

## Predescemetocoele: A distinct clinical entity

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The case report incorporates a Fourier-domain optical coherence tomography (OCT) examination for demonstration of the existence of pre-Descemet's layer (PDL; Dua's layer) overlying a descemetocoele and demonstrates predescemetocoele as a separate clinical entity. The prospective analysis was done in two cases that had descemetocoele, and OCT demonstrated the presence of PDL over an unruptured descemetocoele that offers resilience and can be treated with an elective deep anterior lamellar keratoplasty or a penetrating keratoplasty. A descemetocoele, when covered with PDL, should be correctly designated as a predescemetocoele. Loss of PDL leads to baring of Descemet's membrane that eventually ruptures.

**Key words:** Deep anterior lamellar keratoplasty, descemetocoele, penetrating keratoplasty, pre-Descemet's endothelial keratoplasty, pre-Descemet's layer, predescemetocoele

Descemet's membrane (DM) is a thin, transparent, elastic sheet of tissue. The herniation or anterior bulging of an intact DM through a defect of the overlying corneal stromal and epithelial layers is known as descemetocoele. The surgeon comes across descemetocoele in cases of progressive corneal ulceration which eventually progresses to involve the stroma followed by corneal perforation. During this sequence of events, a stage is attained where a layer of pre-Descemet's layer (PDL; Dua's layer)<sup>[1,2]</sup> covers the descemetocoele. This PDL is a distinct layer, and the authors believe that it provides mechanical strength and support to descemetocoele and that during this stage, where the PDL supports DM, descemetocoele resists perforation. We tend to interpret this stage as a predescemetocoele.

To the best of our knowledge, we are not aware of any study that has incorporated the application of optical coherence tomography (OCT) to delineate the thickness of the wall of descemetocoele and its clinical application.

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## Case Reports

### Case 1

A 50-year-old male patient with a history of corneal infection presented with progressive loss of vision in the left eye. On examination, his vision was hand movement perception, and slit-lamp examination revealed corneal ectasia with a bulge and thinning of central corneal layer, suggestive of a descemetocoele of 4 mm × 3 mm [Fig. 1a]. Subsequent Fourier-domain-OCT imaging showed thinning of the layers of the cornea with the thickness of the ectatic part being 36 μm [Fig. 1b]. The OCT demonstrated that the layer was thicker than the DM-endothelium complex and was probably a "predescemetocoele." Deep anterior lamellar keratoplasty (DALK) was eventually performed in this case.

### Case 2

A 60-year-old male patient who underwent pre-Descemet's endothelial keratoplasty (PDEK)<sup>[3]</sup> for pseudophakic bullous keratopathy presented with progressive loss of vision in the operated eye. On examination, his best-corrected vision was 20/400 on Snellen's visual acuity chart. Slit-lamp examination revealed thinning of cornea in the temporal paracentral region [Fig. 2a] with ectatic corneal layers that were about 3 mm × 2 mm.

The ectatic area included the PDEK graft [red arrow; Fig. 2b] measuring 28 μ and the patient's PDL (white dot arrow) along with residual corneal stroma had a thickness of about 36 μm. Loss of corneal stroma was detected around the ectatic (green circle) area that was covered by the healing epithelium (white full arrow). The reflection of the bandage contact lens is also visualized. The patient underwent penetrating optical keratoplasty.

## Discussion

PDL has been described as a distinct layer that sets it apart from the rest of stroma with a thickness that ranges from 6 to 15 μm.<sup>[1]</sup> DM represents a layer of 8–10 μm and is considered to be resistant to proteolysis. In clinical practice, it has been demonstrated that some descemetocoeles resist perforation better than others. This is probably due to the presence of an additional layer of PDL that has been demonstrated to withstand a high pressure of 700 mmHg in donor corneas.<sup>[1]</sup> Many surgeons have attempted the triple procedure of DALK with phacoemulsification,<sup>[4,5]</sup> and successful outcomes have been reported with the deep stromal dissection. The inherent weakness of DM to take pressure has been denoted clearly in a DALK study where the surgeons tried to perform a phacoemulsification after baring DM. It resulted in DM rupture whereas after baring PDL, they could successfully complete the procedure.<sup>[5]</sup>

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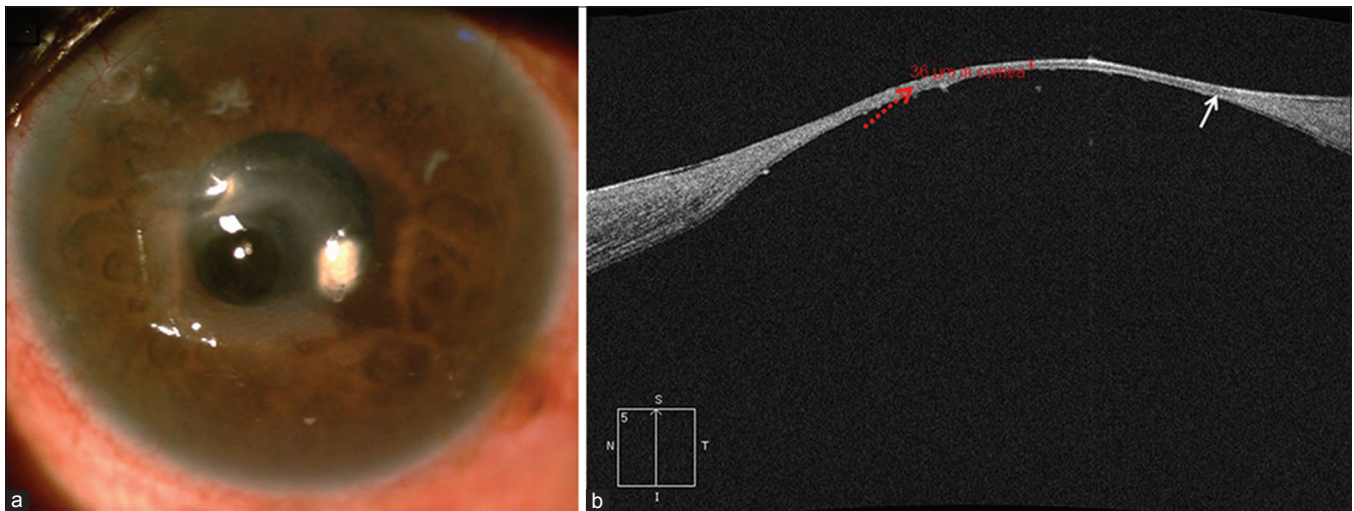
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Our OCT findings reveal that descemetocèles can be covered with PDL that offers resilience and delays the perforation of the same. When the overlying PDL melts or dissolves, the descemetocèle is more likely to perforate. We put forward a clinical entity of predescemetocèle where we believe that all descemetocèles that are yet not perforated have an additional support of PDL and the thickness of the descemetocèles should be closely monitored with OCT and a further progression toward thinning of the descemetocèle membrane prompt a surgeon for early surgical intervention.

