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Brief Reports

Radiesse-Induced Herpes Zoster

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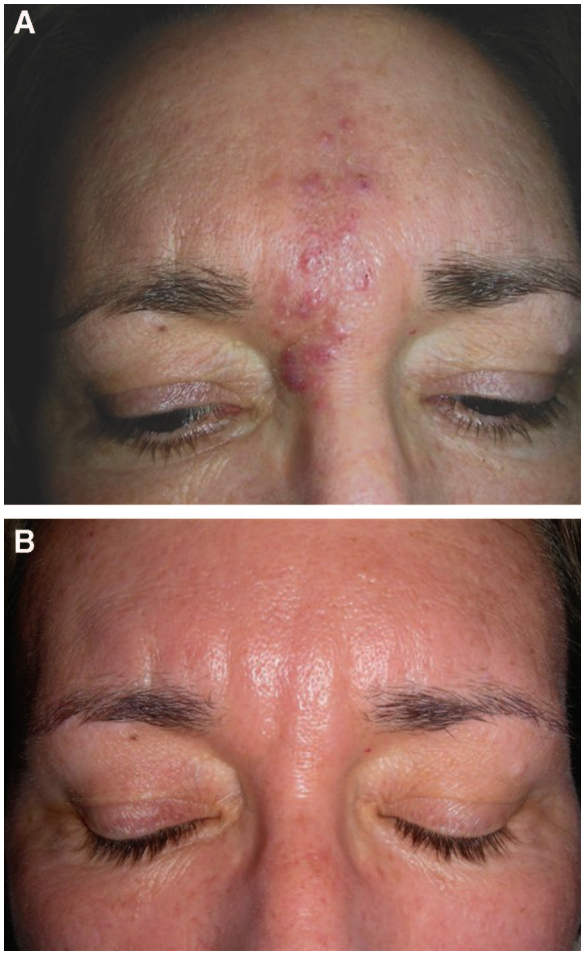
Abstract: **Radiesse is a filler material for deep nasolabial folds that was recently approved by the United States Food and Drug Administration. It is composed of calcium hydroxylapatite crystals measuring 25 μm to 45 μm. Few complications have been reported to date. We present a case of a woman who developed herpetic appearing skin lesions after the injection of Radiesse in the glabella. She noted tenderness and tingling along with redness and bumps. The vesicles were isolated to the right ophthalmic branch of the trigeminal nerve distribution and the skin was erythematous with associated pustules. After disease progression while on systemic antibiotics, she improved markedly when started on antivirals. Three days later the tingling resolved, the erythema was markedly improved, and the vesicles started to resolve. She had returned to baseline after a month. Physicians should be suspicious for herpetic infection or reactivation with facial injections of Radiesse or other fillers and should initiate immediate treatment with oral antivirals upon identifying the above signs and symptoms.**

Radiesse was approved by the US Food and Drug Administration in 2006 as a filler material for nasolabial folds. Use in other regions is considered an off-label application. The material is composed of synthetic calcium hydroxylapatite and is carried in a gel mixture of sterile water, glycerin, and carboxymethylcellulose. The gel is dissipated in vivo and replaced with soft-tissue growth, whereas the hydroxylapatite remains at the injection site. Complication described in the literature include a spectrum from none to minor to potentially severe.[1–5] The minor complications include swelling, redness, and bruising after superficial injections. More severe complications include granuloma formation, scarring and bacterial infections.[4,5] Fortunately, with biodegradable products these complications are mostly time limited.[3] We report a new complication of Radiesse injection and describe its signs, symptoms, and treatment.

CASE REPORT

A 57-year-old healthy, immunocompetent woman developed herpetic appearing skin lesions in the glabellar region after injections with Radiesse. Her first injection with this filler material was 6 months earlier with a total of 4 treatments prior to developing herpes zoster. The 3 prior injections were uncomplicated and were in the regions of the glabella, marionette lines, and nasolabial folds. The first day following the most recent 0.3-ml injection of Radiesse in the glabellar region, she developed tenderness, tingling, and redness with bumps along the right side of the glabellar region. Examination revealed erythema with vesicles or pustules, swelling, and tenderness in the right glabella region. These findings extended to the lateral side of the superior nose and the medial aspect of the right upper eyelid. She was placed on oral ciprofloxacin for suspected impetigo but had worsening of the skin lesions 3 days later (Fig. A). At this time her findings were more prominent in the ophthalmic distribution of the trigeminal nerve. She was placed on oral acyclovir 800 mg 5 times a day for 10 days. Three days after starting the acyclovir, the redness was markedly improved, the vesicles opened up and were drying, and the



A, The patient's mid and upper face show the maximum finding of erythema and pustules in the right V_1 region prior to starting acyclovir. **B,** Six months later, the patient's mid and upper face show resolution of the right V_1 region herpes zoster.

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swelling and tenderness had nearly resolved. One month after the onset of symptoms she had returned to her usual baseline and this persisted at 6 months (Fig. B).

DISCUSSION

Biodegradable fillers have been reported to have a spectrum of minor to potentially devastating complications.[1–5] To our knowledge, the current case is the first description of the filler Radiesse inducing herpetic appearing skin lesions in the region of the glabellar injections. Neither culture nor antibody testing was performed to confirm the diagnosis but the clinical presentation, findings, and resolution with antivirals were classic for herpes zoster. Herpes zoster may be seen in immunocompromised individuals and in those under stress.[6] Stressors can include local insults such as seen in the current case with filler injections. The clinical course described should be lucid in the mind of practitioners who perform filler injections. Once recognized, the patient should be immediately treated with oral antivirals to hasten the course of the disease. If done, this may limit the sequelae. Pretreatment with antivirals may be considered for patients with a history of herpetic reactivations.

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Subconjunctival Injection of Tetracycline 2% for Chronic Bulbar Chemosis After Transcutaneous Four-Eyelid Blepharoplasty

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Abstract: **A 51-year-old white woman had an 18-month history of unilateral chronic bulbar chemosis after 4-eyelid cosmetic blepharoplasty. Tetracycline 2% was injected subconjunctivally in the area of the chemosis. After 2 injections over a period of 6 months, the chemosis resolved completely. At final follow-up 9 years later, the patient remained free of chemosis. Two other patients with unilateral chronic chemosis of unknown cause were similarly treated with tetracycline 2% subconjunctival injections. In the first patient, chemosis had been present before an upper eyelid blepharoplasty. After one injection with tetracycline 2%, the chemosis resolved completely and remained absent at final follow-up 8 years later. The second patient reported a 10-year history of chronic chemosis. He had never had blepharoplasty. Two injections with tetracycline 2% within an interval of 6 months were given. At final follow-up 4 years later, mild residual chemosis was present.**

CASE REPORT

A 51-year-old white woman was referred 12 months after a transcutaneous 4-eyelid cosmetic blepharoplasty by an outside surgeon. Immediate postoperatively she had developed chemosis of the right eye, for which she was prescribed lubricating, corticosteroid, and anticongestive eyedrops. She reported a foreign body sensation and an unsightly "glassy" appearance of her right eye. Examination showed moderate to severe chemosis of the bulbar conjunctiva in the nasal and inferior sector of the right eye (Fig., top). There were no signs of conjunctival follicles or tortuous vessels. Lagophthalmos and proptosis were absent. The patient reported no episodes of chemosis prior to surgery. There was no history of ocular allergy, previous eyelid trauma, or head and neck radiation. Thyroid function and antibodies were normal. We followed the patient for another 6 months, after which no change in the chemosis was noted.

Based on the experience with high concentrations of locally applied tetracycline acting as a sclerosant for pleurodesis, we aimed to inject the agent in to the areas of chemosis. The Ethics Committee deemed this protocol exempt from review. After topical anesthesia with cocaine 2%, a 26-gauge needle was used to penetrate the edematous area in the subconjunctival space. Three small injections with tetracycline 2% were given to the nasal, inferior, and inferotemporal areas of chemosis. A total volume of 0.8 ml was injected. The patient reported a mild burning sensation in the right eye occurring some minutes after the injection and lasting for about 2 days. Immediately postinjection, a yellowish swelling was noted at the injection sites. Two months after the first injection, the area of chemosis had reduced substantially, showing mild to moderate chemosis nasally. A second injection of 0.5 ml tetracycline 2% to the nasal chemotic conjunctiva was given 4 months later. Three months thereafter, the chemosis had completely resolved and the patient reported no further symptoms (Fig., middle). At final follow-up 9 years later, subjectively and clinically detectable chemosis remained absent (Fig., bottom).

Between 1998 and 2001, we treated 2 patients with idiopathic unilateral chronic bulbar chemosis. Their details are outlined in the Table. At final follow-up the chemosis resolved completely after a single injection in one patient, and substantially but not completely after 2 injections in the other patient. Because of the pain after the injection, patient 2 refused a second injection.

DISCUSSION

Conjunctival chemosis is a common finding in the immediate days after eyelid surgery because of accumulation of fluid in the subconjunctival space. It is assumed that disrup-

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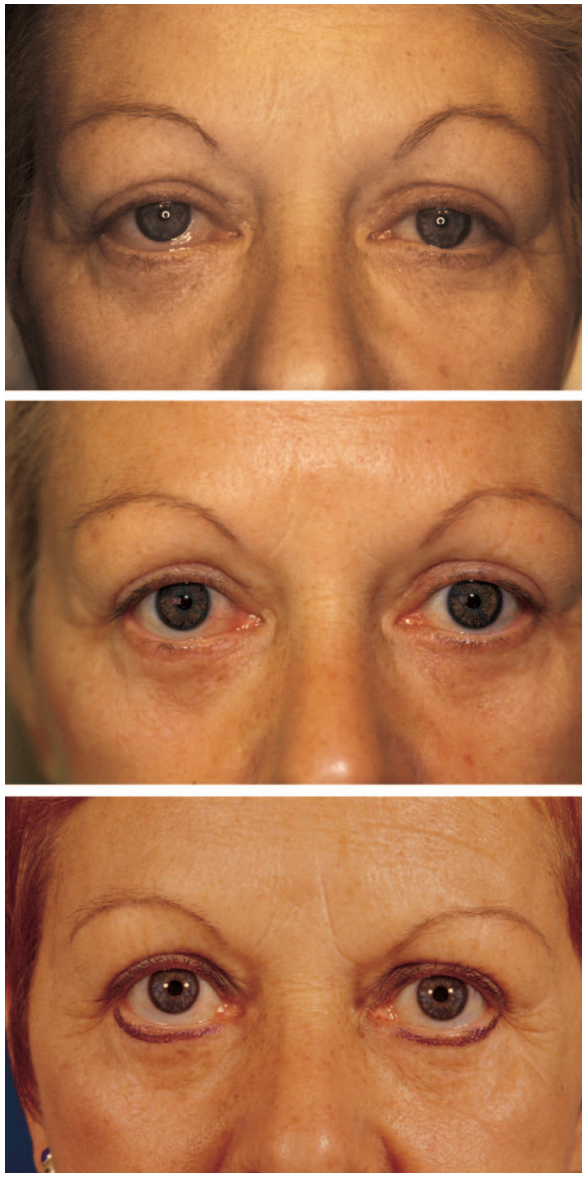

Top, The patient, 18 months after the 4-eyelid blepharoplasty. Note the chemosis in the inferior and nasal sector of the right eye. **Middle,** Same patient, 3 months after the second injection with tetracycline. Chemosis is absent. **Bottom,** Same patient, 9 years later. Chemosis remains absent.

tion of conjunctival and skin lymphatics during surgical dissection and cauterization is the possible cause.[1] In most cases, the chemosis spontaneously resolves in the early postoperative period. However, for unknown reasons, a very small group of patients will develop chronic chemosis. Both transcutaneous and transconjunctival lower eyelid blepharoplasty and 4-eyelid blepharoplasty have been reported to cause persistent conjunctival chemosis postoperatively.[1–3] Risk factors that may predispose development of chronic chemosis include previous periocular surgery, ocular allergy, thyroid orbitopathy, lagophthalmos, and prior head and neck radiation.[1]

There is no standard treatment for persistent chemosis after eyelid surgery. Management with ocular surface lubrication, pressure patching, and corticosteroid eye drops is often unsuccessful.[1,2] Thakker et al.[1] proposed a regional conjunctivoplasty in the area of chemosis, inducing subconjunctival scarring. Enzer and Shorr[2] described a modified Snellen suture to restore the lower conjunctival fornix. Based on the pathophysiologic mechanism of lymphatic fluid accumulation in the space between conjunctiva and Tenon fascia, we adopted the technique of injecting sclerosing agents from thoracic surgeons. Tetracycline is, next to talc and bleomycin, commonly used in the treatment of pleural effusions to achieve pleurodesis.[4] Tetracycline applied locally in high concentrations acts as a sclerosant by inducing an inflammatory reaction with subsequent production of fibrogenic cytokines and collagen.[4] To our knowledge, it has never been used to treat conjunctival chemosis.

TABLE. *Details of 2 other patients with idiopathic unilateral chronic chemosis treated with subconjunctival injection of tetracycline 2%*

	Patient 2	Patient 3
Age	63 years	49 years
Gender	Female	Male
Site	Left	Left
History of cosmetic blepharoplasty	Upper eyelid 2 years before blepharoplasty	No
Onset of chemosis		—
Duration of chemosis	4 years	10 years
Grading of chemosis	2+ to 3+	3+
First injection with tetracycline		
Volume (ml)	0.5	0.8
Area	Nasal + Inferior	Nasal + inferior + temporal
Pain duration	2 days	2 days
Grading of chemosis at 2 months	1+	2+
Second injection with tetracycline	—	At 6 months
Volume (ml)	—	0.5
Area	—	Nasal + inferior
Pain duration	—	2 days
Grading of chemosis at final follow-up (years of follow-up)	0 (8 years)	1+ (4 years)

Chemosis is graded as 0 (no chemosis), 1+ (mild), 2+ (moderate), 3+ (severe), and 4+ (extreme prolapse).

In conclusion, subconjunctival injection of tetracycline 2% may be effective as a simple and safe method to treat chronic bulbar conjunctival chemosis. However, the patient should be warned that a burning pain is expected for a few days after the injection.

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Eccrine Porocarcinoma of the Upper Eyelid

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Abstract: **Eccrine porocarcinoma is an unusual, locally aggressive tumor with a significant risk of metastasis and recurrence after surgical excision. Eyelid involvement is rare. We describe a 70-year-old man who was examined for right upper eyelid eccrine porocarcinoma that was treated with Mohs surgery. Eccrine porocarcinoma should be considered in the differential diagnosis of malignant eyelid tumors.**

Eccrine porocarcinoma (EPC) is a rare malignant sweat gland tumor that arises from the intraepidermal portion of the sweat duct (acrosyringium). It can arise de novo or from a preexisting benign lesion, most commonly an eccrine poroma. Though eccrine poromas have a predilection for the lower extremity, EPC tend to occur on the extremities, trunk, head, and neck.[1] EPC of the eyelid is exceedingly rare with only 5 cases previously reported in the literature.[2–6]

CASE REPORT

A 70-year-old white man presented with a 3-month history of a solitary erythematous nodule on the right lateral upper eyelid. The lesion measured 6 mm in diameter and was associated with loss of eyelashes (Fig. 1). An incisional biopsy was performed. Histopathologic studies showed irregular islands of atypical epithelial cells in continuity with sweat ducts. Ductal differentiation was seen. The cells had a basaloid appearance with pleomorphic dark nuclei, small nucleoli and mitotic figures, consistent with porocarcinoma (Fig. 2). A full blood count, electrolytes, liver function tests, and chest x-ray were normal. MRI of the head and neck showed no evidence of lymph node involvement.

The patient then underwent Mohs surgery with complete excision of the tumor. The resultant defect was reconstructed by direct closure with release of the superior lateral canthal tendon. His postoperative course was uneventful and at last follow-up 6 months later there was no evidence of recurrence.

Macroscopic examination of the resected tumor showed a 9 mm × 14 mm section of eyelid with an indurated, erythematous central lesion measuring 6 mm in diameter. The overall appearance was unremarkable.

