

## Functional and morphological evaluation of autologous retinal graft in large traumatic macular hole

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A 7-year-old boy presented with history of blunt trauma 1 month back. Best corrected visual acuity (BCVA) was 20/200 with optical coherence tomography (OCT) showing a large macular hole. Spontaneous closure of the macular hole seemed unlikely following a month of observation. Pars plana vitrectomy along with autologous retinal graft was performed. At subsequent follow up, hole appeared closed with nasal shrinkage of graft and BCVA improved to 20/100. OCT showed mechanical integration of the graft with adjoining retina. Autologous retinal graft is a feasible option in cases where conventional internal limiting membrane peeling shows lower anatomical success.

**Key words:** Autologous retinal graft, multifocal electroretinogram (mfERG), optical coherence tomography (OCT), pars plana vitrectomy (PPV), traumatic macular hole

Ever since the introduction of surgical technique for macular hole repair, it remains a highly successful procedure with

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high anatomical closure rate.<sup>[1,2]</sup> There are, however, situations including chronic, large, and traumatic macular holes in which hole closure rates are low.<sup>[3-5]</sup> Traumatic macular hole (TMH) are known to close spontaneously the duration of which may vary from 1 week to few months.<sup>[4-6]</sup> However, the closure rates vary widely with a size less than 300-400  $\mu$  showing higher closure rates.<sup>[4,5]</sup> Larger TMH very rarely close spontaneously and usually require surgical intervention. Introduced by Grewal and Mahmoud in a patient with myopic macular hole, autologous retinal graft involves harvesting a retinal graft from a specified site and transplanting it to cover the macular hole surface.<sup>[7]</sup>

### Case Report

A 7-year-old boy presented with history of trauma with a tennis ball 1 month ago with diminution of vision to 20/200 in the right eye. Fundus examination and Optical Coherence Tomography (OCT) at first visit revealed a large size macular hole of basal diameter of 1700 microns [Fig. 1a-c]. At one month follow up i.e., 2 months post injury with no signs of spontaneous closure, the patient was planned for autologous retinal transplantation.

Written informed consent was taken from the patient's parents regarding surgery and publication of this case report along with use of clinical images pertaining to the patient. The surgical technique involved endolaser around the site earmarked for donor site. Endocautery was done to edges of graft to coagulate the bleeder vessels. Intraocular vertical cutting scissor was used to separate the graft and forceps was then used to lift the graft and position it over the base of hole and tuck it in position. The positioning was facilitated using a perfluorocarbon liquid (PFCL) bubble. After fluid air exchange, silicone oil tamponade (1000 centistokes) was done and patient was asked to maintain prone position [Video Clip 1].

At 1-month follow up, OCT revealed a partially closed macular hole with displaced graft attached to the temporal

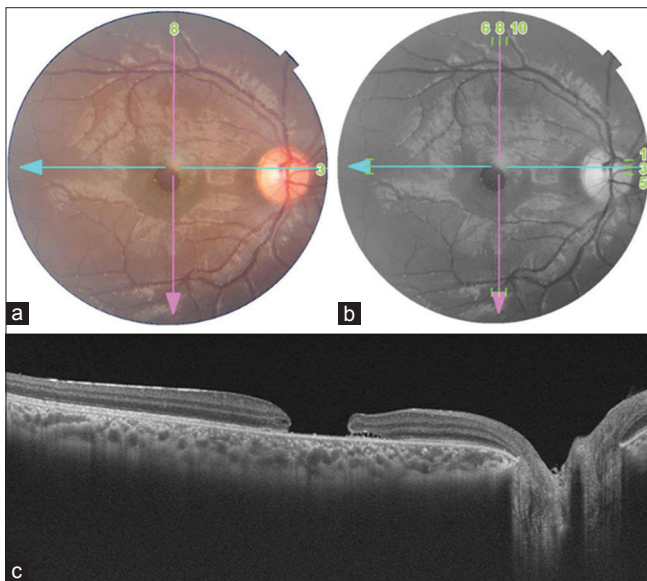
margin of hole. Patient was subsequently planned for silicone oil removal. Intraoperatively, the decentered graft was densely adherent to the temporal edge of the host retina. The graft was repositioned at base of the macular hole and fluid air exchange was done. At 1-month follow up, graft was well taken and appeared integrated with adjoining retinal surface, although it appeared more opaque than the surrounding retina. The retinal layers were however not discernible on OCT.

