YEAR BOOK of OPHTHALMOLOGY 1973

EDITED BY
WILLIAM F. HUGHES, M.D.

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Printed in U.S.A.

Library of Congress Catalog Card Number: 58-1522

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THE LIDS, LACRIMAL APPARATUS AND ORBIT

Introduction

Stephen L. Trokel, M.D., Columbia University

Because the orbit is situated between the cranial fossa and the paranasal sinuses, neurosurgeons and otolaryngologists have vied with ophthalmologists for the treatment and diagnosis of orbital disease. The interest of the neurosurgeon has been reinforced in recent years by the application of improved neuroradiologic technics for the detection and analysis of orbital tumors.

The improved neuroradiologic technics include the use of fine focal spot x-ray equipment which allows magnification radiography. This magnification of the radiographic image combined with subtraction of the underlying bone image permits better visualization of smaller vessels than has heretofore been possible. In addition to visualization of the ophthalmic artery and its branches, authors report visualization of the central retinal artery as well as the ciliary vessels supplying the globe. This ability to visualize small vessels has increased the diagnostic sensitivity of angiography to show neovascularization, vascular displacement and tumor stain, in a much higher percentage of orbital tumors than has heretofore been possible. Unfortunately the use of these more elegant radiographic technics has been restricted to a few neuroradiologic centers throughout the world.

There has been a corresponding improvement in the ability to visualize the orbital veins. In addition to the superior ophthalmic vein, the collateral venous circulation as well as the inferior ophthalmic vein can now be shown in most cases. The direct injection of contrast material into the orbit to perform an orbitogram is falling into disfavor. This is due to the report of complications which include irreversible optic neuritis associated with the injection of contrast material into the muscle cone.

There has been continued interest in scanning of the orbits after the intravenous injection of radioactive isotopes. Technetium in the ascorbate form has been shown to be particularly

effective in identifying orbital tumors. However, the most important new diagnostic technic for orbital disease that has been developed recently has been ultrasonic scanning. Diagnostic ultrasonography, especially B-scan tomography, has been shown to enable recognition of orbital masses and to distinguish them from inflammatory causes of exophthalmos. Certainly, we can look forward to increasing diagnostic sensitivity and accuracy of the ultrasonic technics which are free of the morbidity associated with angiographic methods.

It must be emphasized that in dealing with orbital tumors it is necessary to achieve a biopsy to produce a definitive tissue diagnosis. The importance of these special diagnostic technics, especially ultrasonography, is their ability to recognize with increasing accuracy the presence of exophthalmos due to causes other than neoplasia. Thyroid disease and inflammatory conditions of the orbit show specific ultrasonic scanning patterns which when recognized, will avert the need for surgery. However, when these studies are equivocal, the histopathologic diagnosis requiring orbital exploration remains essential in management of the patient.

The excellent results following radiotherapy of orbital lymphoma have been reported from several centers. In the benign forms of the disease when the lymphoma is restricted to the orbit a cure can be expected with preservation of ocular function in most cases. Thorough physical examination is indicated to make sure systemic disease does not exist at the time of the presentation of the proptosed globe. When the tumor is restricted to the bulbar conjunctiva and lids, a dose of 3,000 rads at one centimeter depth is given by an anterior port. For more posterior lesions, 3,000 rads is given to a depth of 4 cm. by anterior and lateral ports. When a reticulum cell sarcoma has been diagnosed the dose is increased to 4,000 rads over a 4 week period.

A continued interest in radiotherapy for orbital rhabdomyosarcoma indicates that this treatment modality is supplanting exenteration in most centers treating orbital disease. Prior to treatment of these children, it is essential to study these orbits with tomography. Extension of the tumor beyond the confines of the orbit may not be apparent either clinically or on the plain radiographs. To assure adequate radiotherapy and a large enough treatment port, a hypocycloidal tomographic study of the orbit should be made. Very often the tumor will be found to

invade the orbital floor or medial wall and require a more extensive radiation field.

Controversy remains regarding the nature of optic nerve gliomas. Strong stands are being taken by investigators at different centers who consider it either a benign hamartoma or a slow-growing neoplasm. Those that advocate surgical excision and radiotherapy provide clinical data to demonstrate growth of the tumor. Those that advocate no treatment show other cases where glioma has remained stationary with no change in visual acuity or field for many years. Certainly, there does not appear to be sufficient data avaliable at this time to decide with certainty which view should be held.

