

Complications of Scleral Buckling

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Scleral buckles have been successfully used to repair rhegmatogenous retinal detachments for the past 60 years.¹ Despite stiff competition from pars plana vitrectomy, which has been used for 39 years,² scleral buckles are not about to retire. This is because repeatedly, in large prospective multicenter studies, both buckling and vitrectomy have approximately a 95% final anatomical success rate.³ Although this figure is impressive, it gives no indication of the complication rates of surgery. In this article we discuss some of the possible complications of scleral buckling and how to avoid them.

RECURRENT DETACHMENT

By far the most common complication of scleral buckling surgery is retinal redetachment, which may be as high as 47% in the first year.³ The vast majority of redetachments occur ultimately because breaks are unsup-

ported. This is either because of missed breaks, inadequate or misplaced buckles, or inadequate retinopexy.⁴

With scleral buckling in particular, as opposed to vitrectomy, the importance of meticulous preoperative examination cannot be overemphasized. Preoperatively one must be completely satisfied that the breaks fully explain the subretinal fluid distribution. Lincoff's rules are invaluable in this regard (Figure 1).^{4,5} Having an accurate drawing of the retinal detachment, breaks and associated landmarks visible during the operation itself will not only save time but also reduce the chances of missing a break.

The accurate placement of a scleral buckle requires experience and a degree of perfectionism if it is to succeed. One of the most important steps is to accurately mark the break on the sclera. This can be fraught with difficulty, especially in bullous detachments, as it requires you to be aware of the potential for anterior-posterior

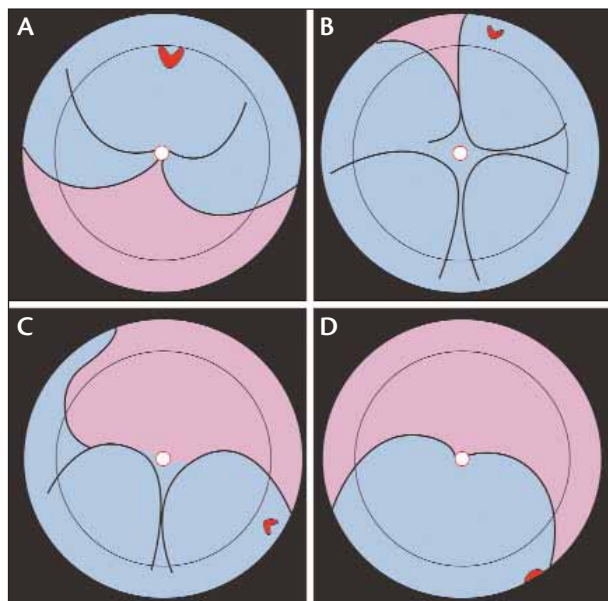


Figure 1. The retinal breaks in Figures 1A and B satisfy Lincoff's rules. However, in Figures C and D the fluid distribution suggests that there are undetected breaks.

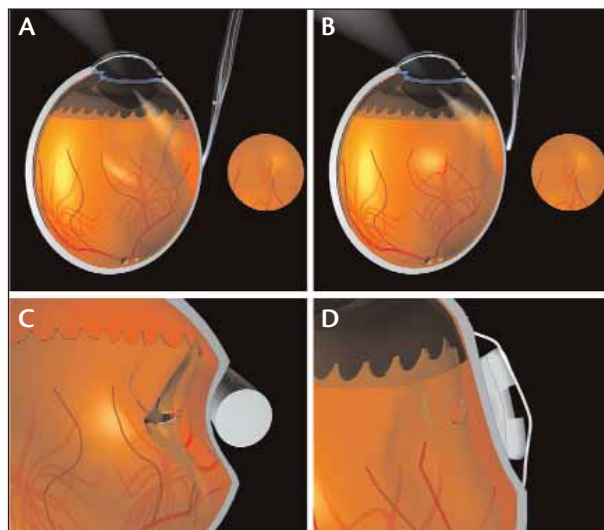


Figure 2. Parallax errors can occur when indenting the sclera in bullous detachments (A). The break may thus be more anterior than expected after buckling (B). This can lead to fish-mouthing of the break with circumferential buckles (C). A break-oral-occlusive buckle prevents this phenomenon (D).

