BENZOCAINE-URETHANE SOLUTION IN OPHTHALMOLOGY*

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BLEPHAROSPASM, whether due to reflex irritation, habit, or disease of the central nervous system, presents a constantly recurring problem to the ophthalmologist. In certain types of this condition where the cause is intractable and no resolution is to be expected, it is sometimes possible to relieve the spasm by the injection of alcohol, either into the orbicularis (Fumagalli, 1909) or into the facial nerve behind the mandible (Benedict, 1942). Both these procedures, however, may produce a permanent impairment of function and are therefore undesirable in the treatment of a blepharospasm which is due to temporary reflex irritation, and logically the ideal treatment of this type of blepharospasm is that of the source of irritation. This, however, may be difficult and prolonged, and the blepharospasm itself may prove a source of embarrassment in treatment in addition to contributing substantially to the discomfort of the patient. Constant blepharospasm makes adequate examination and local treatment more difficult, and is frequently responsible for a vicious circle of congestion and further irritation which delays resolution even in the face of suitable treatment. It seems, therefore, that there is a place in the treatment of such conditions for an agent capable of producing an impairment of conduction in the VIIth nerve of longer duration than the commonly-used preparations, but which nevertheless permits a return to normal function after a period of weeks during which treatment and examination may be carried out free from the difficulties attendant on constant blepharospasm. Such a preparation can also, of course, be used in the treatment of chronic blepharospasm of unknown or intractable origin, and also as a retrobulbar injection in the case of intractable pain. In both these instances, however, its limited period of action is a disadvantage, and the use of alcohol for a permanent effect may be preferable.

From time to time in the past, various agents have been used for the induction of prolonged nerve block. Some, of which probably the best known is Proctocaine, are oily preparations and difficult to handle, requiring warming and the use of large-bore needles. More recently a preparation of much lower viscosity which deposits the active agent in crystalline form has been introduced under the name Efocaine (Puderbach and Shaftel, 1952).

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This preparation offers more promise, but has the drawbacks of being fairly expensive, and of causing complications such as permanent paralysis and anaesthesia (Roualle, 1952; Oldham, 1953; Shapiro and Norman, 1953). The use of a benzocaine (para-aminoethyl benzoate) urethane solution for the induction of prolonged anaesthesia was first reported by Rapaport (1946) and Spira (1946). This solution depends for its action on the property of urethane in preventing crystallization of a saturated solution of benzocaine within certain limits of concentration. On dilution by tissue fluids, however, crystalline benzocaine is deposited in the tissues, giving rise to a depot the action of which though localized, persists over a prolonged period. This solution is stable, is easily prepared in a hospital dispensary, and has no serious side-effects in the dosage used, even if accidental intravenous injection should occur (Kohn, Rutter and Vitali, 1954). Being of low viscosity, it is easily injected through the finest needle, and though in theory dry sterilized needles have been recommended to prevent blockage, in practice it has been found that boiling is satisfactory if the needle is rinsed rapidly with the solution before use.

Technique

Preparation of Solution.—Crystalline benzocaine is added to a 40 per cent. solution of urethane in distilled water in the proportion of 2 per cent., gentle heat being used to dissolve the benzocaine. After standing for 24 hours the solution is filtered and sterilized by autoclaving. The solution keeps well and remains sterile.

Injection.—Injection of the solution around the upper branches of the facial nerve as they cross the neck of the mandible has been found more satisfactory than the van Lindt method, which requires rather more solution and is not so effective, since the very localized action may result in some fibres remaining unaffected. Although it has been stated that a 2 per cent. solution does not penetrate the neurilemma and does not give rise to motor paralysis (Davidson, 1953), this concentration has been found satisfactory in practice. As the solution causes some pain immediately after injection, 1.5–2 ml. procaine is injected as a preliminary procedure.

The injections are made with a 2-ml. syringe and a 16-gauge needle just below the condyle of the mandible as identified by palpation, care being taken to insert the needle right down to the periosteum. Normally it has been found that three depots of 0.5 ml. each are sufficient (Figure, opposite). After injection, the area is massaged for about 30 seconds. There is often a complete facial paralysis immediately after the injection, through diffusion of the procaine, but this wears off rapidly and only occasionally is more than minimal weakness to be observed in the lower facial branches thereafter, though a thoroughly effective block inevitably results in some paresis of the lower facial muscles.

FIGURE.—Reference points for location of depots.

Results

Facial Blocks.—The results of a consecutive series of 26 facial blocks for blepharospasm are summarized in Table I (overleaf). The initial effect was roughly assessed in each case 24 hours after injection. The paresis was assessed as either “good”, “fair”, or “poor”; in every case some paresis could be detected, though in some classified as “poor” the duration was short and the object of the injection was not achieved. In two cases classified as “good”, the patient developed a paralytic ectropion which resolved completely over a period of weeks. The response was classified according to whether subjective relief was obtained or not and to whether the causal condition improved after injection or not.

Subjective Effect.—In all of the cases in which a good paresis was obtained, the patient reported relief from discomfort of blepharospasm, though not, of course, relief of all symptoms. It is notable that even cases where the paresis was assessed clinically as only “fair”, subjective relief was often still reported. As would be expected, none of the cases showing a poor paresis obtained relief. In Cases 12/13, 18, and 19, the blepharospasm was not accompanied by any obvious source of irritation. Of these, two had spasm persisting after operation though the eye had become white and quiet, and one had bilateral uveitis without corneal involvement, in which there seemed to be no reason for spasm. In all three cases the spasm was relieved by injection and did not return.

