

Treatment of Recurrent Squamous Papillomata of the Conjunctiva by Carbon Dioxide Laser Vaporization

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Abstract: Complete resection of recurrent conjunctival squamous papillomata frequently may be exceedingly difficult, since such lesions are typically friable and multilobulated. Recurrent lesions often fill the fornices and spill onto the lid margins. Moreover, since the human papillomavirus (HPV) has been linked to some of these lesions, there remains the further possibility of spread with "cold knife" resection. We discuss the benefits of carbon dioxide laser vaporization therapy for recurrent squamous papillomata of the conjunctiva that have not responded to resection and cryotherapy or topical immunotherapy. The carbon dioxide laser facilitates resection by providing a bloodless field, and reduces the possibility of viral seeding of the conjunctiva by sterilizing the operative site and sealing the lymphatics. [Key words: carbon dioxide laser, caruncle tumors, conjunctival tumors, recurrent squamous papillomata, vaporization.] Ophthalmology 93:1078-1082, 1986

Therapy of recurrent squamous papillomata of the conjunctiva represents a challenging problem. Ideally, the goal of therapy is to completely eradicate this benign lesion, which possesses the propensity both for exuberant regrowth and possibly malignant degeneration, while preserving vital, clinically uninvolved structures. Small primary squamous papillomata of the caruncle often may be locally resected without difficulty. Recurrent lesions, however, may present as rapidly enlarging, aggressive, friable, multilobulated masses, which frequently spill into the fornices, onto the lid margins, and over the lacrimal puncta. A variety of therapies have been employed in the past, including cryotherapy, topical immunotherapy and carbon dioxide laser vaporization.¹ We summarize our experience in treating seven cases of recurrent conjunctival squamous papillomas successfully with resection by carbon dioxide laser vaporization after other modalities had failed.

PATIENTS AND METHODS

Carbon dioxide laser vaporization was performed on seven patients with recurrent squamous papillomata of the conjunctiva (Table 1). Conforming to the classification of "viral type" of papilloma, the lesions were multiple and occurred in younger patients; our patients' ages ranged from 2 to 32 years.^(6,7) Five of the patients had had previous recurrences after cold knife resection plus cryotherapy. One patient (no. 7) suffered four recurrences after cold knife resection plus cryotherapy and did not respond to either of two forms of immunotherapy after skin sensitization. First DNCB (1-chloro-2,4-dinitrobenzene) was used and then applications of Rhus plant oleroresin (poison ivy/oak extract) were attempted.^(3,4,8) The caruncle was involved in seven cases. The palpebral conjunctiva was involved in three cases (nos. 3, 4, 7). The nasal cavity was involved concurrently in one case (no. 2), implying that the lacrimal excretory passage acted as a conduit for spread to or from the caruncle. A Xanar (model 320) carbon dioxide laser with a handheld delivery system was used to perform the vaporization of recurrent squamous papillomata of the conjunctiva. It was set on the continuous mode with a constant 2 mm spot size

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Table 1. Carbon Dioxide Laser Vaporization of Recurrent Squamous Papillomata of Conjunctiva

Cases	Patients' Age Years	No. of Recurrences	Previous Therapy	Location of Tumor(s)	Follow-up Months	Recurrences
1	30	2	cold knife resection	caruncle	27	no
2	32	2	cold knife resection	caruncle, nasal cavity	24	no
3	28	3	cold knife resection & cryo ¹	caruncle/palpebral conjunctiva	21	no
4	2	2	cold knife resection & cryo	caruncle/palpebral conjunctiva superior & inferior fornices	17	no
5	28	3	cold knife resection & cryo	caruncle	16	no
6	12	3	cold knife resection & cryo	caruncle	16	no
7	25	4	cold knife resection & cryo immuno ²	caruncle/palpebral conjunctiva	14	no

¹ Cryotherapy: 2 Sixty second freeze-thaw cycles.

² Topical immunotherapy.

and the power adjusted to form superficial burns (5-15 watts). Black silk 4-0 sutures were used to retract the eyelids, exposing the caruncle, and to rotate the globe (Fig 1). An opaque contact lens was used to cover the cornea. Moistened surgical drapes were used and all flammable articles were removed from the operative field. All operating room personnel wore protective goggles.

SAMPLE CASE REPORTS

The following sample cases illustrate the difficulty in treating recurrent squamous papilloma of the conjunctiva. Table 1 summarizes our experiences with seven patients.

