SUCCESSFUL REPAIR OF RECURRENT OPTIC DISK PIT MACULOPATHY WITH AUTOLOGOUS PLATELET RICH PLASMA: REPORT OF A SURGICAL TECHNIQUE

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Purpose: To describe vitreoretinal surgical technique of using autologous platelet-rich plasma to aid in surgical repair of optic pit maculopathy refractive to previous vitrectomy.

Methods: A case of an 18-year-old woman presenting with serous macular detachment secondary to optic pit is reported. Patient had previously undergone vitrectomy and peripapillary laser, but had recurrence of subretinal fluid and worsening visual acuity. Autologous platelet-rich plasma was harvested from the patient's blood and purified using Arthrex ACP kit (Arthrex, Inc, Naples, FL). Repeat pars plana vitrectomy was performed with internal limiting membrane peeling extending to the optic nerve. Platelet-rich plasma was layered over the pit and long-acting gas tamponade performed with face-down positioning.

Results: At 8 months of follow-up, subretinal fluid was resolved, the connection between optic pit and subretinal space collapsed and the ellipsoid zone near completely reconstituted on optical coherence tomography. The patient's vision improved significantly from 20/100 to 20/50, which is largely limited by posterior subcapsular cataract.

Conclusion: Platelet-rich plasma can augment anatomical and visual outcomes in surgical repair of optic pit maculopathy.

RETINAL CASES & BRIEF REPORTS 0:1–3, 2016

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Optic disk pit is a congenital excavation of the optic nerve head that is considered to be arising from incomplete closure of the superior end of the embryonic fissure.[1] Approximately one-third to one-half of congenital pits present with maculopathy with inferior-temporal pits located presenting the greatest risk. Fluid tracking from the pit into the macula produces characteristic changes and inner retinal cystic changes resembling macular retinoschisis occur first, and are followed by serous retinal detachment from accumulated subretinal fluid.[1]

The natural history of untreated optic disk pit maculopathy is generally poor. Although some reports describe spontaneous resolution of subretinal fluid with improved vision, most eyes lose vision within the first 6 months that requires the need for intervention.[2] Surgical treatment generally involves pars plana vitrectomy with induction of posterior vitreous detachment, internal limiting membrane (ILM) peeling, fluid-air exchange and gas or silicone oil tamponade.[3] In addition, peripapillary laser has been used to prevent fluid reaccumulation after successful resolution of macular detachment and is generally used in conjunction with

This surgical case was presented in part at the annual meeting of the Retina Society, Philadelphia, PA, September 2014.

None of the authors have any financial/conflicting interests to disclose.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.retinajournal.com).

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vitrectomy and ILM peeling. Techniques using epimacular buckling, drainage of submacular fluid with 42-gauge cannula, or passive drainage through inner retinal fenestrations and application of fibrin glue over the pit was described, but are used infrequently.[1] We report a case of serous macular detachment associated with optic disk pit, which was refractory to previous vitrectomy with peripapillary laser and gas tamponade, but responded well to repeat pars plana vitrectomy, ILM peeling, and application of autologous platelet-rich plasma (PRP) over the optic disk pit and gas tamponade.

Case Report and Surgical Technique

An 18-year-old woman presented with 6 months of progressive vision loss to 20/100 related to serous detachment of the macula and the excavated pit at the inferior-temporal edge of the optic nerve (Figure 1A). Spectral-domain optical coherence tomography imaging showed bullous subretinal fluid with overlying macular schisis tracking to the optic nerve (Figure 1B) with a connection between the subretinal space and the pit. She had previously undergone pars plana vitrectomy, peripapillary laser, and gas tamponade elsewhere, but failed to improve with recurrence of macular detachment and progressive loss of vision.

