Editorial

Advanced Approaches for Management of Retinal Detachment

Vitrectomy without scleral buckling[1] for rhegmatogenous retinal detachment is often referred to as "primary vitrectomy"[2]; a term which at least initially implied that scleral buckling was the standard of care and should be tried before resorting to vitrectomy. This "rescue therapy" approach is considered to be "conservative" and applied in many specialties and disease processes but can produce the unintended consequence of delaying adoption of improved therapies and putting the patient through an unnecessary procedure. Anterior segment surgeons do not try intracapsular cataract extraction before resorting to phaco or RK before LASIK. Long bone fractures were not randomized to sham therapy after casts were developed. There are no high quality clinical trials comparing vitrectomy[3,4], scleral buckling, and combined vit-buckle procedures for rhegmatogenous retinal detachment surgery because there are a high number of clinical variables and many treatment options which are often used in combination. Pre-operative variables include type of breaks, size of breaks, number of breaks, lens status, refractive error, vitreous hemorrhage, vitreous traction, family history, status of the other eye, medical status, and many others. Variables in scleral buckling include: hard silicone versus sponges, subretinal fluid drainage versus non-drainage, radial versus circumferential elements, encircling versus segmental buckles, use of air or gas, paracentesis and many others. Variables in vitrectomy include air, SF_6, C_3F_8 or silicone oil, laser versus cryo, 20, 23, 25 or 27 gauge[5], use of liquid perfluorocarbons, combined lensectomy[6] or phacoemulsification, post-operative positioning, and many others. Scleral buckle advocates[7] have stated that pneumatic retinopexy often causes PVR but they manage "fish-mouthing" in scleral buckling with gas injection; this is not rational. Some surgeons use vitrectomy only for pseudophakic eyes believing incorrectly that vitrectomy causes de novo nuclear sclerosis when, in fact, it only causes progression of pre-existing nuclear sclerosis because a permanent increase in the partial pressure of oxygen (12 mmHg).

Complications of Scleral Buckling

Proponents of scleral buckling often minimize the complications of scleral buckling[7]. And state that they "never" produce strabismus yet a high quality prospective trial reported by the late Ron Michels, an excellent surgeon, demonstrated a 50% incidence of increased tropias and phorias. Encircling buckles may result in damage to the superior oblique or superior rectus tendons producing problematic vertical strabismus. Fortunately, most buckle surgeons have given up the unnecessary practice of removing and reattaching extraocular muscles. Aggressive traction on retromuscle traction sutures, especially with small diameter sutures can damage and potentially sever intraocular muscle tendons. Aggressive stripping of the intramuscular septum, Tenon's capsule, and episclera combined with cautery can create adhesions between these layers causing problems when there is subsequent glaucoma filtering procedures.

Many surgeons use encircling bands[7] in essentially all buckle cases. A circumferential buckle produces the same outcomes in most instances without inducing myopia or causing damage to extraocular muscles potentially causing diploplia or damage to the levator aponeurosis resulting in ptosis.

Patients spend substantial sums of money in the pursuit of emmetropia; LASIK, PRK, and refractive lens exchange have raised patient's expectations of life without glasses or contacts. Cataract surgery patients expect emmetropia as well; substantial effort has been applied to microincisional surgery, foldable IOLs, toric IOLs, multi-focal intraocular lenses, accommodative (minimally) IOLs, and femtosecond laser surgery. An encircling band produces 2.75 diopters of myopia on average; this is completely unacceptable to a patient that has paid for refractive cataract surgery, LASIK, or PRK.

More serious complications of scleral buckling include late intrusion of the buckle and buckle extrusion and infection[7]. Intraoperative complications include a 5% incidence of retinal incarceration at the drainage site when using cut-down drainage as well

as bleeding related to the drainage site. Scleral, choroidal, retinal perforation with scleral sutures is a not uncommon as well; sometimes with serious consequences.

Vit-Buckles

Many vitreoretinal surgeons use encircling bands in conjunction with vitrectomy for repair of rhegmatogenous retinal detachment; so called vit-buckles[8]. I have not used this approach for two decades in order to eliminate buckling induced refractive errors, strabismus, ptosis, and pain as well to reduce operating times and therefore labor costs. Patients would not want a vitreoretinal surgeon to use encircling bands when having vitrectomy repair of retinal detachment if they were informed about outcomes and complications. There is no level one evidence that vit-buckles produce better outcomes than vitrectomy without scleral buckles, even in PVR cases.

