Unexplained Visual Loss After Silicone Oil Removal

By Christine Lin, MD

There are several well-known complications associated with long-term silicone oil tamponade, including cataract, glaucoma, and corneal decompensation. Silicone oil removal can be associated with retinal detachment, optic nerve damage, and hypotony. Additionally, unexplained visual loss may occur after silicone oil removal. At VBS|004, Lihteh Wu, MD, reviewed the literature on this important subject, presented study results, and discussed possible reasons for this complication.

Dr. Wu said several reports have described cases of visual loss following silicone oil removal. In the largest study to date, Moorfields Eye Hospital presented the results of 400 patients who underwent silicone oil removal. The study authors reported a 3.3% rate of unexplained visual loss; 50% of patients experiencing visual loss had giant retinal tears. Dr. Wu said that other studies have reported rates of visual loss as low as 1% and as high as 30%.

Dr. Wu described a multicenter, retrospective study of 324 eyes at 11 centers between 2000 and 2012 that sought to report the incidence of unexplained visual loss after silicone oil removal and to describe the clinical features of patients who experienced unexplained visual loss. Significant vision loss was defined as a loss of greater than 2 lines when compared with visual acuity prior to oil removal. Dr. Wu and colleagues found that 13% of eyes experienced significant visual loss after oil removal; 7% were from known causes, but visual loss was unexplained in the remaining 6%. Dr. Wu said his team examined several variables and found that higher intraocular pressure (IOP) and increased duration of silicone oil tamponade appeared to be risk factors for unexplained visual loss. Optical coherence tomography and fluorescein angiography were performed on these patients, but no cause of visual loss was identified.

Several theories have been proposed for why unexplained visual loss occurs after silicone oil removal, Dr. Wu said. One theory suggests that long-term oil tamponade may disrupt the ability of Müller cells to buffer excess intracellular potassium, leading to apoptosis caused by sudden changes in the ionic flux across the retina. This has not been supported by subsequent studies comparing the potassium level in eyes with and without visual loss following oil removal, Dr. Wu noted. Others have proposed phototoxicity as a potential...
tial culprit, as the transmission of high-energy blue light is increased in eyes filled with silicone oil. It is well known that silicone oil impregnates all intraocular tissues. Although this can lead to tissue atrophy, Dr. Wu said, one would expect silicone oil toxicity to cause gradual visual loss rather than the sudden change seen following oil removal.

There were limitations to Dr. Wu’s study. Because it was retrospective, visual acuity checking was not standardized. Dr. Wu and his team did not record the techniques used to remove the silicone oil, and they did not perform any visual fields or electrophysiology studies in those patients who experienced unexplained visual loss. However, the results of the study suggest that better IOP and earlier silicone oil removal may decrease the incidence of unexplained visual loss.

Several retina specialists in the audience also reported unexplained visual loss following oil removal. Harry W. Flynn Jr, MD, discussed the results of a study at Bascom Palmer Eye Institute. Researchers looked at the incidence in patients with 1000 cs oil versus 5000 cs oil and saw a predominance of unexplained visual loss in eyes with 5000 cs oil. They also noted that, if these patients are followed long enough, some do see an improvement in their vision over 6 to 12 months after oil removal. Others in the audience shared anecdotal experiences dealing with this frustrating complication that retina specialists are still working to understand.

Although similar videos have documented this complication, there is little in the way of data. Dr. Leiderman explained that iOCT may one day allow quantitative feedback about how much stress is exerted on the retina during such maneuvers. He added that his lab is working to quantify this stress and to determine the limits and associated consequences for the retina. After desired stress limits are determined, real-time extrapolation of retinal stress from iOCT images could greatly enhance surgical decision-making in the OR. Dr. Leiderman stressed that prospective analyses with patient outcome data will be required before the clinical utility of iOCT is validated.

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repair cases in which cutting the detached bullous retina with the vitreector may occur. Dr. Leiderman explained that an image-guided system could automatically stop the vacuum if the retina quickly jumped too close to the cutter, and that this automated stop could occur faster than the limits of human reaction. Such a system would be analogous to collision-avoidance systems in automobiles, in which a foot-pedal–controlled instrument (an automobile), paired with either radar or optical-based detection, applies the breaks faster than humanly possible when software anticipates a collision.

Dr. Leiderman reported that he is working to develop such a system for vitreoretinal surgery, he called it collision avoidance for vitrectomy. Ideally, this system could prevent iatrogenic retinal breaks from vitreector use. Continuing with the automobile analogy, Dr. Leiderman jokingly suggested that this system might also include a “seat belt” that tightens before an impending mishap, pulling any fellows away from the operating microscope.

Image-guided surgery may offer valuable assistance to even the most skilled and attentive surgeons. Dr. Leiderman provided the following comparison: Airline pilots rarely make errors, but automatic systems have a proven track record of decreasing these errors. In the OR, image-guided systems that integrate intraoperative imaging with instrumentation control may one day work well for skilled surgeons to further improve patient outcomes.

Richard Watson, MD
second-year vitreoretinal fellow, West Virginia University Eye Institute, Morgantown, West Virginia
watsonr@wvumedicine.org

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