Managing Descemet Membrane Detachment by HELP Algorithm
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Abstract
Descemet’s membrane detachment (DMD) is a known intraoperative complication following a complicated cataract surgery. We present an anterior segment coherence tomography based algorithm using Height, length, extent and pupil (HELP) for management of post operative DMD. If the DMD length is less than 1mm and height < 100 microns in any zone (Zone 1 =central 5mm, Zone 2 =5-8mm & Zone 3 = >8mm), medical management is sufficient. When the detachment is 1-2mm with height of 100-300 microns in zone 1(with or without pupillary axis involvement), a surgical repositioning has to be considered. DMD with length 1-2mm and height 100-300 µm in zone 2 and 3 are managed medically. When the same in zone 3 are managed medically. With non improvement by 4 weeks under medical management, surgical intervention can be opted. Through early surgical intervention, even in cases with small Descemet membrane detachments and timely switch of treatment, the visual loss caused by Descemet membrane scarring can be prevented.

Keywords: HELP, DMD, corneal edema, descemetopexy

Introduction
Descemet’s membrane (DM), the posterior membranous layer of cornea is very vital and essential for maintaining the corneal physiology and transparency. Damage to Descemet’s or Descemet’s detachment is one of the known complications of phacoemulsification surgery.1,2 During the learning curve any surgeon may have to face this problem. Complicated surgeries like posterior capsular rupture, shallow anterior chamber or hard nucleus can predispose for DM detachment.3 Preexisting weak DM due to congenital adhesion defects can predispose to spontaneous detachment even in uneventful cataract surgery.4 Though there are different ways of diagnosing, evaluating and managing DM detachment; there are no standard protocols which have analyzed various parameters of detached DM.5,7

Lacunae and Need for Protocols
Untreated DM detachment can lead to scar formation and visual loss. Large DM detachment due to greater surface area involved, may lead to corneal edema or endothelial decompensation due to loss of physiological function. Hence it becomes necessary by the operating surgeon or attending intervene to intervene at the right time. The management by Mackool and Holtz classification for Descemet membrane detachment was based on the length of detachment. They graded DMD as planar when it was less than 1mm and non-planar when more than 1mm.1 They also postulated that all non planar Descemet membrane detachments require surgical treatment and insisted that the absence of scroll is an indicator in spontaneous recovery, even in cases with a large Descemet membrane detachment. Influence of DM in pupillary region and delay in surgical intervention has not been widely evaluated. In this section, we will be discussing on the recent Algorithm put forth by Dr Dhivya and which has been utilized for managing DM detachment in eyes post phacoemulsification.8

HELP -Height, Extent, Length and Pupil-algorithm
Main parameters taken for DM detachment (DMD) are obtained from anterior segment optical coherence tomography (AS OCT). They are height, length, extent and relation to pupil and it goes by the acronym “HELP”.9

Height: It is measured as the distance between the detached DM and corneal stroma (Figure 1) in millimeters.
Length or Chord length: It is the entire length of detached DM (Figure 1) which is away from the cornea in millimeters.
Extent: Extent is the region of DM detachment in relation to zones of corneal area.
Zones of cornea: For evaluation purpose, cornea is classified into three zones; zone 1 (central 5mm), zone 2 (para-central, 5-8mm) and zone 3 (periphery, >8mm).
Pupil : Position of DM detachment with respect to anatomical pupil size of specific patient.

If the DM detachment length is less than 1mm and height < 100 microns in any zone, medical management has to be considered (Figure 2). When the detachment is 1-2mm with height of 100-300 microns in zone 1 (for both with
and without pupillary axis involvement), a surgical plan of action has to be considered. DMD with length 1-2mm and height 100-300 μm in zone 2 and 3 are managed medically. DMD >2mm and height >300 μm long in zone 1 & 2 are surgically treated; while the same in zone 3 are managed medically.

**Medical Management**
Medical treatment (Figure 3) commonly included topical osmotic agent, 5% Hypersenz (Sodium chloride) 5 times per day, topical steroids, 1% prednisolone acetate 4 times per day and topical antibiotic 0.3% ofloxacin 4 times per day.

**Surgical intervention**
This can be intracameral expandable gas (14% C3F8 or 20% SF6) or sterile air injection under peribulbar anesthesia. Other surgical options are Descemetopexy and suturing of DM to host cornea to stabilize it.

**Conversion from medical to surgical treatment**
When the eye on medical treatment failed to show any one of the signs of resolution like decrease in chord length, height or CCT of DMD by 4 weeks, surgical intervention can be opted. However, when any one of the sign is noted, medical management should be continued.
DMD Chart
One can use a follow up chart for prognosis assessment in DMD. The dimensions and response from the observer can be well documented and can be preserved for analysis on long term.

Advantages of Algorithm
The capability for complete visual recovery will be decreased if the Descemet membrane are left to attach spontaneously. This is because, the reattaching DM will result in establishment of fixed Descemet membrane folds, wrinkles or striae, fibrosis, pre-Descemet membrane pigments, opacities, or scars. When these develop in the pupillary region or zone 1 (Figure 5), the potential for visual disruption will be high and there is significant fall in unaided visual acuity. This is why our algorithm prescribed additional precaution in the pupil or zone 1; those eyes are treated aggressively even though the intensity of the Descemet membrane detachment appears to be small. The delay in intervention can be deleterious to functional outcomes when zone 1 and the pupil are involved. Thus the algorithm provides more stress for early management in high risk zone (pupil) and central 5mm. It also emphasizes that effective medical management can be useful in Descemet membrane detachment less than 100 mm height and less than 1.0 mm length in zone 1 which showed spontaneous reattachment.

It has to be noted that by following medical therapy in eyes in which the detachment can resolve spontaneously avoids the inherent risks involved in intervention and that timely surgical intervention in specific Descemet membrane detachments might prevent complications such as fibrosis, shrinkage, and wrinkling of Descemet membrane, which can subsequently prevent reattachment. We reported that in our study, 95.8% of Descemet membrane detachments reattached successfully after gas or air injection and 100% were reattached in cases involving the pupil in zone 1 by following the HELP algorithm. The study confirmed that when its height was less than 100 mm and length was less than 1.0 mm, the Descemet membrane detachment reattached spontaneously in zone 1 without intervention. Surgical intervention was required earlier in Descemet membrane detachments in zone 1 when the detachments were over 100 mm high and over 1.0 mm long and in zone 2 when they were over 300 mm high and over 2.0 mm long.

OCT based method
Recent study of ours has reported significant role of OCT based HELP algorithm in managing DMD. The higher resolution of OCT helps in detecting early Descemet membrane detachments, in quantifying chord length and height, and in obtaining documentation for the prognostic analysis apart from slit lamp assessment. Telemedicine based treatment can also be made possible by proper documentation. OCT is non contact and can be used even in moderate to severe corneal edema.

Conclusion
In this age of high patient anticipations, the best visual outcome in the immediate postoperative period is expected by many of them. Hence managing Descemet’s membrane detachments involving the pupil and those having significant DM detachment height is essential. This new comprehensive algorithm has showed that through early surgical intervention in zone 1, even in cases with small Descemet membrane detachments and timely switch of treatment, we can prevent the visual loss caused by Descemet membrane scarring.

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Figure 5: Untreated DMD in zone 1 causing scar and visual loss. Clinical photo (a) and OCT (b).
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