The morbidity of the eye signs of Graves' disease is receiving wide attention. The difficulties in treatment of this condition are well known. Particular attention has been given to the advanced eye signs of Graves' disease where corneal integrity and optic nerve function is threatened. At present two forms of treatment are being advocated. High-dose steroid therapy greater than 100 mg. daily is effective. However, the complications associated with steroid therapy of this magnitude limit its application. Because of these complications, interest is being paid to surgical decompression of the orbit. Decompression into the paranasal sinuses is advocated as effective in this condition. This may be done either through a Caldwell-Luc incision where the orbit floor and medial wall may be removed and the orbital periosteum incised with prolapse of the orbit fat into the nasal fossa and maxillary antrum. Other authors have advocated an approach via the medial wall of the orbit where the lamina paprycea is removed and the orbit is allowed to decompress against the nasal septum. Both of these methods have been shown to be effective in relieving the severe exophthalmos and reversing vision loss due to optic nerve compression and corneal exposure.

Tumors of the Eyelids and Their Treatment by Radiotherapy. P. J. Fitzpatrick, D. M. Jamieson, G. A. Thompson and W. E. C. Allt[1] (Princess Margaret Hosp., Toronto) report results of treating 565 patients with eyelid tumors in 1958-68. There were 505 basal cell and 36 squamous cell tumors. The group with basal cell tumors included 277 men and 228 women. Median

(1) Radiology 104:661-665, September, 1972.

age was 64 years. Males predominated 3:1 in the group with squamous cell tumors, and median age was 68 years. Of 159 patients treated previously, 97 had residual or recurrent disease. Average tumor diameter was 12 mm. Median duration of symptoms before diagnosis was 1 year. The inner canthus and lower lid were the commonest sites of both types of tumor. Histologic confirmation was obtained in 479 cases. Fifty-four patients had excisional biopsies considered to be adequate treatment. A total of 477 was irradiated. Most patients received superficial 100-kv. therapy. About half received five daily fractions to a dose of 3,500-4,000 rads in 5-7 days, about a fourth received a single treatment to a dose of 2,000 or 2,250 rads and a fourth received 10 daily treatments to 4,000-4,500 rads over 2 weeks. Twenty-nine patients received doses of 4,000-6,000 rads over 3 weeks or longer. In all but 3 instances the eye was protected.

The control rate was 95%. After irradiation, 22 basal cell tumors and 1 squamous cell tumor recurred. No one site was particularly difficult to control and tumor size was not important. Radiation failures were unrelated to a particular treatment regimen. Radiation reactions reached a peak 10-20 days after treatment. Hydrocortisone cream and suspension were used in a few patients. Complications were few and related to large tumors with extensive tissue destruction. Two radiation-induced cataracts occurred where ocular protection was impossible. One patient had exposure keratitis. One had globe perforation and required enucleation. Epiphora was relatively uncommon; 2 patients required surgical repair. Telangiectasia was severe in 7 patients and skin atrophy in 17. Two cases of chronic conjunctivitis occurred but conjunctival keratinization was not seen, and there were no cases of radiation keratitis. Five patients required repair of an ectropic lid. No bone destruction was observed in patients whose orbits were treated for extensive tumor. No deaths were attributable to the tumor or its treatment.

The sinister reputation of irradiation about the eye and orbit has not been substantiated. The cosmetic and functional results were considered excellent to good by most patients in this series. Irradiation is given on an outpatient basis, and patients can continue their normal work during treatment. Squamous cell tumors have required no more aggressive radiotherapy for cure than basal cell tumors.

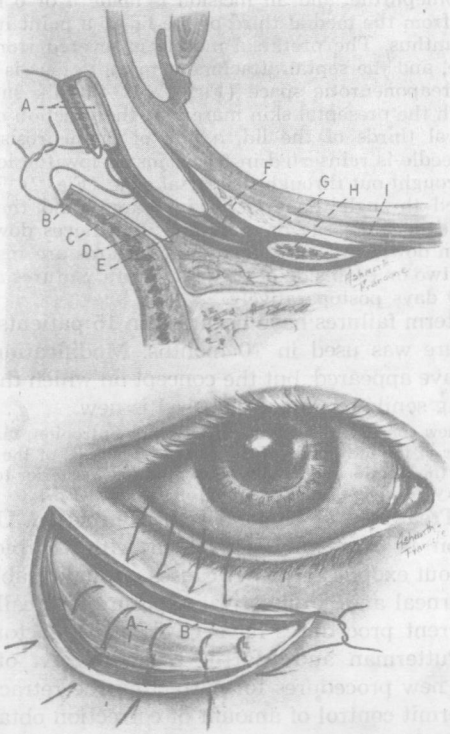
► [The results of treatment of epithelial tumors of the lids continues to be 95% cure, either by irradiation or surgery. The doses used by these radiotherapists ranged from single doses of 2,000 rads to progressively more fractionation as the total dose approached 6,000 rads. They found no difference in dosage required or results obtained between basal cell and squamous cell tumors.—Ed.]