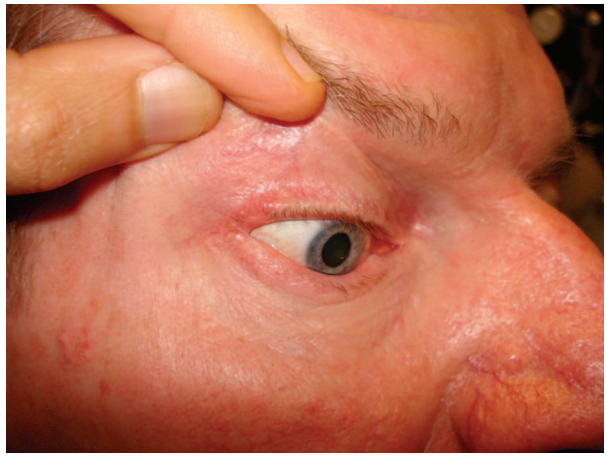

FIG. 1. Clinical photograph showing the indurated lesion with loss of lashes at the lateral margin of the right upper eyelid.

Histologic examination showed a lobulated tumor attached to the epidermis and extending in the deep dermis (Fig. 2A). The lobules were composed of mildly atypical basaloid poroid cells with areas of squamous differentiation where cells were connected by intercellular bridges. Numerous mitotic figures were noted and the mitotic count was assessed as 4 mitoses per high power field. Many of the tumor lobules showed central necrosis (Fig. 2B). Ductal differentiation was detected within the tumor that was confirmed by the presence of Amylase (diastase)-resistant periodic acid-Schiff staining (PASD) positive mucin and carcinoembryonic antigen (CEA) immunostaining (Fig. 2C). This, together with the foregoing features, was consistent with a diagnosis of EPC. The confluence of dermal nests favored a pushing front invasive carcinoma, and no irregular tongues of invasive carcinoma were identified. However, approximately 20% of cells stained positive on immunohistochemistry for Ki-67 antigen, indicating a high proliferative index (Fig. 2D) and p53 immunostaining labeled at least 30% of nuclei. There was no lymphovascular invasion, perineural spread, pagetoid invasion of the epidermis, or ulceration and there was no evidence of benign poroma in the resected tissue.

DISCUSSION

We report a patient with EPC of the eyelid, which is a rare malignant sweat gland tumor. Only 5 cases of eyelid EPC have previously been reported[2–6] and a review of these cases (Table) reveals that it preferentially affects older men, has no predilection for either eyelid and does not possess any distinguishing clinical features.

EPC is usually seen on the trunk, extremities, and the head and neck region. The clinical appearance of EPC varies. It may appear as a nodule, plaque, or as a polypoidal growth that is frequently ulcerated. Multinodularity, ulceration, and rapid growth may be associated with either local recurrence or metastatic disease.[7] It is considered to be a tumor of intermediate malignant potential, with approximately 12% cases developing metastasis, usually to regional

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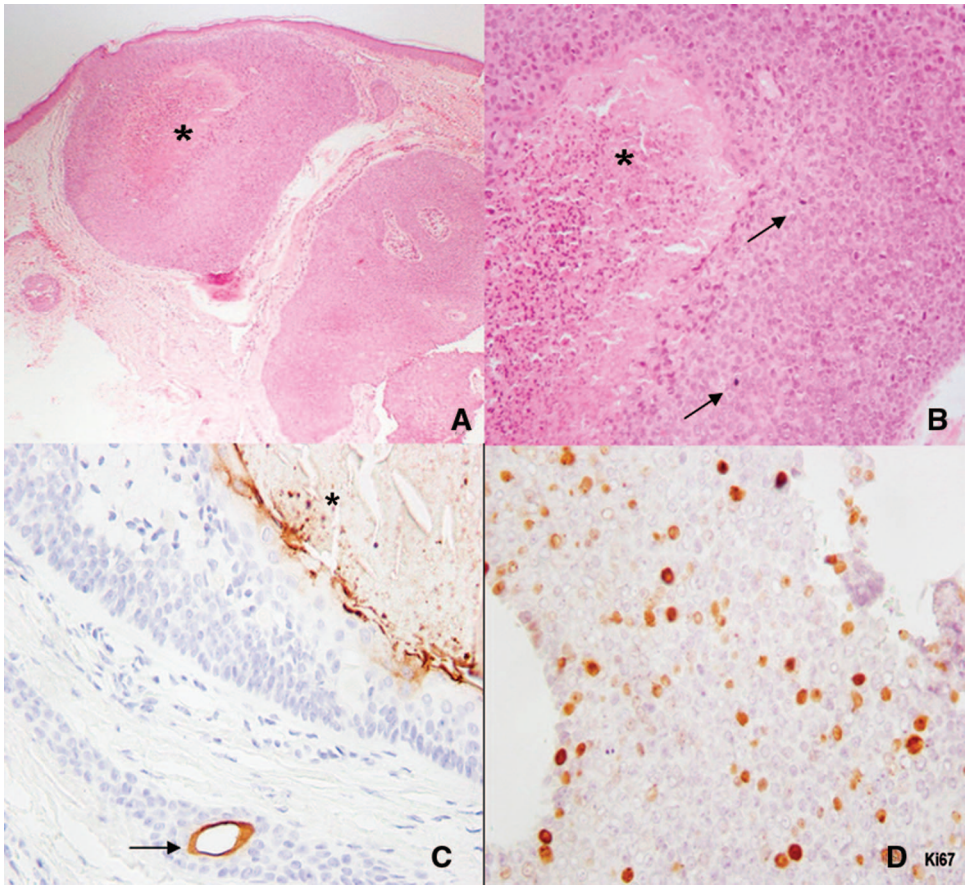

FIG. 2. Histopathology of eccrine porocarcinoma. **A,** Low power photomicrograph showing lobules of tumor in the dermis. Central necrosis (asterisk) and attachment of one of the lobules to the overlying epidermis can be appreciated (hematoxylin-eosin, original magnification ×20). **B,** Higher power photomicrograph demonstrates the central necrosis within the tumor lobule (asterisk) and numerous mitotic figures (arrows) (hematoxylin-eosin, original magnification ×100). **C,** High power photomicrograph showing ductular differentiation within the tumor lobule highlighted with CEA immunostain (arrow) (original magnification ×200). **D,** Immunohistochemical staining reveals positivity for Ki-67 in approximately 20% of the cells (original magnification ×200).

lymph nodes. The tumor has a tendency for epidermal spread, and regional cutaneous metastasis is a characteristic feature.

The histology of this tumor can be variable, as it may be a superficial lesion (rarely limited to the epidermis) or may invade more deeply in the dermis. In the typical case, anastomosing lobules of basophilic epithelioid cells with nuclear pleomorphism and mitotic figures are seen. The cells are glycogen-rich and are perioidic-acid Schiff positive. The presence of ductal differentiation (either intracytoplasmic or actual duct formation) distinguishes EPC from squamous and sebaceous cell carcinoma,[8] which are far more common in the eyelid. The ducts are usually visible on microscopy and can be outlined with CEA and epithelial membrane antigen (EMA) immunohistochemical markers. A further differential diagnosis is adenosquamous carcinoma, an unusual skin malignancy with squamous and glandular differentiation with mucin production. The distinction from a sweat gland carcinoma may be problematic, but adenosquamous carcinoma is typically poorly differentiated, glandular differentiation tends to be seen toward the deeper aspect of the lesion, and there is no spatial orientation to the acrosyringea.[8] Robson et al.[9] found that the presence of lymphovascular invasion, a mitotic count of more than 14 mitotic

Summary of cases of EPC involving the eyelids

	Age/gender	Site	Treatment	Follow-up	Outcome
Boynton and Markowitch[2]	68 years/female	Lower eyelid	Full-thickness excision	3 years	No recurrence
Orella et al.[3]	37 years/male	Lower eyelid	Wide excision	—	No recurrence
D'Ambrosia et al.[4]	71 years/male	Lower eyelid	Mohs micrographic surgery	—	—
Kim et al.[5]	75 years/male	Upper eyelid	Full-thickness excision	6 months	No recurrence
Greco et al.[6]	70 years/male	Lower eyelid	Full-thickness excision	2 years	No recurrence
Present case (2007)	70 years/male	Upper eyelid	Mohs micrographic surgery	6 months	No recurrence

figures, and a tumor depth of more than 7 mm were associated with poor a prognosis.

The most accepted treatment of primary EPC is wide excision. Because EPC has a propensity for epidermal spread, excision with margin control (frozen section, rapid paraffin section with delayed closure, or Mohs micrographic surgery) is highly recommended. In one case series, patients treated with Mohs surgery showed no recurrence at 5-year follow-up.[10]

EPC should be considered in the differential diagnosis of patients with malignant eyelid tumors. Given the significant risk of local spread and metastasis, a histologic diagnosis of EPC should prompt complete surgical removal and long-term follow-up, specifically to assess the patient for regional lymph node involvement and imaging for visceral metastases.

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Pleomorphic Adenoma With Extensive Myoepithelial Component (Myoepithelioma) of the Lower Eyelid

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Abstract: **A 58-year-old woman presented with a nodular lesion on the medial part of her left lower eyelid. The lesion had been removed 10 years ago, but showed subsequent recurrence with slow growth. The lesion was again partially removed at another institution prior to presentation. Afterward removal, the persistent lesion had rapid growth. On presentation to us, the lesion showed a clinical appearance that was very similar to a nodular basal cell carcinoma. A pentagonal full-thickness resection biopsy was performed. The pathologic study revealed clusters of tumor cells and some ductal proliferations. Immunohistochemistry demonstrated positive staining for p63, S-100, and smooth muscle actin. No atypia was observed. A diagnosis of pleomorphic adenoma with extensive myoepithelial component (myoepithelioma) was made. The authors conclude that myoepithelioma should be considered in the differential diagnosis of nodular recurrent masses in the eyelids of adults. Definitive diagnosis is possible only after surgical biopsy.**

The eyelids may be involved by a variety of tumors arising from sweat glands and ducts. Benign tumors of the sweat gland may show a wide spectrum of differentiation. Various histologic types have been reported in the eyelids, including syringoma, hamartoma of sweat glands, pleomorphic adenoma, or chondroid syringoma and myoepithelioma,[1] however, they are uncommon. Fewer than 30 cases of eyelid chondroid syringoma have been reported in the English literature.[2] Pleomorphic adenoma had an incidence of 0.48% in a large series of eyelid

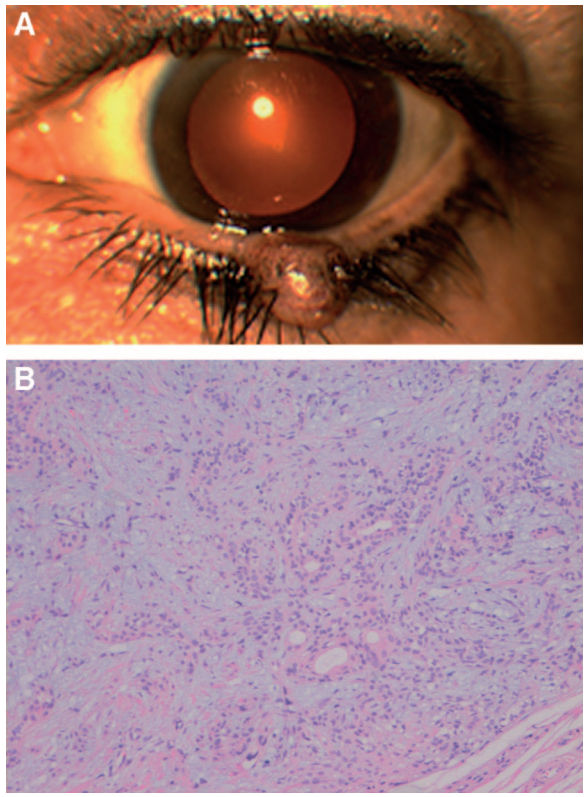

FIG. 1. **A,** Recurrent nodular lesion (4 × 5 mm) with clinical appearance similar to a nodular basal cell carcinoma. **B,** Clusters of tumor cells and some ductal proliferations. Two layers of epithelial cells and a myxoid stroma. Absence of atypia and apoptotic cells (hematoxylin-eosin 20, ×200).

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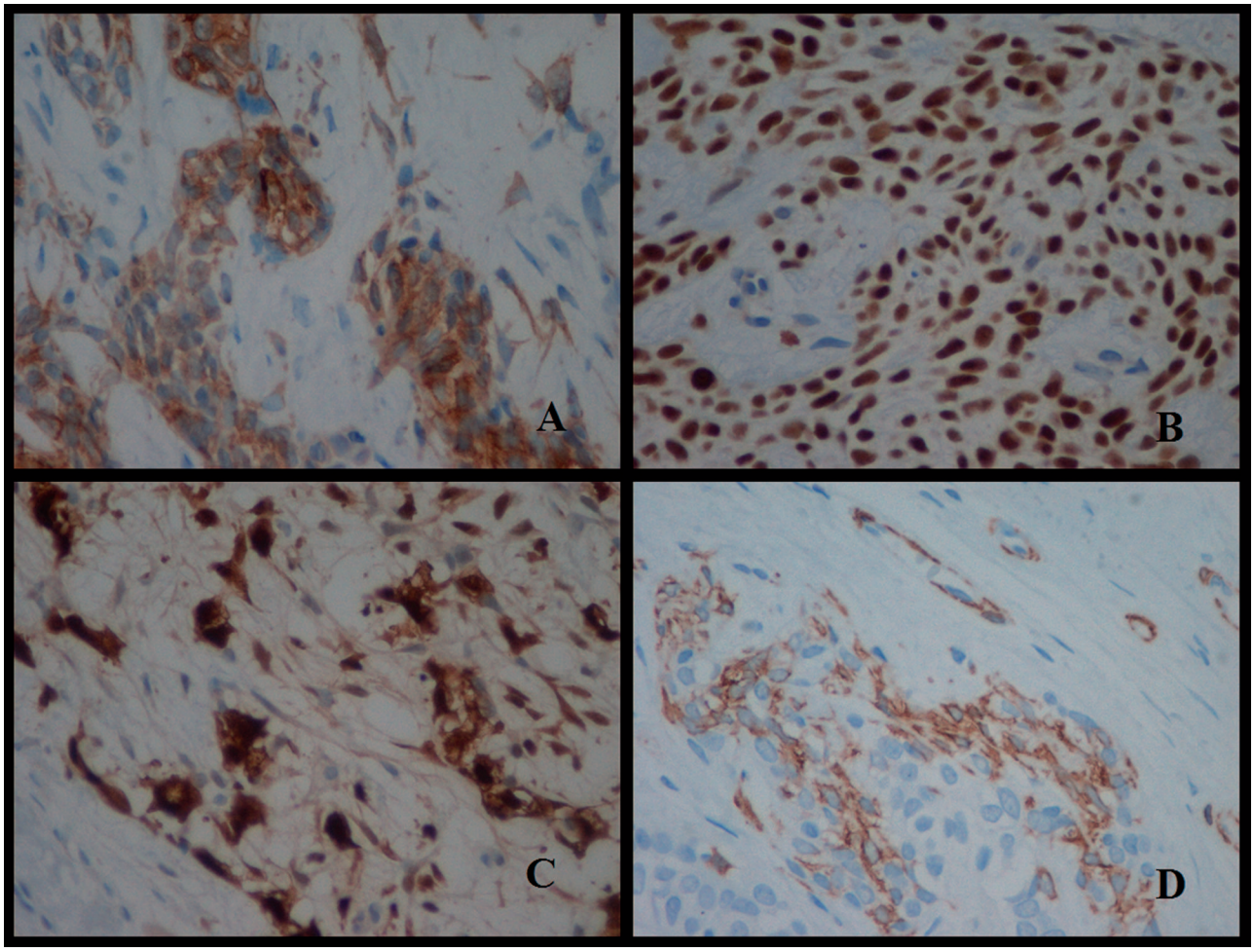

FIG. 2. **A,** Cytokeratin stain (CKAE1-AE3) characteristic of an epithelial tumor. **B–D,** Extensive myoepithelial features. **B,** Myoepithelial marker p63 was positive in the cell nuclei. **C,** Numerous S-100 positive myoepithelial cells. **D,** Positivity for smooth muscle actin in the myoepithelial component.

tumors.[3] Primary myoepithelioma is a rare tumor of the eyelids. Since its first description,[4] few articles have reported the possibility that these tumors occur in the eyelids.[1–4,5] Myoepithelioma and pleomorphic adenoma may show overlapping features. Myoepithelial cells may be the main component in some cases of pleomorphic adenoma.[6] We recently studied a case of pleomorphic adenoma with extensive myoepithelial component in the lower eyelid.

