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Modified Controlled Encircling Scleral Buckle for Retinal Detachment

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Abstract

During encircling scleral buckle placement, the ends of the element are tightened to achieve a shortened radius of the eye. The determining factor of the final buckle height is subjective using usually a combination of the buckle height visualized with the degree of scleral indentation and can be difficult to be taught early on to trainees. Here, we describe a case series in which a modified controlled encircling scleral buckle technique that simplifies and standardizes the achievement of reproducible buckle height of about a 1 mm is objective and easy to be taught. This novel encircling scleral buckling technique successfully achieves a good postoperative scleral buckle height in a reproducible and standardized fashion using objective measurements and it is easier to be taught to trainees.

Keywords

encircling scleral buckle; buckle height; retinal detachment

Introduction

Encircling scleral buckle is a widely used technique for repair of primary or recurrent retinal detachment, as well as proliferative vitreoretinopathy.^{1–3} Although segmental buckles effectively close isolated tears, they do not provide retinal support in other areas of vitreoretinal traction away from the segmental element, making encircling elements commonly preferable. Encircling procedures are particularly indicated in cases with multiple breaks in different quadrants and diffuse vitreoretinal pathologic conditions such as extensive lattice degeneration or vitreoretinal degenerations, proliferative vitreoretinopathy, and young age, although people do not always agree with the indications.^{3–7}

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Ethical Approval

Not applicable.

Statement of Informed Consent

Not applicable.

Declaration of Conflicting Interests

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Although there is a big debate in our community whether buckling or vitrectomy is the best technique, similar rates of primary success (80%) are reported using national databases in the United States.¹ Since select subpopulations of patients may do better with one versus the other, it is important for the person skilled in the art of vitreoretinal surgery to do both. However, new trainees find it difficult to learn this technique well, especially the proper amount of tightening/shortening the encircling scleral buckle (SB) element. Most reports and teachers use qualitative words such as “low”, “moderate,” or “too high,” yet there is a report from Hamilton and Taylor all the way back in 1972 that tried to standardize encircling to 2 mm height using simple trigonometry known to all of us.⁸ Unfortunately, this publication is not well known. Here, we present our own experience with slight modification of this technique that uses tires and with ~1 mm indented height instead of 2 mm. This controlled encircling scleral buckle technique simplifies and standardizes the achievement of reproducible buckle height that is objective and easy to be taught and shows that 1 mm height is adequate for good anatomical results. A video provided may help the new trainees learn this useful technique in the repair of retinal detachment.

Methods

For the surgical approach a 360° peritomy was done and the intermuscular septum was opened. Muscles were identified, stripped of the their “sleeve,” and isolated using 2-0 silk. According to geometry rules, the circumference of the globe is $2\pi R$, where R is the radius of the globe and π the standard value of 3.14. For target buckle height of 1 mm, which we consider to be a good buckle height for primary retinal detachment without significant traction or proliferative vitreoretinopathy, the new circumference of the globe should be $2\pi(R - 1 \text{ mm})$. The difference between the 2 circumferences is always $2\pi = 6.28 \text{ mm}$, independent of the initial radius of the globe (Figure 1A). To make easy of the calculations, we shorten the encircling buckle element by about 6 to 6.5 mm after cutting the 2 ends flush. Subsequently, we directly appose and tie the ends with 3 interrupted 5.0 nylon sutures. We secure the element in place with a double pass mattress suture placed 0.5 mm from each side of the element usually at the superonasal quadrant or in the quadrant where main pathology is located. Then we place another single pass mattress suture in a similar fashion at the quadrant 180° away (Figure 1B, C). Paracentesis of 0.25 mL of fluid was routinely performed. We do not close Tenon separately from conjunctiva (Supplemental Video, available with the online version of the article).

Results

Fourteen patients, 10 men and 4 women, with primary retinal detachment underwent encircling buckle placement using this controlled technique (Supplemental Video 1, available with the online version of the article).

The average age was 37 years, and the mean follow-up time was 12 months. All 14 patients had good buckle height postoperatively (Figure 2), and in 13 of the 14 patients, the retinal detachment resolved and retina remained attached during the follow-up period without any recurrence. No scleral buckle-related complications were noticed. There were no cases of

choroidal hemorrhage, hypotony or increased intraocular pressure, fish-mouthing of retinal breaks, diplopia, anterior segment ischemia, scleral buckle exposure, or infection.

Discussion

Encircling scleral buckle is a valuable tool for primary retinal detachment. During encircling scleral buckle placement, the ends of the element/band are tightened in order to achieve a shortened radius of the eye at the place of the buckle.^{2,8–10} There is a linear correlation of the height and breadth of the scleral indentation with the amount the encircling element is shortened. The determining factor for how much the band should be tightened is traditionally estimated subjectively by the height of the buckle on indirect ophthalmoscopy or the degree of scleral indentation to ensure adequate scleral buckle height for support of the retinal breaks.