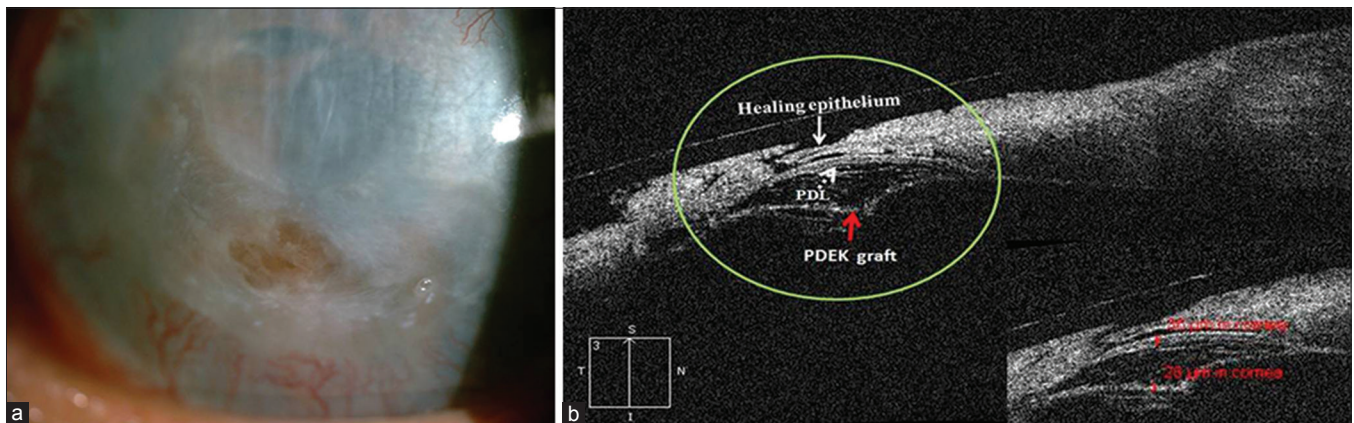
For case 1, a 36- $\mu\text{m}$  residual layer clearly demonstrates DM-endothelium complex with PDL and some amount of corneal stroma. For case 2, the presence of bulge above the 28- $\mu\text{m}$  graft clearly denotes the presence of PDL in a descemetocèle. Specific to case 2, only PDL with residual stroma was detected as the DM had been stripped off during the process of descematorhexis in the recipient eye. This case would never demonstrate a DM bulge, yet a thinning is called a descemetocèle, which is inappropriate.

Another clinical implication of the presence of PDL is that it does not signify an exigency and that the surgeon has a reasonable time frame to arrange for a good donor graft. DALK can be used to treat descemetocèle if PDL is detected on OCT. Various studies have been published that denote the existence of descemetocèle in cases of corneal melting and measures to prevent the eye from perforation,<sup>[6-8]</sup> but to the best of our knowledge, none of these studies have incorporated the application of OCT to assess the thickness of the residual corneal tissue that resists perforation. Although histopathology and electron microscopy are essential for documentation, it could not be performed for case 1 as DALK procedure was performed to reinforce the corneal integrity. For case 2, the patient missed a scheduled follow-up and reported with corneal melting and perforation for which a PK had to be performed.

The terminology “predescemetal corneal ulcer” has been used in the past to denote deep corneal ulcers that have not yet ruptured.<sup>[9]</sup> Some surgeons have reported the presence of PDL in descemetocèles,<sup>[2]</sup> and we the authors also suggest that this



**Figure 1:** Predescemetocèle in case 1. (a) Clinical photograph of predescemetocèle. (b) Optical coherence tomography showing the ectatic layers of pre-Descemet's layer (dotted red arrow) along with Descemet's membrane (white arrow)



**Figure 2:** Predescemetocèle in case 2. (a) Clinical photograph. (b) Optical coherence tomography demonstrating predescemetocèle in an eye that underwent pre-Descemet's endothelial keratoplasty surgery. The stromal loss (green circle), pre-Descemet's endothelial keratoplasty graft (red arrow), patient's pre-Descemet's layer (white dot arrow) with residual corneal stroma of about 36  $\mu\text{m}$  above and epithelialized predescemetocèle (white-arrow) are highlighted

stage of descemetocoele where a layer of PDL is detected on OCT should be labeled predescemetocoele and not descemetocoele.

## Conclusion

The rationale of detection of predescemetocoele is that early surgical intervention when the PDL is still intact should be considered and corneal integrity be restored.

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## Conflicts of interest

There are no conflicts of interest.

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