Surgical Technique

Unilateral double optic nerve head pits with foveo-schisis detachment treated by modified internal limiting membrane peeling technique

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A 44-year-old female with a vision of 10/200 in the right eye had double pits in the temporal segment of the optic disc with serous macular detachment. Spectral-domain optical coherence tomography (SD-OCT) confirmed serous retinal detachment, an outer layer hole, and double optic disc pits. The patient underwent pars plana vitrectomy with modified ILM flap surgery involving fovea-sparing internal limiting membrane peeling (FSIP) technique with inverted ILM flap tucking with gas tamponade. Post surgery, the communications between perineural and intraretinal spaces were obliterated with flaps of ILM covering the pits, with reduced serous macular detachment and BCVA of 20/120. FSIP with inverted internal limiting membrane flap tuck can be an effective technique to manage rare cases of double ODP-M.

Key words: Detachment, disc pit maculopathy, double optic disc pits, fovea, inverted internal limiting membrane flap, optic, schisis, sparing internal limiting membrane peeling

Double optic disc pits are extremely rare. Maculopathy in the form of serous macular detachment and or retinoschisis known as “ODP maculopathy” (ODP-M) is found in 25%–75% of cases in the third or fourth decade of life, more frequently in men. ODP-M has a poor prognosis on observation alone in 75% of cases.

Surgical intervention has been the mainstay of treatment. However, there has been no consensus on the technique of choice. Pars plana vitrectomy (PPV) is the most widely accepted treatment, with adjunctive procedures of internal limiting membrane (ILM) peeling and ILM stuffing inside the pit showing promising surgical results.

Double optic disc pits pose a unique challenge in their management because of the rarity of the condition with no defined surgical technique and sometimes due to different quadrant locations of the pits. Till now, only three cases of double ODP-M managed surgically have been reported.

We describe in this report a rare case of double ODP-M with foveo-schisis detachment managed successfully by a modified technique of inverted ILM flap procedure during vitrectomy.

Method

Single case study describing a modified surgical technique with outcomes.

Case Report

A 44-year-old woman presented with diminution of vision in her right eye for past 1 year. BCVA was 10/200 Snellen in her right eye (RE) and 20/20 in her left eye (LE). Fundus photography showed an oval pit in the macula resembling a hole with serous macular detachment measuring about 2 disc diameter [Fig. 1a]. Superotemporal and inferotemporal aspects of the optic disc had greyish-orange craterlike depressions suggestive of double ODP. SD-OCT of RE showed a normal temporal aspect of macula. The nasal aspect showed outer, middle, and inner layer retinoschisis, the latter communicating with the outer layer hole and schisis detachment underneath the fovea on line scan through macula and optic nerve head [Fig. 1b]. Thus, the foveal pit was a pseudohole due to a drape of ILM covering the inner retinoschisis communication with the outer layer hole and detachment. Corresponding cSLO image of the macula and the optic disc showed ILM folds overlying sensory detachment and hypo reflective dark pits in the temporal aspect of the optic disc [Fig. 1b]. Raster scan through the optic disc revealed at the level of superior pit: communications between perineural and intraretinal spaces, glial tissue/membrane extending from the pit defect inside the optic disc cup [Fig. 1c]; at the level of inferior pit: communications between perineural and intraretinal spaces, and hyperreflective tissue/membrane extending from the pit.
defect inside the optic disc cup [Fig. 1d]. Thus, the detailed anatomy of double ODP-M was outlined.