Senile Entropion: New Concept for Correction. Lester T. Jones, Merrill J. Reeh and John L. Wobig[2] (Good Samaritan Hosp., Portland, Ore.) describe a new concept of senile en-

Fig. 1 (top).—Cross section. *A*, tarsus, pretarsal skin and muscle; *B*, preseptal skin and muscle; *C*, inferior tarsal muscle (Müller's); *D*, septum orbitale; *E*, aponeurosis of capsulopalpebral head of inferior rectus muscle; *F*, Tenon's capsule and fascia attaching to conjunctival fornix; *G*, inferior transverse ligament (Lockwood); *H*, inferior oblique muscle; *I*, inferior rectus muscle.

Fig. 2 (bottom).—Frontal diagram. *A*, aponeurosis, showing white transverse bands; *B*, lower margin of inferior tarsus. Sutures are 4-0 black silk.

(Courtesy of Jones, L. T., *et al.*: Am. J. Ophth. 74:327-329, August, 1972.)



(2) Am. J. Ophth. 74:327-329, August, 1972.

tropion and a procedure for remedying it by correcting the cause. The condition is thought to be secondary to or a symptom of a primary dysfunction of the retractor muscles of the lower eyelid. The lower lid normally retracts about two thirds of the distance that the globe rotates on downward gaze, but retraction does not occur in senile entropion. If the entropic lid retracts, the diagnosis is cicatricial entropion. The enophthalmos of old age, as well as attenuation of the retractor muscle, is responsible for loss of retraction. The term "blepharoptosis" is applicable to defective retraction in the lower lid. Failure to restore downward motion of the lower lid results in failure to cure entropion.

TECHNIC.—The skin of the lower lid is infiltrated with lidocaine containing epinephrine, and an incision is made 5 or 6 mm. below the lash line from the medial third of the lid to a point in line with the lateral canthus. The pretarsal muscle is severed from the preseptal muscle, and the septal attachment to the tarsus is divided to expose the preaponeurotic space (Fig. 1). A 4-0 silk suture is inserted through the preseptal skin margin at the junction of the middle and lateral thirds of the lid, a bite of aponeurosis is picked up and the needle is reinserted in fascia just below the lower tarsal border and brought out through the tarsal edge (Fig. 2). The needle is then passed through the upper skin margin and the ends are tied. If the lid does not sag or evert and if it moves down at least 3 or 4 mm. on downward gaze, four more sutures are inserted 3 or 4 mm. apart, two on each side of the first suture. Sutures are usually removed 6-10 days postoperatively.

No short-term failures have occurred in 15 patients in whom this procedure was used in 10 months. Modifications of this procedure have appeared, but the concept on which this method for correcting senile entropion is based is new.

► [This is a new concept of the etiology of senile entropion; viz., weakness of the retractor of the lower lid which is the aponeurosis of the capsulopalpebral head of the inferior rectus muscle located just posterior to the orbital septum. Surgery consists of about 8 mm. of tucking.—Ed.]

Surgical Treatment of Upper Eyelid Retraction. Upper eyelid retraction is commonly associated with thyroid disease, with or without exophthalmos. It causes an undesirable appearance and corneal and conjunctival exposure and calls for correction. Current procedures have given unsatisfactory results. Allen M. Putterman and Martin Urist[3] (Univ. of Illinois) present two new procedures for correcting the retracted upper lid which permit control of amount of correction obtained. One is used when there is overaction of Müller's muscle alone and

(3) Arch. Ophth. 87:401-405, April, 1972.

the other when overaction of the levator muscles is also present. The condition is determined at operation by complete excision of Müller's muscle and observation of height of the lid. Levator overaction is corrected by partial tenotomy done by stripping and stretching of the levator aponeurosis.

