

Segmental Scleral Buckling

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Segmental buckling is a simple, fast, and inexpensive, yet extremely effective, technique for the repair of retinal detachments.^{1,2} Initial success rates are higher than for pneumatic retinopexy, and in fact rival those seen following retinal detachment repair with vitrectomy, encircling buckle, or vitrectomy/buckle combination.^{1,3-5} Moreover, in contrast to vitrectomy or buckle/vitrectomy, segmental buckling poses no postoperative restrictions on air travel, does not require postoperative positioning, offers faster visual recuperation for macula-sparing retinal detachments (as there is no waiting for absorption of a gas bubble), and does not promote cataractogenesis in phakic patients.

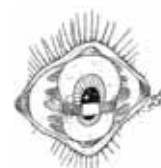
STEPS IN SEGMENTAL BUCKLING

The key premise of segmental buckling is that only the retinal tears causing the retinal detachment need to be supported by the scleral buckle.^{1,2} Buckling areas of attached or detached retina not harboring retinal breaks is unnecessary. Successful outcome depends on accurate intraoperative identification and localization of retinal tears and their correct placement on the scleral buckle. Cryopexy can be applied to create a lasting retina/retinal pigment epithelium (RPE) adhesion at the area of the retinal tear.

Suture placement for segmental buckling is the first step that differs from encircling scleral buckle surgery. To achieve good buckle height upon tightening the sutures, the suture limbs must be at an optimal distance (approximately a distance of half the circumference of the sponge) with each suture limb at least 6 mm long and at least one-half scleral depth to prevent cheesewiring while tightening the knot.⁶ The sponge size must be selected to allow at least 1-mm overlap of the tear. In practice we use a 506 (3 x 5 mm oval) or 510 (2.5 x 5 mm half round) sponge for tears less than 4 mm in greater dimension and a 511 (2.75 x 7.5 mm half oval) or 519 G (3.2 x 7.5 mm grooved) sponge for tears more than 4 mm in greater dimension. The optimal distance between the suture limbs is



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approximately 8 mm for the 506 and 510 sponges, approximately 10 mm for the 511 sponge, and 11 to 12 mm for the 519G. Suture bites are oriented radially for radial buckles (ideal for horseshoe tears) and parallel to the limbus for circumferential buckles (typically for dialysis or multiple tears).

To achieve good buckle height, the assistant may use tying forceps to hold down the knot between throws to avoid slippage and loosening of the knot (Figure 1). Buckle heights of 3 to 4 mm are typically achieved using segmental buckling, and the small buckle volume allows fluid to be displaced laterally, rendering drainage unnecessary (irrespective of the retinal detachment chronicity or location). Many of the complications of scleral buckling are thus avoided.⁷

At times, additional buckle height may be achieved by creating a corneal paracentesis to decrease intraocular pressure prior to knot tightening. Although the buckled eye wall need not oppose the retinal break, success rates are improved when the break is in close proximity to the buckle. For certain superior or lateral breaks in bullous detachments, the injection of 0.3 cc of sterile room air may help increase success rates by apposing up to 90° of peripheral retina for 1 to 2 days, thus allowing the RPE to remove acute subretinal fluid.

Figure 2 shows a segmental scleral buckle that was used to successfully treat a macula-sparing retinal detachment associated with a horseshoe tear.

ADVANTAGES TO SEGMENTAL BUCKLING

Segmental scleral buckling is typically faster than encircling scleral buckle and takes about 30 to 60 minutes to perform. It is often possible to avoid sub-rectus muscle buckle placement with segmental buckling

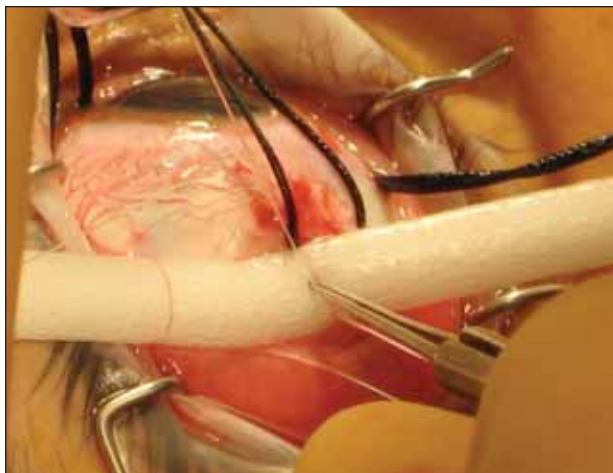


Figure 1. It is crucial that the assistant holds down the knot until it is secured to assure good buckle height.

