Original Article

Manuel's asteroid disruption technique

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A seventy-year-old male presented with dense asteroid hyalosis in both eyes. He had undergone cataract extraction in one eye 3 years ago, and the other eye had immature cataract. Both the autorefractor and dilated streak retinoscopy did not give readings and subjective visual improvement could not be achieved. Immediately following YAG posterior capsulotomy and anterior vitreous asteroid disruption, the vision improved to 20/20 with recordable auto refractor and streak retinoscopy values. Our initial experience indicates that the treatment is simple, safe and effective but needs controlled and prospective studies to confirm its long-term safety.

Key words: Asteroid hyalosis, capsulotomy, Manuel's asteroid disruption technique, posterior capsular opacity, Neodymium Yttrium Aluminium Garnet (Nd:YAG / YAG)

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Asteroid hyalosis (AH) is a generally benign, degenerative condition characterized by small yellow-white spherical opacities throughout the vitreous. It affects all races but with a male-to-female ratio of 2:1. Curiously, asteroid hyalosis is unilateral in over 75% of cases. The prevalence of asteroid hyalosis was previously found to be 0.042–0.5%, although a recent study of 10,801 autopsy eyes found an incidence of 1.96%.[1] Surprisingly, it is usually asymptomatic and does not cause floaters or interfere with vision. However, these particles can interfere with the examiners view of the retina. The prognosis is good and in general no treatment is recommended. In rare circumstances, pars plana vitrectomy is recommended if the asteroids become so severe that they affect vision or interfere with the diagnosis or treatment of retinal disorders.[2]

Materials and Methods

The patient, a 70-year-old male, had undergone phacoemulsification in the left eye 3 years ago, presented to us with decreased vision in both eyes. His best corrected visual acuity (BCVA) was 20/100 in the left eye and 20/50 in the right eye. The right eye had immature cataract. Both the auto refractor and dilated streak retinoscopy could not provide objective refraction values in either eye. The minimal posterior capsular opacity (PCO) in the left eye clinically could not account for decreased vision but the dense asteroid hyalosis (AH) just behind the posterior lens capsule in the visual axis adjacent to the nodal point was suspected to be responsible for it [Fig. 1]. Anticipating inflammation subsequent to Neodymium Yttrium Aluminium Garnet (YAG) disruption, the patient was started on 0.9% Bromofenac eye drops b.d. a week prior to intervention and continued for 3 weeks post laser. The opacities were photo-disrupted with the Appasamy Neodymium YAG laser coupled with the Peyman lens, using energy levels of 1.0 to 5 mJ and a total energy of 205 mJ was used in this procedure. Initially the posterior capsule was removed. Subsequent shots were focused over the asteroid bodies in the anterior vitreous starting immediately behind the intraocular lens in the nodal point plane proceeding posteriorly for 3–5 mm till clearing was noted in the pupillary axis [Figs. 2-4]. The symptomatic blurring of vision completely disappeared after treatment. His post YAG refraction could be obtained clearly with both streak retinoscopy and the auto refractor, the subjective correction being OS Sph -1.0 Cyl + 2.50 x 180° with vision returning to 20/20 immediately post treatment. He subsequently underwent uneventful phaco-emulsification for cataract in his right eye. There was no posterior capsular opacity. A month later, he was subjected to YAG disruption of the anterior vitreous in his right eye as retinoscopy and auto refractor values could not be obtained, the vision could not be corrected beyond 20/50 and fundus details were hazy. Immediately post YAG, the vision improved to 20/20 with clear streak retinoscopy and the auto refractor giving values, with a subjective refraction of OD Sph - 1.25 Cyl + 2.25 x 160° [Fig. 5]. The energy used in this procedure for this eye was 201 mJ. The vision continued to remain at 20/20 in both eyes. Intra ocular pressures monitored by applanation throughout the year and half of follow-ups at the outpatient visits varied between 16 to 20 mm Hg OU. Indirect ophthalmoscopy with indentation revealed a hazy but visible view up to the ora serrata with no visible breaks or holes. This could possibly be attributed to a distance of at least 5 mm or more from the ora to the centre of the posterior capsule and this distance increased as the laser was focused posteriorly into the anterior vitreous. One year one month photographs [Figs. 6 and 7] taken on 26/5/11 demonstrated that the asteroid bodies did not reform or reorganize with time. The vision continued to remain at 20/20 with subjective spectacle correction. The patient was finally reviewed on 6/9/11 and was clinically status quo.