Estimating the appropriate buckle height in a soft eye after drainage of the subretinal fluid and after depression and cryopexy can be tricky especially in the hands of a young surgeon, leading to over- or underestimation of final buckle height when the eye has returned to normal pressure. In addition, it requires optimal visualization which can be compromised by air bubbles, media opacification, or cornea decompensation during this crucial final step of the surgery. The amount by which the element needs to be shortened can be challenging and difficult to be taught early on to trainees because it is subjective based on ophthalmological or external appearance during surgery.

Excessive buckle height can lead to anterior segment ischemia and radial folds on the buckle leading to the fish-mouth phenomenon, while inadequate buckle height can lead to inadequate support of the breaks and failure of the surgery.^{2–4,8,9} Using controlled shortening technique, the buckle height achievement is objective, reproducible, and easier to be taught in trainees.

The exact buckle height is debated, but without using controlled encircling procedures, we may never have data to compare. The 14 cases that Hamilton and Taylor⁸ described using 2 mm elevation had similar success rates with the national averages and with the result reported here by us using 1 mm SB height. However, this controlled technique allows us and others to compare various different SB heights in the appropriate groups. We also have to remember that these calculations will apply when nonelastic (or less elastic) elements like tires (276 and 275 in our case series) are used for encircling. If more elastic silicon bands like 40, 41, or 42 bands are used, we expect them to lengthen when stretched and thus “fudge” factors may have to be introduced.

We agree with the original statement in Hamilton and Taylor that “therefore hope that the encircling operation has been converted from an art to a science” and that more young trainees will learn this technique that successfully achieves a reproducible postoperative scleral buckle height using objective measurements in a standardized fashion that is easily taught.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Day S, Grossman DS, Mruthyunjaya P, Sloan FA, Lee PP. One-year outcomes after retinal detachment surgery among medicare beneficiaries. *Am J Ophthalmol*. 2010; 150(3):338–345. [PubMed: 20591398]
2. Schepens CL. Scleral buckling procedures. *Trans Am Acad Ophthalmol Otolaryngol*. 1958; 62:206–218. [PubMed: 13556797]
3. Thanos A, Papakostas TD, Young LH. Scleral buckle: does it still have a role in retinal detachment repair? *Int Ophthalmol Clin*. 2015; 55(4):147–156. [PubMed: 26322434]
4. Grizzard WS, Hilton GF. Scleral buckling for retinal detachments complicated by periretinal proliferation. *Arch Ophthalmol*. 1982; 100(3):419–422. [PubMed: 7065958]
5. Cankurtaran V, Citirik M, Simsek M, Tekin K, Teke MY. Anatomical and functional outcomes of scleral buckling versus primary vitrectomy in pseudophakic retinal detachment. *Bosn J Basic Med Sci*. 2017; 17(1):74–80. [PubMed: 28135566]
6. Kessner R, Barak A. Pseudophakic rhegmatogenous retinal detachment: combined pars plana vitrectomy and scleral buckle versus pars plana vitrectomy alone. *Graefes Arch Clin Exp Ophthalmol*. 2016; 254(11):2183–2189. [PubMed: 27245856]
7. Lumi X, Luznik Z, Petrovski G, Petrovski BE, Hawlina M. Anatomical success rate of pars plana vitrectomy for treatment of complex rhegmatogenous retinal detachment. *BMC Ophthalmol*. 2016; 16(1):216. [PubMed: 27938367]
8. Hamilton AM, Taylor W. Controlled encircling procedure for retinal detachment. *Br J Ophthalmol*. 1972; 56(9):695–699. [PubMed: 4653861]
9. Harris MJ, et al. Geometric alterations produced by encircling scleral buckles. Biometric and clinical considerations. *Retina*. 1987; 7(1):14–19. [PubMed: 3602601]
10. Lincoff H, Kreissig I, Parver L. Limits of constriction in the treatment of retinal detachment. *Arch Ophthalmol*. 1976; 94(9):1473–1477. [PubMed: 962657]

Figure 1.

(A) According to geometry rules, the circumference of the globe is $2\pi R$, where R is the radius of the globe and π the standard value of 3.14. For buckle height of 1 mm, the new circumference of the globe should be $2\pi (R - 1 \text{ mm})$. The difference between the 2 circumferences is always $2\pi - 6.28 \text{ mm}$, independent of the initial radius of the globe. (B) External photo intraoperatively demonstrating an encircling 276 tire after the 2 ends have been apposed and tied with 3 interrupted 5.0 nylon sutures. (C) The encircling buckle element is shortened by about 6 mm after cutting the 2 ends flush. Subsequently, the 2 ends are directly apposed and tied with 3 interrupted 5.0 nylon sutures. The element is secured in place with a double pass mattress suture placed 0.5 mm from the each side of the element. Then another single pass mattress suture is placed at the quadrant 180° away.

Figure 2. Wide-angle Optos fundus photos of a patient with primary retinal detachment at postoperative month 1 demonstrating resolution of subretinal fluid with good buckle height and contour.