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Introduction

Epiretinal membranes (ERM) are fibrocellular proliferations which are often asymptomatic and idiopathic. When the vision is affected, pars plana vitrectomy (PPV) with peeling of the ERM is recommended.¹ Currently, two platforms can be utilized for posterior pole visualization during surgery: traditional microscope (TM) and 3D heads-up display (3DM).² Several studies highlight the differences between these platforms.^{3,4} An advantage 3DM is the ability to intraoperatively modify the digital image by manipulating parameters such as brightness, gamma, hue, contrast and saturation, which could improve ERM visualization and provide an alternative to the use of dyes that are commonly utilized to identify the ERM tissue.

Methods and Materials

This observational, survey-based study evaluated preferred parameters among surgeons from multiple centers.

Institutional review board approval was obtained to retrospectively evaluate videos of procedures from ten eyes of ten patients, 18 years or older, that underwent PPV for ERM between May-August 2019.

All patients were pseudophakic.

Brightness, contrast, gamma, hue, and saturation were adjusted in each of the 11 optical parameter profiles (OPP) created.

On each OPP one parameter was increased or decreased, randomly, while all other parameters were held constant when compared to the values used for profile 1 (Figure 1).

The resulting image was recorded with each OPP applied before and after staining the macular surface with indocyanine green (ICG) vital dye.

Fourteen graders (6 attending physicians and 8 vitreoretinal fellows) analyzed each recorded video and completed a questionnaire.

Graders were asked to compare each of the 11 OPPs against the control image, using a likert scale, and each profile was graded from 1-7 (1 being the worst and 7 the best).

An average grades were calculated and all graders answered four questions to assess their overall impression of OPPs.

Test parameters	Control	OPP 1	OPP 2	OPP 3	OPP 4	OPP 5	OPP 6	OPP 7	OPP 8	OPP 9	OPP 10	OPP 11
Brightness	40	50	50	50	60	50	50	40	50	50	50	50
Contrast	50	50	50	60	50	50	50	40	50	50	50	50
Gamma	1	1	1	1	1	2	1	1	1	0.5	1	1
Hue	0	0	0	0	0	0	-10	0	0	0	10	0
Saturation	90	150	35	150	150	150	150	150	150	150	150	200

