RPE Toxicity following Membrane Peeling with Membrane Blue and/or Indocyanine Green

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Objective

To investigate retinal toxicity following membrane peel with the aid of membrane blue or indocyanine green staining using Heidelberg fundus autofluorescence, SD-OCT, and EDI-OCT.

Background

Membrane Blue 0.15% Dutch Ophthalmic USA (Exeter, NH) (a form of trypan blue) is the only drug approved by the FDA for intraoperative membrane staining. Trypan blue crosses the membranes of dead cells but cannot cross intact walls of living cells. Hence Trypan blue stains epiretinal membranes excellently but internal limiting membranes (ILM) variably. Staining epiretinal membranes that are difficult to visualize is useful as residual membrane at the end of a case can theoretically account for recurrence. Staining with membrane blue also aids visualization of proliferative vitreoretinopathy and the posterior hyaloid in cases of vitreomacular traction and diabetic tractional retinal detachments.

Indocyanine green (ICG) is used off-label to stain ILM robustly by virtue of its ability to bind to plasma proteins in living cells. Toxicity from ICG staining intraoperatively has been widely reported. Examples of toxicity include RPE death, VT changes, loss of color vision, and optic nerve pallor (Bernhard).

One case of RPE changes has been reported following the use of trypan blue in macular hole surgery (Rishi). We present a small series of macular holes and one case of RPE changes following the use of ICG.

Methods

Retrospective case series

Patients were included if they showed signs of retinal toxicity following vitrectomy and membrane peel for epiretinal membranes or macular holes.

A literature search for Membrane Blue toxicity was performed in Pubmed looking for Membrane Blue, Trypan blue, Brilliant Blue, mentioned in the title or abstract.

Results

3 cases of retinal toxicity are presented from a single institution by a single surgeon.

Vision ranges from 20/80 to 20/200

FAF, SD-OCT, and EDI-OCT images are acquired over time.

Patients were followed for at least 6 months.

Discussion

• Fundus autofluorescence is an excellent imaging tool to highlight post-peel RPE changes.
• Post membrane peel toxicity can occur following staining with ICG and membrane blue 0.15%
• RPE changes can span a much larger area than the area of membrane peeled
• RPE changes can possibly related to light exposure
• Toxicity can be exacerbated in cases of post-retinal detachment repair or following blunt trauma
• EDI – OCT in this limited capacity currently does not show significant differences post-operatively. More studies need to be performed to assess the relationship.

Case 1 VM

Pre-op OCT shows full thickness macular hole

2 wks post-op OCT shows that foveal contour is intact but there is significant loss of outer retina

1 wks post PPV/MP reveals RPE changes in temporal macula. VA 20/200

Fundus autofluorescence reveals much larger area of RPE changes than area that was peeled.

Case 2 IN

Pre-op OCT OS for 20/100 membrane

Post-operative OCT EDI OS shows thinner choroidal thickness compared to OD. Thickness similar to pre-op. Vision 20/50 with some loss of outer retinal layer definition.

Case 3 JH

Post-operative OCT OD demonstrates outer retinal atrophy and vision of 20/70.

Color fundus photographs show mild RPE changes in inferior macula.

Fundus autofluorescence shows corresponding hyperautofluorescence outside of foveal.

Conclusion

Membrane blue was used in all cases with no toxicity noted. ICG was used in one case with significant toxicity noted.

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Case 1 VM

79 yo w/ b/c retinal detachment repair with buckle develops 20/100 macular hole OS c/o distortion and loss of vision. Pre-underwent 23 g PPV. Membrane blue 0.15% was deposited on the macula but no stain was observed. ICG concentration of 1:12 with BSS is attempted to stain the ILM. Stain is insufficient so 1:6 concentration is attempted, successfully.

Fundus autofluorescence shows full thickness macular hole

Post-operative OCT shows that foveal contour is intact but there is significant loss of outer retina

1 wks post PPV/MP reveals RPE changes in temporal macula. VA 20/200

Fundus autofluorescence reveals much larger area of RPE changes than area that was peeled.

Case 2 IN

62 yo w/ b/c blunt trauma develops 20/100 epiretinal membrane OS c/o distortion and loss of vision. Pre-undergoes 23 g PPV. Membrane blue 0.15% is deposited for 1 minute following air-fluid exchange. The dye is suctioned prior to fluid infusion restarted. Membrane was peeled with ILM forceps.

Fundus autofluorescence shows full thickness macular hole

2 wks post-op OCT shows that foveal contour is intact but there is significant loss of outer retina

1 wks post PPV/MP reveals RPE changes in temporal macula. VA 20/200

Case 3 JH

67 yo w/ b/c retinal detachment repair with buckle develops 20/100 macular hole OS c/o loss of vision. Pre-undergoes 23 g PPV. Membrane Blue 0.15% was deposited on the macula but no stain was observed. ICG concentration of 1:12 with BSS is attempted to stain the ILM. Stain is insufficient so 1:6 concentration is attempted, successfully.

ILM is peeled with ILM forceps and membrane scraper. Patient then undergoes air-fluid exchange, followed by C3F8 14% post PPV/MP reveals RPE changes in temporal macula. VA 20/200

Fundus autofluorescence shows full thickness macular hole

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1 wks post PPV/MP reveals RPE changes in temporal macula. VA 20/200

Fundus autofluorescence reveals much larger area of RPE changes than area that was peeled.