

electroprexia provides a most effective therapeutic agency which is competent to produce beneficial effects in many instances in which heretofore our efforts have been of little value. By no means should older accepted measures of treatment be abandoned; quite frequently their association is vital. The harmonious coordination of all helpful therapeutic measures should characterize this undertaking as in all other rational therapeutic procedures.

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THE PREVENTION AND TREATMENT OF KERATITIS NEUROPARALYTICA BY CLOSURE OF THE LACHRYMAL CANALICULI*

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THE present methods of treatment of neuro-paralytic keratitis, though effective, are cumbersome. They interfere with vision and are a nuisance to the patient. Reduction in tear secretion is a recognized feature in these cases. Because of the inadequate supply of tears evaporation leads to dryness and corneal damage. Any measure preventing drying leads to healing. Verhoeff¹ kept the affected eye moist with Ringer's solution and the corneal epithelium was rapidly restored. Suturing the lids reduces evaporation of tears and clears up corneal lesions. Castor oil, liquid paraffin and vaseline serve the same purpose, as does also the Buller's² shield or special protective goggles.

Our studies have convinced us that although the cornea is anæsthetic it is the diminished tear secretion which is the primary factor in the evolution of these corneal lesions. Blocking the canaliculi prevents the escape of tears into the lachrymal sac and should help to prevent drying. In one case with neuroparalytic keratitis this was done, and the corneal lesion healed promptly.

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CASE REPORT

H.M., an intelligent woman, aged 35 years, developed a neuroparalytic keratitis in the anæsthetic eye six months after the right posterior root of the fifth cranial nerve was cut for an intractable trigeminal neuralgia, through a sub-occipital craniotomy approach. When she noticed that emotional tearing was greatly diminished in this eye, she observed the eye more closely from day to day and became convinced that it was constantly less moist than the left eye. Once after the use of a warm blower to dry the hair the conjunctiva became injected. The corneal lesion developed following exposure to extreme cold. As it failed to heal promptly the lids were sutured together and the keratitis subsided, leaving extensive corneal scarring. When she returned to our care the lids had been closed for seven months.

Direct observation verified her impression that the eye was dry, but it was obvious that some tear secretion was present. The adhesion of the lids was divided so that more complete examination could be carried out. There was extensive central scarring of the cornea in the anterior layers; the conjunctival vessels were injected, especially on the nasal side; and vision was 6/30 with correction. Measurements proved that tear secretion was present on the involved side but it was only one-sixth of the amount in the left eye.

Both canaliculi of the right eye were closed by electrocoagulation. They remained blocked for two days, during which time the eye was wet. On the third day the eye appeared dry again and the canaliculi were proved to be open by syringing. With the drying that followed, pitting of the epithelium was first noticed. The lower canaliculus was then slit by the actual cautery and it became permanently closed. The eye was more moist but not so much so as it had been immediately following electrocoagulation of both canaliculi. Therefore, the upper canaliculus was subsequently treated with the actual cautery. Though this did not close the canaliculus permanently it produced an ectropion of the punctum which effectively blocked drainage. Since then the eye has been wet but not too troublesome; the pitting of the epithelium has disappeared, as has also

the congestion of the conjunctival vessels. The subjective sensation of discomfort, present even when the lids were sutured and during the time when the eye was dry, is no longer noticed. She was aware of an improvement in vision which is now equal to 6/15 with correction.

The satisfactory result following closure of the canaliculi has been maintained over a period of five months. It is comparable to the results described by Beetham,³ after he had closed the ducts in patients with filamentary keratitis. Although closing the canaliculi would seem to be a simple procedure, owing to the fact that sensation is lost and no anæsthetic is required, the canals tend to become patent again. When the canaliculus was slit with the actual cautery it closed permanently, and therefore such a procedure would seem to be the one of choice.

The incidence of neuroparalytic keratitis after complete section of the posterior root or destruction of the ganglion by alcohol is very difficult to determine, as it may occur many years after the therapeutic intervention. Wilfred Harris⁴ thinks it probably occurs in about 20 per cent of the cases. Other authors think that 10 per cent is a fair estimate, but both these percentages seem high to us. If the important factor in the development of the corneal lesions is diminished secretion it should be possible by detailed physiological tests to select the cases in which this complication is apt to develop and to prevent it.

