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How a Bleb Responds? Combined Phacoemulsification Versus Combined Manual Sics

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Abstract

Introduction: *Cataract and glaucoma can be present and managed simultaneously by combined trabeculectomy with phacoemulsification or manual small incision cataract surgery(SICS)via same site or different site. Though they have different shape and size of incision but they serve same goal of maintaining a functioning bleb. Successful trabeculectomy is always assessed by good maintenance of intraocular pressure(IOP) which directly correlates with bleb morphology and internal tract patency. This study was conducted using these parameters to compare the functioning of bleb in combined trabeculectomy with phacoemulsification and manual SICS.*

Material and Methods: *30 patientswho had primary open angle glaucoma(POAG) with cataract of nuclear sclerosis grade 2 to 3 and more than 3 months of post operative combined surgery; were taken for the study. 15 patients of combined phacoemulsification were labelled as group A and 15 patients of combined manual SICS as group B. They were examined for functioning of bleb using applanation tonometeryfor IOP; slit lamp examination for bleb morphology via Wuerzberg classification (WBCS)and ultrasound biomicroscopy (UBM) for scleral reflectivity and route under the flap.*

Results: *Bleb morphology showed a diffuse bleb in cases of combined manual SICS and a distinct well demarcated bleb in cases of combined phacoemulsification.IOP control and internal tract patency between the two groups was similar except for 1 case of failed trabeculectomy showing fibrosed route under the scleral flap with raised IOP in combined manual SICS.*

Conclusion: *Combined trabeculectomy with phaco and manual SICS showed different bleb morphology with diffuse bleb in combined SICS and well distinct raised bleb in combined phacoemulsification . Good control of IOP and internal tract patency was seen in all cases. The shape of incision does not hamper the bleb function.*

Keywords: *Intraocular pressure; Trabeculectomy; combined surgery; bleb morphology; Functioning bleb; Ultrasound biomicroscopy.*

Introduction

Elderly patients have cataract and glaucoma as a common ocular pathology which if not treated appropriately can lead to blindness. With an increasing life expectancy over the years there is an increase in the elderly population; thereby an increase in the cases of cataract and glaucoma.[1]

Cataract is the most common cause of preventable blindness in the world followed by glaucoma. Most preferred management of cataract is by manual small incisioncataract surgery or by phacoemulsification. Similarly for glaucoma which if not controlled by multiple medications as well as in non-complaint patients; trabeculectomy remains the choice of intervention.[1]

The coexistence of cataract and glaucoma is not uncommon. In cases where both the diseases coexist

combined surgery becomes the choice of treatment modality.[2] A need for a this suffices in caseswith a significant grade of cataract impairing the vision of the patient with optic nerve changes and significant visual field defect.

A combined procedure has the advantage of treating two distinct co-morbidities in same sitting ; with long term control of intraocular pressure (IOP) and fewer post operative spikes as well as a quick visual recovery. This can be performed via both manual small incision cataract surgery (SICS) and phacoemulsification and both the techniques can be performed via same site or different site.[3]

A same site combined surgery has an advantage over using separate sites as it gives more virgin field for further surgeries and there is lesser induced astigmatism with better self sealing characteristics. It also gives a high mechanical stability post operatively.[2]

A combined surgery requires both a water tight wound closure for cataract along with a leaking wound for glaucoma. This can be achieved by a modification in manual SICS to a " W " incision where the side arms are meant for the self-sealing effect of sclera-corneal tunnel and the center triangular flap in the incision is meant for the leaking bleb in trabeculectomy.[4] In phacoemulsifiaction this suffices by the routine triangular flap as used for trabeculectomy; the base serving the self-sealing effects and the triangular flap itself as the leaking trabeculectomy wound.[6]

Both the techniques serve the same purpose of providing a functioning bleb. A successful trabeculectomy depends upon maintenance of a good intraocular pressure control which can be evaluated by using Goldmann applanation tonometer. Also by examining external bleb morphology on slit lamp using Wuerzberg classification(WBCS); and visualization of internal tract patency of trabeculectomy bleb on Ultrasound biomicroscopy (UBM). UBM is useful to determine internal tract patency in cases of trabeculectomy and in cases of flat/ failed blebs as the reason for failure can be determined and timely intervention can be planned.