Visual acuity was maintained at 20/100 at 3-month follow up. OCT revealed graft covering the base of macular hole except for the superonasal aspect where graft had shrunken. The graft did not appear edematous. The host-graft junction was well delineated. However, photoreceptor layer and inner retinal layers were difficult to identify [Fig. 2a and b]. Autofluorescence showed central area of hypoautofluorescence. OCT angiography [Fig. 2c] and multifocal electroretinogram [Fig. 2d] confirmed the finding of suboptimal graft functioning.

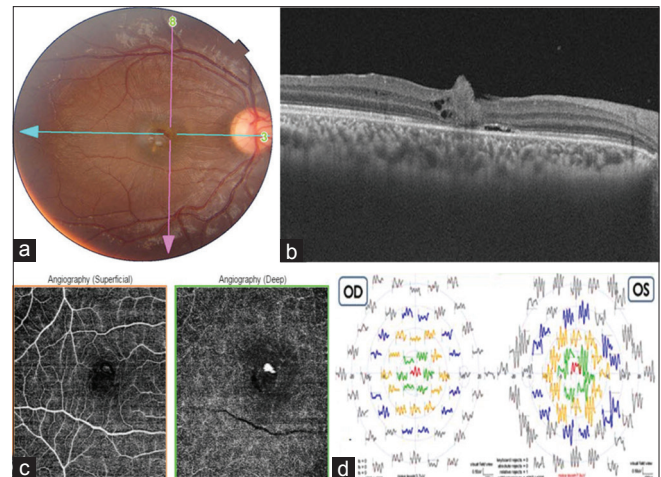
### Discussion

There has been very limited literature on the autologous retinal transplant. Previous reports have noted successful integration of the graft with adjoining retinal layers.<sup>[7-9]</sup> However, in our case the graft uptake was poor with very limited vascularity which was confirmed on OCT angiography. OCT confirmed that the retinal layers were not distinct, and this suggests that the retina may not be functioning optimally in the graft. Intra-operatively, the graft was noted to be densely adherent to the edges of the macular hole, suggesting mechanical integration with the host. However, functional integration may be sub-optimal, as shown by mfERG. Our case indicates that the graft tends to act as a mechanical scaffold with limited functional activity. There is always an inherent property of the retinal graft to shrink with time which was also noted in our case.

The retinal graft technique provides a useful surgical option in these special circumstances where conventional



**Figure 1:** Preoperative fundus photograph and optical coherence tomography (OCT): (a and b) Colour and red-free fundus photo of right eye showing large diameter macular hole (c) OCT showing macular hole with relatively flat edges and no subretinal fluid



**Figure 2:** Three month post silicone oil removal and repositioning of the graft: (a) Fundus photo showing shrunken retinal graft *in situ* with exposed superonasal portion of macular hole (b) OCT showing integrated retinal graft with the donor tissue with poor delineation of retinal layers (c) OCT angiography showing limited vascularization of the graft at level of both superficial and deep capillary plexus (d) Multifocal electroretinogram (mfERG) showing reduced amplitude of N1 and P1 waveforms as compared to fellow eye

Internal Limiting Membrane (ILM) peeling does not yield high anatomical closure rates. The concern at present with this technique is explaining the plausible mechanism leading to improved functional outcomes. Further studies are required to understand whether the neural integration could be improved in autologous retinal transplantation.

#### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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