We have studied the lachrymal and parotid secretion in every patient who has been operated on for trigeminal neuralgia in the past year. Tear secretion has been measured by placing twisted absorbent cotton pledgets in the internal canthus of each eye so that they cover both puncta. They are allowed to remain *in situ* for five minutes. The difference in weight in milligrams before and after insertion is taken as an index of the amount of secretion. To simplify the procedure and make it as accurate as possible the dry cotton pledgets are placed in glass weighing jars with ground glass stoppers and weighed. The pledgets are then removed with forceps from the jars and placed in the eyes then returned to their respective jars and covered with the ground glass stoppers to prevent evaporation, and weighed immediately. We have used the Sartorius analysis suppression scales which weigh to one-tenth of one milligram, and they are always operated by the same technician. For the measurement of parotid

secretion exactly the same technique has been used, except that nasal tampons are placed over Stenson's ducts, as suggested by Poth.⁵

When repeated tests are carried out on the same patient the results, as might be expected, have varied. We have obtained, however, definite information as to the presence of secretion and a fairly accurate impression of its amount. We have felt that the weighing method, done properly, is more valuable than Schirmer's⁶ test with filter paper. It has been surprising to find that the secretion from the parotid gland was usually reduced on the affected side when the lachrymal secretion showed reduction. Since this measurement is a coarser procedure causing less discomfort to the patient it may eventually prove to be the more valuable test, but more data are required before this conclusion can be drawn.

The problem of the secretory nerve supply to the lachrymal gland need not be considered here. It is as complex as that of the parotid gland, and our studies on patients have not served to clarify it. For example, Verhoeff's hypothesis that diminished tear secretion is due to injury of the greater superficial petrosal nerve is contradicted by the case we have reported. In this case neither the greater superficial petrosal nerve nor the facial nerve was injured yet there was diminished lachrymation and keratitis developed. If the sensory loss were the all-important cause the lesions should appear as a complication much more frequently than they do. We can see no reason for accepting a so-called trophic influence as first suggested by Magendie⁷ and more recently advanced by Tagawa.⁸ This complex theory has no adequate proof in our opinion.

Another example of keratitis due to drying is keratitis e lagophthalmo. It is seen very commonly in the comatose patient who lies with the eyes open or only partially closed, with no blinking and no conscious discomfort. Corneal lesions seldom develop after 7th nerve paralysis. Although the patient does not wink, the discomfort which drying causes stimulates him to roll the eye up under the lid and thus moisten the cornea. The drying of the cornea occurs chiefly during sleep, but even then the eye tends to roll up so that the cornea is partially covered. The lack of winking and ectropion of the lower punctum present after seventh nerve palsies,

with the consequent damming back of tears, must also be a beneficial factor.

Years ago Magendie observed in animals that the eye in which keratitis developed following section of the fifth nerve was dry. He dismissed drying as the cause of the lesions, because when he took out the lachrymal gland in other animals corneal lesions did not develop. It is now recognized that corneal lesions do not develop after excision of the lachrymal gland, because the secretion of the accessory lachrymals, such as Krause's glands, is usually adequate. In keratomalacia though the eye appears to be dry this is not really the case.

The occurrence of keratitis after total rhizotomy for the relief of trigeminal neuralgia is such a serious complication that the following routine is suggested. Oil should be dropped in the eye immediately after operation and a Buller's shield applied. The shield should remain in place until it can be determined that the eye is not dry. If tear secretion is adequate to prevent injection of the conjunctival vessels when the eye is left uncovered and every precaution is taken to avoid trauma no complications are to be anticipated. These

patients are discharged from the hospital with Adson's⁹ protective shield attached to spectacles. On the other hand, if tears be greatly diminished and the conjunctiva becomes injected the canaliculi should be closed. This procedure causes no deformity and no special inconvenience. The conjunctival injection should be considered as an elective indication. Corneal pitting or loss of epithelium makes closure of the canaliculi an operation of necessity. Our experience with one case would suggest this to be adequate. Should it fail, tarsorrhaphy is imperative.

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NOTES ON THE MENOPAUSE*

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"I can very confidently announce one or another law, which throws itself into relief and form, but I am too young yet by some ages to compile a code. I gossip for my hour concerning the eternal politics". (Emerson—*Experience*).

THE climacteric is a critical stage in the life of woman, if one heeds the original derivation of the word. Not only is it critical for our female patients but it is almost as much so for their physicians. For centuries this epoch has presented the doctor with some of his thorniest problems, and even today, when the endocrine hieroglyphs of our lives are being rapidly deciphered by new Champollions, it is still the critical test of his skill and his up-to-the-minute knowledge. The term menopause refers to the cessation of the menses, and is perhaps a better

term, although the symptoms so characteristic of this period often begin before and continue for years after all gross evidences of menstruation have disappeared. If "change of life" were not so roundabout a phrase it might be the most suitable term of all those mentioned to date.

SYMPTOMS

At some time between forty and fifty years of age, rarely before, occasionally later, the menses cease. They may cease suddenly or gradually, may stop for a month or for several months, only to recommence. The periods may suddenly become much more profuse than before, presumably due to the development of follicular cysts, or there may be spotting of blood between the menses. In general, it seems that women who demonstrate active ovarian function by the early onset of puberty or fre-

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