CASE REPORT

A 58-year-old woman presented with a painless, nodular lesion (4 × 5 mm) on the medial part of the left lower eyelid that affected the free margin (Fig. 1A). The lesion had been removed 10 years earlier. However, the lesion showed slow growth. The lesion was again partially removed at another institution 5 months prior to presentation. Afterward, the persistent lesion had rapid growth. The patient was referred to us. Previous pathologic slides were not available for review. The lesion showed a clinical appearance that was very similar to a nodular basal cell carcinoma. A pentagonal full-thickness resection biopsy was performed with direct closure of both edges of the remaining tarsal plates for eyelid reconstruction. The cosmetic result was satisfactory. Pathologic evaluation revealed clusters of tumor cells and some ductal proliferations (Fig. 1B). Positive cytokeratin stains demonstrated the epithelial nature of the tumor (Fig. 2A). Myoepithelial markers (p63, S-100) and smooth muscle actin were positive (Fig. 2B–D). The absence of atypia and apoptotic cells was remarkable. A diagnosis of pleomorphic adenoma with extensive myoepithelial component was made.

DISCUSSION

Tumors of the eyelids may arise from the 2 types of sweat glands, eccrine and apocrine. The eccrine sweat glands are composed of a secretory portion, with an outer spindle-shaped myoepithelial cell layer and an inner secretory tubular or cystic branching lumina with a single layer of epithelial cells.[1,2] The apocrine glands of the eyelid are the specialized glands of Moll. The general architecture of apocrine glands resembles that of eccrine sweat glands. Glands of Moll are characterized by the presence of epithelial cells that demonstrate evidence of apical secretory structures and result in decapitation secretion. Myoepithelial cells may occur as the only cellular component of a sweat gland tumor; in such cases, the term myoepithelioma is

used. However, myoepithelial cells may also be a minor component in other types of sweat gland tumors, and this is the case for some pleomorphic adenomas. Furthermore, in some pleomorphic adenomas, the myoepithelial elements may be the predominant component of the tumor,[6] such as in the present case. Myoepithelioma has the histology and growth pattern of the myoepitheliomatous component of a pleomorphic adenoma, but lacks ductal differentiation.[7] Myoepithelioma may occur in sweat glands throughout the body. Primary myoepithelioma is a rarely referenced benign adnexal tumor of the eyelids.[1–5]

Myoepithelioma of the eyelid does not present with any specific clinicopathologic features before excision; therefore, it is usually clinically underdiagnosed. The correct diagnosis can only be established after pathologic examination.[1–5] Myoepithelial markers such as p63, S-100, and smooth muscle actin are helpful in confirming the diagnosis.[8] The diagnosis of myoepithelioma was difficult when these markers were not available, which may explain the rare occurrence of this type of tumor in older case series.[1,4] The tumor is a painless, solid, adherent mass similar to other nodular eyelid tumors. The tumor may grow slowly or rapidly,[4] as in the present case. Determination of the origin of either eccrine or apocrine eyelid glands may be difficult. In the present case, the eyelid margin was involved and 2 layers of epithelial cells were evident. The findings suggest that the tumor arose from the glands of Moll. Recurrence has been described in pleomorphic adenomas of the lower eyelid originated from glands of Moll.[9] However, the presence of myoepithelial cells could be from eccrine sweat glands or even an ectopic lacrimal gland tissue in the eyelid. In the present case, a transition zone with epithelia showing apical decapitation was not demonstrable. It is possible to say only that it is a myoepithelial tumor of uncertain origin.

Primary myoepithelioma of the eyelid with rapid growth was first reported in 1964.[4] Since then, few reports have mentioned its presence in the eyelids.[1–5] Myoepitheliomas have been reported in the lacrimal gland.[10] Pleomorphic adenomas and mixed tumors of the accessory lacrimal glands of Wolfring have been also reported,[11,12] as have malignant myoepithelioma.[13] Orbital metastases from myoepithelioma have been described as the first manifestation of the tumor.[14] Tumor areas with focal fields of infiltrative growth, nuclear atypia, apoptosis, and mitotic activity suggest malignancy.[13,14]

The differential diagnosis of eyelid myoepitheliomatous pleomorphic adenoma includes nodular basal cell carcinoma, epidermoid cyst, dermoid cysts, chalazion, sebaceous carcinoma, and benign hair follicle-derived eyelid tumors. Complete excision and regular follow-up are recommended because malignant transformation may occur.

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Sinonasal Undifferentiated Carcinoma With a Frozen Globe

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Abstract: **A 42-year-old previously healthy woman presented with a 5-week history of headache, facial numbness, proptosis, motility restriction, and visual loss. CT showed soft-tissue infiltration involving the posterior ethmoids, pterygopalatine fossa, and posterior inferior orbit. Histopathologic analysis of a biopsy specimen disclosed a highly aggressive and undifferentiated neoplasm with an immunophenotype and ultrastructural features consistent with an epithelial origin, which was most consistent with a diagnosis of sinonasal indifferentiated carcinoma. The tumor was unresectable and the patient was started on a course of radiation and chemotherapy.**

Sinonasal undifferentiated carcinoma (SNUC) is a rare tumor of the paranasal sinuses and nasal cavity first reported as a clinically distinct entity in 1986.[1] It grows rapidly with symptoms developing over a period of weeks to months and as

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a result, most patients present with advanced disease.[2–5] Approximately 30% to 60% of cases will present with ophthalmic findings as a result of orbital invasion.[2,4,5] Survival rates are typically low and the prognosis is poor.[1,3–5] Since its original description, several case series have been published and although an optimal treatment strategy has yet to be defined, most authors agree that a multimodality approach offers the best chance for improving what have been poor outcomes.[3–5]

CASE REPORT

A 42-year-old woman presented with a 5-week history of diffuse, severe headaches and 4 weeks of right midfacial numbness. Her symptoms were unrelieved with antibiotics, analgesics, and antiinflammatory medications including oral prednisone (50 mg/day). Intravenous morphine provided only partial relief. CT showed a mass in the right ethmoid sinus. Ten days later, repeat CT revealed the mass lesion in the right posterior ethmoid, pterygopalatine fossa, and orbit had significantly increased in size (Fig. 1). Two weeks later she was referred for ophthalmologic consultation. On examination, the visual acuity was count fingers in the superior temporal field OD, 20/20 OS. Motility was decreased in abduction, adduction, and supraduction; 6 mm of proptosis was noted. There was corneal and infraorbital anesthesia. The nasal disc margin was blurred. Oral prednisone (75 mg/day) was not helpful and 2 days later the vision was no light perception OD, the right upper eyelid was completely ptotic, and the globe was frozen in all fields of gaze. A biopsy specimen was obtained through an anterior inferior orbitotomy. The patient's pain was so intense that radiation therapy was initiated 24 hours after the biopsy. Significant pain relief was achieved within 12 hours after the first of 3 doses. No other systems were involved with the tumor at that time.

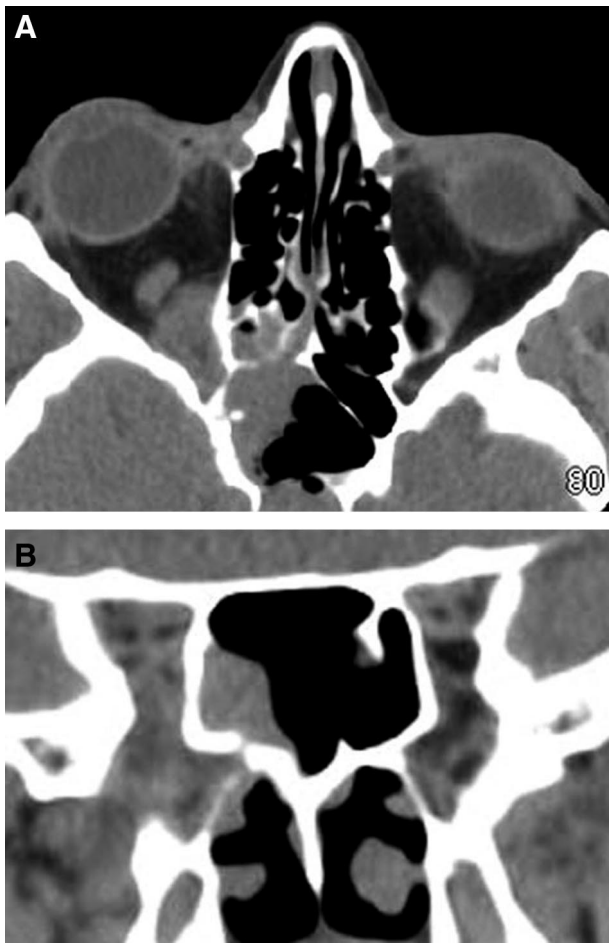

FIG. 1. Axial **(A)** and coronal **(B)** CT show soft-tissue infiltration within the sphenoid sinus, posterior ethmoids, pterygopalatine fossa, and posterior, inferior orbit.

Histopathologic examination of the biopsy specimen disclosed large, undifferentiated neoplastic cells with pleomorphic, vesicular, round to oval nuclei and prominent, occasionally multiple nucleoli, with the cells mostly in a trabecular pattern adjacent to large areas of necrosis with predominantly acute inflammation (Fig. 2A, D). Scattered tingible body macrophages exhibited a starry-sky appearance (Fig. 2A, C). The tumor cells stained positive for epithelial markers, including epithelial membrane antigen (Fig. 2B) and cytokeratins. Neuron-specific enolase was negative, and synaptophysin was focally positive in contrast to esthisoneuroblastoma where these immunohistochemical stains are diffusely positive.[6] Muscle, connective tissue, hematolymphoid, Ewing, and melanocytic markers were negative. Ultrastructural studies revealed rare intercellular junctions indicative of epithelial differentiation (Fig. 2D). The diagnosis was most consistent with SNUC.

The tumor was felt to be unresectable and further radiotherapy and chemotherapy (cis-platinum) were initiated. Eight weeks after the biopsy, the patient was found to have metastasis to the sacral area. She was admitted to the palliative care unit and died 2 weeks later with widespread bony metastases.

DISCUSSION

SNUC is a rare tumor of the nasal cavity and paranasal sinuses thought to be derived from either nasal ectoderm or Schneiderian mucosa.[7,8] The median age at presentation is 50 years (range, 14–83 years).[2] Men are more commonly affected than women. Given its propensity for rapid growth, patients usually present with advanced disease, often with invasion of surrounding structures.[2,5] Presenting symptoms may include nasal obstruction, facial pain, epistaxis, bloody rhinorrhea, proptosis, decreased visual acuity, diplopia, and cranial nerve palsies.[2,3]

Despite recent data that demonstrate an improvement in survival compared with initial reports, it remains an aggressive malignancy with a poor prognosis.[3–8] The pathogenesis of SNUC is unknown. There is no standardized treatment for SNUC, and the optimal therapy has yet to be determined. Most agree that aggressive multimodality treatment with some combination of surgical resection, radiation therapy, and chemotherapy offers the best chance for survival.[2–5,8]

In summary, SNUC is a rare, rapidly developing, and aggressive malignancy with a poor prognosis. It is important for ophthalmologist to be aware of this rare entity as it may present with orbital invasion (30–60%) and the resultant ocular signs and symptoms.

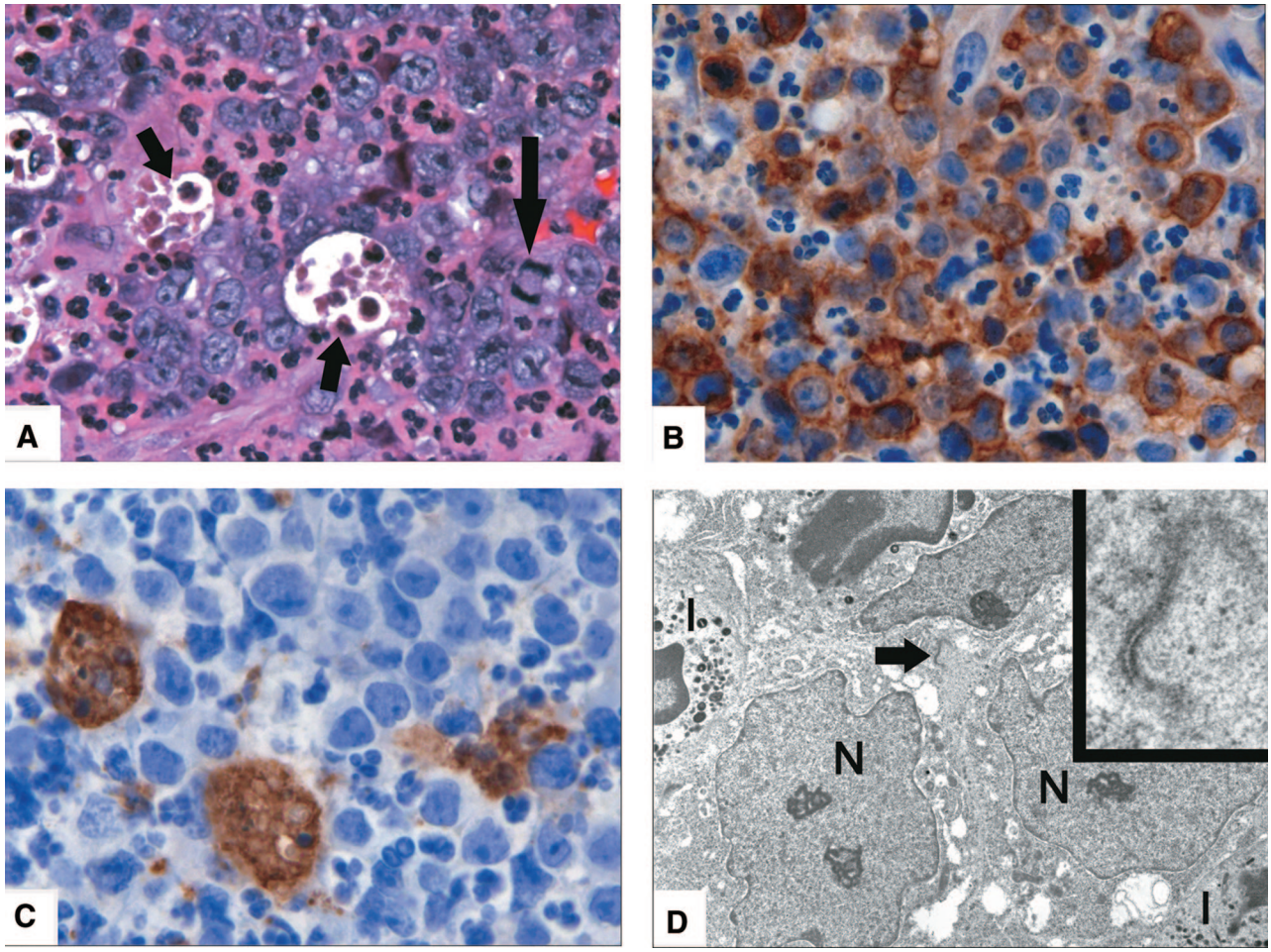

FIG. 2. **A,** Orbital biopsy specimen shows a diffuse infiltrate of highly undifferentiated cells. Long arrow points at a mitosis. Short arrows indicate tingible body macrophages (hematoxylin-eosin, ×640). **B,** Tumor cells express epithelial membrane antigen, consistent with epithelial differentiation (×640). **C,** CD68 demonstrates the tingible body macrophages (×640). **D,** Electron micrograph shows neoplastic cells (N) with vesicular nuclei and prominent nucleoli. An intercellular junction (arrow and inset) is evident. Accumulations of electron-dense material are evident within the cytoplasm of inflammatory cells (I) (×5000, inset ×25,000).

