

A Clinical Study on Risk Factors of Descemet's Membrane Detachment and Visual Outcome Following Air Descemetopexy for Post Cataract Surgery Descemet's Membrane Detachment

Dr Chinta Sravya¹, Dr Royalapeta Vineetha²

¹Post Graduate, Department of Ophthalmology, Kurnool Medical College, Kurnool.

²Post Graduate, Department of Ophthalmology, Kurnool Medical College, Kurnool.

Abstract

Background: To study Risk factors, incidence of Descemet's membrane detachment (DMD) and visual outcome following Air Descemetopexy for post cataract surgery DMD.

Methods: This study is a type of prospective study conducted in 20 patients who underwent Air Descemetopexy for post cataract surgery descemet's membrane detachment. 20 patients were included in the study who had DMD out of 614 manual small incision cataract surgery (MSICS) and 160 Phacoemulsification during the period, June 2022 to December 2022. A clinical analysis on risk factors, corneal comorbidities, incidence and visual outcome were studied.

Results: Mean age of patients was 62.5 years, 40% are males and 60% are females. Incidence of DMD in MSICS was 0.72% and in Phacoemulsification was 0.06%. corneal degenerations and opacities, pseudoexfoliation (PXF), dense cataracts, shallow anterior chamber, phacomorphic glaucoma are the most common risk factors and DMD was higher among Surgical trainees than consultants. 80% of patients has vision better than 6/18 at the end of one month post operatively. Almost 97% patients had successful reattachment.

Conclusion: The results of this case series suggests that DMD is a surgeon induced preventable cause for postoperative corneal edema, Early detection and judicious management reduces the incidence and improves visual outcome. Air Descemetopexy is safe and efficient modality of treatment for DMD and should be tried in patients with moderate and severe DMD before opting for major surgeries like Endothelial Keratoplasty as final treatment of choice.

Keywords: Descemet's membrane detachment (DMD), small incision cataract surgery (SICS), Phacoemulsification, Descemetopexy.

I. Introduction

Descemet's Membrane (DM), the posterior membranous layer of cornea is very vital and essential for maintaining corneal physiology and transparency [1]. It is a basement membrane which is 8 to 10 micrometers thick in adults and composed of collagen type 4. Separation of DM and Endothelium from stroma is called Descemet's Membrane Detachment (DMD) [3]. During the learning curve any surgeon may have to face this problem [1].

The most common cause of DMD is mechanical separation near the incision site by an instrument, fluid or viscoelastic substance [3]. In our setup, with large volume of cataract surgeries under community outreach department, a significant number of cases of corneal edema on postop day 1 were due to DMD.

Grading of DMD was done by slit lamp as MILD, MODERATE, SEVERE DMD as per the classification suggested by JAIN et al [2].,

MILD DMD-< 25% of the cornea and is peripheral.

MODERATE DMD- 25-50% of cornea and is peripheral.

SEVERE DMD - >50% of cornea or with central involvement.

Large DM detachment with greater surface area involved, may lead to corneal edema or Endothelial decompensation due to loss of physiological function [1]. Hence, it becomes necessary by operating surgeon/attending surgeon to intervene at right time.

Very few cases of spontaneous reattachments have been reported, surgical intervention is the preferred approach to promote the reattachment. Early diagnosis and intervention is essential to achieve better visual rehabilitation and further to prevent wrinkling fibrosis and shrinkage of DM [5]. Here we present an alternative technique for treatment of DMD i.e., air descemetopexy in all patients who found to have DMD on POD 1 under slit lamp examination.

II. Materials and Methods

Type of study:It is institution based Prospective Study.

Source of Data: The patients admitted in Regional EyeHospital Kurnool with cataract.

All cases posted for cataract surgery were clinically evaluated for

1. UCVA and BCVA
2. Intraocular pressure measurement.
3. Slit lamp examination – For preexisting corneal disorders, grading of cataract, PXF, Shallow Anterior chamber.
4. Detailed fundus examination using +90D lens
5. B-scan ultrasonography if media is not clear
6. Automated keratometry and IOL power calculation was done.