Case 2. A 32-year-old photographer with a history of intranasal drug abuse had a one-year history of increasing left-sided nasal stuffiness. Multiple squamous papillomata of the left nasal cavity were resected. Within six weeks the patient's symptoms and masses had recurred and filled his left nasal cavity. A 6 X 8 mm mass of his left caruncle was then observed (Fig 1). A dacryocystogram failed to demonstrate any mass lesions of the lacrimal excretory system. Under general anesthesia the intranasal lesions and the squamous papillomata of the caruncle were biopsied and then vaporized. Histopathologic specimens confirmed the presence of squamous papillomata. During a 24-month postoperative follow-up no intranasal or conjunctival recurrences were noted (Fig 2.)

Case 4. A 2-year-old boy had a six-month history of an enlarging papilloma of his left caruncle. Two previous cold knife resections, the second followed by cryotherapy of the base of the lesion, proved inadequate and the lesions recurred exuberantly. When we first examined the patient, the lesions filled the left superior and inferior fornices and covered the upper and lower palpebral conjunctiva. Under general anesthesia the lesions were biopsied and then vaporized with the carbon dioxide laser. A donut-shaped fornix conformer was placed between the bulbar and palpebral conjunctival surfaces to prevent symblepharon formation. An interpalpebral suture,

placed over bolsters, secured the positioning of the conformer for the first three postoperative weeks. After removal of the conformer a nubbin of residual papilloma was evident on the inferior palpebral surface. This resolved spontaneously within two months of surgery. During a 17-month follow-up no recurrences were noted.

Case 7. A 25-year-old white man presented for evaluation and therapy of one large and five smaller squamous papillomata involving the left caruncle and palpebral conjunctiva of the left lower lid. Approximately two years earlier, while living in Florida, the patient had first noted a growth in the inner corner of his left eye. The lesion continued to enlarge during next six months at which time he first sought ophthalmologic consultation. The largest lesion was surgically excised and cryotherapy was performed upon the base of that lesion as well as upon the remaining papillomas. Histopathologic analysis of the excised material at that time confirmed the clinical impression of squamous papillomas; focal nuclear atypia was noted.

One month later the lesions recurred and the patient was again treated with surgical debulking followed by cryotherapy. Each of the six lesions was treated with two 60-second-freeze-thaw cycles without the benefit of thermocouple. One month later, the papillomata again recurred, and once again they were treated with cryotherapy. As before, the papillomas recurred, but at that point the patient refused additional therapy and did not return for follow-up.

During the next 16 months the lesions gradually continued to enlarge. Throughout this period the patient complained of epiphora and foreign body sensation. Becoming increasingly symptomatic, the patient once again sought medical advice.

One examination, multiple pedunculated papillomata of the left lower lid palpebral conjunctiva and caruncle were observed. One of the tumors was immediately adjacent to the inferior punctum. The remainder of the ophthalmologic examination disease were unrevealing, as were the general physical examination and routine laboratory studies. Biopsy of the lateral edge of the largest lesion demonstrated epidermal lined tissue with a marked degree of papillomatosis, stromal edema and congestion. Focal epidermal cellular pleiomorphism and

nuclear atypia were present.

The treatment options were discussed with the patient. He selected topical immunotherapy with 1-chloro-2,4-dinitrobenzene (DNCB) and was sensitized. One week after skin sensitization, topical therapy was begun. The conjunctival lesions were painted with increasing concentrations of the DNCB solution on consecutive weeks without any change in tumor size or configuration. The patient was then rechallenged with 2% DNCB, confirming his prior sensitization to Rhus plant oleroresin mix and topical applications to the conjunctival tumors also had no effect.

The patient refused any additional therapy and did not return for follow-up until two years later, when he returned requesting laser vaporization. During the 14 months following his carbon dioxide laser vaporization, there has been no recurrence of the tumors.