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Prepucial Skin Graft for Forniceal and Socket Reconstruction in Complete Cryptophthalmos With Congenital Cystic Eye

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Abstract: **We report the case of a 23-day-old boy with unilateral complete cryptophthalmos and congenital cystic eye, who had no associated systemic anomalies. We describe**

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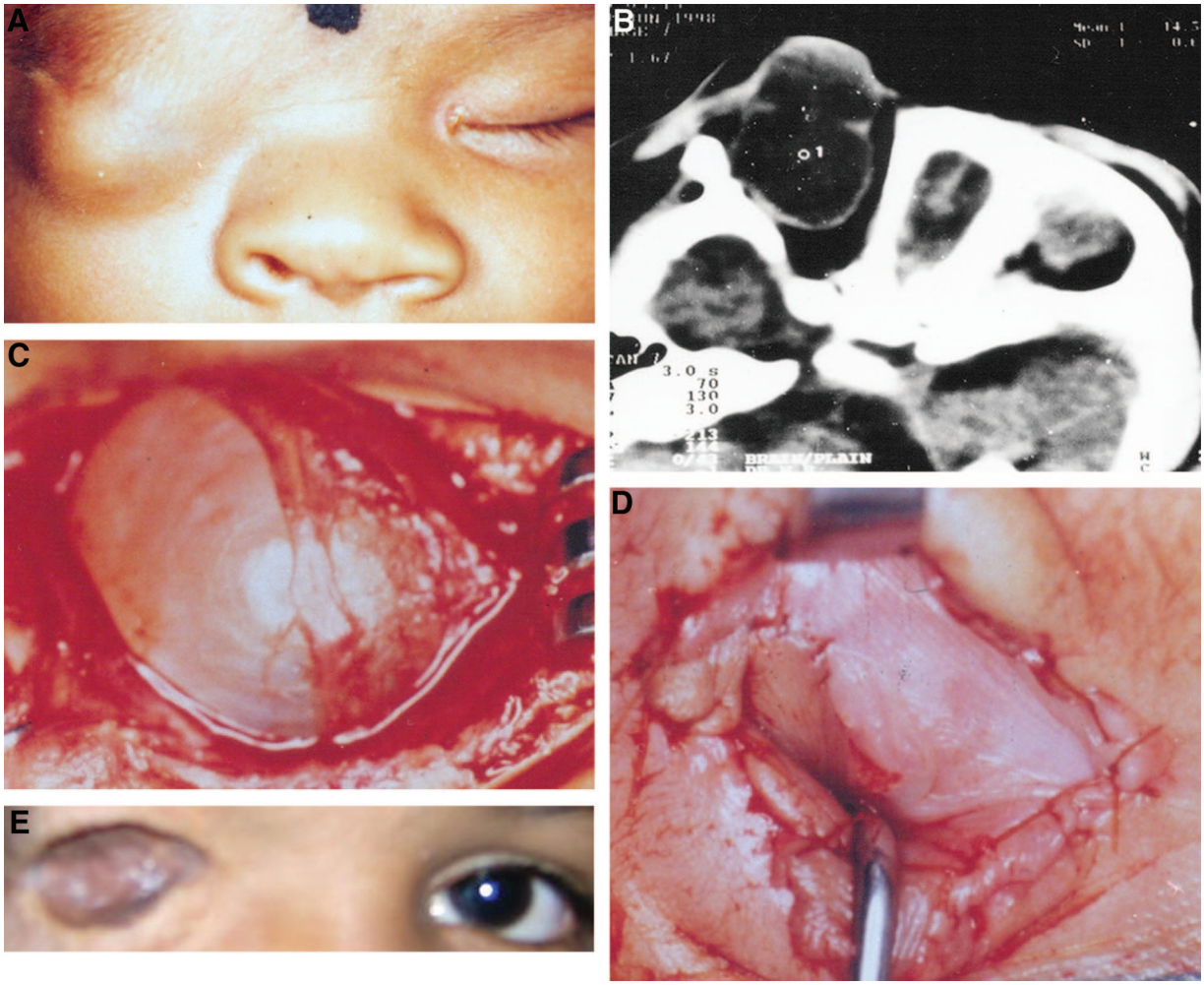

A, Presurgical photograph taken at 28 days of life shows complete left cryptophthalmos. **B,** Axial CT at age 1 month shows an enlarged, proptotic globe with increased anteroposterior dimensions and an enlarged bony orbit. **C,** Intraoperative photograph shows a large cystic globe with severe disorganization and thinning. **D,** Suturing the prepucial graft to the eyelid margins. **E,** At 5 years of age, the patient had a fairly well-formed socket lined by skin.

the technique of socket reconstruction with autologous prepucial skin graft used in this patient.

Crytophthalmos occurs due to a disturbance in the differentiation of the surface ectoderm leading to total ablepharon and complete failure of the eyelid folds.[1–3] Congenital cystic eye results from complete or partial failure of the invagination of the primary optic vesicle.[2] We present a case of unilateral complete cryptophthalmos with congenital cystic eye and describe a surgical technique of socket reconstruction with acrylic sphere orbital implantation and prepucial skin graft for forniceal reconstruction.

CASE REPORT

A 23-day-old boy was brought to us when his parents noticed that the right eye failed to open since birth. The newborn was born via lower segment caesarean section because of cephalopelvic disproportion.

On examination, the right globe of the infant was hidden by a sheet of skin that passed from the forehead and dipped down over the orbit onto the cheek (Fig. A). The right eyebrow was absent nasally and displaced temporally. A small skin tag was present temporally. No eyelid fold was present. No fissure line or opening was seen in the skin. A large, spherical, cystic, compressible, transilluminant swelling measuring 25 mm horizontally distended the upper eyelid, giving it a bluish hue. No facial asymmetry was present. The left eye and orbit were normal. General physical examination was normal.

A large cyst of globular contour was seen on B-scan ultrasonography of the right orbit. A moderate to high reflective membranous spike suggestive of rudimentary iris tissue divided the smaller anterior from the larger posterior cavity of the cyst. A high reflective membranous echo suggestive of retinal and/or choroidal tissue in a closed funnel configuration was seen extending from the posterior pole anteriorly. An enlarged proptotic globe with increased antero-posterior dimension and a figure-eight configuration, and enlarged bony orbit were seen on CT. There were no intracranial abnormalities (Fig. B). Based on these findings, the infant was diagnosed to have right-sided complete crytophthalmos with congenital cystic eye.

Three months after birth, the infant underwent skin separation, evisceration of the rudimentary globe, and acrylic sphere implantation. Intraoperatively, the globe appeared as a large transilluminant cyst with severe disorganization and thinning (Fig. C). The cornea and sclera were replaced by vascularized fibrous tissue that was adherent to the overlying skin. Extraocular muscles were not defined. The cyst was loculated with remnants of iris tissue compartmentalizing the cyst in 2 large cavities. The rudimentary globe was opened and the contents were removed. An acrylic implant was then placed in the orbit behind the cystic globe. The internal aspect of the cystic globe was used as a posterior lining of the newly formed socket. A conformer was inserted in the newly formed fornices at the end of surgery.

Histopathologic studies of the contents of the cystic eye revealed dysplastic retinal and choroidal tissue and abundant glial tissue. A globular Periodic Acid Schiff stain-positive structure suggestive of crystalline lens was noted.

Postoperatively there was repeated dislocation of the conformer because of eyelid edema and shallowing of the socket. Ankyloblepharon and symblepharon formed, which were released on the twentieth postoperative day. Amniotic membrane graft was used to line the socket and conformer was used to deepen the fornices. Recurrence of adhesions and socket contraction were noted at 5 months of age. At this stage it was decided to line the socket with a skin graft. While searching for a donor site it was found that the child had phimosis and needed circumcision, so the prepucial skin was used for socket reconstruction. After releasing the adhesions and deepening the fornices, the prepucial graft was placed in the socket and sutured to the margins of the formed eyelids. A tarsorrhaphy was performed in the postoperative period to retain the conformer and further deepen the fornices (Fig. D). Tarsorrhaphy release was intentionally delayed. Two years later the upper eyelid was lengthened with a postauricular full-thickness skin graft and the brow was reconstructed with local transposition flaps. The right ala of the nose was repositioned using Z-plasty. Four months later, the tarsorrhaphy was divided and a cosmetic eye shell was fitted. The prepucial graft was found to have settled very well and the prosthesis remained in position. Two years after the last surgical intervention, at 5 years of age, the patient had a fairly well-formed socket that retained a prosthesis (Fig. E).

DISCUSSION

Congential cystic eye can occur in isolation[4] or with other ocular or nonocular malformations.[3] The combination of cryptophthalmos and congenital cystic eye is rare and to the best of our knowledge, has not been reported previously in the ophthalmic literature.

Eyelid surgery for visual restoration is seldom possible in complete cryptophalmia because of associated severe ocular defects. Better results have been obtained in abortive and incomplete cryptophthalmos.[5]

Cyst evacuation and suturing of its edges to the newly created eyelid margin has been reported to be associated with subsequent severe contracture on both sides, causing difficulty in insertion of the prosthesis in a patient with cryptophtalmos.[6]

Mucous membrane grafts in infants are difficult to harvest due to their paucity, and often fail due to formation of adhesions. It is difficult to obtain a fat-free partial-thickness cutaneous graft in an infant; infection and scarring of the donor site may also occur.

We used prepucial skin graft for socket reconstruction as it is easier to harvest and prepare owing to the absence of fat, availability of abundant tissue, and reduced chances of scarring and infection of the donor site. Prepucial skin can be a suitable alternative to conventional graft materials in socket reconstruction surgery.

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Parosteal Osteosarcoma of the Orbit

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Abstract: **A 60-year-old woman was referred to Bristol Eye Hospital because of a progressive, painless, right proptosis. CT revealed a well-defined, hyperdense lesion adjacent to the lateral orbital wall. A marginal excision was performed. The mass was stony-hard, lobulated, and encapsulated. Histopathologic findings were consistent with a low-grade parosteal osteosarcoma. Parosteal osteosarcoma is a rare osteogenic tumor that usually affects the long bones. It represents a malignant, though well differentiated, tumor that has a relatively good prognosis after a wide excision. However, local recurrences are not rare and have been associated with dedifferentiation. The latter affects the prognosis adversely and, thus, regular follow-ups are strongly suggested after the initial tumor excision. In the present case, no further treatment was administered and**

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the patient was reported disease free 26 months after surgery.

Parosteal osteosarcoma is a rare osteogenic tumor that commonly arises from the surface of long bones. It is a well-differentiated sarcoma that displays a slow evolution with only local extent.[1–4] To the best of our knowledge, only 3 cases of similar tumors located in the orbit have been reported in the literature,[5,6] although each case had a unique history and different evolution. We report a case of a primary parosteal osteosarcoma of the orbit in a middle-aged woman, with no previous history of trauma or surgery.

CASE REPORT

A 60-year-old woman was referred to the orbital clinic of Bristol Eye Hospital in March 2004 with a complaint of a "popped" right eye that became very obvious over the previous 2 to 3 years. Neither pain nor other symptoms were mentioned apart from diplopia in upgaze. The patient denied having previous trauma or surgery.

On ophthalmic examination, there was 5 mm of relative right proptosis. Visual acuity was 20/20 OU and optic nerve function appeared normal. No palpable mass was found and slit lamp examination was unremarkable. Orthoptic examination revealed moderate restriction in motility, affecting mostly the upgaze. An orbital mass was suspected. CT revealed a well-defined, hyperdense, lobulated tumor adjacent to the lateral orbital wall. The mass, lying extraconally and measuring 2 cm × 3 cm, seemed to cause a significant displacement of the lateral rectus muscle and the optic nerve (Fig. 1).

The patient underwent a lateral orbitotomy. Intraoperatively, the tumor was found attached to the lateral wall of the orbit, invading the lateral rectus muscle. Part of the affected muscle was sacrificed. The tumor appeared lobulated with a smooth capsule. It was extremely hard and grayish (Fig. 2A).

Histopathologic examination demonstrated a well-defined bony mass with several small, separate, peripheral nodules. The bony trabeculae were disposed in a nonstructural architecture and were composed of immature woven bone. Surface osteoblastic activity was almost completely absent. The intertrabecular space was filled with a fibroblastic stroma in which the constituent fibroblasts showed mild nuclear atypia. The findings were consistent with a low-grade parosteal osteosarcoma of the orbit (Fig. 2B).

Postoperatively, the patient had moderate, local edema, and esotropia due to the lateral rectus dysfunction. The diplopia was temporarily managed with botulinum toxin injections; strabismus surgery was planned. The patient has been followed with repeat CT and is free of tumor 26 months after the initial excision.

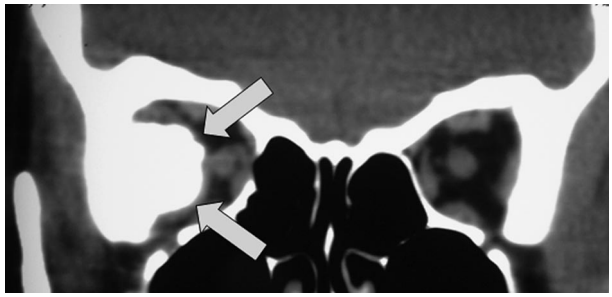

FIG. 1. Coronal T_1 CT shows a well-defined, hyperdense, lobulated lesion emerging from the lateral orbital wall (arrows).

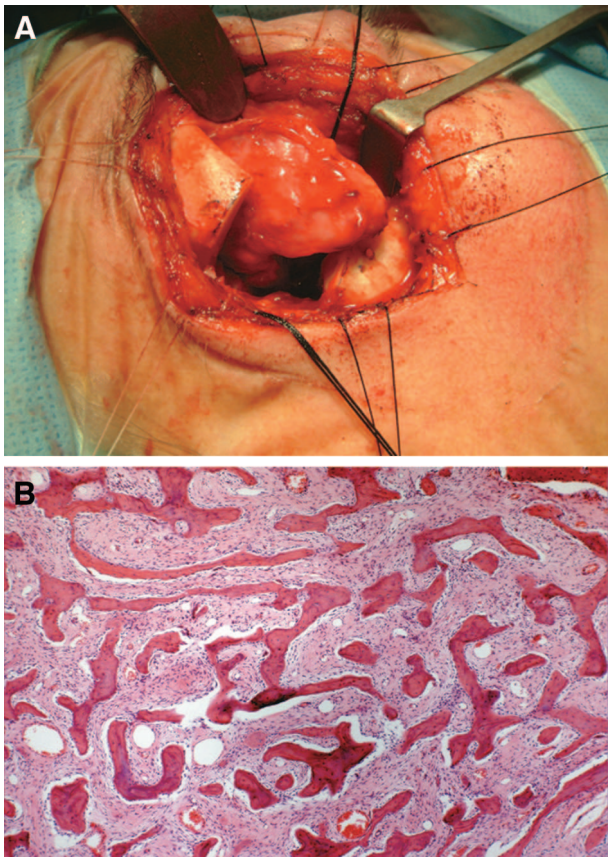

FIG. 2. A, Perioperatively, the tumor is easily recognizable through the lateral orbitotomy. It appeared attached to the lateral orbital wall, showing a smooth, lobulated surface. **B,** The tumor consists of a well-defined bony mass. The bony trabeculae were disposed in a nonstructural architecture and were composed of immature woven bone. The intertrabecular space was filled with a fibroblastic stroma in which the constituent fibroblasts showed mild nuclear atypia. The findings were consistent with a low-grade parosteal osteosarcoma of the orbit (hematoxylin-eosin, ×100).

DISCUSSION

Despite previous discussion on terminology, parosteal osteosarcoma is now considered a distinct clinicopathologic entity.[1,3,4] It is a low-grade malignant tumor that primarily affects the surface of long bones, and it occurs more often in women.[2,4,6] It usually develops slowly with minimal symptoms related mainly to the local extent of the tumor. The patient described here was a woman in her sixth decade with slowly progressive, painless proptosis. Similarly, all 3 of the previously reported orbital cases displayed a slow tumor evolution.[5,6]

CT is useful for the diagnosis of parosteal osteosarcoma, whereby a well-circumscribed and hyperdense mass adjacent to the surface of the bone is revealed.[7] In its periphery, the tumor may appear less opaque due to less mineralization. It has also been suggested that less opaque lesions may be associated with

higher grade or dedifferentiated tumors.[2,6,8] MRI may reveal a suspected local soft-tissue invasion.