In the one case of Meige’s median spasm treated, temporary but, as expected, no permanent relief was obtained.

In one case the injection was given before intracapsular cataract extraction in a patient who had developed violent blepharospasm after extraction in

TABLE I
RESULTS OF FACIAL BLOCKS IN 26 CASES

Case No.	Diagnosis	Initial Paresis	Result		Duration (wks)
			Subjective	Objective	
1	Kerato-uveitis	Good	Good	Good	14
2	Acid burn of cornea ..	Good	Good	Good	12
3	Acid burn of cornea ..	Fair	Good	Good	12
4	Phlyctenular keratitis ..	Good	Good	Good	> 4*
5	Phlyctenular keratitis ..	Good	Good	Good	12
6	Phlyctenular keratitis ..	Good	Good	Good	10
7	Phlyctenular keratitis ..	Poor	Nil	Nil	24 hrs
8	Phlyctenular keratitis ..	Good	Good	Good	12
9	Phlyctenular keratitis ..	Good	Good	Good	8
10	Metaherpetic keratitis ..	Good	Good	Good	8
11	Vascularizing keratitis ..	Fair	Good	Poor	1
12	Blepharospasm following cataract extraction ..	Poor	Nil	Nil	24 hrs
13	Blepharospasm following cataract extraction ..	Good	Good	Good	12
14	Vascularizing keratitis ..	Good	Good	Nil	10
15	Kerato-uveitis	Good	Good	Nil	10
16	Meige's median spasm ..	Fair	Good	Fair	4
17	Rosacea keratitis	Poor	Nil	Nil	Few hrs
18	Chronic blepharospasm (post-operative) ..	Good	Good	Good	> 2*
19	Uveitis	Good	Good	Good	> 6*
20	Metal burn	Fair	Good	Good	8
21	Mooren's ulcer	Poor	Nil	Nil	24 hrs
22	Mooren's ulcer	Good	Good	Nil	6
23	Recurrent keratitis ..	Good	Good	Good	16
24	Hypopyon ulcer	Good	Good	Nil	20
25	Blepharospasm following lamellar graft	Fair	Slight	Nil	Still present
26	Radiation keratitis ..	Good	Good	Good	Still present

* Failed to keep appointment.

the other eye. A bilateral block was performed, and both operation and subsequent convalescence were uneventful.

The solution would appear to be of use where difficulty in dressing is to be expected, and avoidance of post-operative blepharospasm is desirable. One of the cases of phlyctenular keratitis had a spastic entropion which was relieved on the abolition of spasm.

Effect on Causal Condition.—This is much more difficult to assess, as all cases in which an obvious cause was present were undergoing treatment concurrently with the injection. It is, therefore, difficult to know whether an improvement in the days succeeding injection is purely the result of local or other treatment or is in part related to the paresis. It is not, of course, to be expected that relief of the blepharospasm will be in any sense curative of, for instance, an active keratitis, though, as mentioned above, the relief of congestion and increased efficiency of local treatment may speed resolution. In most cases this is the most that can be claimed for the method.

In phlyctenular keratitis, however, its effect appears to be more direct, possibly because of the very intense blepharospasm associated with this condition. In all cases of this latter where a good paresis was obtained, rapid improvement with whitening of the eye was observed. Later recurrences were not of course prevented and were accompanied by a return of spasm.

Retrobulbar Injection.—The solution was also used as a retrobulbar injection in cases of painful blind eye which could safely be treated without enucleation. Here the sole criterion of success was the subjective relief obtained. In three of these cases there was considerable local reaction to the injection, with some chemosis and proptosis, which subsided after a few days. These results are summarized in Table II.

TABLE II
SUMMARY OF RESULTS OF RETROBULBAR INJECTIONS IN NINE CASES

Case No.	Cause of Pain	Initial Result	Final Result when Last Seen
1	Absolute glaucoma	Good	No pain; 4 mths
2	Atrophic uveitis	Improved	Pain in 2nd division of Vth nerve
3	Absolute glaucoma	Improved	Enucleation for pain after 1 mth
4	Radiation keratitis	Good	Good; 9 mths
5	Secondary glaucoma	Good	Recurrence after 6 mths
5a	Secondary glaucoma	Good	Good; 2 wks (repeat on No. 5)
6	Absolute glaucoma	Nil	Enucleation for pain after 1 wk
7	Absolute glaucoma	Improved	Slight pain; 10 mths
8	Hypopyon iritis		
	Secondary glaucoma	Good	Good; 9 mths
9	Dislocated lens		
	Absolute glaucoma	Good	Enucleation for pain after 4 wks

Of eight cases so treated, five obtained relief, and have been followed up for periods of up to 10 months without recurrence. In one case no relief at all resulted. Two eyes were enucleated for recurrence of pain after one month, and in one case there was slight improvement but residual pain in the 2nd division of the Vth nerve. The origin of the pain in this last case was obscure, and it is doubtful if the patient was suitable for treatment either by injection or by enucleation. As mentioned above, the limited duration of action may be a drawback in the use of this method for the relief of chronic pain, alcohol probably being superior. In this connexion, however, it is worth while to note that the effect of succeeding injections has been found to be progressively longer in duration (Kohn, Rutter, and Vitali, 1954). The question of superiority or otherwise over alcohol on a long-term basis remains to be settled.

Summary

The use of a benzocaine-urethane solution as a nerve-blocking agent in ophthalmology is discussed. The results of a series of cases treated by

blocking of the VIIth nerve or by retrobulbar injection are discussed. The method is of value in cases where blepharospasm renders adequate examination and treatment difficult, and may be of value in the treatment of chronic ocular pain.

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