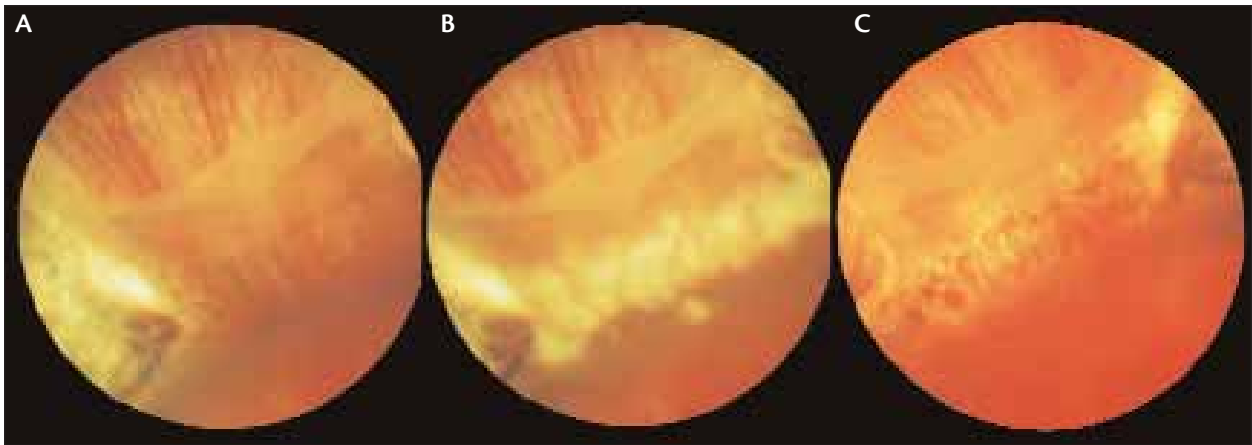


Figure 3. A thorough postoperative examination may reveal untreated breaks (A). Application of retinopexy (B) to seal the breaks (C) will prevent late redetachments.

localization errors due to parallax (Figures 2A and 2B). Parallax errors give the impression that the break is more posterior than it actually is when the retina is detached. Once the retina flattens, therefore, the buckle is found to be too posterior, and the anterior edge of the break may be unsupported, known as fishmouthing (Figure 2C). Fishmouthing can also occur secondary to redundancy folds created by large segmental buckles, which shorten the circumference of the globe. These folds tend to pass through the break, holding them open. To avoid this potential pitfall, radial explants can be used, or a circumferential buckle that extends from the posterior edge of the break right up to the ora, known as a break-ora-occlusive-buckle (Figure 2D).⁶ This gives the added advantage of supporting the vitreous base and preventing the formation of an anterior gutter detachment.

Once the sutures have been correctly sited, it is important to create a sufficiently high indent to allow the subretinal fluid to resorb and the break to settle on the buckle. The best way of achieving this is to perform a paracentesis prior to tying each knot. Not only does this ensure a high indent, but it also reduces the force required to tie the knot and prevents the suture from being torn out of the sclera, particularly in patients with high myopia. If all has gone well, the day after surgery, the retina may be flat. It is vital at this stage, however, to check that adequate retinopexy has been applied. Segmental buckles fade over time, and after 6 months, if there has been inadequate retinopexy, the retina will redetach. Thorough postoperative examinations, with top-up argon laser retinopexy where necessary, could prevent this complication (Figure 3). In contrast, overzealous cryopexy with refreezing of previously treated areas can cause retinal necrosis, creating redetachments from the leaky edges of cryotherapy scars.