Gross anatomy is usually related to the radiologic findings. Parosteal osteosarcomas are typically stony hard, lobulated, and encapsulated. They occasionally invade the surrounding muscles, as in our case.

Histopathology usually confirms the diagnosis of parosteal osteosarcoma, which is typically a low-grade tumor with a hypocellular spindle-cell stroma that contains trabeculae of bone. Based on the grading system suggested by Unmi and Dahlin,[9] the majority of parosteal osteosarcomas show minimal atypia and rare mitoses and are classified as grade 1 tumors. Specimens that display more cellular pleomorphism, higher spindle-cell populations, and rare mitoses are classified as grade 2 tumors. Our case appears to be a grade 1 tumor.

Differential diagnosis should include 1) osteomas that are common in the cranium but without tendency to grow in size; 2) ossifying and cellular fibromas; 3) osteochondromas; 4) high-grade osteosarcomas, which rarely affect the orbit; and 5) myositis ossificans, which is distinguished mainly on the basis of its orderly pattern of maturation.

The concept of dedifferentiation of parosteal osteosarcomas has been well described.[8,10] Transformation in high-grade sarcomas is strongly associated with local tumor recurrences, which often follow marginal excisions. Parmar et al.[6] described an unusual transformation of a twice-excised orbital parosteal osteosarcoma in a liposarcoma. The prognosis of dedifferentiated parosteal osteosarcomas resembles that for patients with intramedullary osteosarcomas and in such cases treatment should include more radical excisions and/or chemotherapy. CT may provide evidence of tumor transformation by showing areas of less opaque, lytic lesions within tumors that have the typical appearance of parosteal osteosarcomas. In one of the largest studies that refer to dedifferentiation of such tumors, the mean interval between the initial surgery and tumor transformation was 153 months.[8] This implies that 5-year survival does not indicate cure for parosteal osteosarcoma.

In contrast, Okada et al.[2] noted the cumulative probability of local recurrence was 26% at 5 years and 41% at 10 years. As widely accepted, tumor recurrence is less likely to occur after wide excision. Unfortunately, wide excisions are not feasible at sites where vital structures are involved, such as the orbit. Therefore, patients with orbital parosteal osteosarcoma should be followed for several years to monitor for local recurrence and possible tumor dedifferentiation.

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Primary Neuroendocrine Tumor of the Orbit Progressing to Neoplastic Meningitis

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Abstract: **A 60-year-old man presented with multiple cranial neuropathies and an identifiable left orbital lesion along the course of the supraorbital nerve. The pathologic features of the excised orbital lesion were consistent with a poorly differentiated primary neuroendocrine carcinoma. Four years after his diagnosis, the patient succumbed to neoplastic meninigitis. No other primary tumor site was identified or clinically apparent during his illness.**

A primary neuroendocrine tumor of the orbit is rare.[1] Only 4 cases of presumed primary well-differentiated neuroendocrine tumor (carcinoid) of the orbit have been reported to date.[2,3] Most orbital neuroendocrine tumors are metastases from a gastrointestinal primary site.[4] We report herein a patient with a poorly differentiated neuroendocrine tumor arising from the orbit who presented with multiple cranial neuropathies that progressed to neoplastic meningitis.

CASE REPORT

A 60-year-old man complained of binocular diplopia and blurred vision in the left eye. Systemic evaluation was negative except for a mild elevation in cerebrospinal fluid protein demonstrated on lumbar puncture. The cerebrospinal fluid cytology was negative as well. Radiographic imaging studies, including MRI of the brain, magnetic resonance venography (MRV), magnetic resonance angiography (MRA), and cerebral angiogram showed only minimal small-vessel ischemic disease with no other abnormalities detected. At presentation to the Wake Forest University Eye Center 6 months later, the patient's visual acuity was 20/25 OS. The patient showed pupillary abnormalities, ptosis, and an ocular motility disturbance

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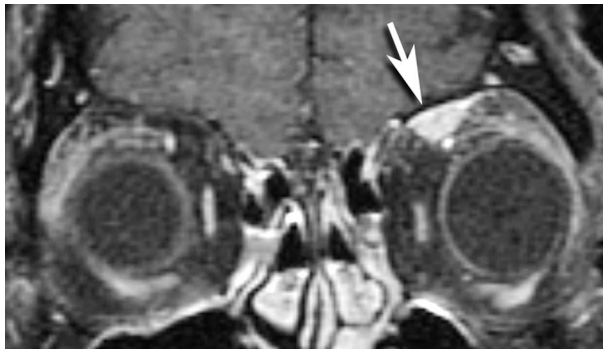

FIG. 1. Coronal section of T_1-weighted MRI with gadolinium contrast shows the tumor located in the superior-nasal aspect of the left orbit (arrow).

compatible with oculomotor nerve palsy and hypesthesia along the distribution of the first division of the left trigeminal nerve (V1). A follow-up MRI study of the brain and orbit (Fig. 1) revealed a nonenhancing 17 × 9 mm fusiform lesion along the expected course of the left supraorbital nerve. The lesion was associated with mild enhancement at the left orbital apex and superior orbital fissure. Minimal widening of the left cavernous sinus compared with the right cavernous sinus was observed.

The lesion and the supraorbital nerve that it was encasing were surgically excised. Pathologic examination showed an infiltrating neoplasm with granular nuclear chromatin and small nucleoli (Fig. 2A). The tumor was epithelial in origin (immunohistochemically staining for epithelial membrane antigen and for intermediate and high molecular weight cytokeratins). A focal area of tumor exhibited focal unequivocal staining for synaptophysin, predominantly in a perinuclear distribution (Fig. 2B), consistent with neuroendocrine differentiation. The carcinoma was negative for low molecular weight cytokeratin (Cam 5.2), chromogranin, CD56, neuron-specific enolase, S100 protein, thyroid transcription factor-1, and mucin stains. A pathologic diagnosis of poorly differentiated carcinoma with neuroendocrine features was made. The patient was evaluated for another primary tumor site, but CT of the chest and abdomen were unrevealing.

Despite receiving chemotherapy consisting of carboplatin and VP-16, the patient developed multiple additional cranial nerve palsies of the left side, including trochlear, trigeminal (V1–V3), abducens, and facial cranial nerves. Subsequent MRI studies of the orbit, head, and neck demonstrated no additional discrete lesions, but clinically the patient suffered from a progression of his cranial neuropathies. Neoplastic meningitis was documented by cerebrospinal fluid analysis. Four years after his diagnosis and still lacking any clinical evidence of an extraorbital primary tumor, the patient succumbed to his condition. No autopsy was performed.

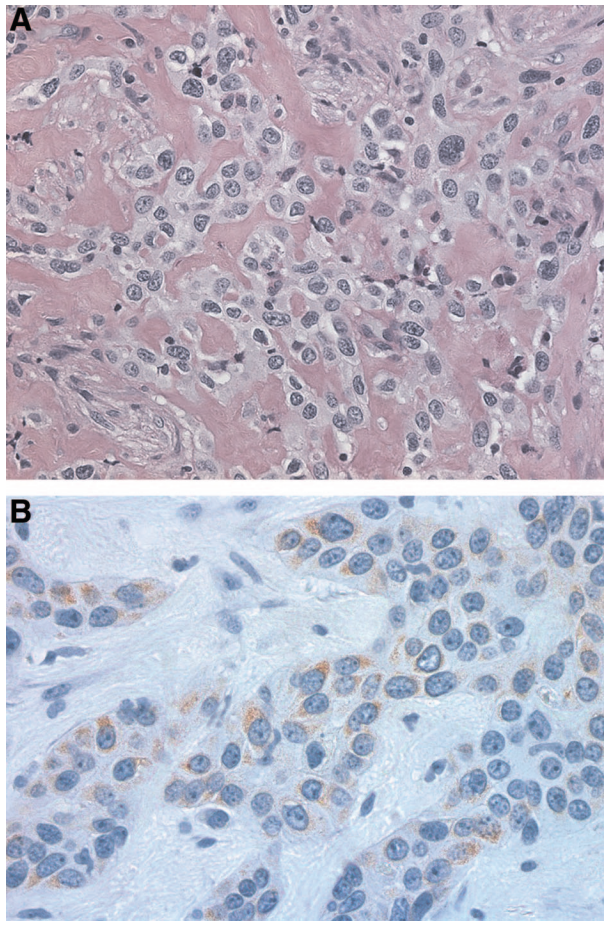

FIG. 2. **A,** Neoplastic cells exhibit granular nuclear chromatin, nuclear pleomorphism, small nucleoli, and moderate amounts of cytoplasm (periodic acid-Schiff, original magnification ×400). **B,** In a focal area of the specimen, the tumor cells exhibit immunohistochemical staining for synaptophysin (original magnification ×400).

DISCUSSION

Neuroendocrine tumors are rare neoplasms derived from the neuroendocrine cell system.[5,6] The most frequent primary sites of neuroendocrine tumors (95%) are the gastrointestinal tract and bronchopulmonary system.[6] Ocular and ocular adnexal manifestations of neuroendocrine tumors are limited to either Merkel cell tumors that arise from specialized cutaneous mechanoreceptors in the eyelid skin or to metastatic tumors. An orbital metastasis commonly comes from a primary gastrointestinal carcinoid tumor that shows a propensity to involve an extraocular muscle. Choroidal metastasis often denotes a bronchopulmonary primary site.[1,4]

Histopathologically, neuroendocrine tumors are classified as either well-differentiated carcinomas (carcinoid tumors) or poorly differentiated carcinomas and are characterized by the presence of abundant neurosecretory granules and neural markers including chromogranin and synptophysin.[2,3,6] Poorly differentiated tumors with a high grade of malignancy carry a poor prognosis.[6]

The uniqueness of our case was severalfold. Neither the cranial nerve involvement at presentation nor the lack of proptosis was similar to previously reported, well-differentiated orbital carcinoid tumors that presented with mass effect. Our patient presented with oculomotor nerve palsy. Choroidal[2] or extraocular muscle involvement[4] characteristic of a metastatic carcinoid orbital tumor was not observed in our patient. Second, the histology of our case revealed greater cytologic atypia than a typical carcinoid tumor (i.e., well-differentiated

neuroendocrine tumor), such as that described by Zimmerman et al.[3] Third, most primary carcinoid tumors have a protracted, benign course. Symptoms of the carcinoid syndrome, namely flushing and diarrhea, were absent in our patient but are commonly observed in patients with metastatic disease.[2] The aggressively infiltrating character of the lesion, unresponsive to multimodal treatment, and the progression to neoplastic meningitis were unique features of this case.

Although the existence of an undetected primary neuroendocrine carcinoma elsewhere cannot be absolutely ruled out, such a tumor was not detected by repeated imaging studies (MRI and CT studies of the chest, abdomen, pelvis, head, neck, and spine, and PET and radionuclide bone scanning) or clinically suggested over the 4-year course of this patient's illness.

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Prostate Carcinoma Metastasis to Extraocular Muscles

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Abstract: **Prostate carcinoma, when metastatic, typically involves bone and produces both osteoblastic and osteolytic changes. Orbital involvement is uncommon and extraocular muscle enlargement is a rare presentation of metastatic prostate adenocarcinoma. The authors present 2 patients with prostatic tumor metastasis to extraocular muscles. One patient had single-muscle involvement; the other presented with bilateral progressive proptosis, upper eyelid retraction, and bilateral multiple extraocular muscle enlargement mimicking thyroid-associated orbitopathy. Clinicians should be aware that, although rare, prostate cancer can involve the extraocular muscles.**

Metastatic tumor of the orbit is uncommon and occurs less frequently compared with choroidal metastasis. Any part of the orbit may be involved. In a report of 100 patients with metastatic orbital tumors, 12 patients had primary prostate gland tumor.[1] It is rare for prostate tumor to present only with extraocular muscle involvement. In this report, we present 2 patients with metastatic prostate tumor to extraocular muscle. One patient (Case 1) had metastatic tumor to the medial rectus muscle and the other (Case 2) had bilateral and multiple extraocular muscle involvement. To our knowledge, Case 2 is the first described case in the English-language ophthalmic literature of bilateral diffuse extraocular muscle enlargement from metastatic prostate tumor.

CASE REPORTS

Case 1. A 90-year-old man presented with progressive left eye pain and double vision for 3 weeks. The patient had history of prostate adenocarcinoma with metastasis to the spine and had prior prostatectomy, chemotherapy, and radiation therapy for the spine metastasis around 1 year prior to the start of the eye symptoms. Visual acuity was 20/40 OU. There was no relative afferent pupillary defect. Hertel exophthalmometer measurements were 15 mm OD and 17.5 mm OS. Motility examination of the left eye revealed severe limitation of adduction and moderate limitation of elevation and abduction. Slit lamp examination showed moderate chemosis OS. Ophthalmoscopy showed optic disc edema OS. Examination of the right eye was unremarkable. Orbital echography revealed an enlarged medial rectus muscle OS with low internal reflectivity. Orbital CT showed nodular enlargement of the left medial rectus muscle and no evidence of orbital bone involvement (Fig. 1).

Biopsy of the enlarged left medial rectus muscle showed metastatic prostate adenocarcinoma. The patient received external beam radiation therapy to the orbit, which led to significant improvement of his left proptosis and ocular motility. The patient died 8 months later.

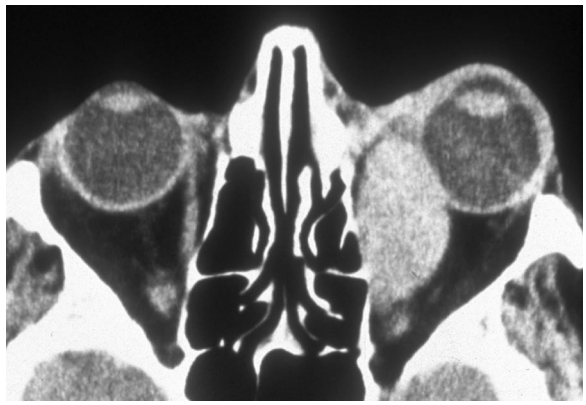

FIG. 1. Case 1. Axial orbital CT shows nodular marked enlargement of the left rectus muscle.

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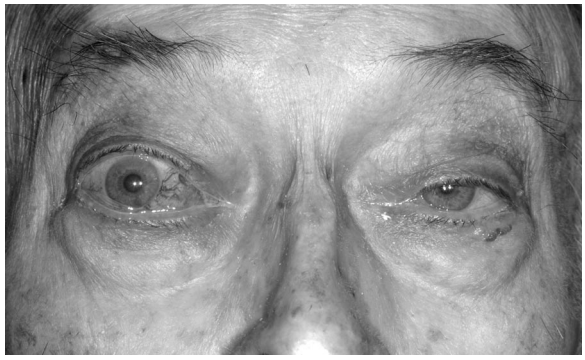

FIG. 2. Case 2. An 84-year-old man presented with right upper eyelid retraction and left upper eyelid ptosis. He had bilateral proptosis in the right eye more than the left.

Case 2. An 84-year-old man presented to his ophthalmologist with painless and progressive decreased vision OD, proptosis, and double vision for a few weeks. Although the serum thyroid stimulating hormone level was at the lower level of normal, a presumed diagnosis of thyroid ophthalmopathy was made. The patient was started on prednisone 40 mg per day by the referring ophthalmologist a few weeks prior to his referral to us. Medical history was significant for prostate cancer 8 years prior to presentation with new metastatic disease to his hips, right shoulder, and knee over the prior year. The patient had had external beam radiation therapy for the metastatic lesions to the bone. Ophthalmic examination showed visual acuity of 20/70 OD and 20/50 OS. Intraocular pressure measurements were 12 mm Hg OD and 13 mm Hg OS. There was no relative afferent pupillary defect. There was a moderate global ophthalmoplegia OU with marked deficiency of abduction OD. The patient had mild right upper eyelid retraction and moderate left upper eyelid ptosis (Fig. 2). Hertel exophthalmometer measurements were 21 mm OD and 19 mm OS. Slit lamp examination revealed conjunctival and episcleral injection along the medial and lateral rectus muscles on the right side. Orbital CT showed bilateral nodular enlargement of multiple extraocular muscles (Fig. 3A, B). Orbital echography revealed low internal reflectivity of the enlarge muscles. The prednisone was increased to 60 mg per day with close observation of the clinical condition. The patient continued to have worsening of his symptoms with more decrease in vision and development of relative afferent pupillary defect OD. The patient underwent bilateral orbital decompression for presumed compressive optic neuropathy, and biopsy of the right lateral rectus muscle was performed. The biopsy showed poorly differentiated metastatic prostate adenocarcinoma. MRI of the brain showed findings suggestive of metastasis to the pituitary gland, base of the skull, and left temporal muscle. The patient was offered radiation therapy to both orbits, but he refused further treatment. The patient became blind in both eyes 6 months later.

