Surgical approach to the vitreous

"Is the vitreous really necessary." This question was raised by the radical removal of the vitreous in certain cases of perforating injury of the globe and when vitreous was lost at the time of cataract surgery. Prior to this the primary direction of clinical research was in finding the ideal vitreous substitute. Only when it became apparent that replacement of vitreous with simple salt solutions did not adversely affect the structure or function of the remainder of the eye did a shift of effort take place—toward the development of instruments and surgical approaches which would facilitate cutting and removal of the vitreous in a way that would minimize damage to other structures of the eye.

The anterior segment surgeon most often must remove normal vitreous. For example, after penetrating keratoplasty in an aphakic eye, vitreous is excised to avoid vitreous touch to the endothelium. In this case, as well as where vitreous loss occurs during cataract extraction, the vitreous removed is not opaque nor does it incorporate tough membranes; it is of relatively normal structure and consistency. In those cases where removal of vitreous is considered necessary, it must be done with great care to avoid complications; yet, even with such care, complications do occur. Probably the most serious one related to vitreous manipulation is the subsequent development of a retinal detachment. In an analysis of a recent series of penetrating keratoplasties done in combination with cataract extraction or in aphakic eyes, the incidence of retinal detachment after vitreous manipulation was 5.4 per cent. Though this is not an insignificant incidence, if the vitreous were left in contact with the wound, postoperative complications (including retinal detachment) would be far greater.

In patients with vitreous pathology, but with a normal cornea and lens, it seemed logical to approach the vitreous through the pars plana rather than anteriorly. Cibis showed that it was indeed possible under direct observation to introduce instruments into the vitreous safely via the pars plana. The technique of pars plana vitrectomy was described by Machemer and others and is summarized in a recent monograph. This approach incorporated the development of an instrument that could cut vitreous membranes, suck away the cut membranes and other vitreous opacities, and replace the removed material with the infusion of an acceptable solution—all under direct visualization. This technique was initially used in patients considered hopelessly blind because of the presence of vitreous opacities. The procedure often resulted in dramatic restoration of vision.

With the clinical value of pars plana vitrectomy proved, the surgical indications were gradually broadened to include a wide variety of problems, but because the risks of this approach are certainly greater than those of simple anterior vitrectomy, the potential benefit of its use must be carefully considered in each case. For this reason, prior to any surgical procedure for patients with diseased vitreous, attempts are made to evaluate the status of the retina. This need has encouraged the concomitant development and refinement of such clinically applicable techniques as ultrasonography and electrophysiology to aid in preoperative evaluation of the retina.

Despite the impressive clinical advances...
in dealing with the vitreous, a series of problems remain which will require the development of additional solutions.

One such major problem is massive periretinal proliferation (MPP). In certain cases of retinal detachment, the retina is held in a tented position as a result of a periretinal membrane. By using a pars plana approach and an elegant two instrument technique, one can now remove the abnormally proliferated tissue and sometimes this results in a “cure” of the severe detachment; however, all too often, there is a recurrence of the problem. Perhaps in these cases, following the peeling off of the membrane and unfolding of the retina, one might instill intraocularly a carefully derived vitreous substitute to help hold the retina in place. Note that this re-establishes the need for development of a safe artificial vitreous.

Finally, for those patients who have been blinded by diseases of the visual cell outer segment, some exciting research is underway. Dawson is attempting to design a method of electrical stimulation of the retina via microelectrodes placed at the nerve fiber layer. This may necessitate the development of still other surgical techniques involving intraocular implantations through an extensive opening of the pars plana (as that described by Lee and co-workers) and manipulation of the vitreous by passing micro-electrodes through it. These are far horizons, but even ten years ago, extensive surgical manipulation of the vitreous was also a far horizon.

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REFERENCES