

Predicting Re-bubbles in Descemet Membrane Endothelial Keratoplasty (DMEK): Early Edema and Location of Graft Separations in Re-bubble v Non-rebubble Cases

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Introduction

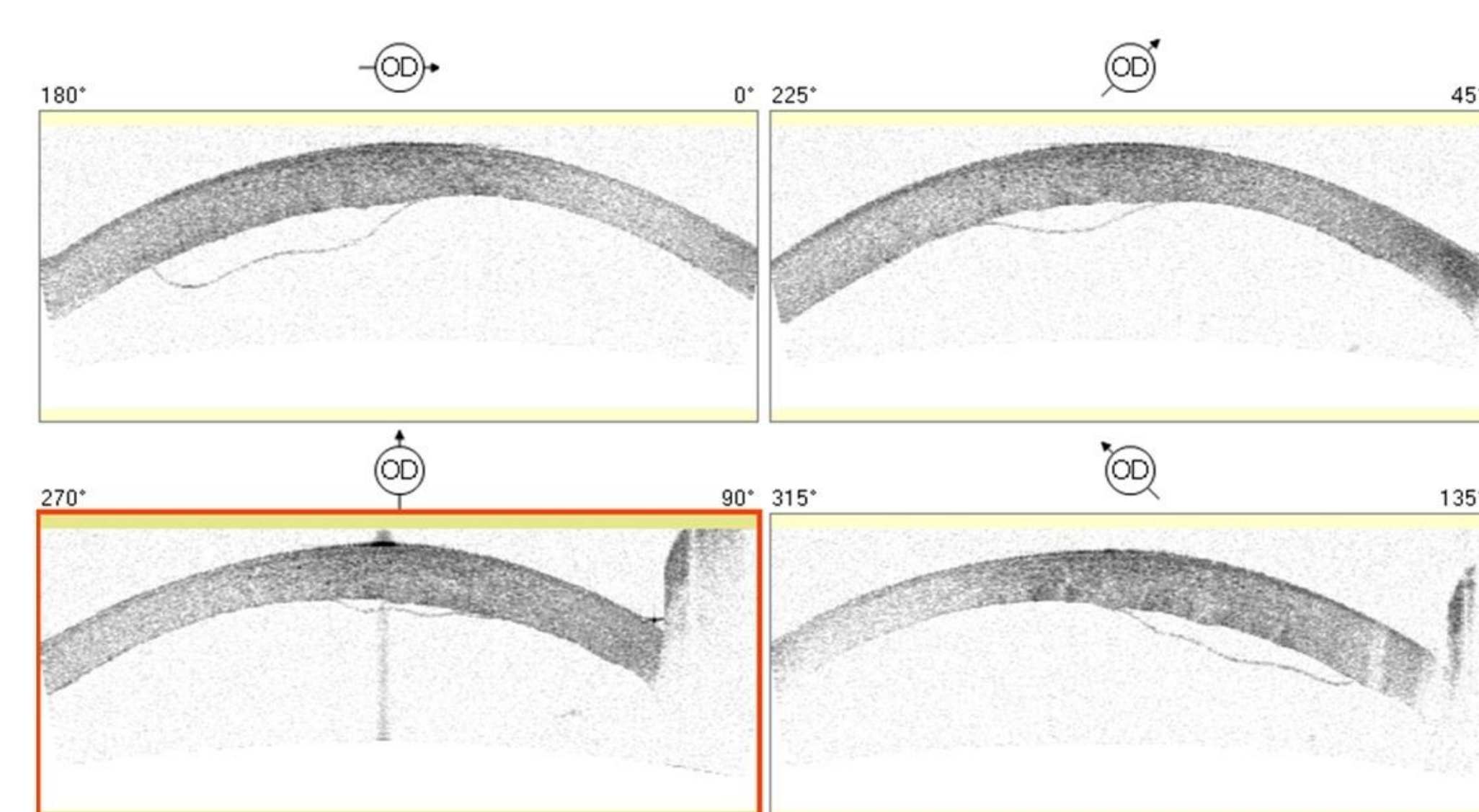
Re-bubbling after DMEK is a regular occurrence. Our current rate is 11%. Being able to identify when, and, if a graft needs to be re-bubbled can save patients undue stress or save a DMEK transplant.