DISCUSSION

Thyroid orbitopathy is the most common cause of unilateral and bilateral extraocular muscle enlargement. Other etiologies such as metastatic tumor should be considered, however, especially in atypical presentations (e.g., strictly unilateral findings, markedly asymmetric disease, single muscle involvement, tendon involvement, nodular enlargement).

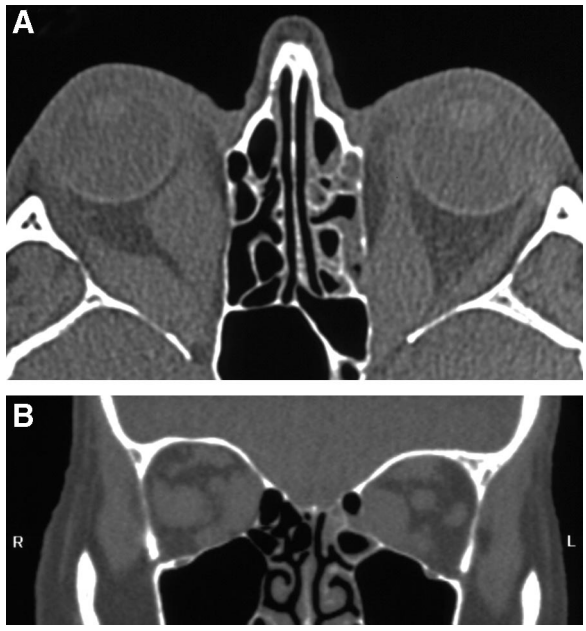

FIG. 3. Case 2. **A,** Axial and (**B**) coronal orbital CT show nodular enlargement of multiple extraocular muscles bilaterally with apical compression.

Extraocular muscle metastases are an uncommon presentation of orbital metastatic disease representing only 9% of orbital metastases.[2] The most commonly reported primary tumor sites with metastases to extraocular muscle were breast, cutaneous melanoma, and gastrointestinal tract.[2] The low incidence of extraocular muscle metastases is presumed to be due to the relatively small number and caliber of blood vessels supplying the extraocular muscles. As opposed to thyroid ophthalmopathy, the imaging studies in metastatic tumors to extraocular muscle may demonstrate a nodular pattern.[3] The orbital echography of the enlarged muscle with metastatic tumor usually shows low internal reflectivity, whereas myopathy of thyroid-associated orbitopathy demonstrates typically higher internal reflectivity due to edema.

Lymphoma is another disease that needs to be kept in mind, especially in elderly patients with enlarged extraocular muscles. It may present with isolated nodular or fusiform enlargement of single or multiple extraocular muscles, either unilateral or bilateral.[3] Inflammatory disorders such as idiopathic orbital inflammation and sarcoidosis usually have fusiform or cylindrical pattern of extraocular muscle enlargement with or without tendon enlargement.

Prostate metastases tend to involve bone more than orbital soft tissue.[4] In a series of 8 patients with orbital prostatic metastases, 4 had osteoblastic lesions on CT.[5] Few cases of prostatic carcinoma metastases to isolated single extraocular muscle have been reported.[3,6] Although rare, metastasis to extraocular muscle may present at diagnosis or several years after the diagnosis of prostate carcinoma. Radiotherapy, hormonal therapy, or chemotherapy may offer symptomatic relief of pain, proptosis, visual loss, or diplopia.

Our cases represent unusual presentations of orbital metastatic disease due to prostate carcinoma. Clinicians should be aware that prostate cancer can metastasize to single or multiple

extraocular muscles. The diagnosis should be considered in patients with atypical clinical findings (e.g., lack of systemic thyroid disease, markedly asymmetric or unilateral findings) or atypical radiographic findings (e.g., nodular involvement, tendon involvement, bone or extraorbital disease). Orbital biopsy of extraocular muscle should be considered to establish the diagnosis in these cases prior to planning further medical, surgical, or radiation therapy.

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Successful Use of Mitomycin C to Prevent Recurrence of the Cystic Component of an Optic Nerve Sheath Meningioma

Dilsher S. Dhoot, M.D., William T. Shults, M.D.†, and John D. Ng, M.D.*†*

Abstract: **A 28-year-old woman presented with 4 months of episodic right-eye vision loss and proptosis. Imaging demonstrated a cystic retrobulbar lesion. Lateral orbitotomy with drainage and biopsy revealed a cystic optic nerve sheath meningioma. The cyst recurred despite radiation therapy followed by craniotomy with partial resection of the meningioma. In an effort to preserve vision, an anterior orbitotomy for cyst drainage with topical mitomycin C was performed. Since this procedure, the cyst and symptoms have remained stable for 19 months. We report a case of cystic optic nerve sheath meningioma and the successful treatment of cyst recurrence with mitomycin C.**

Optic nerve sheath meningiomas (ONSM) are the most common tumors of the nerve sheath but account for only 1% to 2% of intracranial meningiomas.[1] Most ONSMs are of the primary type, arising from the arachnoid surrounding the nerve, usually within the orbit or optic canal; others originate from the sphenoid wing and spread to the optic nerve and are thus considered secondary ONSMs. The most common presenting symptom of both primary and secondary ONSMs is visual loss. Other manifestations include proptosis, chemosis, eyelid edema, and ocular dysmotility.[1]

Diagnosis is made clinically, radiographically, and histologically. Meningiomas are usually solid tumors. Cyst incidence with intracranial meningiomas is 4% to 7%.[2] ONSM cysts are very rare. We report the case of cystic primary ONSM and success with cyst drainage using adjunctive mitomycin C (MMC) to prevent cyst recurrence thereby preserving visual function.

CASE REPORT

A 28-year-old woman presented with episodic right-eye visual blackouts lasting seconds to under a minute superimposed on a slowly progressive hyperopic shift and visual blurring over 4 months. These episodes were induced by positional changes, i.e., sudden standing and aerobic classes. She reported chronic eye pressure and headaches. Over several weeks she developed blurry vision and proptosis. Four months later, she was referred to us to evaluate new optic disk edema. Visual acuity was 20/25 − 2 OD and 20/15 OS. Perimetry demonstrated right blind spot enlargement and generalized depression (Fig. 1). MRI revealed a right cystic retrobulbar lesion (Fig. 2). We performed a lateral orbitotomy with drainage and biopsy of the cyst wall. The patient's preoperative visual acuity was 20/40 + 2 OD. One month postoperatively, it was 20/20 OD. Pathology revealed a meningoepitheliomatous optic nerve sheath meningioma. Within 3 months the cyst recurred and the patient was treated with 6 weeks of radiation therapy, 5,000 cGy. Unfortunately, visual loss and proptosis

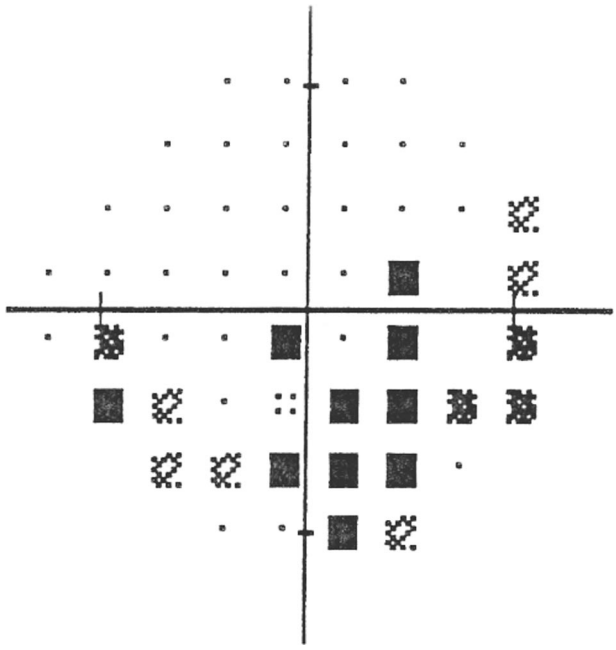

FIG. 1. Automated static threshold perimetry of the right eye at initial presentation reveals blind spot enlargement and diffuse generalized depression.

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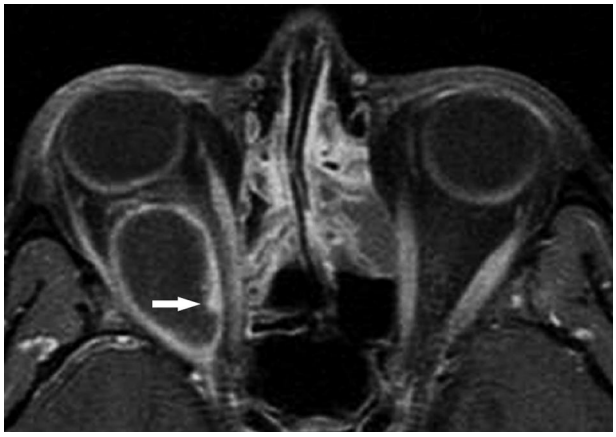

FIG. 2. T_1 MRI axial image shows large intraconal cystic mass with proptosis and flattening of the posterior globe at initial presentation. The optic nerve is displaced medially and the area of attachment of the lesion to the optic nerve is at the posterior half of the optic nerve (arrow).

progressed. One year after initial presentation, her visual acuity was 20/30 − 2 OD. Visual fields showed persistent decline (Fig. 3). An orbitozygomatic craniotomy with partial resection of the meningioma was performed. The delineation between the mass and the optic nerve was not clear and complete resection would have involved direct injury to the intraconal orbital apical structures where the mass was firmly attached. Vision improved to 20/20 OD. After 1 year of clinical stability the patient returned with proptosis and visual decline to 20/40. The patient underwent right medial eyelid-crease orbitotomy and cyst drainage. Topical mitomycin C (4 mg/mL) was applied to the cyst opening for 5 minutes followed by antibiotic solution irrigation. Her vision stabilized and other symptoms have been absent for at least 19 months.

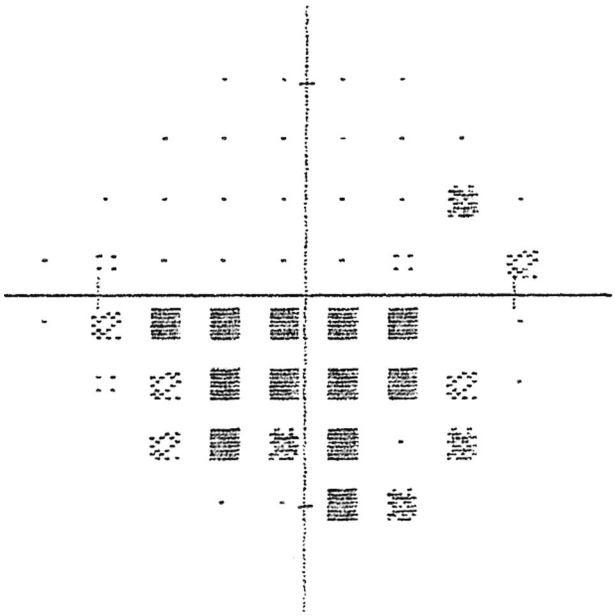

FIG. 3. Automated static threshold perimetry of the right eye 1 year after initial presentation, following right lateral orbitotomy and radiation therapy, demonstrates persistent decline in visual function.

DISCUSSION

ONSM are very rare. A literature review yielded one case of a large peritumoral ONSM cyst. In 10 cases, small cystic dilations of the optic nerve sheath occurred distal to the meningiomas.[3] The mechanism of cyst formation remains unclear.

The mortality of ONSM is low to none, although there is progressive decline in visual function.[1] Traditional treatment has been observation or surgical excision of the tumor and nerve to prevent intracranial extension. The latter option often results in blindness. Use of fractionated radiation therapy has been supported by recent studies.[1] In a retrospective review of 64 ONSM patients managed with either observation, surgery, radiation or surgery and radiation, the radiation group had the best visual outcome in the defined follow-up period.[4]

In our case, the cyst recurred despite surgery and radiation. The patient's good vision precluded more aggressive surgical excision at the orbital apex, which would have resulted in significant vision loss. Therefore, the decision was made to drain the cyst and use topical intraoperative MMC. MMC is used in ophthalmology for pterygium, glaucoma, corneal refractive surgery, and optic nerve sheath fenestration. It acts by inhibiting DNA synthesis thereby inhibiting wound healing. We hypothesized that MMC may suppress recurrence of the cyst and delay more aggressive surgical excision of the entire tumor with high risk of visual loss. The patient's optic neuropathy stabilized and symptoms have not returned for 19 months. Although MMC has been used in optic nerve sheath fenestration and seemed reasonable to use in this difficult case, risk to the optic nerve with MMC must be considered. Taban et al. reported a case series of histologic examination of the optic nerves of patients after optic nerve sheath decompression with MMC. No complications were seen with MMC use. However, others have reported damage to the optic nerve pia mater and decreased visual evoked potentials if MMC is applied directly to the nerve.[5,6]

We report a rare cystic ONSM in which mitomycin C has seemingly delayed recurrence of the cyst and patient symptoms, although the ultimate outcome remains to be established by longer term follow-up.

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Intraorbital Organic Foreign Body in a Tree Surgeon

Bryan D. Edgington, M.D., Craig E. Geist, M.D., and Jana Kuo, M.D.

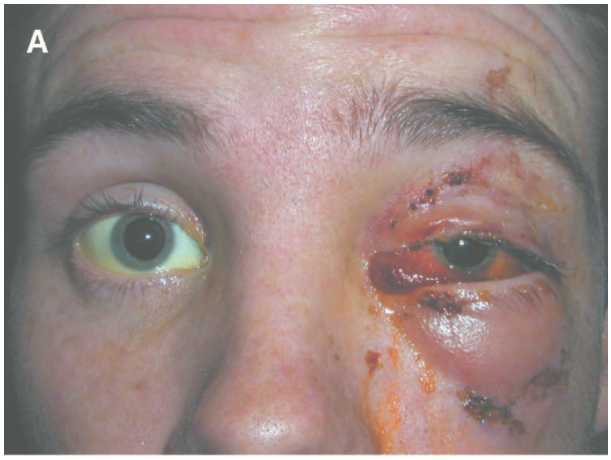
Abstract: **A tree surgeon suffered a traumatic floor fracture complicated by multiple organic foreign bodies. CT confirmed a left floor fracture and medial wall fracture and decreased attenuation in the inferior orbit and maxillary sinus. Exploration of the orbital floor led to the removal of multiple wooden fragments up to 2.5 cm in length. Additional surgeries led to the removal of additional wooden fragments. Detection of organic intraorbital foreign bodies requires a high degree of clinical suspicion and close consultation with a radiologist.**

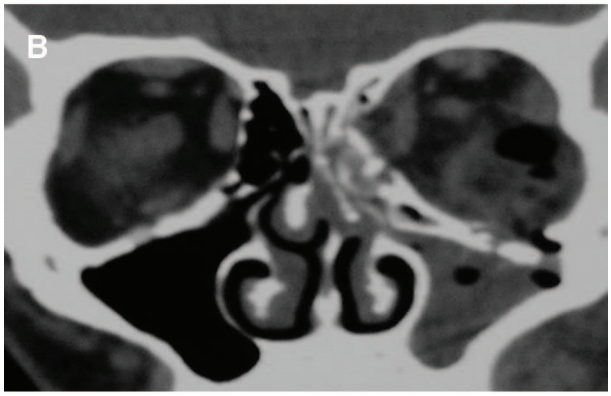
CASE REPORT

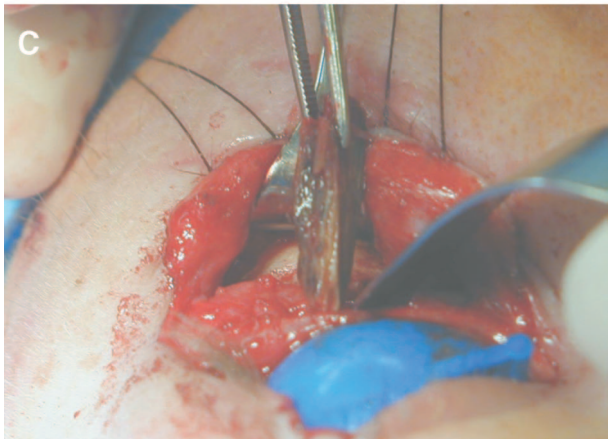
A 26-year-old tree surgeon was struck in the left orbit by a 4-in × 2-ft rotten tree branch. An ophthalmologist at a local hospital explored the injured globe, removed all visible organic fragments, and repaired the eyelid lacerations. The patient was started on both oral and topical antibiotics and referred to our oculoplastics service for evaluation of the left floor fracture. Pertinent findings were visual acuity 20/20 OD, 20/50 OS, anisocoria, marked periorbital edema (Fig. A), limited supraduction, infraduction, and adduction OS and 5.5 mm of left proptosis. A sensory examination showed hypesthesia in the left V2 distribution. CT revealed left floor fracture and medial wall fracture and decreased attenuation in the inferior orbit and maxillary sinus (Fig. B). The patient was started on a Solu-Medrol dose pack to reduce swelling and inflammation.

