

Ocular effects of Pro-Banthine

A. M. GOKHALE AND S. A. GOKHALE

Bombay, India

We undertook this trial because of a patient who came to us with photophobia and fixed dilated pupils following the accidental entry of Pro-Banthine powder into the conjunctival sacs of both eyes.

We subsequently found that several trials of the ocular effects of Pro-Banthine had already been made (Duke-Elder, 1962).

Several drugs resembling atropine in pharmacological action have been synthesized. On the whole they are less effective as mydriatics and considerably less effective as cycloplegics. Among them are methantheline bromide (Banthine) and propantheline bromide (Pro-Banthine).

The pharmacological actions of atropine are:

- (1) Blockage of peripheral cholinergic activity by preventing the entrance of acetylcholine into the effector cells. This is known as antimuscarinic activity and takes place at the parasympathetic postganglionic nerve endings which are cholinergic. Thus, in the eye, mydriasis and cycloplegia occur.
- (2) Blockage of parasympathetic ganglia, including the superior cervical (Tvede and Cahen, 1952) and the ciliary ganglia (Konzett and Rothlin, 1953), when given in large doses.
- (3) Excitation and subsequent depression of certain central and medullary centres.
- (4) A slight local anaesthetic effect.

Methantheline bromide (Banthine), which differs from atropine in having a particularly high ratio of ganglionic blocking to antimuscarinic activity (Goodman and Gilman, 1965), was introduced as an antispasmodic by Hamburger, Cook, Winbury, and Freese (1950). According to Raiford (1952), Banthine is an effective mydriatic and cycloplegic when instilled into the eye in a 1 per cent. solution (D'Ermo, 1953). However, according to Goodman and Gilman (1965), topical application to the eye does not cause enough cycloplegia or mydriasis to be useful.

Propantheline bromide (Pro-Banthine) is a quaternary ammonium compound chemically closely related to methantheline and has similar properties but is more potent. According to Goodman and Gilman (1965), propantheline is two to five times more potent in antimuscarinic activity and about 1.5 times more potent as a ganglion-blocking agent, and very high doses block the skeletal neuromuscular junction. It is dispensed in tablets of 15 mg., and the usual clinical oral dose of 15 mg. acts for about 6 hrs. However, according to Johnson and Wood (1954), propantheline is as effective a mydriatic and cycloplegic as methantheline (Kahnemann and Bisio, 1957; Kahnemann, 1957).

The chemical formula of propantheline is 2-di-isopropyl aminoethyl xanthene -9-carboxylate methobromide (Fig. 1).

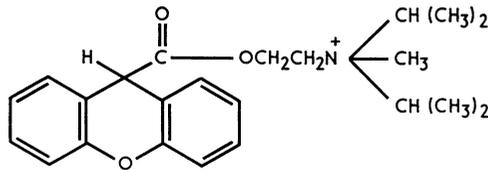


FIG. 1. Chemical formula of Pro-Banthine

Our trial was undertaken to confirm whether Pro-Banthine causes enough cycloplegia and mydriasis to be useful, and to draw the attention of ophthalmologists to its potential clinical uses.

Material and methods

(1) The first trial was carried out on 25 in-patients, most of whom had been operated upon for cataract in one eye. The un-operated eyes were used for the test. The pupillary direct light reflex was noted and the approximate pupil size measured. One drop of 1 per cent. Pro-Banthine solution was instilled into the conjunctival sac and the eye was kept closed for 5 minutes. The pupil size and direct light reflex were then observed every 15 minutes until the dilatation was maximum and then every 12 hours until the pupil returned to its original size with a brisk light reflex.

(2) In a second series of 25 patients, the effect on accommodation was studied. To eliminate possible errors arising from the differences in accommodative power and refractive error, the following precautions were taken. All the patients were above the age of 16 years. The 'near point of accommodation' was determined by bringing the smallest legible print towards the eye, with the other eye closed, until it became blurred. The distance of the print from the cornea at this point was measured. The pupil size and direct light reflex were then noted. One drop of 1 per cent. Pro-Banthine was instilled into the conjunctival sac of the same eye. The 'near point of accommodation', the pupil size, and the light reflex, were noted every 15 minutes for one hour and then after 24 hours. The same print was used each time for the same patient.

