Case report

Posterior pole retinal tears following blunt ocular trauma

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ABSTRACT

Purpose: Posterior pole retinal tears occur rarely following blunt trauma. We describe a case of traumatic macular tears, without concurrent peripheral retinal tears or holes.

Observations: A 17-year-old patient presented to our emergency unit with blunt ocular trauma and multiple maxillofacial fractures after being assaulted. On examination visual acuity was 20/200 in the left eye with scant vitreous and preretinal hemorrhages. Funduscopic examination revealed multiple chorioidal ruptures running concentrically to the optic disc, a subretinal macular hemorrhage, and a large macular tear in the area of the inferior vascular arcade just temporal to the macula. Optical coherence tomography revealed subretinal fluid in the foveal area, chorioidal ruptures and a slight elevation of the macular retinal tear margins without subretinal fluid. Laser retinopexy was performed around the macular tear nasally. On follow-up, the retina in the lasered area remained flat, while a shallow retinal detachment had developed temporal to the tear, with a second tear appearing supero-temporally to the macula. Laser retinopexy was not possible due to surrounding subretinal hemorrhage. The clinical course was later complicated by macular detachment, necessitating pars plana vitrectomy with endolaser around the posterior tears and the retinal peripherly, and silicone oil injection.

Conclusions: While traumatic macular holes and traumatic macular choroidal ruptures have both been extensively described, posterior pole and macular retinal tears following blunt trauma have rarely been reported. This case illustrates this unusual finding, discussing the possible pathogenic mechanisms and the importance of close follow-up of patients after blunt trauma with appropriate imaging.

1. Introduction

Blunt ocular trauma is a significant source of ocular morbidity worldwide. About two million people in the United States annually are estimated to suffer ocular injury requiring treatment.1 Additionally, ocular trauma is a leading cause of acquired monocular visual disability and blindness in children. In an Israeli survey published in 1990, almost half of ocular trauma cases were sustained by children younger than 17 years of age, with 38.1% of injuries occurring at home, 26.8% in the street, and some 65.1% during play and sports.2

We present the unusual case of post-traumatic macular tearing due to blunt trauma. We include documentation of the clinical course using color ultra-widefield fundus photography, optical coherence tomography (OCT), and fundus autofluorescence performed during follow up, both before and after treatment. This case report postulates the pathogenesis of macular tears following blunt ocular injury, and underscores the importance of close follow-up of blunt trauma with appropriate imaging.

2. Case

A healthy seventeen-year-old boy without prior ocular history presented to our emergency department following his assault, having sustained multiple high impact fist blows to the left side of his face. Initial exam showed significant left facial deformation and swelling with tense eyelid hematoma precluding examination of the left globe. The right eye had a visual acuity of 20/20 and an unremarkable exam. Upper and lower left lid skin lacerations were treated with suturing and skin adhesive. Noncontrast head computed tomography (CT), revealed medial and lateral wall and orbital floor fractures with mild prolapse of the orbital fat into the maxillary sinus, while the globe structure appeared to be preserved (Fig. 1A–C). The next morning, the left eye was examined with the resolution of eyelid swelling. He had a visual acuity (VA) of 20/200 from an inferior angle, a negative relative afferent pupillary defect, diffuse hemorrhagic chemosis, a deep and quiet anterior chamber and a clear and central crystalline lens. The peripheral retina appeared flat with signs of commotio retinæ and mild intra-retinal hemorrhages inferiorly, however vitreous and preretinal hemorrhages prevented an adequate view of the posterior pole.

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On day three post-trauma, the vitreous and preretinal hemorrhages had cleared sufficiently to allow partial evaluation of the posterior pole. Visual acuity was stable, and multiple choroidal ruptures running concentrically to the optic disc were noted, along with a subretinal macular hemorrhage, and a large tear in the inferotemporal macula (Fig. 2A). Fundus autofluorescence (Fig. 2B) demonstrated hypo-autofluorescence in the areas of choroidal rupture due to the blockage effect of subretinal hemorrhage. On OCT (Fig. 2C-F) the macular tear had locally elevated margins without surrounding subretinal fluid. Taking into account that the patient was scheduled to undergo maxillo-facial surgery, laser retinopexy was performed in the inferotemporal macula surrounding the tear nasally in an attempt to prevent retinal detachment (Fig. 2F). Subretinal blood temporal to the tear precluded laser treatment in that area.

Over the subsequent two weeks, the patient was repeatedly examined, along with fundus photography and OCT. During this time VA was stable, the commotio retinae fully resolved, the quantity of subretinal fluid decreased, and pale scars formed along his choroidal ruptures. Additionally, early retinal pigment epithelium (RPE) and retinal atrophic changes appeared.
By day 23 the VA in the LE had decreased 20/800, fundus examination revealed mild vitreous hemorrhage primarily in the area of the optic disc, preretinal hemorrhages around the inferior vascular arcade, white scars at the sites of choroidal ruptures and RPE foveal scarring. A shallow temporal macular detachment appeared to be progressing despite the presence of pigmented laser scars partially encompassing the tear. Supero-temporal to the macula, resolving hemorrhages revealed a second tear with surrounding subretinal hemorrhage. The periphery remained flat and attached without new tears or holes. On OCT (Fig. 3D and E), the inferior macular tear had detached margins while the retina in the lasered area remained flat. The remaining sub-retinal hemorrhage prevented laser retinopexy around the new tear (Fig. 3F). An attempt to observe for further resolution of subretinal hemorrhages around the second tear was abandoned when, on day 30, the patient developed a detached macula (Fig. 4A).