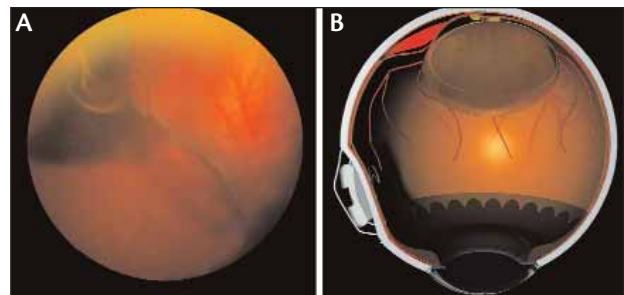


Figure 4. A deep stitch on the edge of a buckle causing subretinal hemorrhage (A). If the macula is detached, pneumatic displacement of the blood (B) may prevent visual loss.

INTRAOPERATIVE COMPLICATIONS

Most retina surgeons agree that one of the most intimidating steps of extraocular detachment surgery is the passing of scleral sutures. Inadvertent scleral perforation could potentially cause a number of consequences, some of which could be catastrophic to vision. Although inadvertent drainage and subsequent suturing of a soft eye are relatively minor consequences, it is important to stop and inspect the retina when this occurs. A white choroidal fleck may be the only trace of scleral perforation; however, it is important to exclude a retinal perforation or a subretinal hemorrhage (Figure 4). If retinal damage has occurred, then further retinopexy followed by extending the buckle to cover this area may be all that is required. Alternatively, if a subretinal hemorrhage has occurred in the context of a macula-off detachment, then further action must be taken to prevent irreversible damage to the vision from submacular blood. One such strategy is to suture the perforation site and then raise the intraocular pressure to stem the hemorrhage. At the end of the procedure, air can be injected into the eye and the patient postured face-down to displace blood from

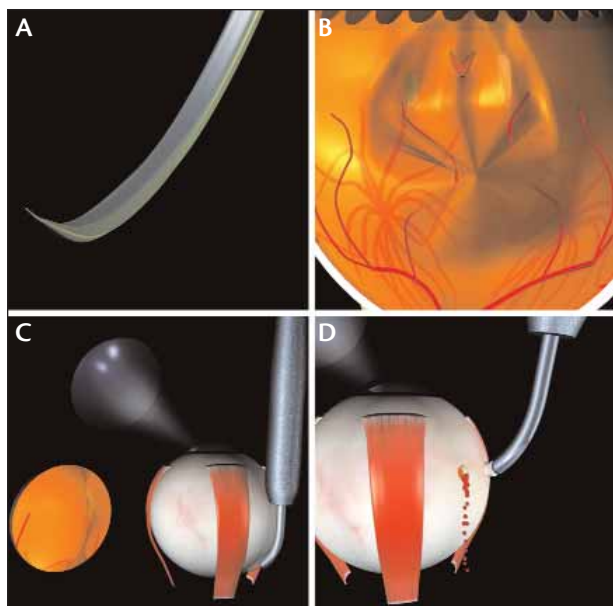


Figure 5. A spatulated needle has a flattened profile (A), allowing it to stay within the pseudolamellar structure of the sclera. Retinal incarceration (B) and hemorrhage can be minimized with a prang drain and high intraocular pressure. Two cryo disasters to be avoided are posterior cryopexy due to indenting with the shaft of the probe (C), and scleral avulsion if the probe is not allowed sufficient time to thaw (D).

the macular region (Figure 4B).

To avoid scleral perforation, one must pay particular attention to the sclera before looking for areas of thinning or striae. The sclera is essentially composed of variably sized collagen fibrils arranged in a crossed lamellar or “pseudolamellar” structure. To take advantage of this anatomy, the most commonly used needle for buckling the sclera is the spatulated needle. Spatulated needles are flattened in their anterior-posterior axis (Figure 5A), allowing them to stay within a plane once engaged. The best technique for placing sutures into sclera is to start with the tip perpendicular to the sclera. Once the tip is engaged, the needle is immediately lowered to be more tangential to the sclera, allowing the flat profile of the needle to keep it within the scleral plane while advancing. Care must also be taken on exiting the sclera, where it is important to follow the curvature of the needle as it is removed from the sclera to ensure that the point is not lifted prematurely, which can cause the heel of the needle to penetrate the sclera.