Hence this study was performed to compare the functioning of bleb in combined manual SICS versus phacoemulsification in cases of primary open angle glaucoma with nuclear sclerosis grade 2 to 3 of cataract.

Purpose of Study

The aim of this study was to compare the bleb functioning in post trabeculectomy patients using of IOP, WBCS for bleb morphology and UBM for internal tract patency in cases of combined trabeculectomy with manual SICS versus phacoemulsification in cases of primary open angle glaucoma(POAG) with nuclear sclerosis grade 2 to 3of cataract.

Material and Methods

This was a cross sectional study where the patients coming to eye out patient department (OPD) for regular follow ups with POAGand nuclear sclerosis grade 2 to 3 cataract who had undergone combined phacoemulsification or combined manual SICS more than 3 months were included.

Inclusion Criteria

1) Both male and female
2) Patients operated atleast more than 3 months ago by combined procedure.
3) Patients with primary open angle glaucoma.
4) Patients who had nuclear sclerosis grade 2 to 3 preoperatively

Exclusion criteria

Patients withprimary angle closure glaucoma and secondary glaucomas were excluded from the study. Secondary glaucomas are associated with more post operative complications and increased failure rate so were not included in the study.

30 patients of POAG and nuclear sclerosis grade 2 to 3 of cataract with more than 3 months post operative period were taken for the study. 15 cases of combined trabeculectomy and phacoemulsification were labelled as group A and 15 cases of combined manual SICS as group B. Both the groups were then examined for IOP, bleb morphology and UBM.

The intraocular pressure was measured using Goldmann applanation tonometer as it is the gold standard technique. True IOP was calculated after measuring the corneal thickness using pachymetry. The bleb morphology was assessed using slit lamp microscopy using Wuerzberg classification which uses the following parameters:

Parameters	Scoring
Vascularity	3 = avascular
	2 = similar to adjacent conjunctiva
	1 = increased
	0 = massive
Corkscrew vessels	3 = none
	2 = in one third
	1 = in two thirds
	0 = entire bleb
Encapsulation	3 = none
	2 = in one third
	1 = in two thirds
	0 = entire bleb
Microcysts	3 = entire bleb
	2 = lateral or medial of the flap
	1 = over the scleral flap
	0 = none

Based on the above parameters the scoring of the bleb was done in all cases. A score of more than 10 is considered as a good bleb and less than 10 is a failed bleb according to Wuerzberg classification.

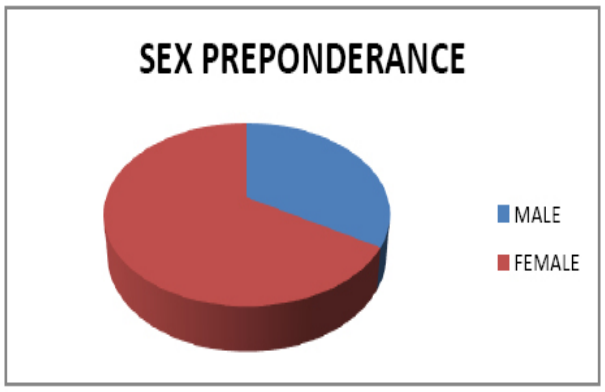
An ultrasound bio- microscopy (UBM) was done in all cases to note the scleral reflectivity and route under the flap. A minimum of 3 months post-operative period was chosen as in order to perform UBM, a complete healing is required post operativelysince it is a contact procedure. The maximum duration in our study post operatively was 2 years.

Observations and Results

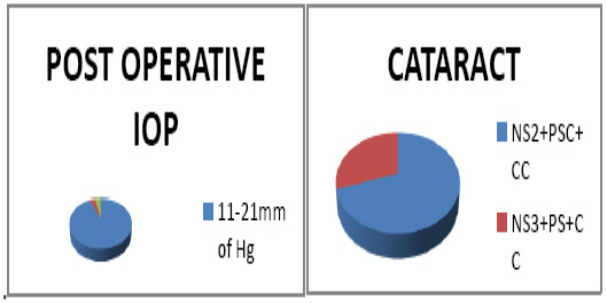
It was observed that out of a total 30 patients a female preponderance of seen (66 %) with maximum patients lying in an older age group of 51 to 60 years.