Vitrectomy Techniques

Wide-angle visualization techniques and/or scleral depression are essential if vitrectomy is to be used for retinal detachment repair.[9] Contact-based wide-angle visualization (Volk, AVI) produces 10 degrees greater field of view than non-contact (BIOM, ReSight, Merlin and eliminates all corneal asphericity (keratoconus, LRI, RK, PK, cataract surgery, LASIK, PRK). In addition, contact-based wide-angle visualization greatly reduces the need for ocular rotation to view the periphery which reduces flexural forces on 25/27 gauge tools. Just as with scleral buckling, all retinal breaks must be identified and treated with retinopexy.[10] Traction to the flap as well as vitreous traction surrounding all breaks must be eliminated to produce ~90% single procedure success rates. Internal drainage of subretinal fluid performed simultaneously with fluid-air exchange with a soft-tip cannula usually drains most of the subretinal fluid. If internal drainage is initiated prior to fluid-air exchange, posterior migration of subretinal fluid is reduced. Drainage retinotomy can be used if substantial posterior migration of subretinal fluid occurs or the retinal breaks are very small and far peripheral which can make internal drainage challenging. Another option for removal of subretinal fluid is perfluorocarbon liquids; N-perfluorooctane (PFO) is the preferred agent because the interface is visible unlike perflurodecalin. PFO will remove all subretinal fluid if the optimal techniques are utilized while internal drainage of subretinal fluid plus fluid-air exchange always leaves a thin layer of fluid which must be pumped out by the RPE. Because PFO causes subretinal fluid to float anteriorly, care must be taken to remove all SRF anterior to the retinal breaks to enable surrounding all breaks with endolaser. This can be done by extending the break to the ora or making a very peripheral, small drainage retinotomy but the best approach is to slowly drain SRF through the retinal break using a 25G soft-tip cannula just when the PFO reaches the break[12]. Care must be taken to not remove any PFO. The MedOne 25G dual-bore VFI is ideal to inject PFO while allowing infusion fluid egress to maintain optimal IOP.

25/27 Gauge Sutureless Vitrectomy

The author utilizes 25/27G sutureless[13] approach for all vitrectomies including rhegmatogenous retinal detachments, PVR, giant breaks, and diabetic traction retinal detachments. Just as today's patients expect emmetropia without strabismus or ptosis as discussed above, they expect a painless procedure and a non-inflamed eye. A non-inflamed, pain-free eye is not achievable with 20G sutured wounds or vit-buckles. Contrary to what some surgeons believe, 25G vitrectomy fluidics are preferable to 23G or 20G fluidics for RD[14] cases because port-based flow limiting due to a smaller lumen reduces pulsatile vitreoretinal traction. The author strongly recommends use of the highest possible cutting rate for all tasks and all cases; especially for giant breaks and other retinal detachment cases. The author uses the Alcon Constellation Vision System at 7500 cuts/minute. Sutured-on contact lenses damage the conjunctiva, cause sub-conjunctival bleeding, and are inappropriate for sutureless, trans-conjunctival surgery.

Medium Term PFO for Inferior Retinal Detachments

The author developed and has used medium term PFO for virtually all inferior retinal detachments including phakic and pseudo-phakic eyes, young myopes without PVDs, giant breaks and early PVR. Vitrectomy, PFO injection and laser is performed at the initial procedure; the PFO is removed at 14 days. The patients can sit, stand, work and fly; no bedrest is required. PFO is not toxic; it causes a reversible foreign body response in some patients with no long term sequela. Retained small bubbles in the anterior chamber must be removed with a 30 gauge needle at the slit lamp to prevent long term glaucoma. If PVD if

not present at the initial procedure, it will slowly and safely occur during the 14 days the PFO is in place.

Silicone Oil

Silicone oil injection is not difficult with the Alcon 25/27 gauge tools; there is no need for reverting to 20 or 23 gauge surgery for silicone oil cases. 1000 cS oil has the same emulsification rate as 5000 cS oil and is 5X faster to inject and remove; there is no need for 5000 cS oil. Oil should be injected with a short thin wall cannula after fluid air-exchange not through infusion cannula tubing system. Removal of oil is not necessary or advantageous for PVR re-operation or epimacular membrane; forceps membrane peeling with Alcon 25G DSP ILM forceps, retinectomy, removal of subretinal fluid an endophotocoagulation can all be performed handily "under" oil.

Summary

Sutureless, trans-conjunctival microincisional vitrectomy is ideal for retinal detachment repair. In the author's opinion, vit-buckles are no longer indicated; the focus should be on microincisional vitrectomy techniques and wide-angle visualization to repair retinal detachments without causing pain, refractive error, strabismus, ptosis, cosmetic problems and longer, more costly operating times.

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