Commentary: Retinal pigment epithelium–choroid patch graft for large submacular hemorrhage

Submacular hemorrhage can cause sudden, profound and often irreversible visual loss. Although, it can occur in young patients in the setting of ocular trauma, one is more likely to encounter it in older patients with wet age related macular degeneration and idiopathic polypoidal choroidal vasculopathy (IPCV). It can range from a thin film of blood in the submacular region involving a small area to massive subretinal hemorrhage extending far beyond the arcades. The damage to the vision is multifactorial and involves toxic effects from the hemosiderin and iron, contraction and shearing forces from the fibrin and obstruction of the nutrient transfer.[1,2] The duration of the hemorrhage determines the extent of permanent impairment to the vision and both the duration, as well as the thickness of the blood determine the treatment approach.[1,2]

In an experimental study by Toth *et al*.,[3] it was seen that the photoreceptors become edematous within 24 h of accumulation of blood in the subretinal space. Within 1 week there was more advanced damage due to shearing of the outer segments of the photoreceptors. The retinal pigment epithelial (RPE) cells showed mitochondrial distortion and shortened apical microvilli. By 14 days, there occurs atrophy and disorganization of the outer retina and the RPE. Hence, time is an important factor to be considered in the management of submacular hemorrhage. For small hemorrhages, many clinicians prefer to continue with the anti-vascular endothelium growth factor

antibody monotherapy. Pneumatic displacement with or without tissue plasminogen activator (TPA) is another option which is relatively less invasive and treats the slightly thicker submacular hemorrhages well. The liquefied blood gets displaced from the macula resulting in good visual recovery especially in patients in whom the cause of the hemorrhage is a retinal arterial macroaneurysm or IPCV with extrafoveal polyps. However, there is concern regarding the possibility of increased bleeding following the use of TPA.

Massive submacular hemorrhage is a challenging situation and so far there is no consensus about the best way to tackle it. The goal of the surgery here is to remove the subretinal blood, limit further damage to the photoreceptors, and prevent rebleeding. Going one step further, the diseased RPE and the neovascular tissue at the macula can be replaced by a donor healthy tissue from a peripheral site. Theoretically, this is likely to result in better visual outcome. However, the published studies in this regard have hardly shown significantly better results.[4-6] Even with surgery the vision is no better than counting fingers. In contrast, Boral *et al*.,[7] have shown visual improvement (2.64 ± 0.3 logMAR to 1.095 ± 0.7, $P < 0.05$) over a mean follow-up of 20 months in a limited number of patients. However, the level of evidence in these studies is poor as most are retrospective in nature with very small sample size. A randomized, prospective study by van Zeeburg[6] also turned to be inconclusive due to poor patient recruitment. In a metanalysis by Falkner *et al*.,[8] which included 94 cases (in 9 studies) with RPE transplantation, the mean visual acuity improved from 20/250 to 20/222. Improvement of ≥ 2 lines of vision was seen in 21%, while 22% of patients had deteriorated by ≥2 lines. And the overall complication rate was 61%.

Compared with other vitreoretinal surgeries, the RPE – choroid patch graft surgery has a higher rate of postoperative complications, notably redetachment, formation of proliferative vitreoretinopathy (PVR) and hypotony. The reason for the high rate is thought to be due to the manipulation and cutting of the RPE and choroidwhich leads to dispersal of the RPE cells in the vitreous cavity.[5] The exposed donor site might also contribute to this phenomenon and can also predispose the eye for hypotony. Furthermore, McLaren *et al*.[5] postulate that the heaped up RPE at the posterior pole can obstruct the absorption of the subretinal fluid by the RPE predisposing for a detachment even in the absence of PVR.

The choice of surgical technique in the scenario of a massive, long standing submacular hemorrhage should be carefully weighed for possible benefits versus risk of complications. The etiology, size, and the duration of the hemorrhage will dictate the surgical technique and adjuvants used. The visual potential and the status of the other eye too, play a big role in the choice of the management. Most importantly, the comfort of the surgeon with the technique will determine the surgical approach as this is a challenging surgery and should only be attempted by the confident surgeon. No matter which approach is employed, early management and careful monitoring for possible complications will likely result in a favorable outcome.

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