Internal Limiting Membrane Dehiscence and Rouleaux Formation in a Case with Branch Retinal Vein Occlusion and Macular Edema Treated with a Single Dexamethasone Implant Administration. A Case Report

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SUMMARY

A 70-year-old woman was examined with a 10-day history of photopsia and floaters in her left eye. Her best-corrected visual acuity was 20/25 in both eyes, with a normal intraocular pressure and some nuclear sclerosis. Spectral-domain optical coherence tomography revealed a separated posterior vitreous, with a rolled internal limiting membrane flap and inner retinal dimples in the left eye. Optical coherence tomography angiography demonstrated reduced vessel density in both the superficial and deep capillary plexuses of the left fundus. Sixteen months earlier, she had received a single intravitreal Dexamethasone implant injection, due to inferotemporal branch retinal vein occlusion-related macular edema. A diagnosis of internal limiting membrane tear following an uneventful posterior vitreous detachment was reached and no treatment was recommended.

Key words: Dexamethasone implant, inner retinal dimples, internal limiting membrane tear, intravitreal injection, macular edema, optical coherence tomography, posterior vitreous detachment, retinal vein occlusion

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INTRODUCTION

The current treatment option for branch retinal vein occlusion (BRVO) and macular edema is intravitreal administration of either anti-vascular endothelial growth factor (anti-VEGF) therapy or Dexamethasone implant [1]. Intravitreal administration of Dexamethasone implant has been associated with a range of potentially severe ocular complications, including endophthalmitis, posterior subcapsular cataracts, increased intraocular pressure, anterior chamber migration, viral retinitis, ocular toxoplasmosis, activation of latent intraocular infections, hypotony, vitreous hemorrhage, retinal tear with retinal detachment, secondary epiretinal membranes (ERM), subconjunctival hemorrhage, and intralenticular implantation [2–5].

Internal limiting membrane (ILM) tear has been documented in association with ERM and acute central retinal artery occlusion [6–9]. The occurrence of an ILM tear in an eye treated with an intravitreal Dexamethasone implant administration has not been documented thus far. We describe the presence of ILM tear with a rouleaux formation in a patient who underwent a single Dexamethasone implant administration and experienced posterior vitreous detachment (PVD).

CASE REPORT

A 70-year-old woman was examined with a 10-day history of photopsia and floaters in her left eye. There was no history of trauma. She had high blood pressure.

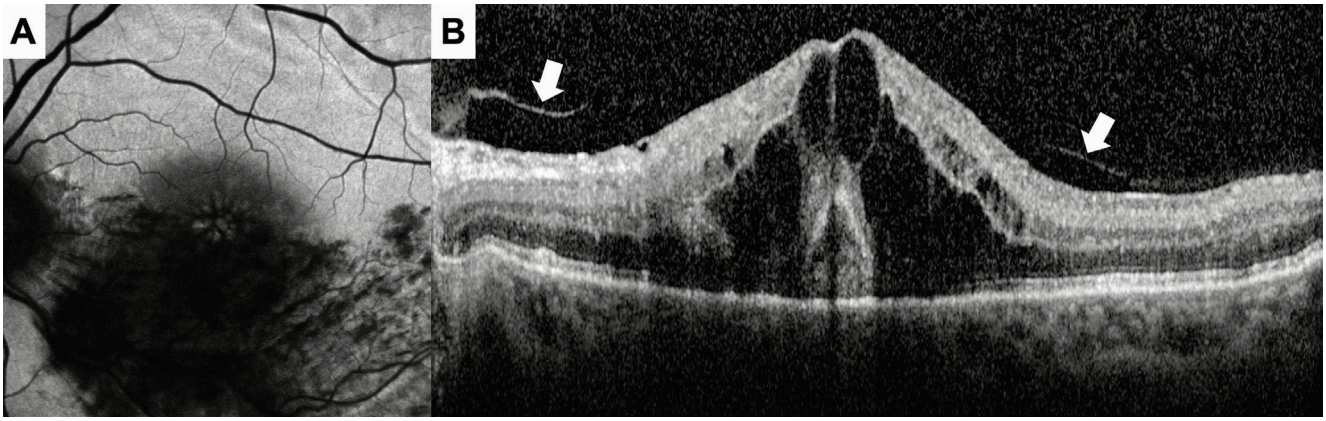

Figure 1. Left eye. Seventeen months prior. Optical coherence tomography demonstrates the increased retinal thickness due to macular edema and vitreomacular adhesion (white arrows)