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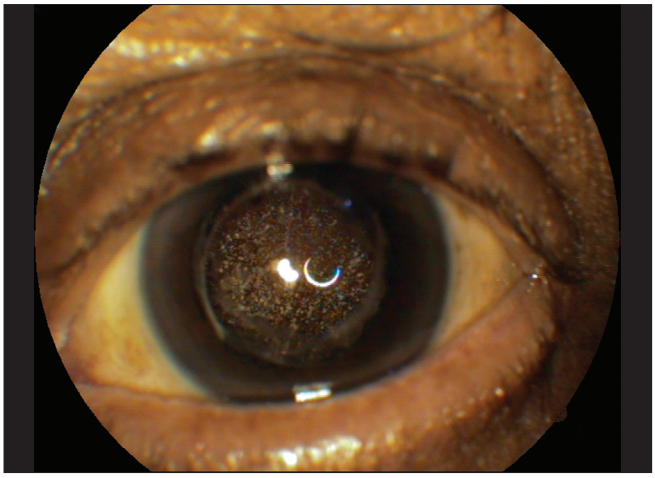

Figure 1a: Camera focus at posterior capsular plane

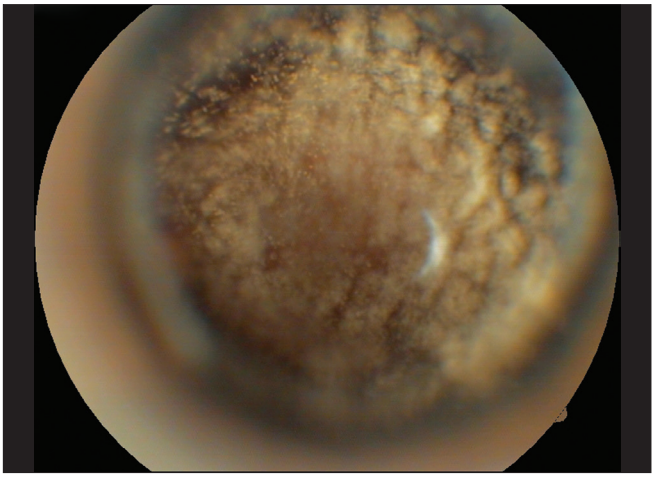

Figure 1b: Camera focus moved posterior

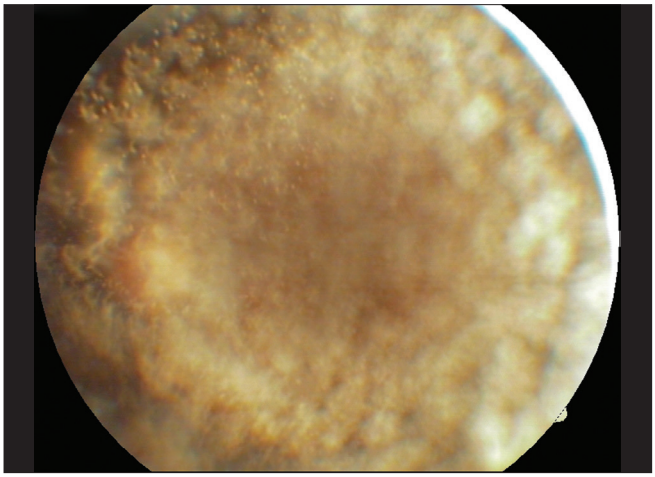

Figure 1c: Camera focus moved progressively posterior than in Fig 1b

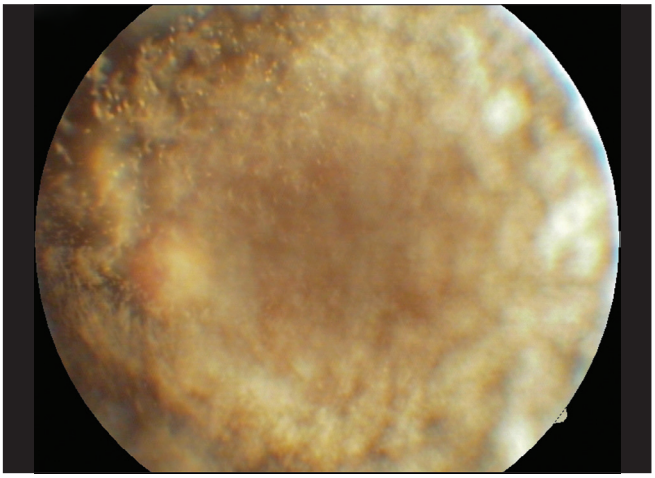

Figure 1d: Disc details not made out