Table 1. *Correlation Between Age And Sex*

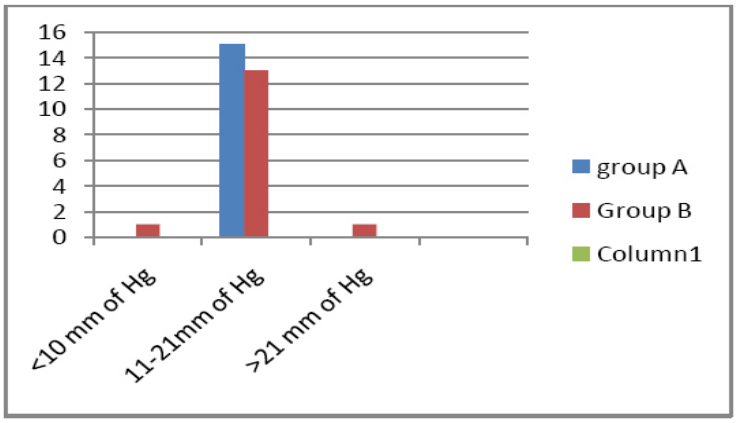
Age	Male	Female
21-30 yrs	0	0
31-40 yrs	2	1
41-50 yrs	1	1
51- 60 yrs	5	7
1-70 Yrs	4	6
- >70yrs	1	2
Total	13	17



Preoperatively all the cases had immature cataract with primary open angle glaucoma (POAG) . Among these 21 had nuclear sclerosis (NS) grade 2 with Posterior subcapsular (PSC) and cortical cataract (CC) (70%); and 9 had nuclear sclerosis grade 3 with posterior subcapsular cataract and cortical cataract (26.66 %). The cases chosen were of a minimal 3 months to a maximum of 2 years post operative period.



Post operative IOP in 28 cases (93.33%) was found ranging from 11- 21mm of Hg following both combined manual SICS or Phacoemulsification with an exception of 2 cases; wherein one patient had a low IOP of 8mm of Hg and the other had a raised IOP of 32mm of Hg. Both these cases were operated by combined manual SICS.



Graph Depicting Iop Range In Both Groups

The bleb morphology on slit lamp examination showed a " good" bleb according to WBCS in all cases of combined phaco and in all except 1 of the cases of combined manual SICS which showed a flat bleb. This was a case of failed trabeculectomy and was 2 years old.

Table 2. *Bleb Morphology On Slit Lamp Accordingto Wuerzberg Classification*

	Vascularity				Corkscrew Vessels			Microcysts		Encapsulation
	Avascular	Similar To Adj Conj	Increased	massive	None	IN 1/3rd of bleb	In 2/3rd of bleb	In more than half of bleb	In less than half of bleb	Present
Combined Sics	1	13	1	-	-	13	2	6	9	None
Combined Phaco	1	14	-	-	-	14	1	8	7	None

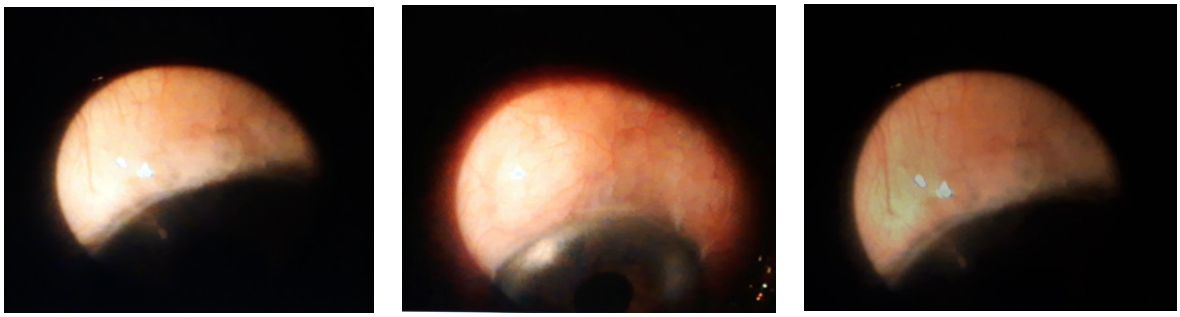


Figure 1. *Image Showing Bleb Morphology In Combined Trabeculectomy + Manual Sics*

