Sealing Effect of External Diathermy on Leaking Sclerotomies After Small-Gauge Vitrectomy: A Clinicopathological Report

Small-gauge vitrectomy has surged in popularity in recent years and has become a widespread alternative to traditional techniques. Eighty-five percent of retinal surgeons now routinely use 25- or 23-gauge systems for uncomplicated macular surgery compared with 22% in 2005.1

These small-gauge systems have advantages over larger-gauge systems, including shorter operative times, less tissue manipulation, decreased postoperative inflammation and pain, and quicker visual recovery.2 However, the sclerotomies are not routinely sutured in small-gauge vitrectomy, resulting in a unique set of potential postoperative complications, namely, wound leakage predisposing to postoperative hypotony, incomplete fill of tamponading agents, and possibly an increased risk of postoperative endophthalmitis. Applying external diathermy on a leaking sclerotomy is effective in sealing the surgical wound.3,4

The purpose of this clinicopathological report is to evaluate local histological and wound architecture changes in scleral wounds of varying sizes following the application of external diathermy.

Methods | A 3-port pars plana vitrectomy was performed on fresh porcine eyes to remove the vitreous gel. After conjunctival displacement, the sclera was penetrated 3.0 mm from the limbus in a beveled manner, with insertion at a 30° angle, then beveled to a 90° angle, using trocars of various sizes: 20-, 23-, 25-, and 27-gauge trocars. At the end of the surgical procedure, external bipolar diathermy with a power of 44 W was applied to the sclerotomy sites for 5 seconds. These eyes were compared with a nondiathermized control. This experiment was repeated 3 times in 3 different eyes for every gauge tested. Eyes were then placed in 4% formaldehyde and embedded in paraffin.

Histological sections through the sclerotomy sites were stained with hematoxylin-eosin and Masson trichrome collagen stains. Sites were microscopically examined for histological changes, with particular attention to collagen changes sealing the wounds, and for adhesion of conjunctiva to the sclerotomies.

Results | Sixty percent of the small-gauge (27- and 25-gauge) sclerotomies were closed without diathermy, in comparison with none of the larger-gauge sclerotomies. Histological sections of all sclerotomies for which diathermy was not applied showed sclerotomies with homogeneous collagen architecture throughout the thickness of the sclera (Figure, A). Large-gauge (20-gauge) sclerotomies for which diathermy was applied demonstrated partial-thickness outer scleral melting and denaturation of scleral collagen (Figure, B). Fusion of tissue over the sclerotomies sealing the outer portion of the sclerotomies was noted in all the small-gauge sclerotomies (Figure, C).

Discussion | Sclerotomy suturing of at least 1 sclerotomy is reported in a mean of 38.5% of cases with 23-gauge vitrectomy surgery (range, 2.2%-93%)3 and in 7.1% of cases with 25-gauge vitrectomy surgery.2 Potential drawbacks of sclerotomy suturing are astigmatism and postoperative inflammation. Applying external diathermy on a leaking sclerotomy was suggested as a useful, easy, and less traumatic technique to reduce the entry of ocular surface fluid into these incisions and prevent leakage of intraocular fluid in the immediate postoperative period, thus potentially reducing the incidence of postoperative endophthalmitis and hypotony.3 However, the mechanism was never demonstrated and was speculated to be conjunctival adhesion over the surgical wound. Porcine sclera was reported to have inferior mechanical stiffness in comparison with human aged sclera. Differences in collagen content and cross-link density may vary with age and with axial length if this experiment were to be performed on human sclera.5 In this article, we demonstrate the mechanism by which external diathermy seals small-gauge sclerotomies.

Figure. Histology of Large- and Small-Gauge Diathermized Sclerotomies

Sclerotomies (20-gauge) for which diathermy was not applied showed homogeneous collagen architecture throughout the thickness of the sclera (A), large-gauge (20-gauge) sclerotomies for which diathermy was applied demonstrated partial-thickness outer scleral melting and denaturation of scleral collagen (B), and scleral fusion of tissue over the sclerotomies sealing the outer portion of the sclerotomies was noted in all the small-gauge (23-, 25-, and 27-gauge) sclerotomies (C) (hematoxylin-eosin and Masson trichrome collagen stains, original magnification ×20).
To our knowledge, this is the first clinicopathological report demonstrating the histological scleral changes composing fusion of scleral collagen to seal the sclerotomy site. We believe this technique to be an easy and effective way to seal leaking sclerotomies in small-gauge sutureless vitrectomy (Video).