The goal of this project was to compare location of graft separation and stromal edema levels in DMEK eyes. We identified cases that required a re-bubble for full attachment and cases that did not require a re-bubble.

Methods

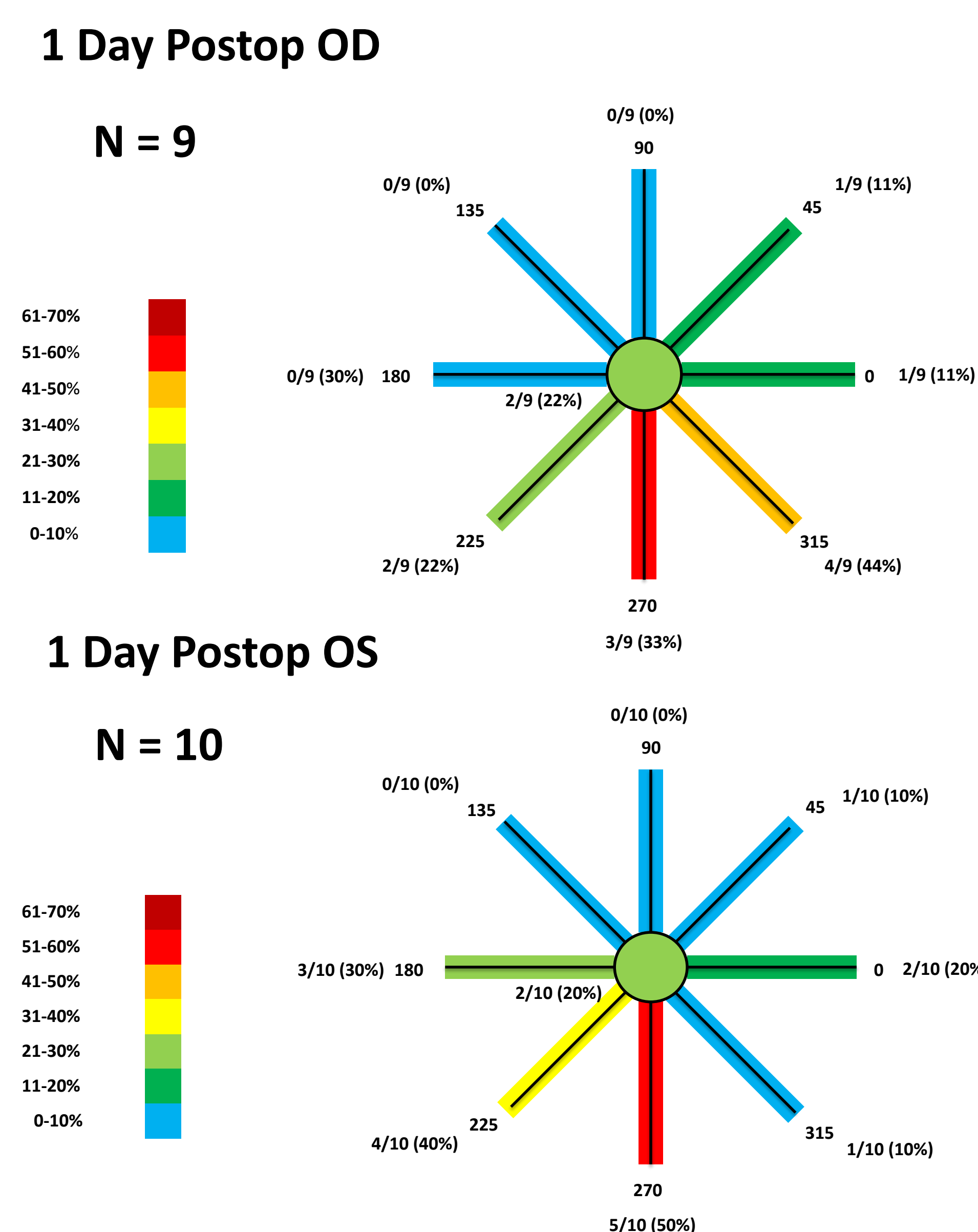
100 DMEK cases with temporal clear cornea incisions had OCT performed postop at 1 day and 6 days post surgery. Nine locations (central, 2 vertical, 2 horizontal and 4 oblique) were evaluated for graft separation and edema at each location and time point. Locations of graft separation and thickness of the cornea was compared between re-bubble and non-rebubble cases.