The patient underwent pars plana vitrectomy, with endolaser around both tears as well as 360° around the retinal periphery, along with silicone oil injection. Seven days post-op the macula was flat with pigmentary changes surrounding both tears and in the temporal aspect of the posterior pole. On OCT both the inferior and superior tears had attached margins with resolving subretinal blood and fluid (Fig. 4B-D). Two months post-op he had a visual acuity of 20/400, remained stable clinically without further changes on imaging or auxiliary testing (Fig. 4E).

Fig. 3. A - On the first day after laser retinopexy color fundus photograph demonstrates white burns surrounding macular tear. B - On day 23, following laser retinopexy, photography reveals pigmented laser scars surrounding the area of inferiorly located large macular tear with shallow retinal detachment, with a new macular tear in the area of superior vascular arcade and shallow retinal detachment. C - OCT done 23 days after laser retinopexy shows decreased quantities of subretinal fluid and distortions of the IS/OS junction. Note atrophic changes in the fovea and scarring around choroidal ruptures. D,E - Total detached margins of the inferior macular tear with flat retina in the area of prior laser treatment. F - New superior macular tear with shallow retinal detachment can be observed. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

Fig. 4. A - OCT performed 30 days after laser retinopexy shows detached neurosensory retina in the macula. B,C,D - OCT 7 days after the surgery reveals an attached macula with atrophic changes, resolved subretinal fluid, and attached margins of the inferior macular tear with resolving subretinal fluid, attached retina of the inferior macular tear with resolving subretinal fluid and closing margins. E - Color photograph two months after surgery reveals a flat macula with pigmented scar changes in the temporal aspect of the posterior pole, surrounding the area of inferiorly and superiorly located macular tears. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

3. Discussion

Cranio-maxillo-facial trauma in different regions of the face is often associated with multiple retinal injuries. The mechanism of such injuries may be related to the behavior of the vitreous body during high impact ocular contusion. Although this process is poorly described, previous studies implicate tractional stress on the retina at points of vitreous adhesion during sudden compression and expansion of the eye. As the vitreous is strongly attached in the area of the major vascular arcades and the equator, this dynamic process may lead to breaks and tears in these areas. Subsequently, liquefied vitreous may leak pass through the retinal tear into the subretinal space and cause a retinal detachment.

In this case, a seventeen-year-old patient developed temporal macular tears with subsequent macular detachment despite a preserved and attached peripheral retina without tears or holes, following blunt ocular trauma. Blunt trauma typically causes retinal breaks in the region of the ora serrata and peripheral retina. The rarity of posterior pole tears is presumably due to lower strain on this area during trauma. Traumatic macular holes are common findings and may be ascribed to the contra-coup effect of the traumatic force and sudden traction on the macular area by a distorted vitreous body. If the strength of vitreous adhesion is not equal at all sites of the macula, and the patient undergoes high-energy blunt trauma, the sudden traction exerted on the macula can rarely lead to macular tearing, but not a hole. Based upon the pattern of facial bone fracture and displacement in our patient, the...
force was applied radially to the globe from an inferolateral and lateral direction. This resulted in the observed posterior pole injuries in the areas of apparent vitreous adhesion, with several choroidal ruptures concentric to the disc, loss of integrity of the retinal pigment epithelium, and posterior retinal tearing. Although the observed curvilinear pattern of choroidal rupture concentric to the disc is frequently described as a result of blunt ocular trauma,7 macular tearing of the retina is a highly irregular finding.

Imaging in this case was helpful in confirming the diagnosis and creating an appropriate therapeutic strategy. In a retrospective survey of 129 patients, RPE sequelae occurred in approximately 20% of patients with blunt ocular trauma and was associated with the disruption of the pumping mechanism of subretinal fluid, permanent photoreceptor defects and visual loss.8 Pathologies such as those described can be assessed for via fundus autofluorescence, color fundus imaging and OCT. These non-invasive methods are useful for examining corresponding structural changes in the posterior segment of the eye resulting from blunt ocular trauma. Furthermore, these techniques provide valuable information to direct the choice of treatment and anticipate a visual prognosis, especially in the presence of choroidal ruptures, scar tissue or atrophy, subretinal hemorrhages, subretinal fluid, and the location of macular tears.6,9

Due to of the sparsity of comparable cases, formulating a treatment plan was a challenge. The dearth of examples in the literature with which to compare, as well as the particular findings in this case - attached retina and the need for urgent facial surgery - led our team to first attempt laser retinopexy and observation, and when this failed, to perform vitrectomy as described above.

4. Conclusion

In the literature, there are few reported cases of retinal detachment due to posterior pole tears treated successfully with pars plana vitrectomy and endolaser photocoagulation. In these cases, vitrectomy provided satisfying results and allowed for more complete resolution of the posterior tractional forces, ameliorating further potential shearing forces whilst removing vitreous hemorrhage.10 We described a case of unusual traumatic macular tearing, showing the complex clinical course via auxiliary testing and imaging, and eventually treated surgically to achieve anatomical and functional stability.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interest

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