All patients, out of 774 cataract cases during the period, June 2022 to December 2022 – 614 underwent MSICS and 160 underwent Phacoemulsification.

On POD 1 patients were examined under slit lamp and findings were recorded.

17 out of 614 who underwent MSICS and 3 out of 160 who underwent phacoemulsification found to have DMD. Details of DMD including location, size and extent were noted and grading was done as per JAIN et al., classification of DMD, all cases were posted for Re-surgery on the same day (POD 1) and were discharged on POD 3.

Procedure / Technique: Air descemetopexy was performed under topical or peribulbar anesthesia. A peripheral corneal paracentesis was made in the area of clinically attached descemet's membrane, with 30G hydrocannula mounted on 2 cc syringe, air is injected slowly below the plane of detached descemet's membrane and the needle was withdrawn slowly. The paracentesis was sealed with cotton sponge for 1 minute or viscoelastic substance is applied at paracentesis site to prevent leaking air bubble during withdrawal of needle. Anterior chamber was filled with 100% air bubble for 15 minutes followed by air fluid exchange leaving 80% residual air. Postoperatively patient was advised for strict supine position for 2 hours. Topical antibiotics and steroids in tapering doses were advised along with cycloplegic eye drops i.e., homatropine eye drops TID till complete resolution of air bubble to avoid pupillary block.

Post intervention Evaluation: IOP, Slit Lamp examination findings on first post intervention day and at discharge were noted.

Patient was followed up after 1 week, 2 weeks and 4 weeks and IOP, BCVA, slit lamp examination were done at every visit.

III. Observations and Results

20 patients underwent Air Descemetopexy for DMD. All the patients had 1 month follow up.

Mean age of patients was 62.5 years.

Male to Female ratio was 2:3

Preoperatively under slit lamp examination- 3 patients had corneal degeneration, 2 patients had shallow AC, 3 patients had corneal opacities, 3 patients had intumescent cataract with phacomorphic glaucoma, 4 patients had PXF's with rigid pupil, 5 patients had dense nuclear cataract.

Table 1:

Grading of DMD	No. of Cases
MILD	4
MODERATE	12
SEVERE	04

Table 2:

Anterior segment Comorbidities	No.of Cases
Corneal degeneration	03
PXF	04
Dense nuclear Cataract	05
Phacomorphic / Intumescent Cataract	03
Shallow AC	02
Corneal opacity	03

Table 3:

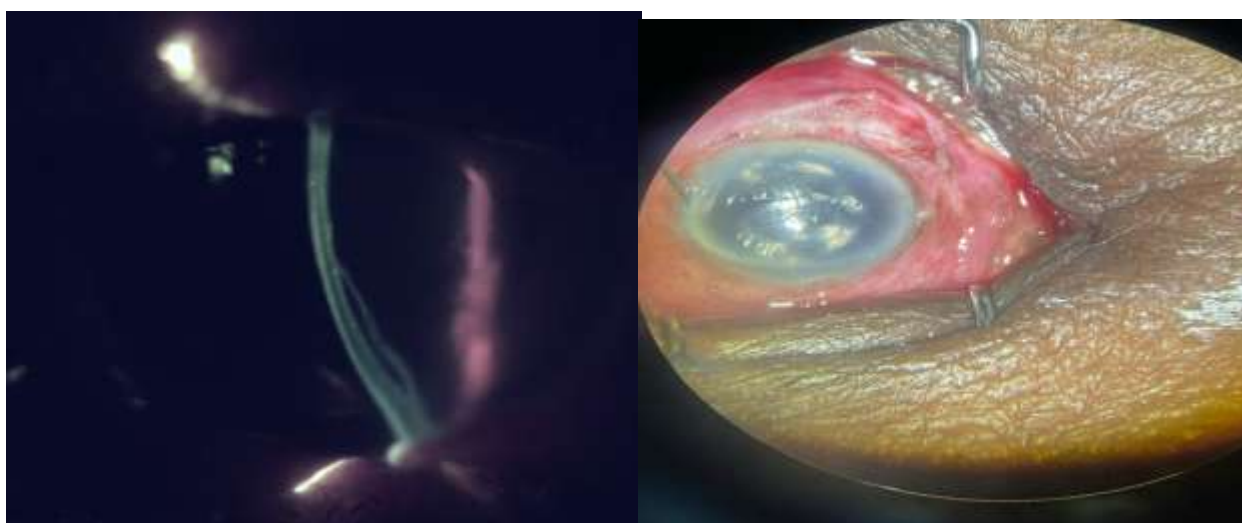
Incidence of DMD	
Type of Cataract Surgery	Patients with DMD
MSICS	0.72%
Phacoemulsification	0.06%