Exploration of the orbital floor was performed via a transconjunctival approach. Numerous wooden fragments up to 2.5 cm in length were removed from both the maxillary sinus and inferior orbital soft tissue (Fig. C). The largest fragments were found within the maxillary sinus. A Medpor channel implant was used to span the floor fracture. The patient was administered oral and topical antibiotics.

On follow-up, the patient reported improvement in diplopia but also noted a firm area in his left cheek over the maxillary sinus. The area was explored and additional wood fragments were removed. A percutaneous drainage tube was placed and otolaryngology was consulted. Additional wood fragments were removed from the region of the maxillary sinus on visits to otolaryngology and ophthalmology. Subsequent examination revealed good motility OS and symblepharon formation in the inferior conjunctival fornix.







A, Patient at presentation with left orbital floor fracture and multiple organic intraorbital foreign bodies. **B,** CT demonstrates a left orbital floor fracture and medial wall fracture and areas of attentuation within the maxillary sinus. The areas of attenuation in the maxillary sinus corresponded to the larger wooden fragments removed during surgical exploration. **C,** A wooden fragment being removed during surgical exploration.

DISCUSSION

This case demonstrates the difficulty of treating a patient with trauma from organic material. This material must be removed to reduce the risk of inflammation and secondary infection with abscess formation. These risks must be balanced

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with the risks of exploratory surgery if it is not known to what extent the material has penetrated.

Organic matter is difficult to image with current radiologic modalities. CT relies on varying radiodensities of tissues for differentiation. Orbital adipose tissue and air can have a radiodensity that is similar to wood. In the presence of emphysema, wood lying on the soft-tissue–air interface is difficult to diagnose.[1,2] Intraorbital foreign bodies are frequently identified as air. Previous reports indicate that wood, particularly dry wood, is not detected on CT unless it is associated with a radiopaque substance such as metallic paint, or a granuloma has developed as a reaction to the foreign body. Lee and Lee[3] reported that wood foreign bodies were only delineated on CT if calcification occurred.

MRI is highly sensitive to water content.[4,5] Although many authors suggest that MRI is only comparable to CT, others report that organic foreign bodies were only visualized after MRI imaging. Dry wood appears as a low density signal on both T_1- and T_2-weighted images due to the high air content. Green wood (hydrated wood) appears hypointense or isointense on T_1-weighted studies, depending on the level of hydration. If gadolinium-diethylenetriaminepentaacetic acid enhancement is used, a surrounding area of hyperintensity is seen, which reflects fluid and inflammatory debris accumulation.[6]

In an experimental study by Mizel et al.,[4] the location and duration of a retained foreign body determined which imaging modality was potentially best. CT was better able to image drier splinters close to bone than ultrasound or MRI. With more hydrated wood, the sensitivities shifted and MRI was superior to both the other imaging modalities.

The density of wood varies over time. Dead wood has greater air content, which appears radiolucent. Live wood has greater water content, which has similar density to surrounding tissues and appears radiopaque. Chronic retained wood absorbs more water to increase its radiodensity, thus making it initially more difficult to visualize and later much easier to visualize.[4,6,7] The increase in water content can occur as early as 7 to 10 days within the body, consistent with the timing of most orbital fracture repairs.

Initial radiologic evaluation should include orbital CT with both axial and coronal views. If a skilled ultrasonographer is available, this imaging modality may help to localize and delineate a retained foreign body. Once a metallic substance is ruled out, MRI should be ordered. The MRI may be delayed to help increase the chance of detecting an organic foreign body. Given the absorption of water over time by wood, it may be optimal to have the MRI performed just before surgical intervention.

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Late-Onset Occult Cerebrospinal Fluid Leakage After Orbital Exenteration

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Abstract: **Orbital exenteration can be complicated by cerebrospinal fluid leakage, mostly during surgery. Late-onset cerebrospinal fluid leakage that occurs years after the initial orbital exenteration is rare. The authors report a case of cerebrospinal fluid leakage that occurred 4 years after orbital exenteration that was not due to tumor recurrence. The leakage was managed successfully by the application of cyanoacrylate tissue glue. No complication was encountered.**

CASE REPORT

A 69-year-old man presented in July 2001 because of increasing proptosis of his left eye that developed during the past few years. Best corrected visual acuity was 0.7 OD and no light perception OS. CT showed a contrast enhancing lobulated mass that almost completely occupied the left orbit (Fig. A). There was no extension in the paranasal air sinuses or the intracranial cavity. Incisional biopsy revealed the mass to be a hemangiopericytoma. Uneventful orbital exenteration was performed in March 2002. The orbital contents were removed as posteriorly as possible in view of the apical extension of the tumor. No cerebrospinal fluid (CSF) leakage was noted during surgery. Histopathologic examination of the specimen confirmed the diagnosis of hemangiopericytoma with posterior margin involvement. Radiotherapy was subsequently administered as recommended by oncology consultation. The socket surface was left for self granulation and remained well with complete epithelialization. A spectacle-mounted prosthesis was prescribed. The patient was followed in our clinic every 3 months and the socket remained well for 4 years. No CSF leakage was noted during the follow-up period and the patient did not report any leakage of fluid from the socket.

At a follow-up visit in November 2006, a slow egress of clear fluid with de-epithelialization of the socket surface at the

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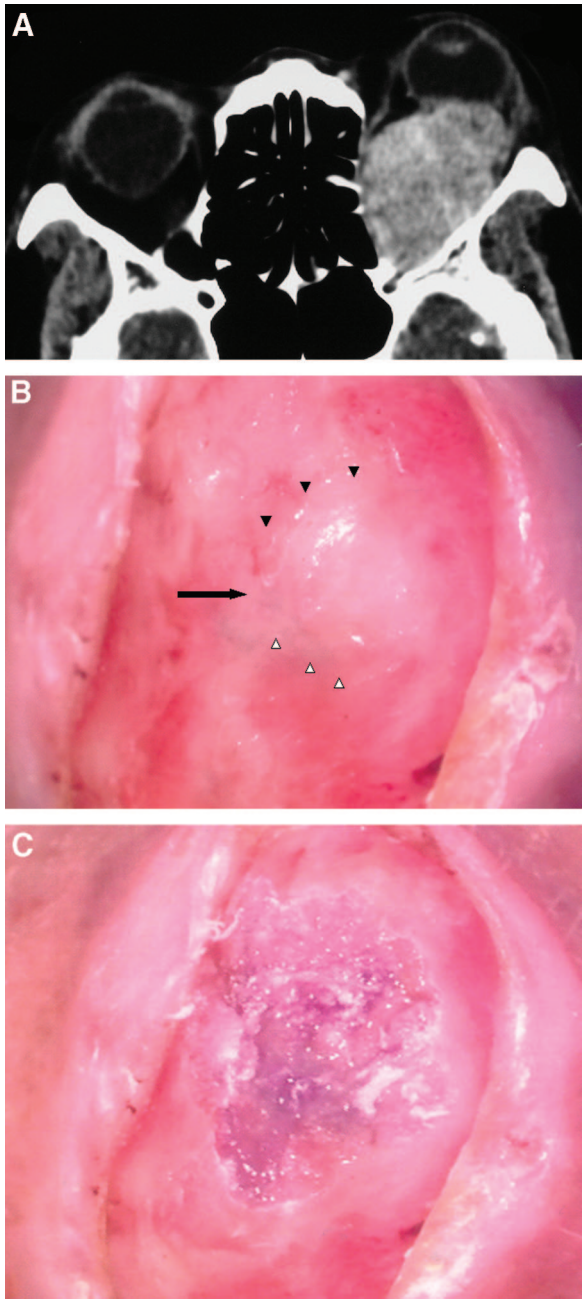

A, CT shows a large, contrast-enhancing lobulated mass over the left orbit. **B,** The nonhealing orbital socket with occult cerebrospinal fluid leakage from the optic canal (black arrow). The superior orbital fissure (black arrowhead) and inferior orbital fissure (white arrowhead) can be identified as well. **C,** Appearance of the orbital socket immediately after the application of cyanoacrylate tissue glue.

region of the orbital apex was noted during slit lamp examination (Fig. B). No mass lesion or abnormal soft tissue suggestive of tumor recurrence was present. The glucose level of this fluid was 5 mmol/l, which is consistent with CSF. Orbital CT showed no evidence of tumor recurrence in the socket, optic canal, or superior orbital fissure. A presumptive diagnosis of late-onset CSF leakage with de-epithelialization of the socket surface was made. Topical and systemic antibiotics were prescribed. The clear-fluid leakage persisted and the surface was not epithelialized after 1 week. The patient was managed with cyanoacrylate tissue adhesive (Histoacryl, B. Braun, Germany) application to the de-epithelialized surface at the area of leakage (Fig. C). The leakage stopped after the application of cyanoacrylate tissue glue. The socket bed was later re-epithelialized and no leakage was detected up to 9 months after cyanoacrylate tissue glue application. No complications such as local or intracranial infection or irritation were seen.

DISCUSSION

Orbital exenteration is a disfiguring procedure and is usually performed for the eradication of malignant tumors involving the orbit.[1] Some nonmalignant conditions may also require exenteration, such as sclersoing pseudotumor[2] or orbital mucomycosis. Potential complications of orbital exenteration include bleeding, infections, formation of sino-orbital fistula, forehead sensory loss, chronic discharge, graft- or flap-related complications, and tumor recurrence.[1] Occasionally, leakage of CSF may occur especially if there is damage to the roof of the orbit during surgery.[1,3] CSF leakage is also associated with the use of monopolar diathermy.[1]

In our patient, the orbital socket was healed and remained epithelialized during the first 4 years after orbital exenteration. CSF leakage was identified 4 years after exenteration, presumably due to the de-epithelialized, nonhealing surface over the socket. Careful examination under slit lamp disclosed slow leakage of clear fluid from the orbital apex at the region of the optic foramen. The fluid contained glucose and was consistent with CSF. Biopsy would be useful to exclude tumor recurrence, but was not performed in our case because of lack of evidence of tumor recurrence both clinically and radiologically, and because there was a thin epithelial lining over the socket. The exact cause of the late-onset CSF leakage is not known. Several factors may have contributed including removal of orbital content close to the orbital apex during exenteration and the use of postoperative orbital irradiation.

Systemic antibiotic treatment is essential in cases of CSF leakage to prevent meningitis. Various methods have been described in the management of CSF leakage, including direct suturing of the dural defect,[2,3] various type of grafts or flaps to cover the defect[2,3] and the use of tissue adhesive glue.[1,3–6] Compared with flaps or grafts, repair with tissue adhesive glue is technically less demanding. The use of cyanoacrylate tissue glue to treat intraoperative CSF leakage during orbital surgeries has previously been described.[1,3] Our experience also suggests that cyanoacrylate tissue glue can be used to treat late-onset CSF leakage. Theoretically, fibrin-based glues can also be used to treat CSF leakage after orbital exenteration but this has not been described. Compared with cyanoacrylate glue, fibrin-based adhesives carry the disadvantages of prolonged preparation time, increased cost, and the theoretical risk of viral and prion transmission.[5] In our case, the CSF leakage was successfully stopped by the application of cyanoacrylate tissue glue over the leakage site.

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Meningoencephalocele as a Rare Cause of Cerebrospinal Fluid Fistula During Dacryocystorhinostomy

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Abstract: **A meningoencephalocele is a herniation of meninges and brain out of the cranial fossa through a bony defect. Cerebrospinal fluid leakage may occur due to a defect in the wall of the meningoencephalocele. The defect may be traumatic, iatrogenic, or may appear spontaneously. In this report, the authors present an unrecognized transethmoidal meningoencephalocele that resulted in a cerebrospinal fluid leak during dacryocystorhinostomy.**

Meningoencephalocele is a rare neural tube defect in which meninges and brain tissue have herniated out of the cranial fossa. It is most commonly located in the occipital region. Although usually congenital, a meningoencephalocele may appear following trauma.[1] In this report, an unrecognized transethmoidal meningoencephalocele that resulted in cerebrospinal fluid (CSF) leak during dacryocystorhinostomy (DCR) is presented.

CASE REPORT

An external DCR was planned for a 24-year-old woman with right-sided epiphora. After making the initial skin incision, the surgeon noted leakage of clear fluid. The wound was closed and the patient transferred to our facility with the suspicion of CSF leakage. On presentation, clear fluid was oozing between the sutures (Fig. 1). On further history, the patient related that she had a mass in the region of the DCR incision for which she had surgery at age 4 years (Fig. 1).

Nasal endoscopic examination was unremarkable. CT demonstrated a defect in the anterior skull base (Fig. 1). MRI demonstrated brain tissue in the sac. The nasolacrimal canal was obstructed radiographically (Fig. 2).

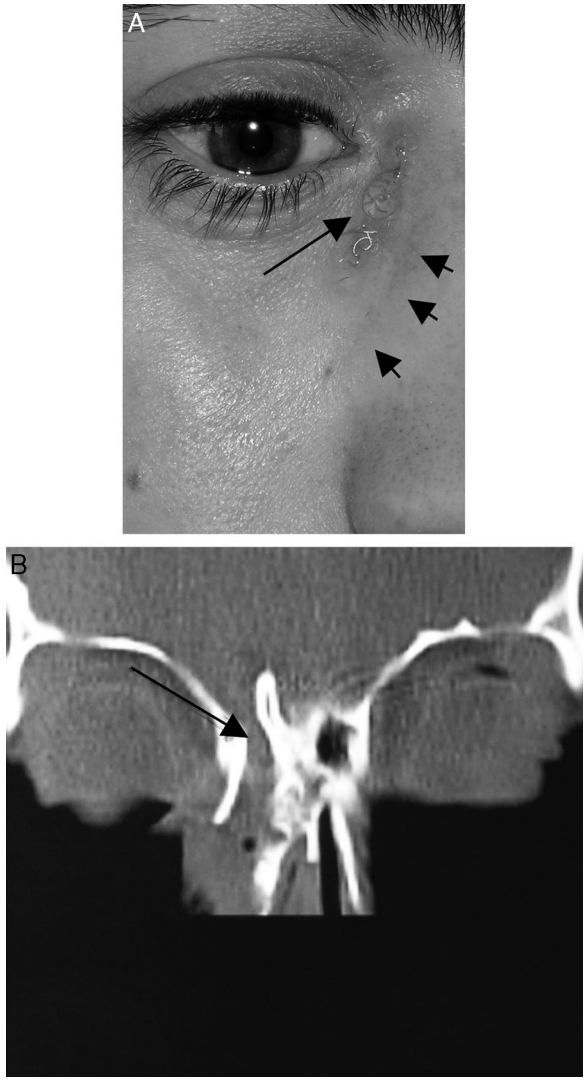

FIG. 1. **A,** Cerebrospinal fluid oozing between sutures. Arrowheads indicate old incision. **B,** Bony defect in the anterior skull base.

