

Macular Buckle: Indications and Limitations

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Abstract

Progress in ophthalmology, specifically in macular surgery, is accompanied not only by discovering the new surgical technique, but also by renewed interest to old surgical procedures have been described for the treatment of retinal detachment in myopic macular hole and foveoschisis. The macular buckling was described for the first time in 1957 by Charles L. Schepens, the father of modern retinal surgery, using a radially placed polyethylene tube. In 1966 Rosengren B described a silver ring and plomb technique to indent the macula. The ring is attached to the limbus and an arm fixed to the ring has a terminal ball, which was made to indent the macula. In 1974, Theodossiadis used a silastic sponge rod placed between the inferior oblique insertion and the optic nerve. The rod was stretched vertically across the macula by fixing sutures to produce the required indentation. In 1980, Ando introduced the Ando plombe, consists of a T-shaped semirigid silicone rubber rod internally reinforced with titanium wires and an indenting head at one end. Different types of macular buckles have been proposed, but proper alignment of the buckle under the fovea is still a major concern in this technique.

Keywords: *Retina; Macula, Buckle; Myopia; Staphyloma; Indications, Limitations*

Introduction

Retinal detachment resulting from a macular hole occurs most commonly in high myopic eyes [1,2]. Degenerative myopia is defined as a myopic refractive error of more than 6 dioptres associated with degenerative fundus changes [3]. The scleral shell of highly myopic eyes has a tendency to expand gradually and to thin due to increased elasticity with consequent formation of a staphyloma. The greater the axial length, the greater the risk of developing a posterior retinal detachment, due to the inability of the retina to adapt to the progressive axial elongation in eyes with high myopia and posterior staphyloma [4]. The staphyloma is accompanied by a stretching of the posterior fundus, resulting in various kinds of myopic lesions [5,6]. Myopic traction maculopathy [7,8] represents a common progressive disease characterized by different stages: macular schisis (MS), macular hole (MH) with or without schisis, and MH with macular detachment (MD); MH-related retinal detachment (RD) is an uncommon complication that often develops in highly myopic eyes, particularly in association with posterior staphyloma [2,9-11]. The management of these pathological entities is mainly based on two different surgical approaches: Pars Plana Vitrectomy (PPV), and Posterior Scleral Buckling. For many years, pars plana vitrectomy (PPV) with gas or silicone oil tamponade, internal limiting membrane (ILM) peeling with or without epiretinal membrane peeling has been preferred as the first choice in the treatment for MHRD in highly myopic eyes [12]. But recent case series indicated that PPV and ILM peeling achieve a poor anatomic success rate and high recurrence rate postoperatively [13-15]. This is because retinal traction cannot be completely eliminated by means of vitreoretinal surgery alone (PPV and ILM peeling) since some of the components causing retinal stretching, such as vascular traction and posterior staphyloma, are still present [16,17]. In order to solve the problem, a variety of episcleral surgeries such as posterior scleral reinforcement and macular buckle are designed to change the concavity of the posterior part of the eye into a flatter or even convex shape, and release the inverse traction caused by the posterior staphyloma [13]. However, these surgical procedures still have some disadvantages including inability to check the exact position of buckle intraoperatively, and lack of buckling strength control

[13,18]. To overcome these difficulties, some new methods are designed [19-21]. Parolini [22] described a L-shaped buckle made of silicone sponge containing a titanium stent to indent the macula. Fujikawa [19] used the scleral imbrication technique made by sutures on the temporal side to produce shortening of axial length and flattening of the posterior eye wall including the posterior staphyloma. Mura, *et al.* [23] positioned a T-shaped macular buckling made of solid silicone under the macular. Nevertheless, all these approaches still could not be performed under direct vision, and even cause some complications at the posterior pole (such as subretinal haemorrhages) associated with suture at the back of the eye globe, which could attenuated the effect of the surgery. Thus, MHRD is really a refractory disease with poor visual prognosis [24]. Despite all the above interventions, reopening of the macular hole and recurrent retinal detachment may still develop, especially for extreme high axial myopia. Previous study demonstrate that axial length of 30.0 mm or more may increase the risk of anatomic failure of macular hole surgery [16,17,25,26]. The primary goal of this review was to evaluate the indications and the limitations of macular buckle in myopic eyes with posterior staphyloma.

Indications

Macular buckling is a technique that has been used for years but with changing indications over time. The main indication is currently the correction of posterior staphyloma in highly myopic patients and their complications. Macular buckling corrects the increased posterior concavity of the eye wall into a flatter convex shape, which alleviates the stretched macular area. Macular buckling has mainly been used in cases of retinal detachment due to macular hole, but several authors have also reported good results in myopic tractional retinoschisis [21,27].

In resume, macular buckling has mainly been used in cases:

- Myopic macular retinoschisis with posterior pole staphyloma with recent decrease in visual acuity.
- Posterior pole detachment associated with myopic macular hole with posterior staphyloma.
- Failed and recurrent cases of macular hole with or without RD following vitrectomy with or without tamponade.
- Optic disc pit maculopathy.

Limitations

The mains limitations of macular buckling are:

- Possible damage to nerves and vessels in the posterior pole.
- Precised alignment of the buckle under the fovea is of concern.
- Thin sclera increases the risk of perforation and erosion is more.
- Severe IOP elevation or even eyewall ischaemia [22].
- Iatrogenic dome-shaped maculopathy.
- Subretinal haemorrhages

The prolonged excessive compression of the already impaired foveal and parafoveal choroidal vascular network in these patients may give rise to ischaemic problems. Excessive compression may also accelerate inevitable scleral erosion in these patients with very thin scleral walls.

Complications

The intraoperative complications include inadvertent globe perforation, injury to vortex veins, ciliary vessels and nerves, malposition of the buckle, optic nerve abutting, subretinal hemorrhage, choroidal detachment and threatening suprachoroidal hemorrhage intraoperatively. Late complications include buckle displacement, exposure, infection, choroidal neovascular membrane progression, restriction of eye movements, diplopia, focal retinal pigment epithelium atrophy due to circulatory disturbances [23,28,29].

Conclusion

Macular buckle can be a good option for myopic posterior staphyloma-related macular conditions such as progressive macular schisis, macular hole and posterior pole RD. The technique requires appropriate case selection and has a good anatomical and functional success as reported in many of the studies. Detection and correction of the retinoscleral mismatch would help improve functional outcomes in these eyes with high myopia-related maculopathy.

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