Major Article

Strabismus surgery outcomes without removal of scleral buckle in patients with previous retinal detachment repair

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PURPOSE To report the motor and sensory outcomes of strabismus surgery following scleral buckle procedure for retinal detachment (RD) without removal of the scleral buckle.

METHODS The medical records of patients who underwent strabismus surgery without removal of scleral buckle following RD surgical repair at a tertiary referral center between 2002 and 2015 were reviewed retrospectively. Demographic data were recorded, and rates of surgical motor success (defined as horizontal deviation of $\leq 10^{\Delta}$ and vertical deviation of $\leq 4^{\Delta}$) and sensory success (resolution of diplopia) were calculated.

RESULTS A total of 23 patients (mean age, 58.4 ± 24.4 years; 12 males) were included. The average time between the RD surgery and onset of strabismus was 11.05 ± 10.95 months (range, 1-42 months). The strabismus was horizontal in 6 patients, vertical in 2, and combined in 15. Eighteen patients (78%) presented with diplopia. Adjustable sutures were used in 18 patients. Final motor surgical success was achieved in 17 of 23 patients (74%), and diplopia improved in 17 of 18 patients (94%) who had preoperative fusional capability. There was no statistically significant difference in age, number of RD surgeries, macular status, time to strabismus surgery, visual acuity in the worse eye, or magnitude of preoperative horizontal and vertical deviation with regard to motor success rate and with persistence of diplopia postoperatively.

CONCLUSIONS In our study cohort, strabismus surgery without removal of the scleral buckle resulted in motor success and alleviated diplopia in the majority of patients with prior RD repair. (J AAPOS 2018;■:1-4)

The use of scleral buckles to repair retinal detachments (RDs) has been shown to cause ocular motility disorders. Postoperative strabismus develops in 3.8%-25% of cases[1,2]; diplopia, in 3%-73% of patients.[2-4] The cause of strabismus in these patients is often multifactorial. Etiologies include sensory factors, such as poor vision due to macular damage, myotoxicity from peribulbar/retrobulbar anesthesia, and mechanical disturbances related to the scleral buckle (eg, direct intraoperative muscle damage, fibrosis, scarring and adhesions between the muscle, sclera, fat, and scleral buckle, mass effect of the underlying scleral buckle, and muscle displacement).[2,5]

Surgical treatment of strabismus in eyes with scleral buckle poses challenges. Successful motor outcomes, ranging from 47% to 80%, have been reported,[2,4,6] with successful sensory outcomes in up to 62% of patients.[2] However, whether or not removal of the scleral buckle improves ocular alignment is still debated. Some authors suggest that scleral buckle removal eliminates the mechanical factors implicated in muscular imbalance[4]; however, removal of the scleral buckle has also been associated with redetachment of the retina in 4% to 33% of cases.[7,8] The purpose of this study was to report the motor and sensory outcomes of strabismus surgery following RD repair without scleral buckle removal at a single center over a 14-year period.

Subjects and Methods

This study was approved by the University of Miami Institutional Review Board, adhered to the tenets of the Declaration of Helsinki, and complied with the US Health Insurance Portability and Accountability Act of 1996. The medical records of patients

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who underwent strabismus surgery following RD surgical repair at Bascom Palmer Eye Institute between 2002 and 2015 were reviewed retrospectively. Financial claims data were searched to identify patients who underwent RD surgical repair with scleral buckle with and without pars plana vitrectomy (Current Procedural Terminology-4 67107, 67108, 67110, 67112) as well as extraocular muscle surgery (Current Procedural Terminology-4 67311, 67312, 67314, 67316).

Surgeries were performed by 3 pediatric ophthalmologists (HC, KMC, CAM). All scleral buckles were left in place, provided there was no extrusion or infection. Intraoperatively, the scleral buckle was not deliberately avoided during surgery. When the scleral buckle was encountered, the surgeon released any adhesions between the muscle and the scleral buckle and performed the intended procedure. The muscle was reattached to the globe at the insertion for resections and suspended over the buckle with hang-back or adjustable sutures for recessions. Patients that required scleral buckle removal prior to strabismus surgery for extrusion or infection were excluded, as were patients with concomitant ocular morbidities that could cause strabismus (such as glaucoma drainage devices and thyroid ophthalmopathy) and those with <6 weeks postoperative follow-up.