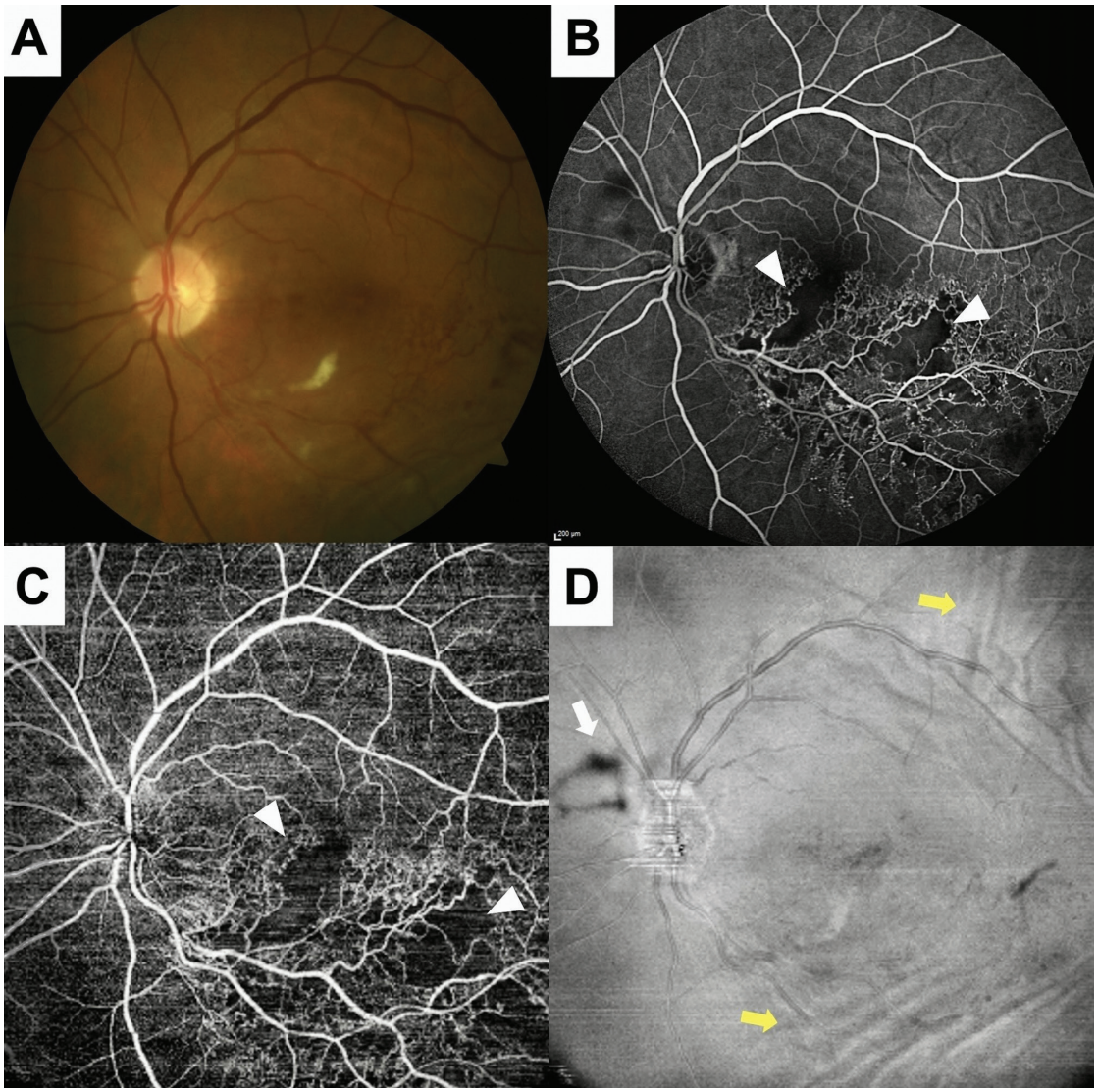

Figure 2. Left eye. Seventeen months after the initial presentation. (**A**) Color fundus photograph showing a few hemorrhages with some collateral formation. (**B**) Venous phase of fluorescein angiography depicting the non-perfuses areas (white arrowheads), microaneurysms, and collateral vessels at the inferotemporal retina. (**C**) 12x12 mm optical coherence tomography angiographic section revealing the flow void areas, decreased vessel density, and collateral vessels (white arrowheads) located at the inferotemporal macular region. (**D**) The presence of the Weiss ring (white arrow) and an appearance resembling a dissociated optic nerve fiber layer (yellow arrows) was observable on 12x12 mm en-face OCT images

Seventeen months prior, she had been diagnosed with an inferotemporal hemorrhagic-looking BRVO in the left eye, featuring flame-shaped retinal hemorrhages and significant central macular edema with a vitreomacular adhesion (Figure 1). Her best-corrected visual acuity (BCVA) was 20/200 in her left eye at that time, and a single intravitreal Dexamethasone implant administration was performed. The patient did not attend any follow-up visits over the subsequent 17 months.

