Role of Buckling in the Modern era of Vitreoretinal Surgeries

Sangeeta Roy MD, Shorya Vardhan Azad DO, MS, Brijesh Takkar MD, Anil Babanrao Gangwe MD

Rajendra Prasad Centre for Ophthalmic Sciences, All India Institute of Medical Sciences, New Delhi

Jules Gonin changed the entire concept of pathogenesis of retinal detachment and identified retinal breaks as the cause of retinal detachments. He developed the surgical technique of drainage of subretinal fluid beneath the retinal break combined with direct treatment of the break by transscleral cautery (ignipuncture) with a success rate of 40%. The invention of binocular indirect ophthalmoscope made the localisation of the breaks easy. Custodis in 1949 described non drainage sclera buckling with polyvinyl explants with a success rate of 80%. Charles Schepens in 1951 described a technique of sclera buckling with the help of intrascleral silicone implant with diathermy with a success rate of 80%. In 1964 Harvey Lincoff used cryopexy along with silicone sponges for treatment of retinal detachment with a success rate of about 80%.

And finally came, the first flirtation with the vitreous when David Kasner in 1969 introduced the concept of planned open sky vitrectomy. Soon, Robert Machemer developed a more conservative pars plana vitrectomy in a closed system with controlled intraocular pressure. This served as the starting of a distinct and separate vitreoretinal speciality. Since then there has been significant developments in Vitreous surgery with latest cutters, illuminators, endolasers and all in one integrated machines making surgery minimally invasive and least traumatic for the patients. So, from Machemer’s vitreous infusion suction cutter (VISC) that needed a 17-gauge sclerotomy port we soon shifted to a three-port vitrectomy with a 20-gauge system which was developed by Conor o Malley. Recently, 25 and 23-gauge vitrectomy system have been commonly used for various indications with excellent post operative results. Henceforth 27 gauge and 29 gauge instruments have also been developed but there applicability in their present form is still found to be lacking.

Primary repair of fresh and uncomplicated rhegmatogenous retinal detachment (RRD) has undergone considerable changes in recent decades. Since the invent of pars plana vitrectomy (PPV), scleral buckling and PPV have competed with each other as methods for the treatment of retinal detachment. Conventionally, Scleral buckling was the method of choice in uncomplicated retinal situations, i.e., single breaks and/or a limited retinal detachment. In contrast, PPV was indicated in complicated situations, i.e., vitreous hemorrhage/opacify, proliferative vitreoretinopathy (PVR), or breaks at the posterior pole. But recently there has been a paradigm shift in the management of primary repair of fresh RRD from conventional methods of sclera buckling to ever evolving and exciting enhancements in vitreous surgery with comparable attachment rates. This has seen more and more surgeons shifting to par plana vitrectomy and a losing the art of traditional buckling surgery.

This throws up a question that what exactly is the role of conventional retinal detachment surgery in comparison to recent advances in vitreoretinal surgery. Thus this article will try to answer this question, taking into account the pro and cons of both the procedures with a guide to specific indications for either of the procedures.

Buckling surgery

Scleral buckles changes the geometry and physiology of the eye. It changes the direction of the vector forces so that it overcomes the forces tending to detach the retina. The principle of buckling surgery is “to seal all the breaks”. Different methods are used to create these chorioretinal adhesions like diathermy, cryopexy or laser photocoagulation.

The advantages of sclera buckling over PPV in RRD are many as enumerated below:
Excellent attachment rates of 90% in well selected cases.

Essentially extra-ocular, non invasive intra-ocularly maintains the internal integrity of the eye and at the same time addresses the problem by relieving the dynamic traction.

No intraoperative complication such as iatrogenic breaks, lens touch and port site dialysis.

It does not have oil related complications such as cataract and glaucoma.

It is a single procedure as there is no requirement of oil removal later.

Preferred procedure in young patients.

Intra-operative complications such as scleral perforation while passing buckle sutures, retinal incarceration, vitreous incarceration and more disastrous complication as subretinal bleed reaching till the macula during subretinal fluid (SRF) drainage can be expected. Re-detachment following buckling surgery can also be caused by missed break or new break formation due to PVR. Other complications are glaucoma, epiretinal membranes, buckle extrusion or infection, anterior band migration, diplopia, induction of refractive error and anterior segment ischemia.