Visual outcome:

On POD 1 – BCVA for all the patients is ranging between 6/36- 6/60 which improved to 6/12 and better for 16patients after 1 month. One patient had central corneal opacity, so there is no significant improvement even after surgical reattachment.

3 patients had corneal degeneration so no improvement is seen.

97% patients had successful reattachment of DM after intervention.



Slit Lamp Picture on POD 1 – Severe DMD During intervention by AirDescemetopexy



Post Intervention Day 1 Slit Lamp Picture



After 1 month of Follow up

IV. Discussion

DMD is remediable but potentially blinding cause of post operative corneal edema. Due to increasing popularity of cataract surgery, post operative reports of DMD are common.

The management of DMD depends on various factors such as location, area of detachment, degree of Anteroposterior separation from posterior stroma, timing of intervention.

Most of the detachment of mild to moderate grade could be selfhealing. Some detachments are complicated with folds and complete detachment of DM causing refractory corneal stromal edema / Endothelial dysfunction with severe decrease in visual acuity.

MACKOOL and HOLTZ classified DMD into planar (separation < 1mm) and nonplanar (> 1mm separation from posterior stroma)[2]. Planar detachment resolve spontaneously, nonplanar should be repaired early.

Anterior chamber entry, section extension are well known risk factors leading to DMD. Coming to surgical instruments, if the disposable and reusable tools are not sharp and inappropriate force to penetrate corneal inner tissue easily leads to separation of DM from stromal layer[3].

For the surgical skills, if the surgeon is less skilled and the surgery is too difficult. If microscope depth of field is too small, detached DM may be mistakenly identified as Anterior capsule and thus sucked out, causing wide range of DMD [5].

DMD seems to be more common in complicated cataract surgeries as is evident from the fact that 20 patients in this study group had some preoperative pathology or intraoperative complication [2].

Pre op risk factors – PXF, Brown cataracts, Shallow AC attributed to difficult nucleus delivery, hard nucleus, insufficient space and poor pupil dilatation [3].

Incidence reported in Literature – 0.04% after Phacoemulsification, 0.11% after MSICS [4]. In this study the reported incidence was 0.06% after Phacoemulsification and 0.72% after MSICS.

Incidence was more in MSICS than Phacoemulsification due to larger vulnerable area of disrupted DM at the incision site.

Rajat jain et al., in his study reported prolonged duration between cataract surgery and descemetopathy were associated with a significantly poorer final visual outcome [6].

With the advent of ASOCT newer classification system of DMD have been proposed[2].

ASOCT is optical, noncontact ophthalmic imaging device that enables tomographic and quantitative measurement of entire as structure.

ASOCT examination is not affected by corneal edema and can easily be used to find DM detachment, it is of high resolution, accurate to micron level, minimize incidence of infection in early post operative patients [4]. Amar Agarwal et al., proposed ASOCT based HELP algorithm (Height, Length, Extent, Pupil) for management and to assess the prognosis of DMD [7].

As many of the government institutions doesn't have facility of ASOCT, slitlamp based grading is easiest and available in all setup for early diagnosis and intervention for better visual prognosis.