Figure 1. OCT image of a detaching DMEK graft and location



Financial Interest Disclosures - None

Figure 2. Inferior and Temporal Graft Separation



Results

1,800 data points were analyzed. In the 100 cases, at POD1 19 eyes (19%) and at POD6 49 eyes (49%) had at least one area of graft separation that tended to be temporal and inferior in location. There were 15 re-bubble cases. Of these, at POD1, 3 eyes and POD6 15 eyes had at least one area of graft separation. The location of separation in rebubble cases however included more superior and central separations than the non-rebubble cases at both time points. At POD1 mean central pachymetry for non-rebubbles was 670 $\mu\text{m} \pm 83$ and for re-bubbles was 732 ± 103 . ($p = .023$). At POD6 mean central pachymetry for non-rebubbles was 605 ± 82 and for re-bubbles was 695 $\mu\text{m} \pm 126$. ($p < .001$). At POD1 and POD6 rebubble corneas were thicker (by 40 to 80 μm) in all 8 peripheral areas than eyes that were not rebubbled.

Figure 3. OD and OS eyes with Graft Separations at 1 Week

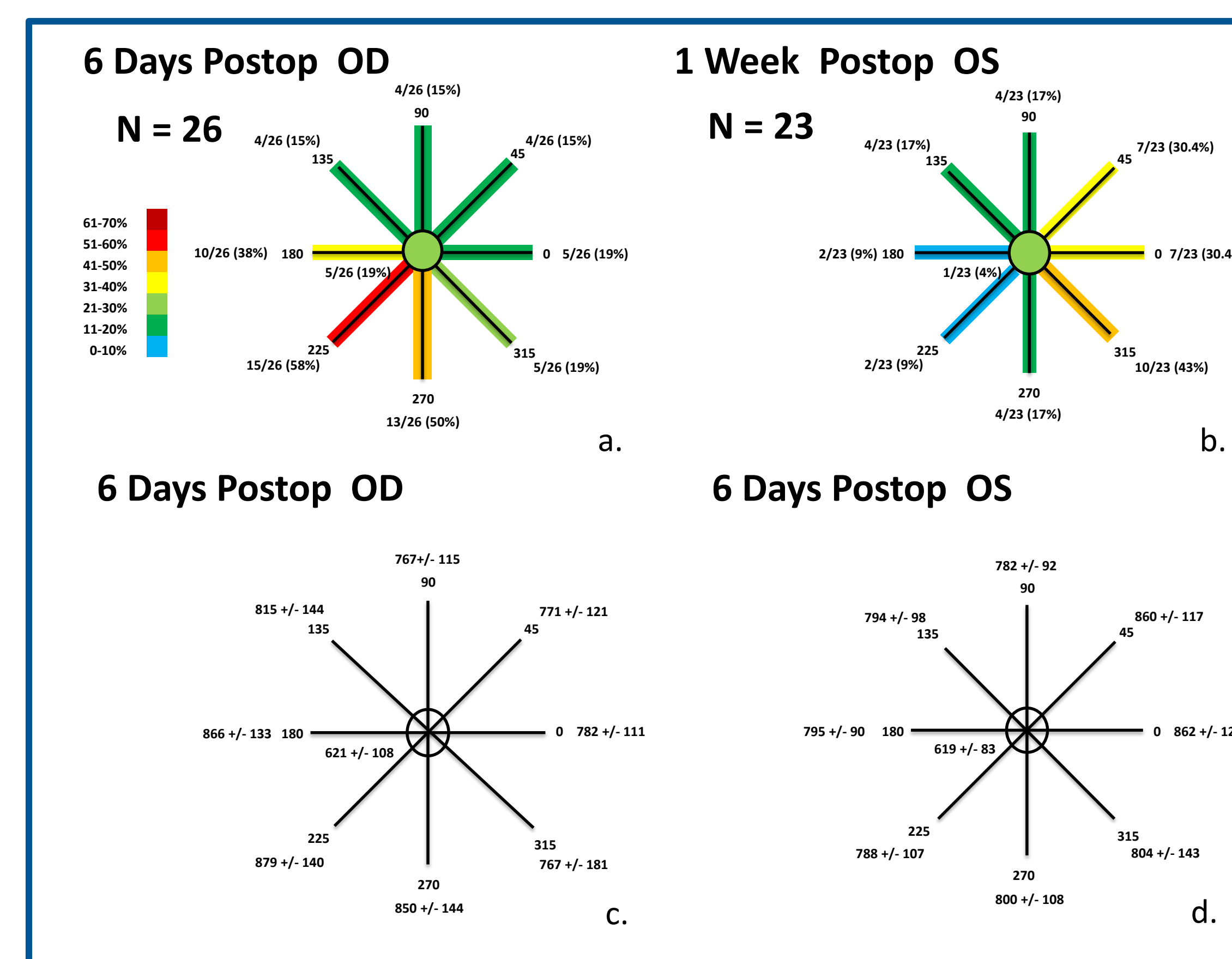


Figure 3a/b. Location and number of detachments on left and the right eyes at Post Op day 6.

Figure 3c/d. Corneal Graft thickness measurements for recipient eyes that had an observed graft detachment at Post Op day 6.