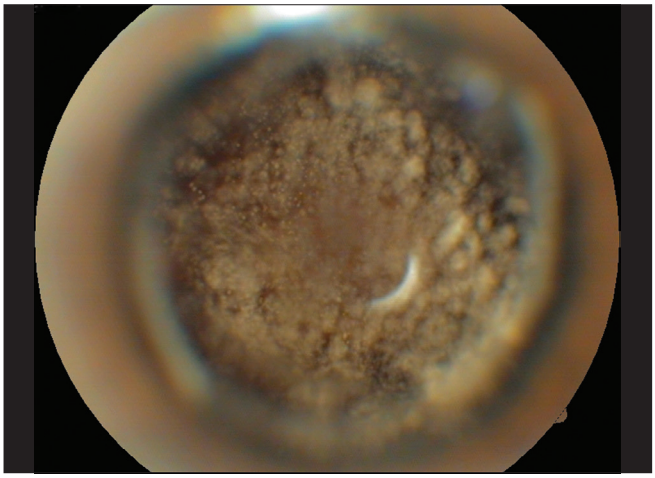

Figure 2: Early central clearing with YAG

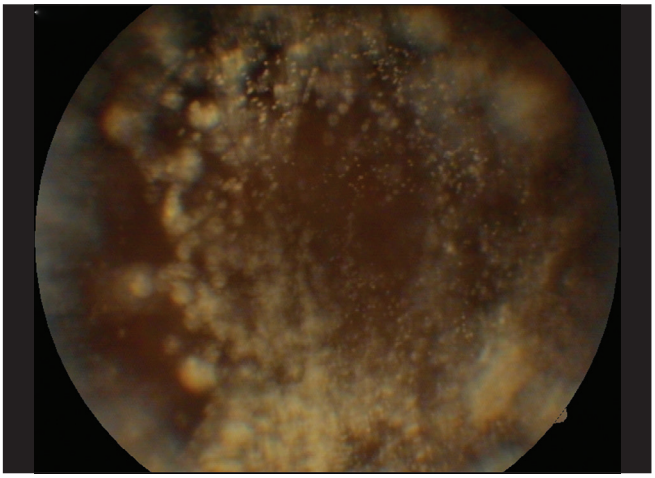

Figure 3: Better central clearing with YAG

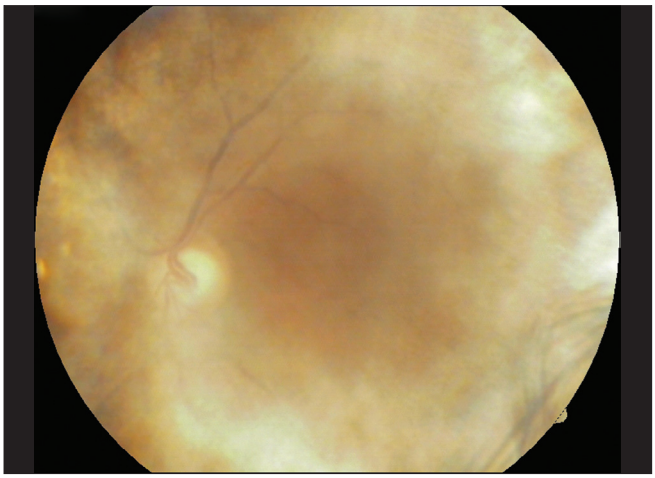

Figure 4: Disc details made out hazily, note the central clearing in the left eye

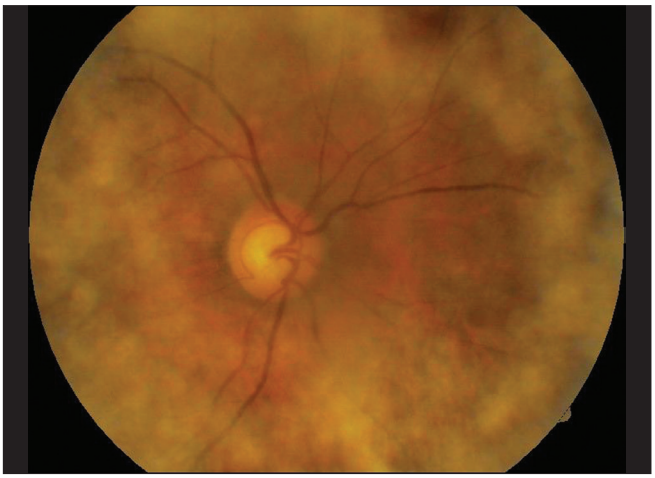

Figure 5: Disc details made out hazily, note the central clearing in the right eye