Figure 1. Values of the parameters used in each optical parameter profiles

Results

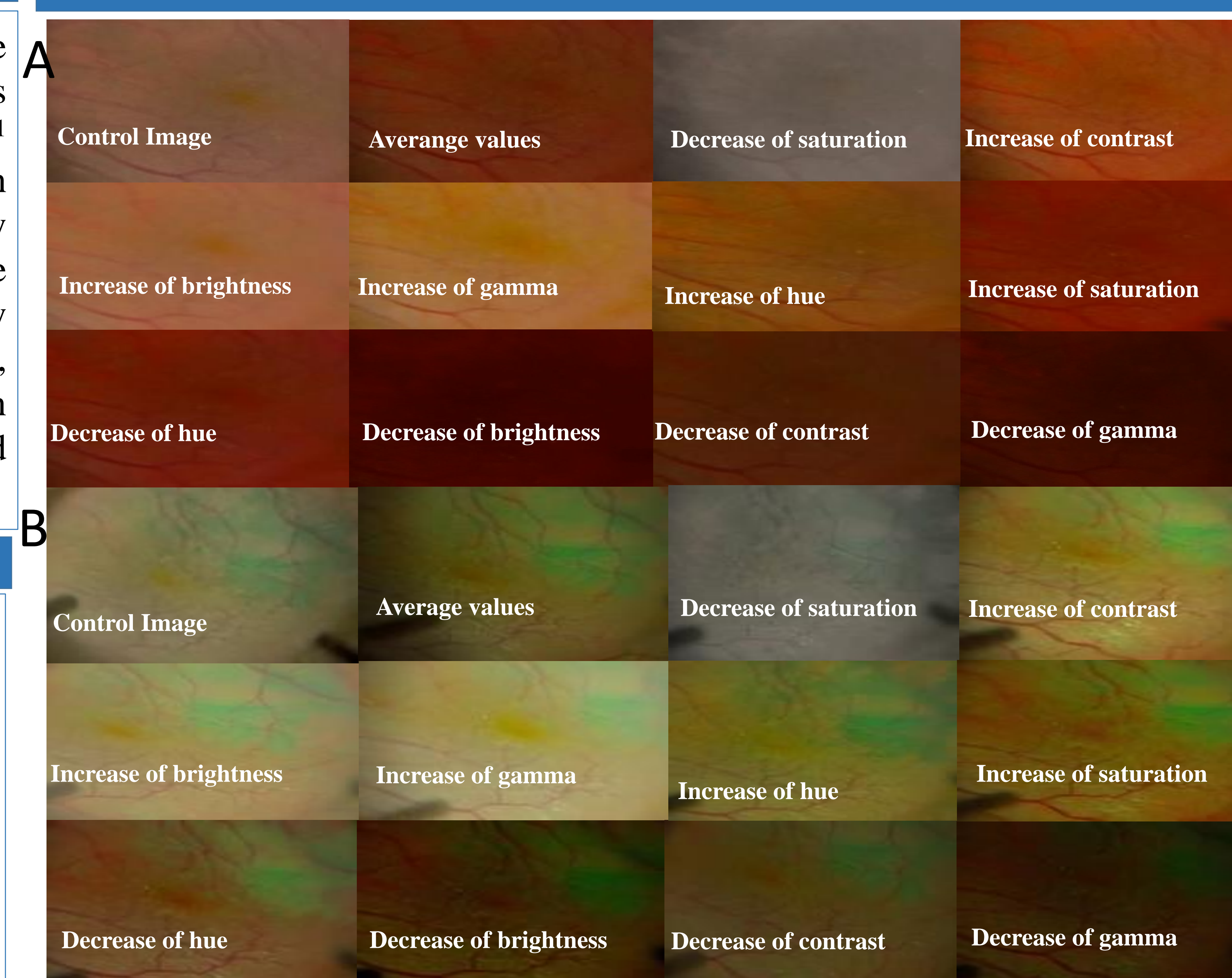


Figure 2: Intraoperative photographs of each unique optical parameter profile during heads-up surgery. Figure 1A: Before use of Indocyanine dye; Figure 1B: after use of Indocyanine dye.