Surgical repair aims to reapproximate the descemet's membrane against the stroma using tamponading agent until it attaches. Descemetopexy with injection of gas into anterior chamber to reposit the detached DM is now well accepted for management of post cataract surgery DMD. The success rates have been reported to be 90-95%. Tamponading agents include 100% air, Sulphur hexafluoride (20% SF₆) and perflouropropane (12-14% C₃F₈).

AIR is usually preferred for many reasons—shorter time of absorption, lower cost, less risk of endothelial toxicity, less chances of pupillary block [5].

JAIN et al [2]., found that anatomic and functional outcome of descemetopexy with air was better than C₃F₈ with reduced incidence of pupillary block.

CHAURASIA et al [2]., reported successful reattachment of DM with air in 13 out of 14 patients in their series.

A retrospective report by GARG et al [2]., showed functional improvement in visual acuity in 74.63% of eyes after C₃F₈. In this series a slightly higher success rate with air descemetopexy was observed.

Several factors should be borne in mind to help minimize the risk of DMD. These include gentle instrumentation, avoidance of blunt blades, minimal manipulation at the incision site, good tunnel construction so that insertion and removal of instruments is easy in case of hard cataracts [3].

V. Conclusion

- DMD is surgeon induced preventable cause for post operative corneal edema and low vision.
- Gentle instrumentation, early detection may reduce incidence of DMD especially in patients with associated preoperative risk factors – Nuclear sclerosis / Dense cataract / PXF, Corneal opacities, Shallow Anterior chamber.
- Air descemetopexy is a minimally invasive technique, safe and efficient modality of treatment for DMD and tried even in patients with severe DMD before planning for major surgery.
- Intracameral injection of C₃F₈/SF₆ was not a good option due to high probability of increase in IOP postoperatively leading to complication like splitting of primary sutured corneal tunnel and pupillary block.
- Prognosis depends on prompt recognition and early treatment of Descemet's membrane detachment.

References

1. Kumar DA. Managing descemet membrane detachment by HELP algorithm. Delhi J Ophthalmol [Internet]. 2016 [cited 2023 Feb 2];27(2):128–31.
2. Odayappan A, Shivananda N, Ramakrishnan S, Krishnan T, Nachiappan S, Krishnamurthy S. A retrospective study on the incidence of post-cataract surgery Descemet's membrane detachment

- and outcome of air descemetopexy. *Br J Ophthalmol* [Internet]. 2018 [cited 2023 Feb 2];102(2):182–6.
3. Sasidharan A, Kandasamy P. Risk factors for descemet's membrane detachment following small incision cataract surgery. *J Clin Diagn Res* [Internet]. 2018; Available from: https://jcdr.net/article_fulltext.asp?issn=0973-709x&year=2018&volume=12&issue=7&page=NC01&issn=0973-709x&id=11813.
 4. Guo P, Pan Y, Zhang Y, Tighe S, Zhu Y, Li M, et al. Study on the classification of Descemet membrane detachment after cataract surgery with AS-OCT. *Int J Med Sci* [Internet]. 2018;15(11):1092–7.
 5. Weng Y, Ren Y-P, Zhang L, Huang X-D, Shen-Tu X-C. An alternative technique for Descemet's membrane detachment following phacoemulsification: case report and review of literature. *BMC Ophthalmol* [Internet]. 2017 [cited 2023 Feb 2];17(1):109.
 6. Jain R, Murthy SI, Basu S, Ali MH, Sangwan VS. Anatomic and visual outcomes of descemetopexy in post-cataract surgery descemet's membrane detachment. *Ophthalmology* [Internet]. 2013 [cited 2023 Feb 2];120(7):1366–72.
 7. Kumar DA, Agarwal A, Sivanganam S, Chandrasekar R. Height-, extent-, length-, and pupil-based (HELP) algorithm to manage post-phacoemulsification Descemet membrane detachment. *J Cataract Refract Surg* [Internet]. 2015 [cited 2023 Feb 2];41(9):1945–53.