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Epstein-Barr Virus–Positive Polymorphous Lymphoplasmacytic Infiltrate of the Lacrimal Glands in a Patient With Acute Lymphoblastic Leukemia

An atypical inflammatory infiltrate of the orbital tissues in the setting of a patient with a known history of treated leukemia presents the clinician with the daunting task of having to establish whether a relapse of the leukemia has occurred, which would necessitate reintroduction of toxic chemotherapeutic agents. Herein, we report such a case.

Report of a Case | A boy in his early teens presented to the hospital with a 3-day history of painless swelling and erythema of bilateral upper and lower eyelids. He had had high-risk acute lymphoblastic leukemia that was in remission with maintenance chemotherapy. The upper eyelids exhibited temporal fullness (Figure 1A and B). Computed tomography revealed preseptal edema with bilaterally enlarged lacrimal glands and no bony destruction or globe compression (Figure 1C and D).

After admission to the hospital, blood cultures and viral cultures were obtained and were negative for cytomegalovirus, influenza, respiratory syncytial virus, and adenovirus. Of note, Epstein-Barr virus (EBV) IgG was positive and IgM was negative, with a serum viral load greater than 100 000 copies/mL. Lacrimal gland biopsies revealed that the lacrimal gland lobules were preserved (Figure 1E). The acini and ducts were splayed apart by polymorphous lymphoplasmacytic cells displaying mildly enlarged and irregularly shaped nuclei with modest amphophilic cytoplasm (Figure 1E, inset). There was no fibrosis of the lacrimal gland or spillover of the infiltrate into the adjacent orbital connective tissues.

Immunohistochemical staining revealed the following results: CD10+ and CD20+ lymphocytes; a small focus of CD21+ and CD23+ dendritic cells; CD56 predominantly negative except for some natural killer cells; CD138 strongly positive for plasma cells; BCL2 dimly positive; BCL6 negative; terminal deoxynucleotidyl transferase negative for leukemic cells; and Ki-67 positive in 70% of cells (Figure 2A). Immunoglobulin staining disclosed IgG greater than IgA greater than IgM. Many CD3+ and CD5+ T cells were dispersed throughout the lesion (Figure 2B). Flow cytometry did not reveal any abnormal B-, T-, or plasma-cell populations. The T cells showed an inverted CD4 to CD8 ratio, which would most likely represent a T-cell response to EBV-infected B cells. In situ hybridization to test for EBV-associated RNA expression was strongly positive in lymphocytes but was negative in the acini (Figure 2C).

In situ hybridization for κ immunoglobulin light chain (Figure 2D) was slightly more positive than that for λ immunglobulin light chain (Figure 2E). Polymerase chain reaction testing revealed a clonal heavy-chain gene rearrangement, indicating the presence of a small clonal B-cell population considered to be of no clinical significance.

Discussion | The central dilemma in this case was to determine whether the lacrimal gland infiltrates represented a relapse of the acute lymphoblastic leukemia, an inflammatory infiltrate, or a B- or T-cell neoplasm caused by EBV-positive lymphocytes. The clinical picture was confusing because the patient was receiving maintenance chemotherapy. The bilaterality of the process and its rapid evolution appeared ominous, as did the infiltrates composed of intermediate lymphocytes with somewhat irregular nuclei displaying a high Ki-67 proliferative index of 70%. Immunohistochemical studies, however, disclosed EBV infection of B lymphocytes with in situ hybridization and showed approximately equal κ and λ light-chain expression. Polymerase chain reaction disclosed a small clonal immunoglobulin heavy-chain gene rearrangement, which was not interpreted as evidence of a malignant cell population.

In light of the absence of peripheral blood and bone marrow abnormalities of leukemia and the results of the lacrimal gland biopsy, it was decided not to treat the patient for a