When subretinal fluid requires drainage, careful planning of this procedure will minimize complications. The chosen site must be an area with sufficient subretinal space to allow passage of a needle and located as far as possible from any large vessels. In this regard, the vortex veins are known to lie anatomically closer to the vertical recti than

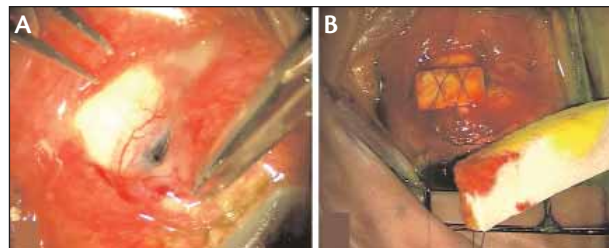


Figure 6. If a scleral defect is detected during surgery (A) a scleral patch may be required (B).

the horizontal recti.⁷ Thus, a point near the horizontal recti is considered safest to minimize the risk of hemorrhage. Although many drainage techniques are described in the literature, the most commonly used methods are either a prang drain or a cut-down drain with laser or diathermy. Prang drains rarely result in retinal incarceration, and firm pressure can be applied to the eye throughout drainage to minimize or tamponade any choroidal hemorrhage. Alternatively, the purpose of a cut-down drain is to avoid hemorrhage with the application of laser or cautery. Because they create larger sclerotomies, however, they are more prone to incarceration. The signs of incarceration would be a sudden cessation of subretinal fluid drainage. If this occurs, a retinal examination would show a dimpled appearance with radial folds emanating from the center (Figure 5B). Moving or extending the buckle to cover this area will suffice in most cases. In rare cases, a vitrectomy or retinectomy may be needed.

There are two potential cryotherapy disasters of which one must be aware, avoiding them if possible. The first occurs if the cryoprobe tip is more posterior than expected. This may allow the shaft of the probe to create a false indent, thereby inadvertently delivering cryopexy to the macular or optic nerve (Figure 5C). The second disaster can occur if insufficient time is allowed for the cryoprobe to thaw before it is moved. If moved while the cryoprobe is still frozen, the choroidal vessels may rupture, resulting in a subretinal hemorrhage or avulsed sclera, creating a scleral defect (Figure 5D). Such scleral defects are a rare complication of buckling surgery,⁸ but they can be encountered secondarily to needle lacerations, pressing on scleromalacia, or discovered while revising explants (Figure 6A). In such cases, if the sclera is healthy and the defect is small, a simple mattress suture can be applied. If the defect is larger or the sclera is ectatic, a buckle with or without glue can be sutured into place. Alternatively, donor sclera or a pericardial patch graft can be sutured over the defect (Figure 6B).

Lastly, although this rarely necessary, care must be taken when temporarily removing extraocular muscles in the course of scleral buckling. If a muscle is “dropped”

and cannot be found, do not panic—often a more experienced surgeon can retrieve the muscle the next day.

INFLUENCE OF TRAINING ON FUTURE PRACTICES

For various reasons, over the past 20 years there has been a noticeable swing in practice from scleral buckling toward vitrectomy and gas for the repair of retinal detachments. As a result, surgeons in training are not learning the necessary skills to confidently perform buckling. Twenty years ago most trainees were expected to be competent at indirect ophthalmoscopy, strabismus surgery, and suturing of extracapsular cataract extraction incisions. Currently, trainees do not need to perform indirect ophthalmoscopy, they perform sutureless surgery, and are competent with bimanual bipedal intraocular surgery and advanced fluidics. For this reason, only the most straightforward buckles, with the fewest risks, may be performed by future generations of vitreoretinal surgeons, forcing an eventual retirement of the scleral buckling technique.

CONCLUSION

Scleral buckling is in principle a simple closed operation. As with any procedure, however, it is important to try to minimize failures while avoiding perioperative disasters. Given the current trends in surgical training, an internal approach may be the only approach in the future. ■

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