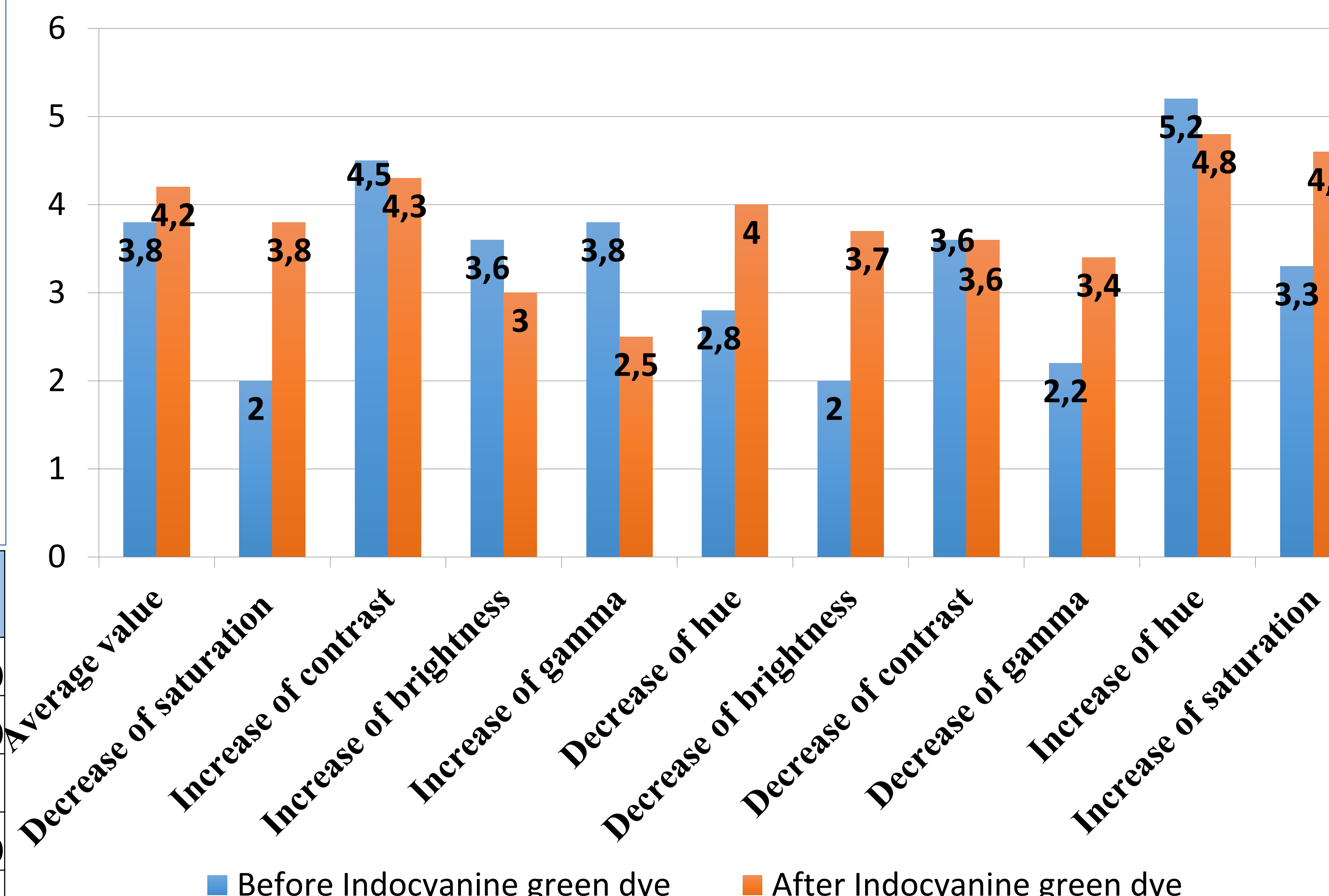
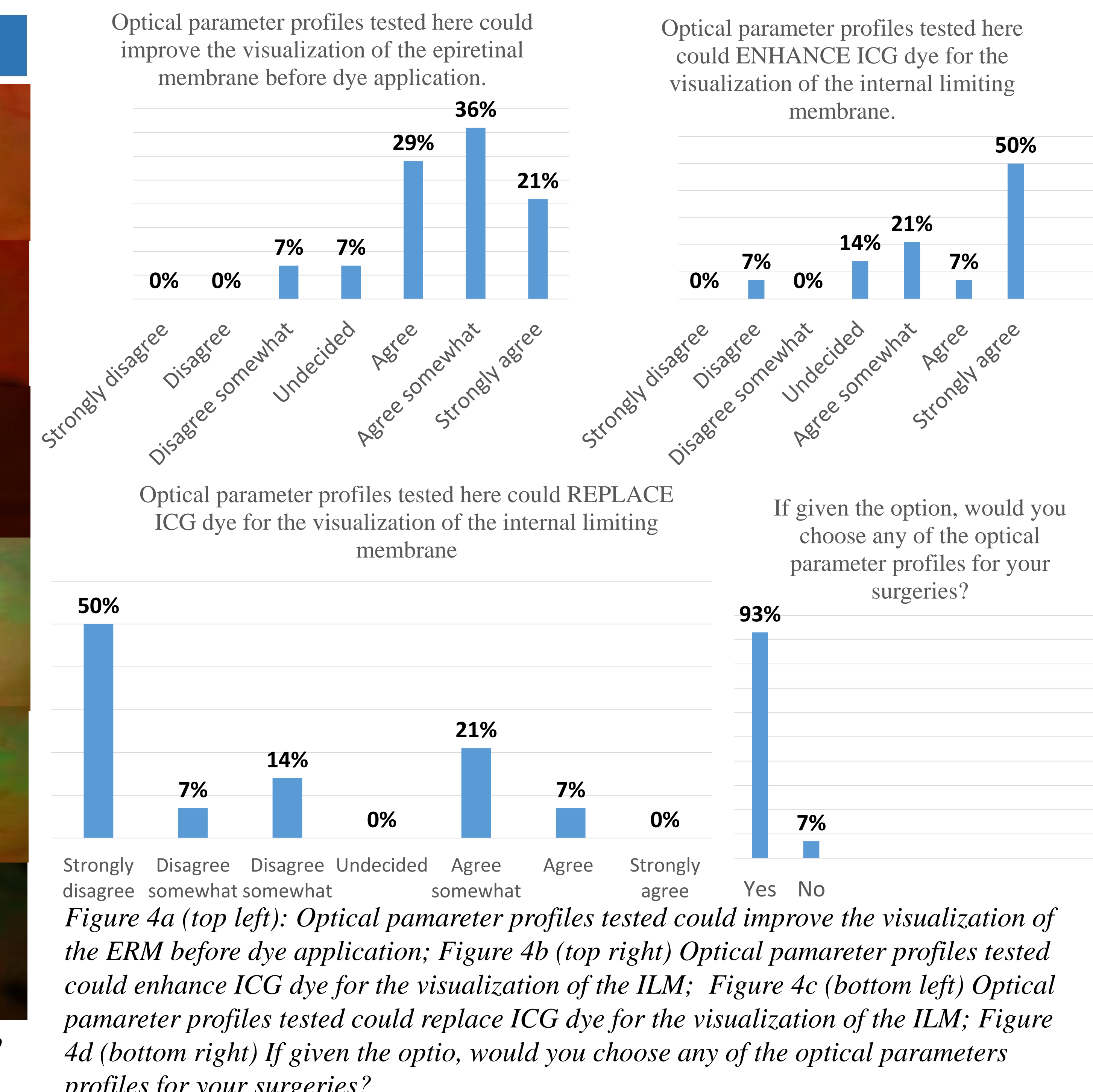


Figure 3: Average grade in each test before and after ICG dye.



Discussion/Conclusion

Before ICG dye, analysis showed increase of hue and increase of contrast received the highest grade average (5.2 and 4.5). After injection of ICG dye, the increase of hue and increase of saturation received the highest grade average (4.8 and 4.6). Most of the graders agreed that optical parameters profiles could improve the visualization of the ERM before dye application (86%) (Figure 4A) but could not replace the ICG dye (71%) (Figure 4C). However, most of the graders agreed that color filter could enhance ICG dye visualization of ILM membrane (78%) (Figure 4B) and 93% would utilize at least one of these filters for their surgeries (Figure 4D).

Our study indicated an overall positive impression of the OPP. The potential advantages of the digital platform in the context of retinal surgery are vast. Investigation into the platforms full potential is still in its early stages, but studies such as this will be instrumental in driving forward the use of this technology.

References

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