Figure 4. OD and OS Eyes that were Re-bubbled

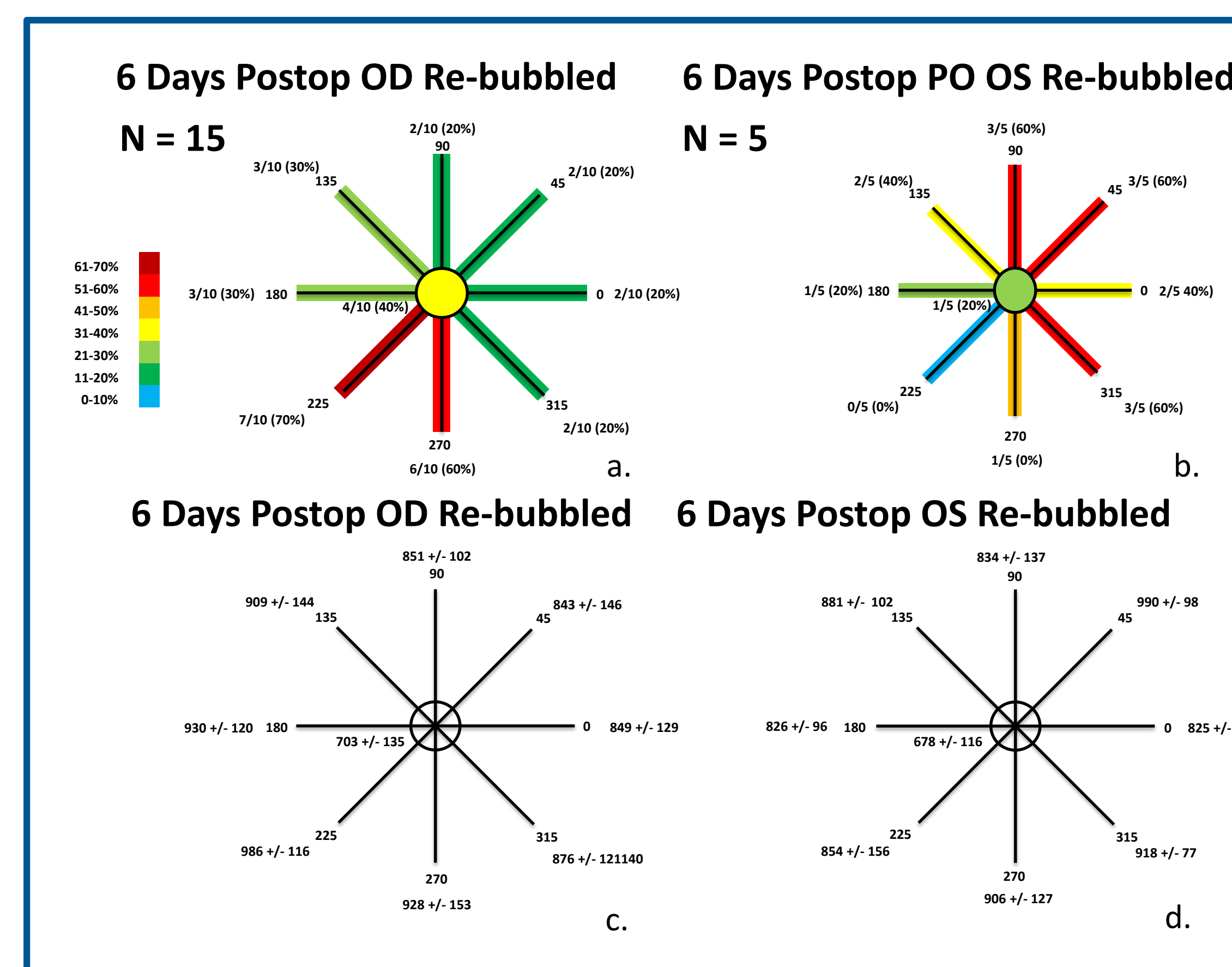


Figure 4a/b. Location and number of detachments on left and the right eyes that had a re-bubble

Figure 4c/d. Corneal Graft thickness measurements for left and right eyes that had a re-bubble

Conclusion

The most common area of DMEK graft separation is inferior and temporal and nearly half of grafts will have some separation at six days postop. Eyes requiring re-bubble were characterized by significantly more central and peripheral edema than other cases on POD1 and distinguished at POD6 by additional superior areas of separation that were rarely seen in non-rebubble cases. Strategies for better graft support of the inferior and temporal areas (gas bubble, head positioning) may prove beneficial in preventing re-bubbles.

Clinical Significance

The incidence of graft separation and need for placement of another air bubble to make DMEK tissue stick is higher than in the related procedure of DSAEK. If we know where separation is most likely to occur and if we can identify the characteristics early on of eyes that will go on to need a re-bubble, then we can consider strategies that can reduce the need for re-bubbling.

This study shows that nearly half of DMEK grafts will have at least one location where the graft edge does not fully adhere by 6 days after surgery. While the most common location was inferior as described by others, the temporal location was also very common, even in eyes that did not need a re-bubble. What distinguished the eyes that went on to re-bubble was the additional areas of non-adherence superiorly and superior temporally, which were rarely seen in eyes that did not need a re-bubble. In addition, the central corneal thickness was statistically more edematous in re-bubble eyes than non-rebubble eyes, as was the peripheral cornea at all locations, at both postop days 1 and 6. This indicates uniformly poor endothelial function early on in re-bubbled eyes vs non-rebubbled eyes. Strategies to reduce the rate of re-bubble to be considered are the use of larger SF6 (20%) gas bubbles and head positioning to the nasal side while supine to get more persistent support by the bubble in the most at risk areas of graft detachment.