biomechanics of Schlemm's canal endothelium and intraocular pressure reduction. *Prog Retin Eye Res* 44: 86-98.
5. Tingting Shao, Jiaxu Hong, Jianjiang Xu, Qihua Le, Jiajian Wang, et al. (2015) Anterior Chamber Angle Assessment by Anterior-segment Optical Coherence Tomography After Phacoemulsification With or Without Goniosynechialysis in Patients With Primary Angle Closure Glaucoma. *J Glaucoma* 24: 647-655.
6. Vasile Potop, Valeria Coviltir, Speranța Schmitzer, Cătălina Gabriela Corbu, Cătălina Ioana Ionescu, et al. (2019) Ultrasound biomicroscopy as a vital tool in occult phacomorphic glaucoma. *Rom J Ophthalmol* 63: 311-314.
7. Rameez, N Hussain (2010) To compare anatomical parameters and biometric findings of ocular structures in phacomorphic glaucoma, intumescent cataract with normal eyes using ultrasound biomicroscope and conventional A scan. Masters thesis, Institute of Ophthalmology, Joseph Eye Hospital, Tiruchirapalli.
8. Sujata Subbiah, Philip A Thomas CA, Nelson Jesudasan (2017) Comparison of ultrasound biomicroscopy and ultrasonographic parameters in eyes with phacomorphic glaucoma and eyes with mature cataract. *Int Ophthalmol* 37: 849-858.
9. Sherar MD, Foster FST (1989) The design and fabrication of high frequency poly(vinylidene fluoride) transducers. *Ultrason-Imag* 11: 75-94.
10. H Yasutani, K Hayashi, H Hayashi, F Hayashi (2004) Intraocular pressure rise after phacoemulsification surgery in glaucoma patients. *J Cataract Refract Surg* 30: 1219-1224.
11. Atsushi Nonaka, Takehisa Kondo, Masashi Kikuchi, Kenji Yamashiro, Masashi Fujihara, et al. (2006) Angle widening and alteration of ciliary process configuration after cataract surgery for primary angle closure. *Ophthalmology* 113: 437-441.

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