TECHNIC.—Anesthesia is induced with topically applied tetracaine, and sensory frontal nerve block is produced by injection of 0.5 ml. of 2% lidocaine injected below the midsuperior orbital rim 4 cm. back into the orbit. This does not affect lid motility. All attachments to Müller's muscle are released by blunt dissection. The muscle then is stripped from the superior tarsal border and separated from the levator aponeurosis for a distance of 8 mm. above the superior tarsal border. If the upper lid is at a satisfactory level, the detached section of muscle is excised. Otherwise, the muscle is stripped completely and excised. If the lid is not low enough, the superficial part of the levator aponeurosis is stripped vertically by layers along the central part of the lid, the patient being placed in a sitting position several times to check the progress. A ptotic lid is corrected by suturing as much of the levator aponeurosis as necessary back to the tarsus. The conjunctiva is then resutured to the superior tarsal border. The levator is kept stretched while healing by pulling down the lid with a double-armed suture placed in the central part of the upper lid margin.

This procedure provided satisfactory correction of lid retraction in 7 cases. Also, Schatz (1970) performed the Müller muscle resection on two lids with satisfactory results.

► [Resection of Müller's smooth muscle of the upper lid produces a greater effect than merely severing its attachment to the tarsus which lowers the lid about 2-3 mm. (1965-66 YEAR BOOK, p. 8). If this is insufficient, varying numbers of the vertical fibers of the levator aponeurosis to the tarsus can be severed. Since the motility of the lid is not affected by the frontal nerve block, the amount of desired lowering can be determined with the patient in a sitting position.—Ed.]

Clamp for Strengthening Müller's Muscle in Treatment of Ptosis: Modification, Theory and Clamp for the Fasanella-Servat Ptosis Operation. In 1961, Fasanella and Servat described a procedure for relieving minimal ptosis of about 2 mm. with good levator function. Curved hemostats were placed on the everted superior tarsus, a suture was run above them and the tissues held by them were excised. Allen M. Putterman[4] (Univ. of Illinois) describes a new clamp for use in this operation.

PROCEDURE.—The clamp is 22 mm. wide and has a concave curve over its central 14 mm. and a convex one on each end. There are numerous interlocking serrations and three teeth over the grasping part of the instrument.

The upper lid is everted with a traction suture (Fig. 3, *A*). Three

(4) Arch. Ophth. 87:665-667, June, 1972.

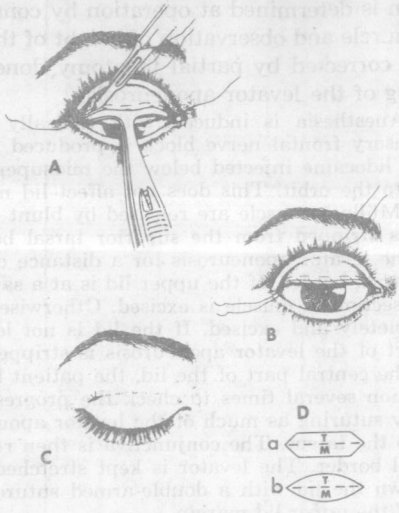


Fig. 3.—Fasanella-Servat operation. *A*, application of clamp to everted tarsus; mattress suture above clamp; excision of tissues held in clamp. *B*, continuous suture over cut ends of tarsus and Müller's muscle. *C*, suture end brought out through temporal lid fold at site of skin incision and tied. *D*, *a*, excision of consistent amount of tarsus and Müller's muscle was made possible by concave curve in clamp to avoid peaking of lid; *b*, ellipse of tarsus and Müller's muscle, wider in center, when procedure is done with two curved hemostats leading to lid peaking. (Courtesy of Putterman, A. M.: Arch. Ophth. 87:665-667, June, 1972; copyright 1972, American Medical Association.)

scratch incisions are made on the tarsus 3 mm. from the superior tarsal border and the clamp is applied so that it just meets them. A 5-0 double-armed, plain catgut suture is run above the clamp in mattress fashion between the tarsus and Müller's muscle, temporally to nasally, about 1.5 mm. distal to the clamp, and a blade is used to excise the tissue held in the clamp. The nasal end of the suture is then run through the cut edges of tarsus and Müller's muscle, nasally to temporally (*B*) and the ends are brought out where a 4-mm. incision has been made in the skin of the temporal lid fold and are tied (*C*).

This clamp is easy to apply, does not slip, may be used without assistance, and is easily rotated back and forth during suturing. About 3 mm. each of tarsus and Müller's muscle are excised over about 15 mm. (Fig. 3). Peaking of the upper lid is avoided; it has not occurred in the 7 cases so far operated on. Excision of the palpebral lobe of the lacrimal gland and unnecessary excision of tarsus are avoided.