RESULTS

Table 1 summarizes our experience with seven patients who have had recurrent squamous papilloma of the conjunctiva. In our hands cold knife resection and cryotherapy have not adequately irradiated these exuberantly recurring lesions. Topical immunotherapy attempted in case 7 was totally ineffective in spite of adequate sensitization. In all seven of our cases carbon dioxide vaporization effectively treated these lesions. In one case (no. 4) we noted a small residual lesion postoperatively that completely regressed spontaneously within two months. In that case the lesion was extensive and the possibility of inadequately treating a small patch of involved palpebral conjunctiva was not unlikely. The spontaneous resolution of this residual lesion, however, provokes further speculation

DISCUSSION

Immunopathologic, histopathologic, and DNA hybridization techniques have implicated the papillomavirus in the pathogenesis of conjunctival papilloma in at least 5% of the cases studied.^(6,7) Of the 11 human papillomavirus types so far isolated, type 11 preferentially involves the laryngeal, conjunctival, and cervical mucosal surfaces. Type 11 papillomavirus has a documented association with cervical dysplasia, carcinoma-in-situ and frank carcinoma of the cervix.^(6,9,10) Although no direct correlation has been documented with the papillomavirus, squamous papillomas involving the mucosa of the lacrimal sac have demonstrated high rates of recurrence and cellular atypia. Case 2 may demonstrate that the lacrimal excretory passage can act as a conduit for the virus from the nose to the conjunctiva without direct extension or tumor involvement and that the patient may transport the virus to another site with his finger. It is unclear what percentage of conjunctival papillomata recur, however, recurrences do occur and these lesions are often aggressive. They may possess potential for malignant degeneration if the data on lacrimal sac papillomatous cellular atypia and papillomavirus-induced cervical dysplasia may be extrapolated to squamous papillomata of the conjunctiva.¹¹ Recurrence of intraepithelial conjunctival tumors af-

ter cold knife resection is at least 20%. Therefore adequate therapy of recurrent squamous papillomas must eradicate the mass, eliminate the possibility of seeding, and "sterilize" the operative field.

Cryotherapy has been used to obliterate recurrent squamous papillomata to further decrease the likelihood of recurrence.^(1,2) Lesions have first been debulked and then rapidly and extensively frozen (-100°C) with liquid nitrogen spray. Achieving insufficiently low temperatures or inadequate zones of freezing may explain our lack of success using cryotherapy.

In 1976, Ferry et al reported the first successful use of DNCB in the treatment of recurrent conjunctival papillomas involving the palpebral conjunctiva of the lacrimal sac.⁷ In 1981, Petrelli et al reported a second patient for whom DNCB immunotherapy was employed for treatment of a large, recurrent conjunctival squamous papilloma.⁽⁴⁾

It is conceivable that some tumor regression might have resulted inpatient 7 had we been able to intralesionally inject the immunotherapeutic agents, as had been done with DNCB in the two previously reported cases. However, unlike those patients where topical applications of DNCB resulted in immediate evidence of at least some tumor regression, our patient evidenced no such response at any time to topical DNCB or to Rhus oleroresin, even when the therapeutic concentrations employed finally equalled the sensitizing concentrations. Conceivably, Me DNCB, Rhus antigen immunotherapy might be more effective in treating smaller lesions or lesions that have first been surgically debulked.

Cautery, radiation, and topical silver nitrate therapies have been used to treat recurrent squamous papillomas of the conjunctiva with varying success and potential side effects.^(12,13) Intralesional injections with anti metabolites have been used to treat other recurrent viral lesions."

Otolaryngologists have used the carbon dioxide laser to resect squamous papillomata from the trachea and larynx.⁽¹⁵⁾ Schachat et al were the first to vaporize a recurrent squamous papilloma of the conjunctiva. They noted no recurrence after 12 months.⁽⁵⁾ In our series, the carbon dioxide laser provided a totally bloodless field and eliminated any need to manipulate the lesions. In addition to reducing the possibility of viral seeding, it is believed that the carbon dioxide laser has the capacity to prevent tumor spread by sealing lymphatics and sterilizing the operative site.^(15,17,18) Producing intense light energy in the invisible infrared light spectrum (10,600 nm), the carbon dioxide laser beam is absorbed by intracellular water, superheating and vaporizing only the most superficial layer of cells. Tissue is thus reflected one cell layer at a time. In this fashion, with appropriate caution, the surgeon can avoid excessively deep tissue destruction by wiping away the superficial charred debris between laser applications.

Carbon dioxide laser can be used with great accuracy with little tissue damage as close as 100 u from the vaporized target.^(15,17,18,19) Postoperative edema and ecchymosis are minimal. Potential complications of this technique include inadvertent burns to the surgeon or the surgical assistant, reflected ocular injury to the operating room staff not wearing protective goggles, trans-sclera(intraocular penetration, or retinal burns.

The ease and effectiveness of dealing with a difficult disease entity makes the carbon dioxide vaporization ideal for resect-

ing recurrent conjunctival squamous papillomas. It provided complete hemostasis and complete resection without recurrence and without distortion of normal structures.

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