Vitreomacular Traction: Management

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Vitreous is a clear gel that occupies the posterior segment of the eye which is made up of 98% water and 2% macromolecules. The outer cortex of vitreous which is made up of dense collagen (Type II) is firmly attached to internal limiting membrane (Type IV collagen). Vitreous is strongly attached at vitreous base, optic disc and to some extend on macula. As the age advances, gel undergoes liquefaction and attachment between vitreous and internal limiting membrane (ILM) weakens and it gets completely separated which is called posterior vitreous detachment (PVD), which usually begins in the perifoveal macula. PVD occurs in two phases liquefaction followed by separation. The completion of vitreo-papillary separation often characterized by the Weiss ring is usually an acute and symptomatic event. Inadequate or incomplete vitreo-retinal interface separation result in anomalous PVD with vitreo-macular interface (VMI) anomalies. Anomalous PVD is defined as partial vitreous detachment with persistent attachment in the macular region featuring an anomalous strength of adhesion to one or more structures in the posterior pole, resulting in tractional deformation of retinal tissue.

Definition and Classification of Vitreomacular Adhesion

Vitreomacular adhesion (VMA) denotes residual strong adhesion between vitreous and macula when PVD is incomplete.

With the evolution of Optical Coherence Tomography visualization and understanding of the vitreo-retinal interface has improved. OCT is central to diagnosis and increased the likelihood of detecting VMT. When vitreous separation is full and complete, detached vitreous is difficult to detect by OCT. Clinical examination and ultrasound are useful tools to diagnose PVD in such circumstances (Figure 1).

Posterior Vitreous Detachment (PVD) and anomalous PVD

Outer cortex of vitreous is made up of type II collagen which is strongly attached to internal Limiting membrane (type IV Collagen). With the advancing age vitreous gel liquifies, a process called synchysis and collapses which is known as syneresis. As the age advances vitreous detaches from retina, a process known as Posterior vitreous Detachment (PVD) (Figure 2). Though some people experience some floaters, generally PVD is asymptomatic. If vitreo retinal adhesions are not weakened at places, patients can be symptomatic which is known as anomalous PVD. The effects of persistent traction on optic disc (vitreo papillary adhesion) can lead to neovascularization of optic disc(NVD) especially in diabetics, which can lead to haemorrhage and loss of vision. Traction near vitreous base cause tears and retinal detachment. When perifoveal vitreous cortex gets attached on to macula after detached from surroundings, Focal VMA develops, which is usually asymptomatic. Or

Figure 1: Fundus photograph and OCT scan of normal normal macula. * formerly known as inner segment – outer segment junction, interdigitation between photo receptors outer segment and RPE.
Vitreomacular Traction (VMT) is defined as a structural abnormality associated with loss of vision. Symptoms associated with VMT are blurring of vision, metamorphopsia and difficulty in reading.

Vitreomacular Adhesion: focal adhesion of the vitreous face within macular region.

Vitreomacular Traction: VMA causing focal tractional distortion of macula.

Vitreo macular traction syndrome: VMT associated with loss of visual function

Symptomatic VMA: VMT syndrome, macular hole or cases where normal or abnormal VMA coexist with macular diseases, with loss of vision.

International Vitreomacular Traction Study (IVTS) Group has developed a simple, evidence based clinically applicable classification system to identify, monitor and manage vitreomacular interface disorders. This is based on multiple OCT B-line scans images and classified by the size of attachment or lesion and presence of retinal or vitreoretinal conditions.

Definitions of Macular hole and Pseudo Hole

Impending macular hole: It is described in cases where there is full thickness macular hole in one eye and VMT is observed in the fellow eye.

Full thickness macular Hole: Full thickness lesion with interruption of all layers of retina from ILM to RPE. If size of the hole is <400μm, pharmacological vitreolysis can be tried. Chances of FTMH closure (40.6%) at day 28 vs placebo (10.6%). Lamellar macular hole: round or oval reddish lesion with partial thickness foveal defect. OCT features include irregular foveal contour, intra retinal splitting.

Broad VMA and tractional Macular Thickening: when VMA is > 1500μm, it can cause schisis of retinal layers.

ERM and macular pucker: cause of ERM is not completely known. After PVD vitreous remnants are attached to the surface of retina (vitreoschisis), which stimulate proliferation of hyalocytes, glial cells and histiocytes on its surface cause development of ERM. Centripetal tractional forces on retinal surface cause macular pucker.

Pseudohole: ERM with central opening can give rise to Pseudo hole formation which appear as round or oval shaped defect. Surgical membrane peeling is advised in all these condition.

Treatment of Vitreomacular Adhesion

Observation: Focal VMA can resolve spontaneously even without treatment. Amsler grid evaluation is advocated in patients with asymptomatic focal VMA.