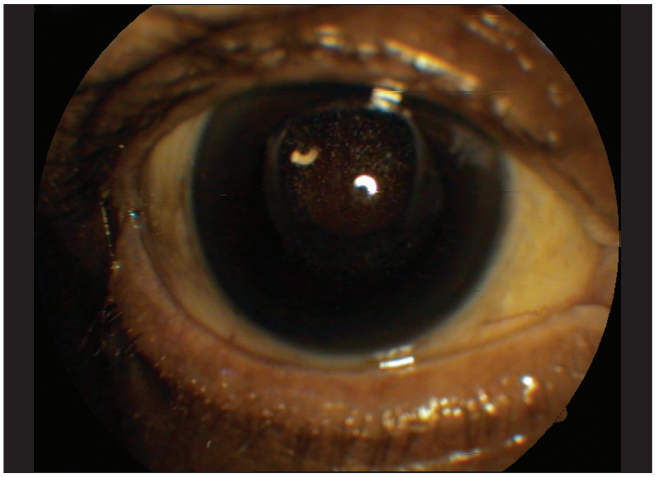

Figure 6: One-year follow up pictures of the right eye

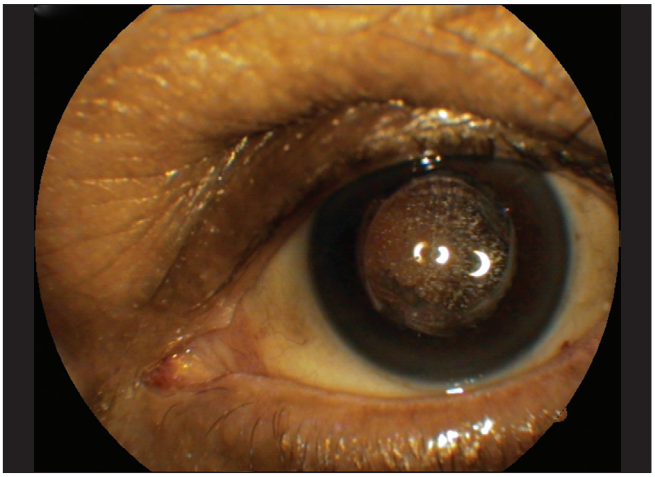

Figure 7: One-year follow up pictures of the left eye

Discussion

A ray of light from an object of interest directed towards the nodal point will go straight to the retina without bending. The object and its image subtend the same angle at the nodal point. Retinal image calculation is obtained by multiplying the distance of the nodal point from the retina by the angle in radians subtended by the object at the nodal point. The Maxwellian principle states that radiance is conserved regardless of the optics throughout a light beam path, but it may be attenuated by filtration (e.g. as in AH). The radiance of the source may be decreased by apertures (e.g. pupil size) or by transmission losses in the optical delivery system (e.g. as in AH). Hence, a large area of the retina can be clearly illuminated by a converging beam focused at or near the nodal point of the eye provided there are no opacities present at that point contributing to the attenuation/filtration effect.[3]

The Nd:YAG laser is most commonly used for photodisruption of the posterior capsule following cataract extraction and less frequently for anterior and posterior segment vitreolysis.[4,5] In brief, indications of Nd:YAG capsulotomy include presence of a thickened posterior capsule leading to functional impairment of vision, and need to evaluate and treat posterior segment pathology. However, caution should be exercised if there are signs suggestive of intra ocular inflammation, raised IOP, macular edema and a predisposition to retinal detachment (e.g. high myopia).

Asteroid bodies are associated intimately with the vitreous gel and move with typical vitreous displacement during eye movement, which suggested a relationship with collagen fibril degeneration.[6] Despite studies describing laser vitreolysis as a treatment for vitreous floaters, this technique does not appear to be widely practiced. The reason for this is unclear but may be a combination of disappointing results, or reluctance to use Nd:YAG laser in the posterior segment. The latter may be influenced by the known complication of retinal detachment following YAG capsulotomy, which occurs at an incidence of between 0.50% and 4.16%.[7] However, Little *et al*.,[5] following the use of YAG laser to cut vitreous bands as well as to clear vitreous opacities have also reported complications which included focal lens opacities, retinal detachment and minor retinal hemorrhages.

To be on the safe side, no laser is to be applied if the floater(s) are located within 2 mm of the retina or crystalline lens.[8] Other authors also recommend the use of specially designed convex-surfaced contact lenses to reduce the energy threshold for plasma formation thereby further increasing the safety of intravitreal Nd:YAG laser.[9] By applying these criteria, the risk of retinal damage is reduced if not eliminated.[10]

In a majority of cases, AH is a unilateral condition and does not affect vision. In this case the AH has been bilateral and has affected vision. This has been very unusual. Our initial experience on this technique in treating AH indicates that the treatment is simple, safe and effective. The technique which is accompanied by few complications needs controlled and prospective studies to confirm its long term safety.

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