After the induction of general anesthesia, autologous blood was harvested from the antecubital vein with a citrate-based anticoagulant using a sterile technique. An Arthrex ACP kit (Arthrex, Inc) was used to centrifuge the anticoagulated blood (1500 rpm for 5 minutes) and generate autologous conditioned plasma supernatant, which was enriched in platelets (Figure 1C). She subsequently underwent standard 3-port 23-gauge pars plana vitrectomy and diluted Triesence (triamcinolone acetonide) injection was used to confirm that all the posterior hyaloid remnants were removed. The ILM was stained with indocyanine green and ILM peeling was initiated over the attached retina between the temporal vascular arcades and peeled as a single sheet extending to and including the temporal edge of the pit. Care was taken not to introduce any iatrogenic breaks. Fluid-air exchange was performed with repeated soft-tip aspiration over the nerve initially and then 5 minutes later to verify that all residual fluid had been removed. Platelet-rich plasma was slowly layered over the optic nerve pit (see Video 1, Supplemental Digital Content 1, http://links.lww.com/ICB/A17). The eye was filled with 16% C_3F_8 gas and she was instructed to stay supine for 2 hours followed by face-down positioning for 5 days. In the second postoperative month, she noted subjective

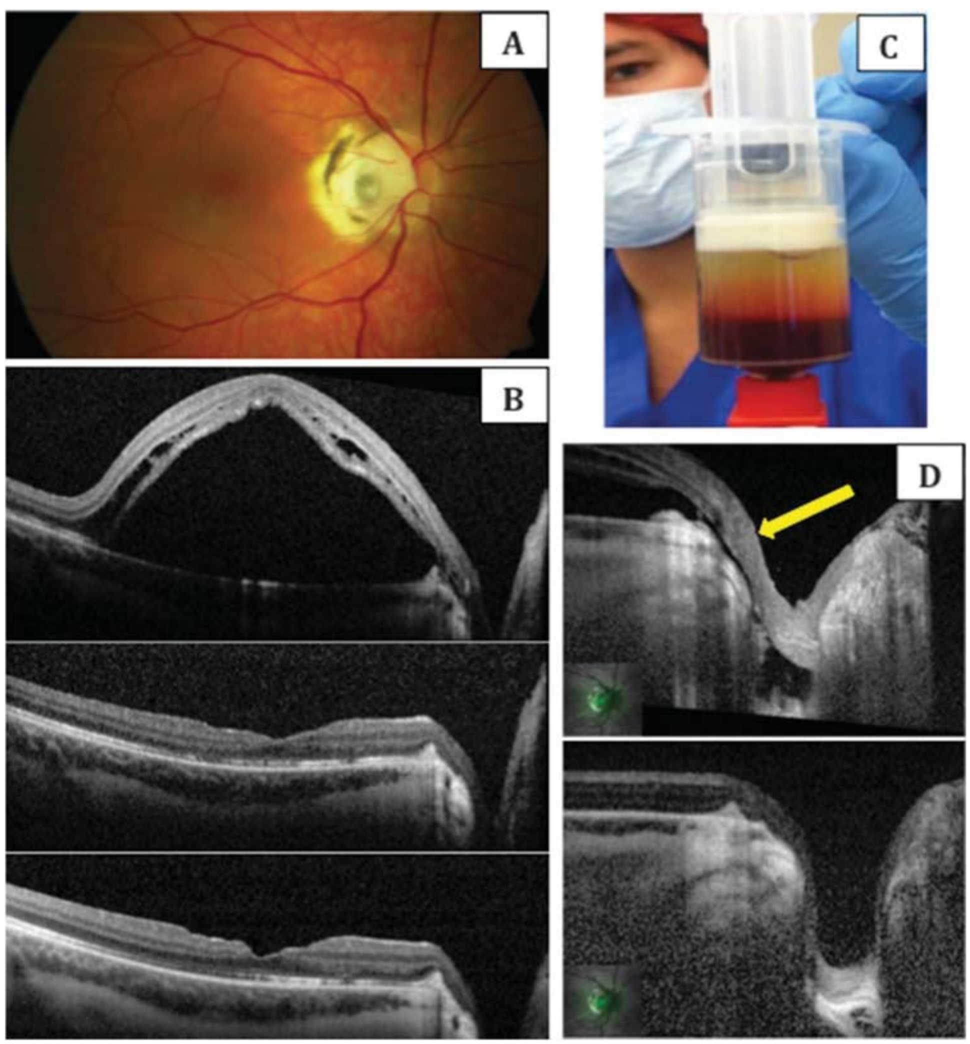

Fig. 1. Optic disk pit maculopathy. Fundus photograph of patient with optic disk pit shows serous macular detachment and peripapillary laser scars just temporal to the disk (**A**). Macular optical coherence tomography shows serous macular detachment with overlying retinoschisis (**B**, top). Spectral-domain optical coherence tomography demonstrates resolution of submacular fluid at 2 months (**B**, middle) and 8 months after surgery (**B**, bottom) with almost complete recovery of the inner-segment ellipsoid zone. The inner retinal contour is greatly improved with the surface irregularity consistent with dissociated optic nerve fiber layer appearance seen after ILM peeling. Intraoperative collection of PRP supernatant after centrifugation of autologous blood (**C**) was achieved using an Arthrex ACP kit. Preoperative 24-line enhanced depth imaging spectral-domain optical coherence tomography through the optic disk shows the pit with a connection to the subretinal fluid in the macula (**D**, top). The same frame postoperative enhanced depth imaging spectral-domain optical coherence tomography demonstrates collapse of the connection and pit cavity with complete resolution of submacular fluid in the second postoperative month (**D**, bottom).

resolution of central scotoma with 20/80 vision, which improved further to 20/50 eight months after surgery and is currently limited by posterior subcapsular cataract. There was complete resolution of subretinal fluid, restoration of inner segment ellipsoid zone, and reconstitution of the foveal contour on spectral-domain optical coherence tomography imaging (Figure 1D). The connection between the optic disk pit and the subretinal space (Figure 1D, yellow arrow) was closed (Figure 1D). No complications were encountered intraoperatively or in the postoperative period.

Discussion