Modern era of vitreoretinal surgery

In 1980 Kloti broadened the indications of PPV and coined the term “primary vitrectomy in RRD”. Next three decades saw an immense improvement in instrumentations, vitrectomy machines, operating microscope, intensified endoilluminators, endolaser and wide angle viewing system which further led to the expansion of PPV to all kinds of RRD.

The advantages of PPV over sclera buckling in RRD are many as enumerated below:

- It helps in complete reattachment of the retina intra-operatively.
- It is less likely to cause refractive error which was very common with sclera buckling.
- There is no risk of retinal haemorrhages and retinal incarceration inherent to external drainage procedure in sclera buckling.
- Primary PPV - very useful in cases where retinal breaks could not be identified preoperatively which is an essential prerequisite for sclera buckling.
- Minimal invasive vitrectomy surgeries help in easy recovery with less pain and more comfort.
- Preferred in pseudophakic patients.

In addition to all the above mentioned advantages of pars plana vitrectomy it also has some complications inherent to the procedure and to the tamponading agent (silicone oil) used. The most frequent intra operative complications are high rates of iatrogenic breaks (0.78%-2%), and lens touch (0.03%-9%). Rare complications like port site dialysis, haemorrhages at retinotomy site, corneal abrasions can also occur.

Postoperatively the patients may have increased intraocular pressure and phakic patients are at significant risk of cataracts. The major complications include retinal re-detachment with or without PVR usually by new or new breaks or reopening of old breaks. Other minor complications are cystoids macular oedema, macular pucker, macular hole and silicone oil induced complications. There are more concerns for endophthalmitis and hypotony with microincision vitrectomy systems.

Role of buckling in the era of vitreoretinal surgery

At last we come to the question, where does conventional surgery stand up against the ever evolving modern day vitreous surgery with vitrectomy machines having better fluidics causing less retinal flutter, better endoilluminators, bent probe lasers and good microscopes. Possibility exists that the next generation of vitreoretinal surgeons, weaned on the sutureless incisions, will be slower to acquire the necessary skills in external buckling anyway. So should we assume that we are seeing the end of buckling procedures? or does it still have to offer something which PPV can’t? The answer is YES!

As we have discussed earlier the vitrectomy is not without complications and it also has as slow learning curve for the beginners. It is very difficult to achieve a complete vitrectomy in a young phakic patient which can predispose to PVR formation leading to redetachments. Increased IOP, cataract formation in phakic patients and silicone oil induced corneal de-compensation or band shaped keratopathy are the major complications after vitrectomy. The patients also require a second surgery for silicone oil removal. Thus scleral buckling surgery still has role in this modern era of vitreoretinal surgeries in selected cases.

In our experience, scleral buckling in young phakic patients with peripheral breaks, especially posttraumatic rhegmatogenous retinal detachment with retinal dialysis yields excellent results. It can also be done in pseudophakic or aphakic patients where we are absolutely sure of the location and number of breaks and where the configuration of RRD could be explained by the location of the breaks. A segmental buckle can be done in cases of fresh quadrantic RRD with single break but an encirclage is preferred along with a buckle in cases with early PVR, multiple breaks in 3 or 4 quadrants and in extensive detachments in which breaks are difficult to locate like in pseudophakes.

On the other hand, PPV is indicated in pseudophakic patients with wide and bullous retinal detachment with no breaks found, RRD with posterior location of the break, giant retinal tear induced retinal detachment, multiple breaks in
multiple quadrants, RD with proliferative vitreoretinopathy (more that PVR Grade C1) and macular hole RD.

Another option is combining the both, encircling band along with vitrectomy which is also preferred by many vitreoretinal surgery. It supports the pre-equatorial vitreous preventing recurrent retinal detachment due to peripheral new breaks or small missed breaks especially in pseudophalic or aphakic patients. In phakic patients the complete peripheral vitrectomy is not possible, in these cases an encircling band support the peripheral residual vitreous. It is also useful in patients with inferior PVR as it supports the inferior retina and we can avoid an inferior retinectomy.

Recent studies assessing scleral buckling versus primary vitrectomy in rhegmatogenous retinal detachment have shown superiority of PPV in pseudophakic and aphakic eyes in terms of a primary success rate and a rate of secondary procedure although no difference was seen in phakic patients\(^7,8\).

In conclusion, scleral buckling surgery still has a very important and irreplaceable role to play in this modern era vitrectomy surgery.

References