**Surgical Technique**

Surgery was done on a 25-G MIVS system. Anterior and core vitrectomy was done followed by completion of PVD assisted by triamcinolone acetonide and removal of posterior hyaloid. Next, brilliant blue G (BBG) staining of ILM was done using 0.2 mL with a concentration of 0.25 mg/mL, 0.025%. The glial tissue from inside the pits were first removed followed by peeling of the Elschnig’s membrane to create beds for ILM tucking. Fovea-sparing ILM peeling (FSIP) technique was adopted for the underlying schisis detachment to prevent full-thickness macular hole (FTMH) formation intra or postoperatively. The ILM was peeled off in a centripetal manner by using ILM forceps to raise multiple flaps measuring approximately 1–1.5 times the diameter of pseudohole for 360° around it and the peeling was then extended toward the pseudohole until the ILM flaps remained adherent only to a circular rim of the retina on its surface. Following this, two tongue-shaped ILM flaps hinged on the optic disc margin were fashioned from the nasal macular ILM at the level of superior and inferior ODPS. The bunched-up whorl of foveal ILM flaps was trimmed using the cutter set at low suction and low cut rate. Fluid–air exchange was started and gentle strokes with the soft-tip silicon cannula of flute needle were used to tuck/stuff the ILM flaps into the double pits assisted by aspiration of the fluid at the nasal aspect of the disc. During this maneuver, the mouth of the flute tubing was closed with the fingertip to stop passive suction force, thereby preventing inadvertent flap loss. The surgical steps are summarized in the intraoperative photographs [Fig. 2]. In the end, sulfur-hexafluoride gas (SF₆, 20%) was injected. The patient was asked to maintain a head-down posture for 7 days.

**Results**

Postoperatively at 1 month, BCVA had improved to 20/200 with resolving submacular fluid and ILM flaps over fovea and ODP. At 8 months follow-up, BCVA had improved to 20/120. cSLO and SD-OCT showed decreased subretinal fluid, resolved inner retinal and middle layer retinoschisis, resolving outer layer retinoschisis, closed outer layer hole, thickened vitreoretinal interface, and ILM flaps covering pits [Fig. 3a and b]. Scan of the optic disc showed ILM flaps lining the wall of the disc at the level of superior and inferior pits with obliterated communications between perineural and intraretinal spaces [Fig. 3c–e]. The patient did not come for subsequent visits.

**Figure 1:** Pre-op images. (a) Digital fundus photograph of right eye showing macular neurosensory detachment with a pseudohole and grayish-yellow double optic disc pits in the temporal segment. (b) Confocal scanning laser ophthalmoscope (cSLO) image of macula and optic disc showing the same; spectral-domain optical coherence tomography (SD-OCT) along the green line shows schisis detachment (yellow arrows), outer layer hole, retinoschisis of the inner, middle, and outer retina. (c) cSLO and SD-OCT images of superior pit show communication between perineural and intraretinal spaces (red arrows) and a hyperreflective membrane or glial tissue overlying the pit (blue arrow). (d) cSLO and SD-OCT images of inferior pit show communication between perineural and intraretinal spaces (red arrows) and a glial tissue overlying the pit (orange arrow). Pre-op images. (a) Fundus photograph of right eye showing neurosensory detachment with a pseudohole and double optic disc pits in the temporal segment. (b) cSLO image of macula and optic disc showing the same; SD-OCT along the green line shows schisis detachment (yellow arrows), outer layer hole, retinoschisis of the inner, middle, and outer retina. (c) cSLO and SD-OCT images of superior pit showing communication between perineural and intraretinal spaces (red arrows) and a hyperreflective membrane in the pit (blue arrow). (d) cSLO and SD-OCT images of inferior pit shows the same (red arrows) and (orange arrow)
Figure 2: Intra-op photographs of fovea-sparing internal limiting membrane peeling (FISP) with inverted internal limiting membrane (ILM) flap tuck. (a) At the start of the peeling, removal of glial tissue from the pits. (b) Centripetal peeling of the internal limiting membrane around the fovea started and the raised ILM flap is visible. (c) Whorl of multiple ILM flaps seen around the fovea overlying outer layer hole and schisis detachment. (d) Creation of ILM pedicle flap for inferior pit (yellow arrow) hinged at the disc margin. (e) Double pedicle ILM flaps for superior and inferior pits (arrows) with trimming of bunched-up foveal flaps with cutter. (f) Tucking of pedicle flaps into the pits assisted by passive suction at nasal disc margin along with trimmed ILM flaps covering the fovea.

