Commentary: Autologous retinal transplantation for macular hole

Advancements in the surgical techniques and instrumentation over the last couple of decades have revolutionized the surgical outcomes of full-thickness macular hole (FTMH).[1] Patient expectations have also risen at a similar rate. Failure to achieve an anatomical closure becomes a nightmare for the vitreoretinal surgeon. A refractory or persistent FTMH is one which remains open after primary surgery, while a recurrent FTMH is one which re-opens at least four weeks after an initial successful closure.[1]

The incidence of refractory and/or recurrent FTMH ranges from 3.3% to 11.4%.[1] The various risk factors include large size (500 μm as per the BEAVRS macular hole outcome group and 650 μm as per the Manchester Large Macular Hole Study Group), chronic configuration with flat edges, more than six months duration, high myopia, traumatic MH, inadequate internal limiting membrane (ILM) peeling or gas tamponade, patient's inability to maintain postoperative prone positioning, presence of concomitant age-related macular degeneration, and postoperative cystoid macular edema.[1–3] The various treatment options for refractory or recurrent MH include revisional vitrectomy with or without adjuncts like enlargement of the ILM peel, subretinal fluid injection, relaxing retinotomies, retinal massage, autologous platelet-rich plasma, autologous ILM free flap transplantation, lens capsular flap transplantation, autologous retinal transplantation (ART), and human amniotic membrane graft.[1]

We congratulate the authors for their work comparing the various techniques of harvesting full-thickness retinal tissue for large or persistent MH.[4] ART was initially described for the management of refractory myopic MH. Currently, it is also being used for the management of MH with high risk of failure like large size and associated retinal detachment, and secondary to pathologies like trauma, macular telangiectasia, Alport syndrome, etc. The ART Global Consortium showed that 90% of transplants included only the neurosensory retina, whereas the remaining 10% were harvested to include deeper tissue as well, that is, neurosensory retina, RPE, and choroid. The order of preference for clockwise location of graft harvestation was superior (45%), inferonasal (17%), superotemporal (11%), inferior (8%), superonasal (8%), temporal (7%), and inferotemporal (4%). Surgeons preferred to harvest the graft posterior to the equator (84% of cases) rather than anterior to the equator (16% of cases). The graft was tucked subretinally in 19% of cases and positioned pre-retinally or in the same plane in 81% of cases. Most surgeons (60%) aimed to take edge-to-edge size of the graft, whereas 40% preferred an oversize graft.[5] We prefer to harvest a little oversized graft neurosensory retinal graft from the inferonasal quadrant posterior to the equator to reduce the impact of the resultant scotoma and placed it subretinally. The size of the graft can be easily customized intraoperatively. The use of retinal punch and intraoperative ocular coherence tomography (iOCT) makes the graft harvestation and placement easier and accurate.[6] No significant difference has been seen between the tamponade agent and MH closure rate.[5]

The neurosensory retinal graft serves the double purpose of a barrier between the vitreous cavity and subretinal space and as a scaffold for the migration of muller cells. Its advantages over other tissues used for transplantation include easy availability, easy handling due to greater thickness, and better tissue integration. OCT- and OCTA-based studies have shown that the transplanted retinal graft tends to integrate into the host retina with centripetal migration of the surrounding retina, partial outer retinal layers recovery, cellular rehabilitation, and partial vascular reperfusion of the graft. It is hypothesized that the transplanted photoreceptor cells establish synapsis with bipolar cells in the host area. The retinal graft may also contain retinal progenitor cells (RPCs), which have the capability to differentiate into photoreceptor and ganglion cells.[1,7]

Studies evaluating microperimetry have shown an improvement in sensitivity. However, the fixation remains relatively unstable and eccentric. Patients tend to fixate on the nasal or supero-nasal perifoveal region, on or near the border of the transplant. Multifocal electroretinography (mfERG) showed 50% recovery in the responses from the retina stimulated by the first ring and complete 100% responses from paracentral retina covered by the second ring.[8]

The various intraoperative complications include graft slippage, undersized graft, subfoveal retinal pigment epithelium (RPE damage), and intraoperative bleeding.[1,7] Great care must be exercised to maintain the correct polarity of the graft. Postoperative complications include graft dislocation, proliferative vitreoretinopathy changes, retinal detachment, subfoveal RPE damage, choroidal neovascularization (CNV), and subretinal or vitreous hemorrhage.[1,7] Studies with long-term follow-up showed that inner retinal cystic changes were observed in 16%–40% of eyes. However, this did not significantly affect vision.[9] The use of adjuncts like autologous

blood clot, dispersive ophthalmic viscoelastic devices, and PFCL (2 stage surgery) has been proposed to prevent graft dislocation.[1,7]

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