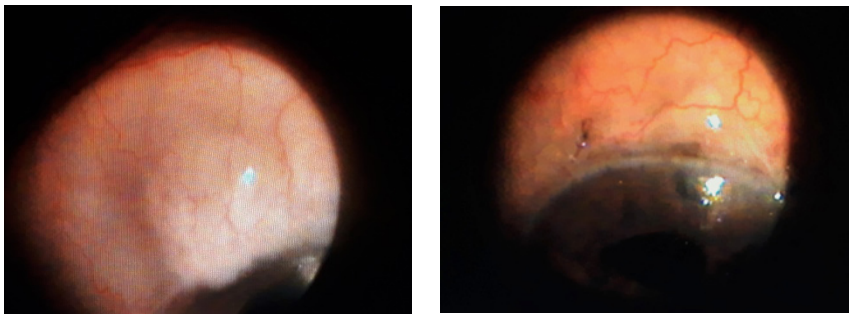


Figure 2. *Images Showing Bleb Morphology In Patients With Combined Trabeculectomy + Pahco*

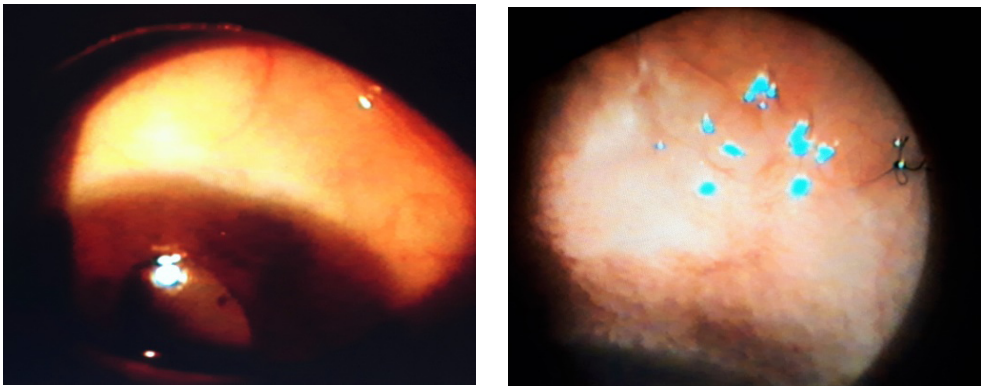


Figure 3. *Images Of Flat Bleb Morphology In Case Of Combined Sics With Raised Iop Of 32mm Of Hg*

Table 3. *Correlation Between Iop And Bleb Morphology*

	Good Bleb	Iop	**Failed Bleb**	Iop
Combined Manual Sics	13 cases	11-21mm of Hg	1	32 mm of Hg
	1 case	8 mm of Hg		
Combined Phaco	15 cases	11-21mm of Hg	-	-

Table 4. *Correlation Between Iop And Type Of Bleb Morphology*

Iop	Diffuse	Raised	Encysted	Flat
<10 mm of Hg	1 Case of Combined Manual Sics	-	-	-
11- 21 mm of Hg	13 Case of Combined Manual Sics	15 Cases of Combined Phaco	-	-
>21 mm of Hg	-	-	-	1 Case of Combined Manual Sics

A distinct raised well demarcated bleb was seen in combined Phacoemulsification in all cases in our study; whereas a diffused bleb was seen in all cases of combined SICS except 1case which showed a flat bleb. This case also had an increased IOP of 32 mm of Hg.

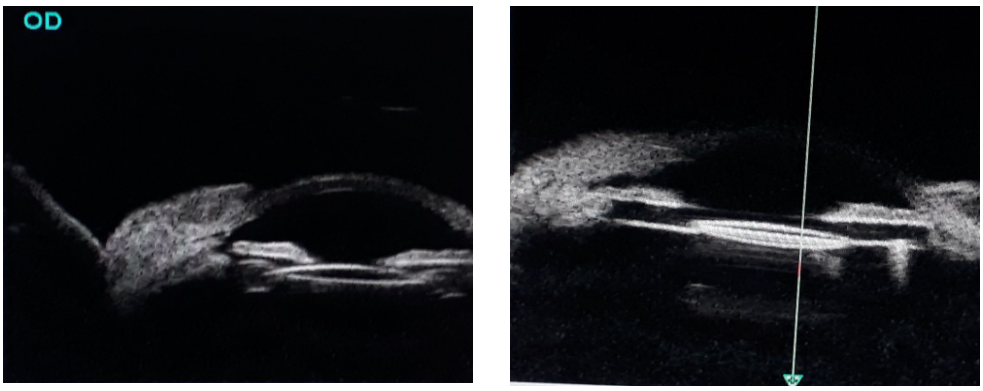


Figure 4. *Images Showing Ubm In Cases Of Combined Trabeculectomy With Phaco Showing Distinct Raised Bleb With Internal Tract Patency*