Upon examination at the actual admission, her BCVA on the Snellen chart was 20/25 in both eyes. Slit-lamp examination revealed a moderate nuclear cataract, and intraocular pressures were within normal limits in both eyes. Dilated fundus examination of the right eye was unremarkable. In the left eye, no retinal tears were detected; however, a few hemorrhages were present, along with some collateral vessels in the inferotemporal macula (Figure 2A). There were non-perfusion areas at the inferotemporal arcade on the fluorescein angiogram of the left eye (Figure 2B). 12x12 mm optical coherence tomography angiography (Triton, Topcon Inc., Oakland, New Jersey, USA) (Figure 2C) demonstrated flow void areas and reduced vessel density at the superficial capillary plexus layer, together with the collateral vessels at the inferotemporal macula of the left fundus. The presence of the Weiss ring and dissociated optic nerve fiber layer appearance that indicates the ILM defect could be detected on 12x12 mm en-face optical coherence tomography (OCT) (Triton, Topcon Inc., Oakland, New Jersey, USA) images (Figure 2D). Spectral-domain OCT scans (Heidelberg Spectralis, Heidelberg Engineering, Heidelberg, Germany) (Figure 3) depicted a marked ILM flap with a rouleaux

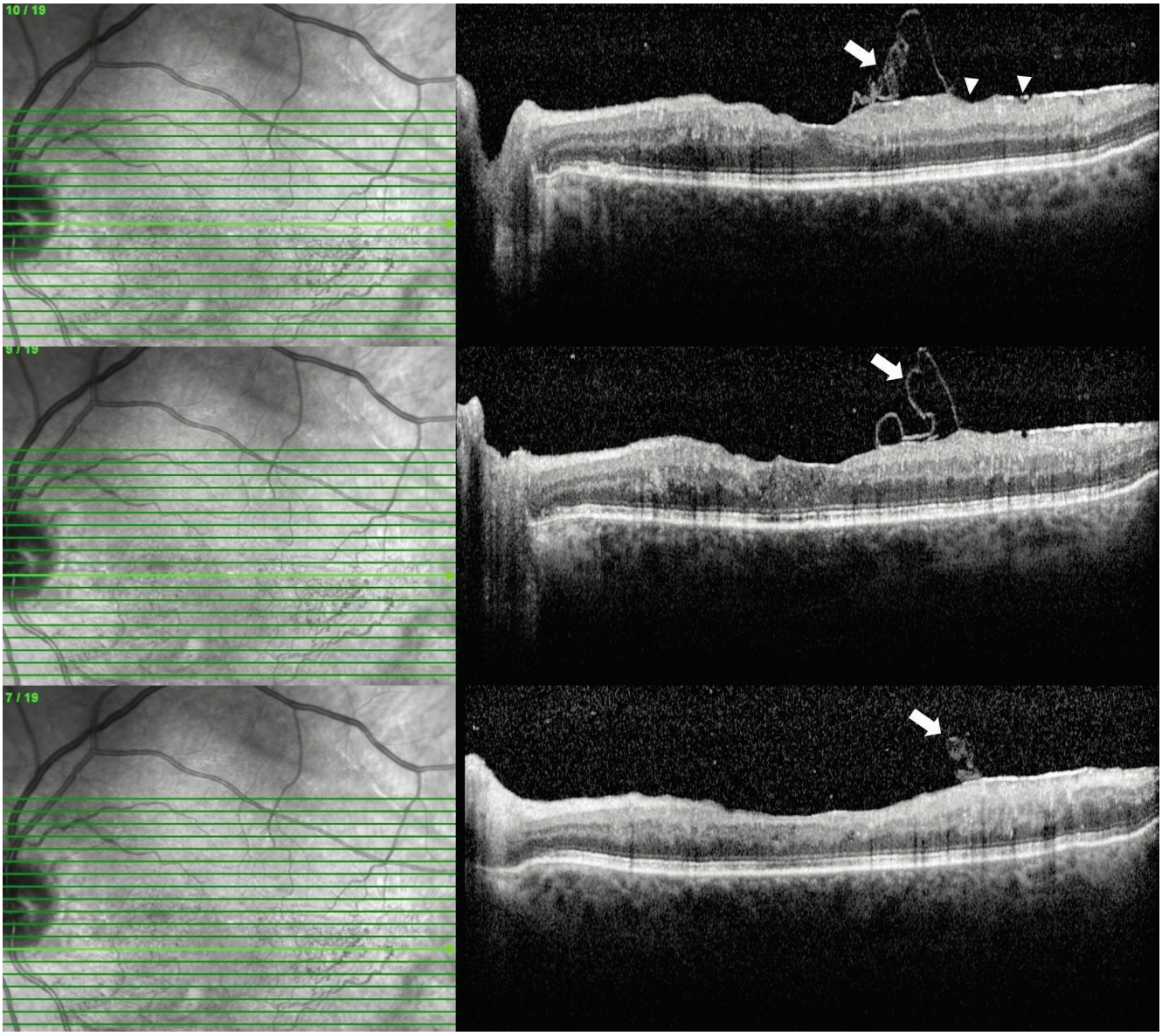

Figure 3. Serial spectral domain optical coherence tomography sections of the left eye clearly illustrating a tear in the internal limiting membrane (white arrows) located temporal to the foveola. There were irregular areas of dimpling within the region of internal limiting membrane dehiscence (white arrowheads)

formation, located just temporal to the foveola in association with the PVD. Typical inner retinal dimples were also noted within the area of the ILM dehiscence. Our diagnosis was ILM tear and roll in association with the PVD. No treatment was recommended.

DISCUSSION

Internal limiting membrane represents the basal lamina of the inner retina and Müller cells, and it has been demonstrated to play a crucial role in maintaining the homeostasis of the retinal microenvironment [10,11]. Müller cells play a vital role in preserving the structural integrity of the foveal walls surrounding the central foveola. Their footplates are located between the ILM and the external limiting membrane [12]. Inner retinal dimples corresponding to thinning the ganglion cell/retinal nerve fiber layer (RNFL) thinning, are frequently reported after the vitreoretinal surgery with ILM peeling [11,13]. Dimpling is thought to be associated with the trauma to Müller cell footplates, in conjunction with the subsequent healing process [14,15]. Histopathological studies have demonstrated that peeled ILM retains the Müller cell footplates. Therefore, conditions that are fraught with Müller cell degeneration may exhibit inner retinal dimples [13,16,17]. The presence of inner retinal dimpling also suggests to us the ILM dehiscence and tear in the present case. Jain et al. [9] reported the clinical features, multi-modal imaging characteristics, and prognostic value of ILM detachment in acute central retinal artery occlusion. They hypothesized that as ischemia worsened, increasing damage to Müller cells resulted in structural disintegration, leaving the ILM unsupported [9].