The following data were extracted from the medical record: age, sex, pre- and postoperative visual acuity, previous RD repair procedures, timing of strabismus or diplopia onset after RD repair based on patient's report, pre- and postoperative ocular alignment in primary gaze, limitation of ductions in the affected eye, pre- and postoperative presence of diplopia, type of strabismus surgery performed, intra- and postoperative complications, use of adjustable suture technique, and length of postoperative follow-up. Torsion, stereopsis, ocular alignment in different gaze positions, forced duction testing, and types of scleral buckles were not analyzed, because documentation in medical records was inconsistent.

Ocular alignment in primary position was measured by alternate prism cover testing or by Krimsky testing in patients with a best-corrected visual acuity of ≤20/200. The postoperative surgical results were described as motor and sensory outcomes. Surgical motor success was defined in all patients as postoperative horizontal deviation of $\leq 10^{\Delta}$ and vertical deviation $\leq 4^{\Delta}$ in primary position of gaze. In patients that presented with diplopia preoperatively, sensory success was defined as intermittent or constant resolution of diplopia in primary gaze with or without prism glasses. In patients without preoperative sensory complaints or diplopia, only postoperative surgical motor success was evaluated.

Statistical Analysis

Statistical analysis was performed with SAS software version 9.4 (Cary, NC). Correlations between motor success rate and age, visual acuity, number of previous retina surgeries, macular involvement, and preoperative deviation were determined using the Fisher exact test for categorical variables. Continuous variables were tested for a normal distribution. For non-normally distributed variables, groups were compared using the Mann-Whitney-Wilcoxon two-sample nonparametric test. For normally distributed variables, groups were compared using an independent samples *t* test, assuming equal or unequal variance, as appropriate. Snellen best-corrected visual acuity results were converted to logMAR values for analysis.

Results

A total of 23 patients (12 males [52%]) who underwent strabismus surgery after RD repair with scleral buckle were included. Mean age at surgery was 58.4 ± 24.4 years (range, 12-81 years), including 3 pediatric patients with RD due to acute retinal necrosis or trauma. Patient characteristics, including pre- and postoperative sensorimotor examinations, are highlighted in eTable 1.

Eleven patients (48%) required 2 or more RD repair surgeries prior to strabismus surgery. The macula was affected in 20 patients (87%). The average time between the last RD repair surgery and the onset of strabismus and/or diplopia was 11.05 ± 10.95 months (range, 1-42 months). The average time between the last retinal repair surgery and strabismus surgery was 22.17 ± 15.81 months (range, 6-63 months).

Strabismus was horizontal in 6 patients, vertical in 2, and combined horizontal and vertical in 15. In the last group, the vertical component was addressed by horizontal muscle supra- or infraplacement in 3 patients and concurrent horizontal and vertical muscle surgery in 4. In 8 patients the surgical approach was tailored to address only the deviation most visually apparent to the patient (horizontal in 6 and vertical in 2), because the accompanying deviation was either of very small magnitude or present intermittently. Preoperative horizontal deviations addressed surgically ranged from esotropia of 40^{Δ} to exotropia of 60^{Δ} (mean magnitude [absolute value], $27.9^{\Delta} \pm 11.6^{\Delta}$); vertical deviations, from 8^{Δ} to 25^{Δ} (mean magnitude, $13.1^{\Delta} \pm 4.9^{\Delta}$). Preoperatively, 18 patients (78%) presented with diplopia. Of the 5 patients without diplopia, 4 had sensory exotropia (best-corrected visual acuity of ≤20/400) and 1 had a long-standing large-angle exotropia, which likely enabled the patient not to experience diplopia.

A retina specialist confirmed that the retina was attached prior to strabismus surgery. Twenty-one patients (91%) underwent surgery in the same eye as the scleral buckle; 2 underwent surgery in the contralateral eye with lower best-corrected visual acuity. Eighteen patients (78%) underwent strabismus surgery using an adjustable suture technique, of whom 5 patients required postoperative adjustment consisting of re-recessions of 1–3 mm (mean, 2 mm). In these patients, although the position of the buckle was considered during postoperative adjustment, there is a chance that in some cases the muscle may have healed onto the silicone band. Two patients (9%) underwent a second operation. The mean postoperative follow-up was 9.2 ± 11.9 months (range, 2-36 months).

Alignment Outcomes

Surgical success was achieved in 16 patients (70%) after the first surgery and in 17 (74%) after two surgeries. Motor