Figure 3: Post-op images. (a) Digital fundus photograph of right eye shows resolving neurosensory detachment. (b) Spectral-domain optical coherence tomography (SD-OCT) along the green line shows flattening neurosensory detachment, closed outer layer hole, flap covering the vitreoretinal interface, and resolving outer retinal schisis. (c–e) SD-OCT images of the superior pit, central optic cup, and inferior pit shows internal limiting membrane flaps covering the pits with closed communications (yellow arrows) and resolving outer retinal fluid pockets.
Discussion

This case report discusses a unique challenge in the management of temporal segment double ODP-M by a modified surgical technique.

Gregory et al.[7] reported successful anatomical and functional recovery in two cases who underwent vitrectomy along with posterior hyaloid separation, endolaser, and gas tamponade. Babu et al.,[11] however, used partial thickness homologous scleral flaps to plug the pits following ILM peeling with good visual recovery but with persistent but reduced serous retinal detachment.[2] This again highlights the lack of a standard procedure to treat double ODP-M. Even for single-pit maculopathy, a universal surgical technique is yet to achieve any consensus. In the last few years, technique of ILM stuffing combined with long-standing gas tamponade during PPV has been advocated to be an effective treatment strategy for ODP-M.[6,8‑10] The mechanism behind the success of stuffed ILM flap lies in the creation of a barrier along the disc margin by ILM acting as a scaffold for cell proliferation of Müller cells resulting in subsequent glial proliferation. This in turn leads to formation of a physiological barrier for pressure gradients and the passage of fluid within the retinal layers. The above theory is based on the hypothesis postulated by Jain and Johnson.[11] As with any other surgical procedure, complications may arise out of peeling the ILM and fashioning the flap to fill the pit, most notably full-thickness macular hole formation (FTMH). While Shukla et al.[12] reported the development of FTMH in 57% of eyes after vitrectomy with ILM peeling for ODP-M, Idoate et al.[10] did not encounter any ILM-related complications in the largest series to date on ODP-M managed with vitrectomy combined with ILM flap filling of the ODP. The rather safe result obtained in the latter series can be attributed to the “sparing” of foveal ILM as peeling the ILM off the fovea may induce breaking of the thinned central foveal tissue and damage to inner retina.[12,13] This technique was described by Shimada as “fovea-sparing ILM peeling” (FSIP) wherein ILM peeling was started away from the central fovea and restarted from a new site when the peeled ILM flap came close to the central fovea for myopic foveoschisis.[13] Superiority of FSIP in myopic traction maculopathy with good visual outcome and prevention of postoperative macular hole has been validated again recently.[14]

For this case, we used a combination of FSIP with double-pedicle inverted ILM flap tuck inside the pits. During the process at the start of the pit site surgery, glial tissue from inside the pit was first removed. This ensured the removal of additional retinal traction in and around the pit. Gregory et al. found that in all the cases where the fibrous or glial tissue had been removed, OCT images showed a completely attached macula.[7] Postoperatively in this patient, vision improved with a stable vitreoretinal interface, reduced and resolving subfoveal serous fluid and closed communications between the pits and the retina, thereby demonstrating the efficacy of this modified procedure. However, the lack of complete resolution of subretinal fluid was not totally unexpected for two reasons. First, the coexistent double pits in the same segment made it a more complicated anomalous ODP-M. Second, studies have shown the process of subfoveal fluid absorption post surgery is slow and may take anywhere between 6 and 12 months.[10] Nearly 44% of the cases were having persistent foveal detachment at the last follow-up in the study employing ILM flap cover for pits.[10] Therefore, we can expect to see in this case a complete retinal reattachment with improved vision when the patient returns for follow-up.

Conclusion

This is the first case of same-segment double optic disc pits with maculopathy managed successfully by a modified surgical technique of fovea-sparing ILM peeling (FISP) with inverted ILM flap tuck.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report along with the consent to publish the images.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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