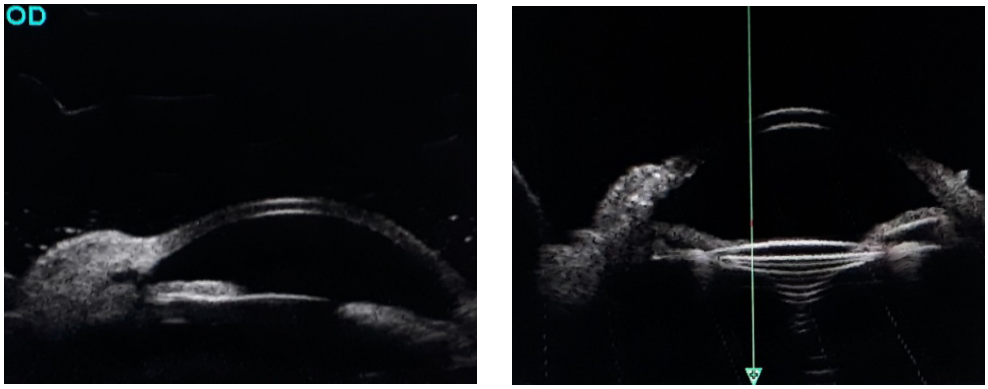


Figure 5. *Images showing ubm in cases with combined trabeculectomy with manual sics showing diffuse blebs and internal tract patency*

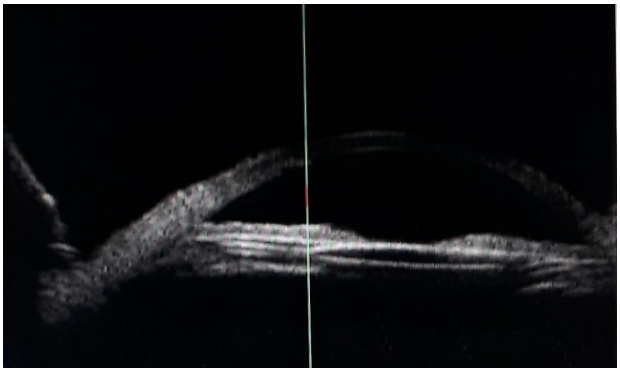


Figure 6. *Image showing a ubm case of combined manual sics with fibrosed internal tract and increased scleral reflectivity*

Table 5. *comparision between bleb morphology and ubm*

Type of Bleb	Scleral Reflectivity	Route Under The Flap
Good	Low	Present
Poor	High	Not Seen
Fair	Any of the bleb which did not fall in the above categories.	

UBM findings showed a low scleral reflectivity and good route under the scleral flap in all cases except for one case in which a high scleral reflectivity and fibrosis of the internal tract was noted and route under the flap could not be detected.

Table 6. *correlation between iop bleb morphology and ubm*

	Iop	Bleb Morphology	Ubm	No. of Cases
Combined Manual Sics	<10 mm of Hg	Good	Route under flap was present	1
	11-21 mm of Hg	Good	Route under flap was present	13
	>21 mm of Hg	Failed	Fibrosed internal tract	1
Combined Phaco	11-21 mm of Hg	Good	Route under flap was present	15

The raised IOP was associated with poor bleb morphology and a fibrosed route under the scleral flap was seen on UBM. Appropriate management was planned for this case. As the case was 2 years old re-trabeculectomy at separate site was done.

Discussion

Coexistence of cataract and glaucoma is not infrequent in elderly population.The most accepted mode of treatment for the two conditions is combined procedure which can be either by manual SICS or via phacoemulsification. Both the techniques have different trabeculectomy incisions but aim at maintain a good functioning bleb.The parameters for the assessment of the bleb function include IOP, external bleb morphology by slit lamp and internal tract patency by UBM.