Patients whose upper lids elevate to a cosmetically acceptable

position 10 minutes after instillation of several drops of 10% phenylephrine into the ipsilateral eye are selected for the Fasanella-Servat ptosis operation. The test has selected patients with 2 mm. of congenital ptosis and up to 4 mm. of acquired ptosis who were successfully treated by the operation.

Feasibility of a Bank for Storage of Human Fascia Lata Sutures. Fascia lata has been used in ophthalmic operations for many years. Mark S. Mandelcorn and Jack S. Crawford[5] (Toronto, Ont.) studied cadaver fascia to determine whether it can be cut into suitable strips, sterilized and stored without loss of the properties that make it suitable for use as sutures. Male cadaver donors aged 20-65 years who died of other than malignant or infectious disease were used. Fascia was placed in normal saline at 4 C. before processing and was then frozen and cut into .03×18-cm. strips before being exposed to 2.7 million rads ^{60}Co irradiation. After the strips were stored for varying periods, saline was withdrawn from the packets and inoculated into thioglycolate broth. The packets were stored in saline at room temperature or at 4 C. and the resultant tensile strengths of the strips were measured.

Fascia stored at room temperature was significantly stronger than fascia stored in the cold. Tensile strength did not change significantly with storage up to 196 days. Neither processing time from 24 to 144 hours nor cadaver age from 19 to 63 years significantly affected tensile strength. Correlation coefficients showed no significant relationship between tensile strength and storage time, processing time or cadaver age. All packets had been sterilized by irradiation.

Fascia lata can be removed from cadavers, sterilized by gamma radiation and stored for up to 6 months without losing sterility or tensile strength. Suture packets can be distributed to centers distant from a bank without a loss of suture strength. Establishment of a bank would obviate the need to remove fascia from a cadaver the night before operation or to remove fascia from the leg of the patient. A bank for storing human fascia lata sutures is feasible.

► [These studies indicate that human fascia can be adequately sterilized by gamma irradiation and stored at room temperature without loss of tensile strength. Despite the fact that this preserved material is apparently well tolerated in frontalis sling operations for ptosis, even when bovine material is used (1969 YEAR BOOK, p. 17), fascia lata "banks" for the convenience especially of ophthalmologists have not been generally established.

(5) Arch. Ophth. 87:535-537, May, 1972.

I assume that this is not a result of resistance by general plastic surgeons who have no hesitation about obtaining autogenous fascia. Such fascial implants are probably replaced by the host fibrous tissue, and would seem to be preferable to the use of ersatz nonabsorbable materials which have all the defects of foreign bodies.—Ed.]

Treatment of Essential Blepharospasm with a Frontalis Sling. Essential blepharospasm is a bilateral, intermittent, involuntary closure of the eyelids of obscure cause. Some patients are severely handicapped. Alcohol injection of the 7th nerve and excision of the orbicularis oculi have carried high rates of early recurrence. Selective avulsion of facial nerve branches is a major surgical procedure, carrying several possible complications and high rates of recurrence. Allen M. Putterman and Martin Urist[6] (Univ. of Illinois) describe a modified Friedenwald-Guyton frontalis sling, which is advocated for use in patients who desire a reduction in the visually handicapping symptoms of essential blepharospasm.

TECHNIC.—Frontal nerve block anesthesia is preferred. Five 5-mm. incisions are made through the skin and orbicularis muscle, two above the eyelashes, one above the middle of the eyebrow and one on either side of the midbrow incision just above the brow. A 4-0 polyfilament suture is threaded through these openings to bring the upper lid to about 1 mm. below the superior limbus. Slight overcorrection is desirable. The procedure is then repeated on the other eyelid.

This operation is advised for patients who are severely handicapped visually by involuntary, prolonged, tight closure of the eyelids. In 4 instances the operation permitted patients to keep their lids open during spasm and to resume such activities as reading, driving and working. In 3 it markedly reduced the frequency and severity of blepharospasm. In 1 it mildly reduced blepharospasm. One patient was free from symptoms for 8 months before a partial facial neurectomy was required. The operation provided marked improvement in hemifacial spasm in another patient. The frontalis sling operation is a relatively simple, innocuous procedure that can be reversed by removing the suture. When it is successful, the result is highly gratifying to the patient.