Use of PRP as an adjuvant in the treatment of optic disk pit maculopathy had been previously attempted with some success.[4,5] Platelet-rich plasma represents plasma enriched with autologous activated platelets, growth factors, and cell adhesion molecules (PDGF, IGF-1, TGF-β, bFGF and EGF) and is presently FDA approved to enhance wound healing in orthopedic and plastic surgery procedures. In ophthalmology, PRP has been used previously for corneal epithelial wound healing specifically in conditions, such as severe dry eye syndrome, post laser in situ keratomileusis ocular surface syndrome, nonhealing epithelial defects, and with amniotic membrane transplantation for surface reconstruction after corneal perforation. In intraocular surgery, PRP has been used to improve closure rate after macular hole surgery.[6] However, the mechanism by which PRP promotes closure of macular holes and optic disk pits remains unknown. One possibility is that PRP can percolate through porous breaks in the diaphanous membrane covering the pit and stimulate healing or serve as an adhesive aiding in closure of the fluid flow channel into the pit and its interconnections to subretinal space. Unlike fibrin glue, which is more solid, PRP is a liquid, which can more easily penetrate through microbreaks and stimulate closure of the fluid flow channel. However, we have not observed vitreoretinal traction or microbreaks on ophthalmoscopy and on high-density enhanced depth imaging spectral-domain optical coherence tomography through the pit and the macula in the patient (Figure 1, B and D). Another possibility is that PRP reaches the pit cavity by passive diffusion. Although the human retina would normally exclude molecular species larger than 76.5 KDa, thinning retinal tissue overlying the pit in combination with ILM peeling immediately before application of PRP may transiently increase the permeability of the neurosensory retina to larger molecular species and allow for penetration of PRP. Even if the cellular elements (platelets) were excluded, penetration of cytokines and cell adhesion molecules could promote healing and adhesion, and facilitate the closure of the porous spaces in the optic disk pit cavity. Use of intraoperative optical coherence tomography with real-time imaging during administration of PRP may serve to clarify this mechanism in the future.

The long-term safety and efficacy of PRP after vitrectomy surgery is unknown. Although complete resolution of submacular fluid was observed in this case, recurrence of macular detachment after initial successful repair has been observed in patients with optic disk pits, months and years after treatment. Additionally, ILM peeling was not performed as part of the initial surgical repair and may have played a role in the eventual resolution of the optic disk pit maculopathy. Although no adverse effects related to the use of PRP were observed in this case or reported in the literature when used for ocular surface conditions, there is at least a theoretical concern that PRP can trigger or exacerbate the formation of proliferative vitreoretinopathy. We have not observed recurrence of subretinal fluid or proliferative vitreoretinopathy in this case, but long-term follow-up of these patients is necessary.

In summary, autologous PRP may be an effective and safe adjuvant in surgical repair of recurrent optic disk pit maculopathy and may be considered in the primary repair of optic disk pit maculopathy.

Key words: optic disk pit, pars plana vitrectomy, platelet-rich plasma, serous retinal detachment.

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