Several studies have previously assessed the effect ofcombined cataractextraction on IOP and bleb morphology by extracapsular cataract extraction (ECCE) or by phacoemulsification, in comparison with the course of trabeculectomized eyes without cataract extraction.[9]Studies have also been conducted to compare two different surgical sites for combined trabeculectomy and their effect on functioning of bleb. In our study both procedures were performed through same site.

In a studies done previously [6] 48% of the patients out of 251 were male; average age was 76.5 years. In our study we observed that 43.33% of the individuals were males and average age was from 51 to 60yrs which were 40% of the study. This was conducted on a sample size of 30 patients. In their study both primary as well as secondary glaucoma were included whereas in our study only primary open angle glaucoma (POAG)were considered. Secondary glaucoma and primary angle closure glaucoma have a higher incidence of increased post operative IOP spikes. Also there have been reported higher incidences of failed trabeculectomy in such cases.[12]Hence we chose patients with only POAG so that the results remain comparable.

In our study the patients that underwent combined procedures had nuclear sclerosis grade 2 to 3 with open angle glaucoma whereas in the other studies done for combined procedures the grading of the cataract have not been assessed. We chose this in order to avoid bias with the results of the study.

In previous studiesthe pattern of intraocular pressure changes were recorded following combined SICS and noted that suture less combined SICS had lower IOP than those with sutures at the initial post operative period where the IOP ranged from 12+/- 3 mmhg.[12] These studies were done over a course of time post operatively and regular follow ups were noted.

In our study patients with both combined SICS and phacoemulsification flaps were sutured and showed good control of IOP except for 1 cases of combined SICS which was 2 years old showed an elevated pressure of 32mm of Hg; this being a single reading when the patient came for routine follow up. This was a main drawback in our study as long term success as well as failure could not be assessed. Also the fluctuations in IOP post operatively could not be noted as only a single reading at the time of presentation was considered.

Several bleb grading systems were previously described to allow an accurate evaluation of bleb morphology and to predict early signs of failure. Some of these systems are the classification system described by Picht and Grehn, the Indiana Bleb Appearance Grading Scale (IBAGS) and the Moorefields Bleb Grading System (MBGS).[6]We used Wuerzberg classification in our study as it is easier to do on an OPD basis; it works well in predicting the IOP control when at least 10 points are attained , and helps in determining clinically the raised IOP causes.

We found a single study by Sandra furer and associates [7][6]a correlation between the IOP and the bleb morphology using wuerzberg classification was compared on 57 patients and it was found that the bleb morphology and IOP correlated in 51(89.4%) cases. In our study also IOP correlated with bleb morphology in all cases.

Mayur B khamar in Glaucoma Centre, Raghudeep Eye Hospital, Ahmedabad, India studied the bleb morphology post trabeculectomy using AS- OCT[8] that demonstrated external bleb morphological features that may be used to predict the functioning of a bleb. AS OCT did help in revealing the bleb morphology but did not help to study the route under the sclera flap.[5] The functioning of the bleb depends upon the patency of the internal tract which is best assessed by UBM.[11]

The Internal tract patency was assessed using UBM in our study and it was observed that all the cases showed low scleral reflectivity and route under

the scleral flap was found to be patent in both the techniques in 29 cases (99%) except for 1 case of combined SICS which was a failed trabeculectomy and we could assess the reason as fibrosis of the internal tract with increased scleral reflectivity. This case was a 2 years old operated case and had raised IOP of 32 mm of Hg onapplanationtonometery. Re-trabeculectomy was done in this case.

There was significant correlation seen between the IOP , bleb morphology and the UBM findings and both the techniques were found equally efficacious in maintaining a good bleb function. To the best of in our knowledge no previous studies have compared the efficacy of these two techniques in terms of maintaining bleb functioning.

This study is a useful prospect through which we can assess the bleb functioning in terms of patency of internal tract or failure of combined techniques through UBM as well as through bleb morphology. We could also assess the reason for bleb failure and appropriate intervention could be planned.

Conclusion

Combined trabeculectomy with phacoemulsification and manual SICS showed equally efficacious good functioning bleb and IOP and UBM correlated in all cases. The shape of incision does not hamper the bleb function. Bleb morphology varied in both the groups with distinct raised bleb seen in cases of combined phacoemulsification and diffuse bleb was seen in cases of combined SICS.

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