In 2008, Bovey and Uffer [6] documented a series of 23 eyes with ERM, in which tearing and folding of the ILM were identified by time-domain OCT. They hypothesized that large ILM tears might be caused by vitreoretinal traction occurring during the PVD [6]. In the present case, vitreomacular adhesion was observed prior to intravitreal Dexamethasone implant injection. However, subsequent OCT imaging revealed the detached posterior vitreous along with an ILM tear and retinal dimpling. On the other hand, it is also well known that intravitreal anti-VEGF injection may induce PVD [18]. Durrani et al. [7] retrospectively examined 71 eyes from 70 consecutive patients who underwent ERM peeling and found that large ILM tears were present in 23 of the 71 eyes (32.4 %) that underwent vitreoretinal surgery. The authors claimed that large ILM tears were true dehiscences of the ILM and could easily be missed preoperatively without careful examination with multimodal imaging [7]. They also pointed out that tearing of the ILM occurred along the major retinal blood vessels, where the ILM was thin, and suggested that ILM might have been weakened further by micro-dehiscences related to vitreoretinal traction during the age-related PVD.

Hussnain et al. [19] reviewed their surgical cases and reported similar ILM tears, which they termed as "ILM dehiscence". They also observed a protrusion of the RNFL schisis through the dehiscence of the ILM on a horizontal B-scan and designated this finding as the "spaghetti sign". They suggested that presence of the spaghetti sign should alert the surgeon to a potential ILM tear before the surgery. They recommended not to peel ILM over these areas, to prevent further damage to the underlying exposed neurosensory retina in such instances [19].

The ILM is recognized for its reduced thickness over the major retinal vessels [20]. Yeo et al. [8], reported that the spaghetti sign did not only indicate the RNFL schisis, but also the presence of torn and scrolled ILM in a retrospective review of 158 consecutive patients with idiopathic ERM, including 19 with bare RNFL and 139 without, who underwent vitrectomy [8]. They also hypothesized that traction forces applied to these major vessel arcades might contribute to disruption and tearing of the ILM at these locations [8].

In the present case, multimodal imaging demonstrated a complete PVD and ILM dehiscence with rouleaux formation, together with inner retinal dimples strongly suggestive of ILM tear. Posterior vitreous detachment might have developed as a consequence of intravitreal Dexamethasone implantation, or spontaneously as the result of age-related vitreous liquefaction. Although ILM tears are often reported in association with ERM, they may also occur in situations where Müller cell support is compromised due to ischemic processes or other factors, including those characterized by vitreoretinal traction.

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