The patient was admitted. Treatment consisted of daily lumbar punctures (normal CSF opening pressures), acetozolamide 250 mg orally 3 times a day and ampicillin-sulbactam 1 g IV 4 times a day. The CSF leakage stopped on the seventh day of treatment. The patient was discharged on hospital day 10 with oral antibiotics.

DISCUSSION

Basal meningoencephaloceles that pass through the skull base have 4 subtypes: transsphenoidal, sphenoethmoidal, sphenoorbital, and transethmoidal.[2] Our patient had a transethmoidal meningoencephalocele. The history of surgery in childhood suggests that it was congenital. Symptoms of meningoencephaloceles vary according to their location and size. The symptoms may include nasal obstruction, spontaneous rhinorrhea, and recurrent meningitis.[3] Our patient did not have any nasal symptoms since the meningoencephalocele did not occupy the nasal cavity. Her persistent epiphora was most likely

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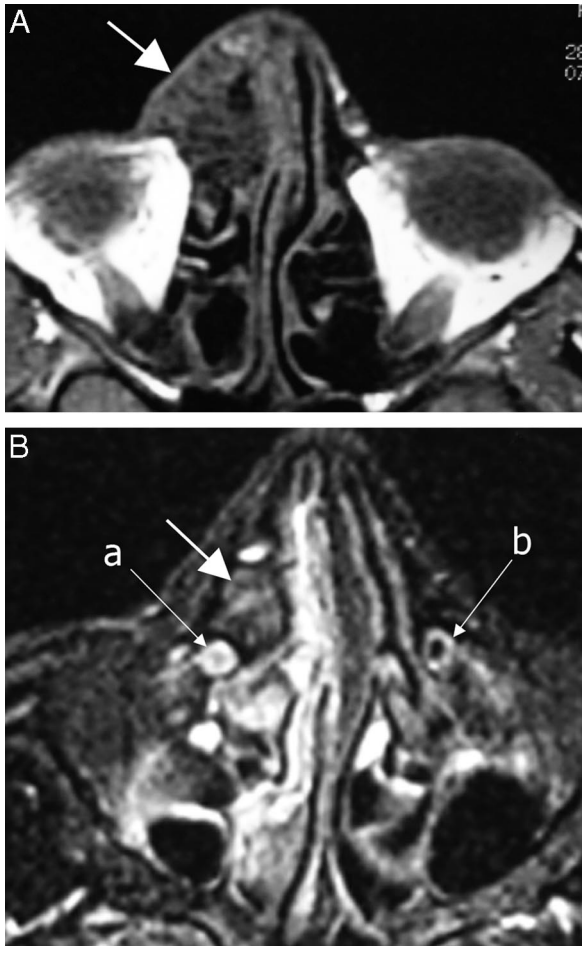

FIG. 2. A, Meningoencephalocele beneath the skin. **B,** obstructed right nasolacrimal canal (a); right canal is open (b).

due to obstruction of the lacrimal system from extrinsic pressure from the meningoencephalocele.

Neuroimaging is necessary to identify where the meningoencephalocele herniates out of the cranium. CT is useful to localize the site and size of the bony defect whereas MRI can demonstrate if there is brain tissue in the sac.

The differential diagnosis of meningoencephalocele includes dermoid cyst, epidermoid cyst, and glioma.[3] Meningoencephaloceles must not be biopsied because this may cause CSF leakage. Treatment often requires a multidisciplinary approach.

A CSF fistula following DCR is rare and may be related to anatomic abnormalities such as in our patient. Bagheri et al.[4] reported bilateral CSF leakage following sequential bilateral DCR and silicone intubation in a case with Mobius syndrome and a history of surgically repaired fronto-ethmoidal meningoencephaloceles and bilateral canthopexy. CSF leakage ceased spontaneously with conservative management similar to our case.

A CSF fistula following DCR usually occurs from trauma to the cribriform plate in patients without anatomic abnormalites. The rhinostomy must be created carefully while keeping in mind the anatomy of critical surrounding structures. The distance between the cribriform plate and the superior border of the bony window is quite short and the cribriform plate may be very thin.[5] An investigation on cadavers demonstrated that the cribriform plate can be injured and a CSF fistula can develop during osteotomy of the nasal bone due to torsion or traction of the neighboring structures.[6] Neuhaus and Baylis[5] reported 2 cases of CSF fistula following DCR in patients without anatomic abnormalities.

Our patient had an unrecognized meningoencephalocele at the site of the DCR incision and her CSF leakage occurred just after the incision. This case underscores the importance of obtaining a detailed medical history, including previous surgeries, and performing a careful physical examination before surgery.

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Mycobacterium chelonae Canaliculitis Associated With SmartPlug Use

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Abstract: ***Mycobacterium chelonae*** **is ubiquitous in the environment but is an uncommon cause of ocular and periocular infections. It is a pathogen that has been gaining increased attention in the ophthalmic literature because of the relatively large number of infections associated with laser-assisted in situ keratomileusis and other forms of refractive surgery. The authors present 3 patients who developed canaliculitis culture positive for *M. chelonae* more than a year after SmartPlug placement. These cases highlight some of the clinical scenarios that may be encountered in those who present with canaliculitis with a history of intracanalicular plug placement. Therapeutic considerations are also suggested.**

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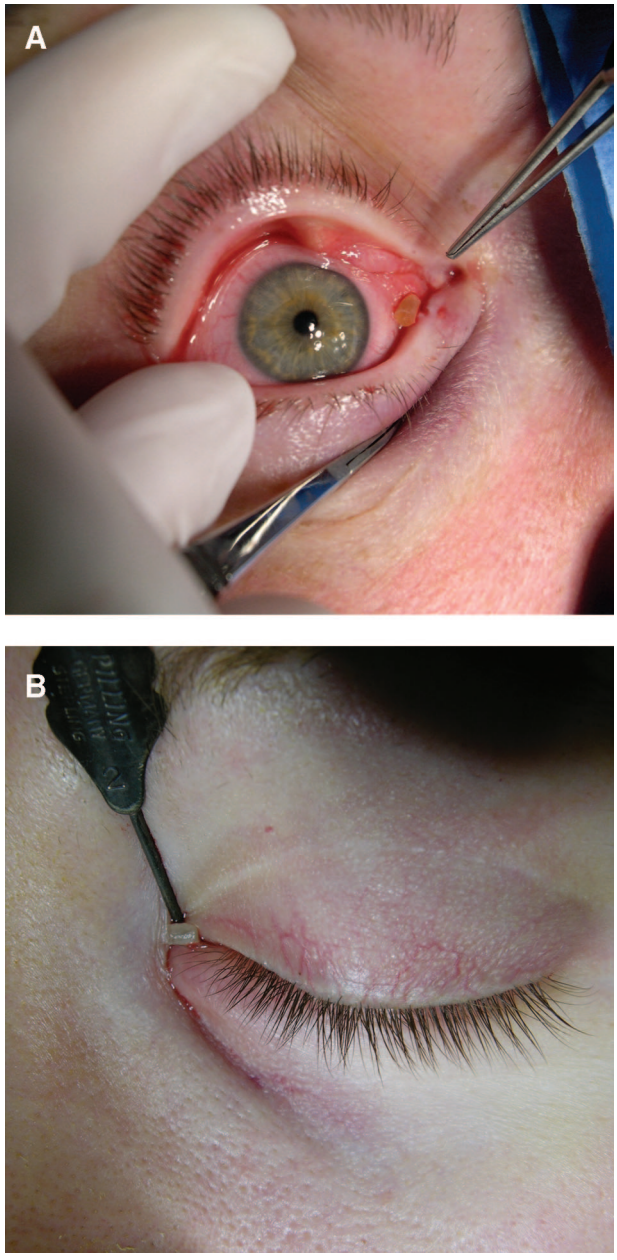
CASE REPORTS

Patient 1. A healthy 41-year-old white woman with a history of severe dry eye and bilateral SmartPlug (Medennium, Inc., Irvine, CA, U.S.A.) placement 2 years prior presented with significant ocular irritation in her right eye. She had symptoms consistent with Sjögren syndrome, and was started on aggressive topical lubrication, topical 0.2% cyclosporine A, and oral omega-3 fatty acids. One month later she presented with right lower eyelid erythema, purulent discharge, and a history of occasional blood-stained tears. Palpation of the right lower canaliculus expressed red-tinged purulent discharge. Cultures for bacteria, fungus, and *Mycobacteria* were taken and the patient was started on moxifloxacin (Vigamox, Alcon Laboratories, Ft. Worth, TX, U.S.A.) every hour while awake and oral cefalexin. Upon irrigation of the right lower canaliculus, there was initial resistance, followed by easy flow to the nose.

There was minimal improvement at 3 days and oral clarithromycin was added as initial culture results were positive for acid-fast bacilli. Reprobing of the canaliculus demonstrated no resistance and irrigation with a solution of 1% betadine, moxifloxacin 0.5%, and 2% lidocaine again demonstrated initial resistance followed by a "pop" sensation and subsequent easy flow. Her symptoms improved initially, but in 2 weeks she noticed "gelatinous material" at the right lower punctum. This material could not be massaged out, yet she had a normal dye disappearance test (DDT) with recovery of dye from the right nostril and easy irrigation. Concerned about plug retention despite "normal patency," a right lower canaliculotomy was performed. A yellow, fully expanded SmartPlug was found at the midportion of the canaliculus and the canaliculus appeared to be dilated (Fig. A). No diverticula or granulomas were found, and a Mini Monoka stent (FCI Ophthalmics, Marshfield Hills, MA, U.S.A.) was placed as part of the canalicular repair. Cultures of the plug grew *Mycobacteria chelonae.* Repeat cultures at 2 weeks and 3 months (at the time of stent removal) were negative. She has had no recurrences.

Patient 2. A healthy 42-year-old white woman had undergone laser-assisted in situ keratomileusis 2 years prior and subsequently developed dry eye. SmartPlugs were placed in both lower canaliculi a few months after surgery with improvement in dry eye symptoms. She presented to our institution with a 3- to 4-month history of bilateral epiphora, left lower eyelid erythema, and blood-tinged, purulent discharge OS. Cultures were taken and irrigation of both lower canaliculi revealed initial resistance, with subsequent easy flow. Because of our recent experience with patient 1, we empirically started her on moxifloxacin 0.5% and clarithromycin. Her epiphora OU and discharge OS improved. However, her tears continued to be blood-tinged on the left. Cultures grew *M. chelonae* OS. Retrograde massage of the canaliculi did not express any plug material so bilateral lower canaliculotomies with Monoka stent placement were performed. No plug material was recovered, but the left lower canaliculus was debrided of tissue consistent with pyogenic granuloma on pathologic evaluation. At the time of surgery cultures were taken OU, but only the left grew *M. chelonae*. Week 2 postoperatively the patient was doing well with resolution of epiphora and discharge OU, and repeat cultures were negative. At postop week 3, her left stent fell out, but she did not return to clinic for another 2 weeks. She now had left lower canalicular stenosis and evidence of partial nasolacrimal duct obstruction. Concerned that the new nasolacrimal duct component could be related to dislodgement of plug material from our initial irrigation, we recommended canaliculoplasty with dacryocystorhinostomy OS. The patient has not returned since that visit.



A, Intact SmartPlug from patient 1, adjacent to opened canaliculus. The device is yellow in color and cultures on 7H11 media recovered *Mycobacteria chelonae*. **B,** Intact SmartPlug recovered from patient 3 during probing of the lacrimal drainage system. It is clear in color and did not grow *M. chelonae*. The plug recovered from the opposite side was yellow in color and was culture positive for *M. chelonae*.

Patient 3. A healthy 38-year-old white woman underwent bilateral laser-assisted in situ keratomileusis surgery in 2000. She

developed significant dry-eye symptoms and bilateral lower SmartPlugs were placed with subsequent improvement of her symptoms. She presented to us in 2006 with a 6-month history of epiphora and mucoid discharge worse in the left eye than the right. All 4 puncti were markedly stenotic. DDT was slightly delayed on the right with recovery of dye in the nose and easy irrigation. DDT was delayed on the left and irrigation of the left lower canaliculus demonstrated near-total reflux from the lower punctum and no recovery of fluid in the nose. The patient would not tolerate left upper punctual dilation and irrigation.

Two weeks later, while waiting for further exploration in the operating room, the patient presented with new symptoms of pain, redness, and purulent discharge from the right lower punctum. Cultures of the discharge grew *M. chelonae.* The right lower canaliculus was again easily probed and irrigated. Her exam on the left was unchanged. She did not improve on oral clarithromycin and topical moxifloxacin 0.5% in the right eye. In the operating room, using cotton-tipped applicators, aggressive retrograde massage of the right lower canaliculus expressed a yellowed, fragmented piece of SmartPlug. Retrograde massage expressed nothing from the left lower canaliculus. However, during probing of the left canalicular system a clear, an intact SmartPlug emerged (Fig., B). The right plug grew *M. chelonae*, whereas the left plug was culture negative.

DISCUSSION

M. chelonae was first identified and named in 1903 when Freidman isolated an acid-fast bacillus from the sea turtle *Chelona corticana*.[1] An organism ubiquitous in the environment, *M. chelonae* is an infrequent human pathogen most commonly associated with localized soft-tissue infection following surgery, penetrating trauma, and injections. This organism has gained increasing attention in the ophthalmic literature as a relatively common pathogen in cases of postrefractive surgery keratitis. While the incidence of postlaser-assisted in situ keratomileusis keratitis is low (approximately one in every 3,000 cases) the incidence of atypical *Mycobacteria* as the etiology ranges from 48% to 60%.[2] Other reported eye-related *M. chelonae* infections include those associated with scleral buckles, clear-cornea cataract extraction, contact lenses, penetrating keratoplasty, and silicone lacrimal stents.[3–7] There are no published reports of *M. chelonae* canaliculitis associated with traditional punctal plugs, but a recent article on the complications associated with SmartPlug placement reported a case of culture positive *M. chelonae* infection of the lacrimal drainage system.[8] All of our patients had a history of SmartPlug placement, and we were able to recover and culture the plugs in 2 of 3 patients, which confirmed the association of the organism with the device. The infections postdated plug placement by several months and did not resolve until the device was removed. This is likely related to the development of bacterial biofilms which have been repeatedly demonstrated in the medical literature to be the cause of chronic, recalcitrant infections associated with indwelling devices. *Staphylococcus* and *Candida* biofilm formation on a punctual plug has been associated with conjunctivitis, and differing microbial biofilms, including *M. chelonae* biofilms, have been associated with scleral buckle infections.[9,10]

Punctal plugs have become an important therapeutic modality in the treatment of tear insufficiency. SmartPlugs are made of an acrylic polymer with thermodynamic qualities that allow them to expand from their original 0.4 mm × 9 mm rod shape and conform to the shape of the punctal ampula upon insertion.[11] Irrigation of the lacrimal drainage system is recommended for removal. Our cases demonstrate that this type of plug can be retained within the canaliculus, despite indicators that would suggest dislodgement (i.e., normal Jones testing and easy irrigation in the nose).

In patients presenting with canaliculitis and a history of SmartPlug placement, the following should be kept in mind: First, the plug may be the source of bacterial load and irrigation may not ensure removal of the device from the lacrimal drainage system. Second, *Mycobacteria* cultures and coverage should be considered. The 7H11 and Lowenstein-Jensen media are excellent for recovering acid-fast bacilli. Oral clarithromycin and topical moxifloxacin 0.5% have been shown to be effective against these organisms. Lastly, if the canaliculitis is resistant to therapy and retrograde massage of the plug out of the canaliculus cannot be achieved, consider canaliculotomy to adequately debride the canaliculus. Our canaliculotomy technique includes dilation of the punctum followed by the creation of a lengthwise incision along the canaliculus with a Vannas style iris scissor or fine Westcott style scissor. The canaliculus is opened for whatever length is needed for adequate exposure and the incision ends before entering the common canaliculus. After the canaliculus is explored and debrided, a Mini Monoka stent trimmed to 15 mm is threaded in the intact portion of the canaliculus and allowed to lie in the opened portion. The punctum is reformed around the neck of the stent with a 7–0 chromic suture and the cut margins of the canaliculus are closed over the stent with interrupted 7–0 chromic sutures. The stent is removed in clinic 3 months following the procedure.

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