Summary

Vitreous plays an important role in retinal diseases is that it is attached to the retina. Thus, the aging changes in vitreous that result in gel liquefaction may have untoward effects upon the retina in many cases.

Posterior vitreous detachment (PVD) is a degenerative process in which the posterior hyaloids and the vitreous cortex detaches from the retina in association with a vitreous gel which is generally in a progressive liquefaction process.

Diseases Such as proliferative diabetic retinopathy, macular hole, and proliferative vitreoretinopathy are associated with pathologic changes at the vitreoretinal interface induced by anomalous PVD.

Vitreous surgical procedures have been performed to relieve vitreoretinal tractions or adhesions to facilitate reattachment of a detached retina and to reduce retinal edema. Removal of the cortical vitreous by mechanical means, however, does not result in complete vitreoretinal separation.

Enzymatic vitreolysis which for years has held promise of minimally invasive solutions for surgical problems in vitreoretinal diseases such as diabetic retinopathy and macular hole. Enzymatic vitreolysis replace standard mechanical vitrectomy, over which it presents important advantages:

- It offers lower operative risks
- Less surgeon time
- Lower costs
- Greater patient access.

Several enzymes, including microplasmin, plasmin, tissue plasminogen activator, dispase, nattokinase, hyaluronidase, streptokinase, chondroitinase, and collagenase, have been tested as adjunctive therapy during vitreous surgery.

The common goal of such surgery is to manipulate vitreous collagen, both centrally achieving liquefaction, as well as along vitreoretinal surface to be able to achieve cleavage plane cleaner than can be mechanically achieved currently.

Enzymatic-assisted PVD with microplasmin increases vitreal O2 levels and increases the rate of O2 exchange within the vitreous cavity.

Microplasmin induces a dose-dependent cleavage between the vitreous cortex and the ILM without morphologic alterations of the retina. In the feline eye, there is no cellular response of retinal glial cells or neurons.

Intravitreal injection of recombinant microplasmin in the rabbit induces no ERG or retinal ultrastructural abnormalities. Pharmacologic vitreolysis with this agent may be a useful adjunct to vitreous surgery and could be used to induce PVD without vitreous surgery.

Plasmin induces a cleavage between the vitreous cortex and the ILM without morphological changes to the retina. In contrast with previous reports, plasmin produces a smooth retinal surface and additional surgery is not required in this experimental setting. The degree of vitreoretinal separation depends on the concentration and length of exposure to plasmin.

The laminin and fibronectin at the vitreoretinal junction are degraded during plasmin-assisted vitrectomy.

Nattokinase is a useful enzyme for pharmacologic vitreolysis because of its efficacy in inducing PVD.

Intravitreal injection of dispase at 0.025 U or more can induce PVD, but it is not safe. Plasmin (1–4 U) is safer, except for the potential risk of inducing intraocular inflammation.

Chondroitinase is a specific enzyme that lyses chondroitin sulfate proteoglycan associated with vitreoretinal interface. It induces disinsertion of vitreous body to separate vitreoretinal interface.

The intravitreal injection of streptokinase in a dose of 1,500 IU succeeded in the induction of PVD without toxic retinal effects as shown by electroretinography and transmission electron microscopy of the retina. Scanning electron microscopy of the internal retinal surface of this group of rabbits after 10 days illustrated a bare retinal surface showing no apparent collagen fibers. This finding obviously reflects a successful induction of PVD with separation of the posterior vitreous collagen from the retinal surface.

An intravitreal injection of 1,500 IU of streptokinase can lead to a PVD without major toxic effects on the retina.

The future of enzymatic manipulation of the vitreous collagen and vitreous cavity biochemistry allow a new mechanical and biochemical way of managing vitreoretinal diseases that require surgical intervention.