Pharmacological vitreolysis should be considered when VMA has progressed to VMT. These agents break down the peptide bonds in laminin and fibronectin molecules which keeps the adhesion between ILM and vitreous. Collagenase, chondroitinase, hyaluronidase, plasmin, plasminogen activator are few agents used for vitreolysis. Plasmin is manufactured from patients own blood and it is very unstable. Ocriplasmin, is a recombinant truncated form of human plasmin with molecular weight 27.8kDa. it is a DNA molecule which is more stable than plasmin and has emerged as new vitreolytic agent. It is recombinant protease with activity against fibronectin and laminin.

VMT and FTMH with focal VMA are called symptomatic VMA and VMT. Ocriplasmin was approved for treatment of symptomatic VMA and VMT, including macular hole with diameter <400μ. In patients with
isolated VMT, without ERM had resolution by 28 days after single injection of 0.125mg/0.1ml ocriplasmin (29.8%) as compared to placebo injection (7.7%). Natural history of VMT associated with AMD, DME and retinal vein occlusion is poorly understood. If there is no release of VMT, patients can undergo PPV. 30-50% of stage I MH regress spontaneously where as only 10% stage II and III holes do so. 125 μg Ocriplasmin injection resulted in

### Anatomical State

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<th>Anatomical State</th>
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| VMA                  | **Definition:** Evidence of perifoveal vitreous detachment from retinal surface vitreous cortex attached to macula within a radius of 3mm no change in foveal anatomy  
**Classification:** by extent of attachment area- focal \(<1500\mu m\), Broad \(>1500\mu m\): Isolated absence of concurrent retinal condition, Concurrent: associated with retinal anomaly |
| VMT                  | **Definition:** Evidence of perifoveal vitreous detachment from retinal surface vitreous cortex attached to macula within a radius of 3mm Associated with distortion of foveal surface, intraretinal structures,  
**Classification:** by extent of attachment area- focal \(<1500\mu m\), Broad \(>1500\mu m\): Isolated absence of concurrent retinal condition, Concurrent: associated with retinal anomaly |
| FTMH                 | Full thickness macular lesion, interrupting all layers from ILM to RPE  
**Classification:** By Size  
Small \(\leq 250\mu m\)  
Medium \(250 \mu m \leq 400\mu m\)  
Large \(\geq 400\mu m\)  
By presence or absence of VMT  
By cause: Primary (initiated by VMT)  
Secondary (trauma or associated disease) |
| LMH                  | **Definition:** irregular foveal contour  
Defect in the inner fovea  
Intraretinal splitting  
Intact photoreceptor layer |
| Macular pseudohole   | **Definition:** invaginated or heaped foveal edges  
Concomitant ERM with central opening  
No loss of retinal tissue  
Steep macular contour to central fovea with near normal central foveal thickness |

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Figure 3: Optical coherence tomography (OCT) scans illustrating (A-C) vitreomacular adhesion (VMA) and (D-F) vitreomacular traction (VMT) according to International Vitreomacular Traction Study Classification System.
spontaneous resolution of FTMH in 40.6% (MIVI TRUST-Microplasmin for IntraVitreous Injection- Traction Release without Surgical Treatment) of patients, within 28 days versus placebo (10.6%). Closure rates were higher in small FTMH (58.3%) as compared to medium (36.8%) and large MH (0%). Only 8.7% of eyes with FTMH with ERM had resolution of VMT.

Side Effects of ocriplasmin

Ocular adverse effects of Ocriplasmin injection are vitreous floaters, photopsia, blurred vision, conjunctival hemorrhage, potential for lens subluxation, retinal breaks and dyschromatopsia (as yellow vision). ERG changes in the form of reduced ‘a’ and ‘b’ wave amplitude is reported in patients experiencing dyschromatopsia. Patients can experience transient loss of vision, which is attributed to the disruption in the ellipsoid layer( previously known as photoreceptor IS/OS junction). Wide spread retinal dysfunction can develop in patients due to its effect on laminin which is present in other layers of retina, including Bruch membrane, interphotoreceptor matrix, External limiting membrane, Outer plexiform layer, inner plexiform layer and ILM. Though the effect on photoreceptor outer segment is transient, the action on rods is more prolonged.

Surgical treatment: Pars Plana Vitrectomy (PPV) with ILM peeling is the standard treatment advocated for VMT. The success of relieving VMT ranges from 80-90%. The surgery helps to improve blurred and distorted vision, also can help in improving vision. But this can be associated with various complications like retinal breaks, retinal detachment, endophthalmitis, and development of cataract.

Summary

Clinical outcome depends on ability of treating physician’s ability to form correct diagnosis and treat accordingly. Untreated cases can lead to permanent damage to retina. With the availability of non-surgical treatment patients comfort and quality of life can be improved.
References