techniques, which decreases the risk of diplopia. Nondrainage also avoids some of the more severe complications seen in encircling buckles with drainage. Additionally, radial scleral buckles often obviate the need to change a patient's spectacle prescription post-operatively.⁸

Segmental buckles are known to be safe in the long term (>15 years of follow-up).¹ In contrast, there is evidence that encircling buckles (including the ones used in combined buckle/vitrectomy procedures) reduce choroidal perfusion to the macula, and optic nerve cases have also been reported. Additionally, there are case reports of progressive visual field loss that stabilized (and in one case purportedly reversed) after cutting the encircling element.⁹⁻¹³ Although the clinical applicability of such findings is controversial, the fact remains that there are no long-term data on the safety of encircling elements. In one paper with 20-year follow-up of encircling buckles, 50% of scleral buckles were cut during a second surgery, leaving only the height that had been imparted by tightening the sutures over the tire element.¹⁴

Segmental buckling is as fast as vitrectomy but is much less expensive (considering the cost of the vitrectomy pack, tamponade agent, endolaser, and possibly perfluorocarbon liquid). Segmental buckling also eliminates restrictions in positioning and air travel and decreases the need for further surgery (such as cataract surgery in phakic patients or silicone oil removal in monocular patients or patients living at high altitudes or who must travel). Further, a cataract surgery after vitrectomy consumes additional resources, but also destroys the patient's accommodation, which is a significant consideration in younger patients. Refractive error does not change after a segmental buckling procedure.

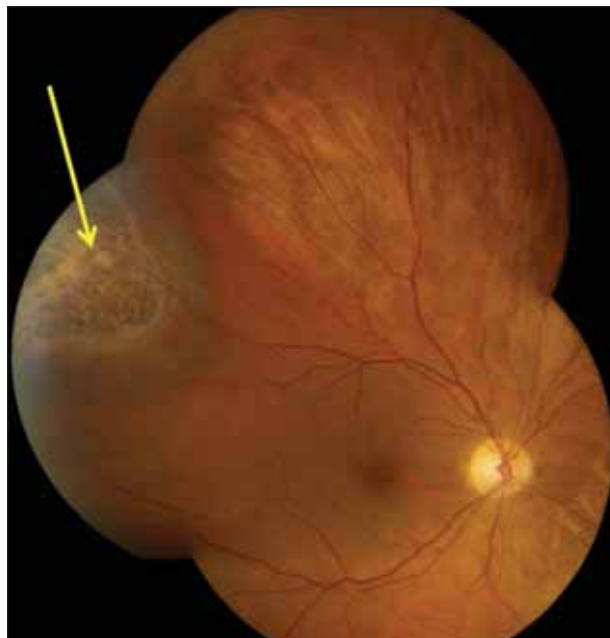


Figure 2. A radially-oriented 511 sponge was used to successfully treat a macula-sparing retinal detachment. The 7.5 mm half-oval element was chosen to support a 5 mm wide lattice-associated tear treated with cryopexy (see arrow).

Segmental buckles are known to be safe in the long term.

CONSIDERATIONS

Retina surgeons have been reluctant to adopt this technique, due to concerns about redetachment from new breaks, difficulties in retinal tear identification and localization, anxiety about leaving the OR with the retina still detached, or concerns about sponge infection and/or extrusion. Although it is true that papers in the late 1960s showed a high risk of infection using sponges, with the closed-cell sponges in use today, current patient preparation and draping techniques, and the practice of soaking the sponge in antibiotic solution (such as gentamicin) the risk of sponge infection has been reduced to less than 1%.^{15,16} Sponge extrusion may occur if the sutures are short and/or shallow and also, in our experience, when the sponge is placed circumferentially over more than 3 clock hours. The risk of redetachments due to new tears in areas of unbuckled retina is approximately 1.4% within 2 years after retinal detachment repair; we have seen similar redetachment

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rates in patients with encircling buckles as well as in vitrectomized eyes.¹ In our view, vitrectomy is advantageous in regard to short-term postoperative cosmesis and short-term postoperative comfort.

We commonly perform segmental buckling as the procedure of choice for phakic retinal detachments and retinal detachments due to a dialysis or holes in lattice in myopic eyes. For pseudophakic eyes, we consider segmental buckling for macula-sparing retinal detachments and for patients who must travel. We do not perform segmental buckling when more than 3 clock hours must be buckled: in these cases we buckle the pathologic area with a tire (such as a 519G sponge or a 275/276/287 silicone element) and impart buckle height by tightening the tire sutures. We use an encircling 240 band tied with a 270 Watzke sleeve but avoid additional constriction at the sleeve. ■

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