► [This simple procedure might be considered for the symptomatic improvement of moderately severe essential blepharospasm. The authors speculate that such patients may be able to utilize the bilateral supranuclear innervation to the frontalis muscle when the unilateral peripheral innervation to the orbicularis muscle is spastic. The more definitive treatment of selective avulsion of branches of the 7th nerve to the orbicularis is not without its complications (see the following article).—Ed.]

(6) Arch. Ophth. 88:278-281, September, 1972.

Complications in Surgery for Blepharospasm. Surgery is the treatment of choice for essential blepharospasm, although it does not correct the underlying cause. Richard K. Dortzbach[7] (Univ. of Wisconsin) prefers selective avulsion of the distal branches of the facial nerve innervating the orbicularis oculi muscles. Complications encountered in 6 cases of essential blepharospasm and 1 of hemifacial spasm were reviewed. Patients were followed for 4 months to 3 years. General anesthesia was used. A nerve stimulator was used to identify the branches and the facial muscles they innervated and to determine the completeness of denervation. The temporal and zygomatic branches were divided and the distal portions avulsed. It was often necessary to avulse parts of the buccal branch. In essential blepharospasm, the facial nerves on both sides were denervated at the same operation.

Blepharospasm recurred in 3 patients within 6 months after operation. One patient required further surgery. Avulsion of the nerves for several centimeters distal to the site of division reduces the risk of the proximal fibers growing back along their former routes. In 2 patients without recurrence the proximal end of the cut nerve was rolled into a ball and sutured. Great care is necessary in preserving the facial nerve branches that control movement of the corner of the mouth. Two patients had transient drooping. If severe drooping does not improve after 6 months, the corner may be suspended. Mild ectropion occurred in 2 patients in the first few postoperative weeks, resulting in epiphora. Surgery was unnecessary. Lagophthalmos was a common complication, varying in severity. Artificial teardrops and a protective ointment reduced the risk of exposure keratitis. Marked eyebrow droop may be corrected after 6 months by the technic described by Beard. Dermachalasis worsened in 1 patient after operation and was repaired after 6 months at a suspension operation to correct drooping of the eyebrow.

Essential blepharospasm and hemifacial spasm can be successfully treated by selective avulsion of the distal branches of the facial nerve. Some complications clear spontaneously in the first postoperative months. If they persist, effective treatment is available.

Lacrimal Drainage. The transport of tear fluid from the conjunctival sac to the inferior nasal meatus has always been a

(7) Am. J. Ophth. 75:142-147, January, 1973.

controversial subject. Anatomic studies have led to conflicting conclusions; the most that can be concluded is that, during blinking, some actions in the lacrimal passages are conceivable. B. Rosengren[8] (Univ. of Göteborg) reports the results of experimental physiologic studies.

Pressure changes were recorded in the lacrimal sac during blinking using a catheter inserted via the nasal duct. A probe made from a hypodermic needle was used. The increments from individual blinking movements varied, being largest after ordinary complete blinks and extremely small with blinks in rapid succession. The studies showed no function of the sac except that it can empty under compression. Fluid is squirted into the sac from the canaliculi in fairly uniform amounts and is prevented from regurgitating by a valve mechanism situated in the inner orifice of the canaliculi.

When the pressure was measured with a catheter inserted through the inner canalicular orifice, the canaliculi were compressed during blinking movements. Studies done with a cannula inserted into the lower punctum showed the existence of a canalicular pumping mechanism whose capacity in a single canaliculus was about 0.8 cu. mm.

The strength of the surface tension is the main element in counteracting regurgitation from the canaliculus. The slit made in the lacrimal punctum in Bowman's operation should provide effective communication between the lumen of the canaliculi and the lacus but should not be larger than necessary in order not to risk excessive regurgitation.

Krehbiel observed that, in some persons, fluid can be sucked into the lacrimal ducts when the eyelids are immobile, even in the prone position, and that as much as 20 cm. mm. can be sucked in. This occurs with the eyelids open and must be ascribed to a change in the volume of the lacrimal sac, perhaps combined with capillary force. The phenomenon has little in common with the active tear drainage associated with blinking movements.

Tear transport ceases in facial paresis, indicating that active function is mediated by the orbicularis muscles. It continues after Toti's operation, which inactivates the lacrimal sac. It is not yet clear whether there is regurgitation via the punctum during blinking movements but such a tendency would be counteracted by the vertical course of the first part of the cana-

(8) Ophthalmologica 164:409-421, 1972.