(3) In a third trial, two patients who showed local allergy to atropine were asked to discontinue atropine and to instill Pro-Banthine 1 per cent. twice a day. These patients were observed daily for a week.

Results

FIRST TRIAL (Figs 2 to 4)

On an average, the mydriasis started after 10 to 15 minutes, reached its maximum in 15 to 30 minutes, and lasted for 6 to 7 days. None of these patients complained of diminished near vision even after full mydriasis, and in none was glaucoma precipitated. The light reflex was absent after full mydriasis.



FIG. 2 Time required for mydriasis to begin in 25 cases after instillation of Pro-Banthine 1 per cent.

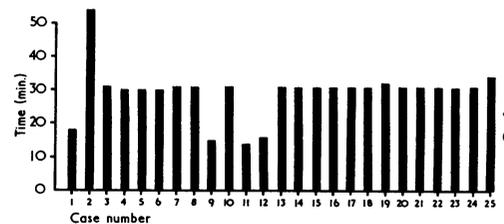


FIG. 3 Time required for full mydriasis to develop in 25 cases

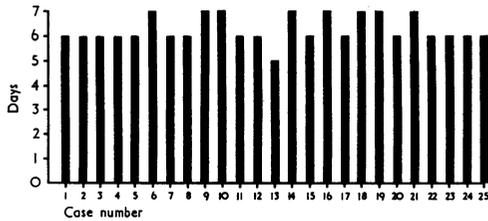


FIG. 4 Duration of mydriasis in 25 cases

SECOND TRIAL (Fig. 5)

Except in three cases, in which there was significant cycloplegia, the near point of accommodation receded only slightly and continued to do so for 24 hours. Thus, the cycloplegic effect was negligible in most cases.

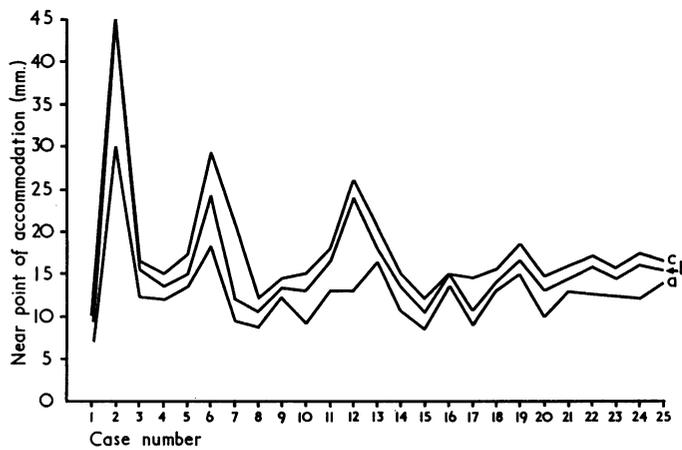


FIG. 5 Near point of accommodation in 25 cases
 (a) before instillation of Pro-Banthine 1 per cent.
 (b) 1 hr after instillation
 (c) 24 hrs after instillation

THIRD TRIAL

There was no allergic reaction to Pro-Banthine in patients who were allergic to atropine.

Discussions and conclusions

Pro-Banthine 1 per cent. acts as a strong mydriatic, usually with little cycloplegic effect. The Table shows a comparison with the commonly used mydriatics.

Drug	Mode of Action	Start of mydriasis (min.)	Full mydriasis (min.)	Duration of mydriasis	Cycloplegia
Atropine 1 per cent.	Parasympatholytic	15	about 60	10-12 days	Very marked
Homatropine	Parasympatholytic	15	60 to 120	about 24 hrs	Marked
Phenylephrine	Sympathomimetic	about 5	about 30	3-4 hrs	Slight
Pro-Banthine	Parasympatholytic	10 to 15	about 30	6-7 days	Usually slight

Mydriatics are required for diagnostic purposes in funduscopy and retinoscopy, and for therapeutic purposes as in iridocyclitis, after certain operations, and sometimes to improve vision in cases of central cataract.

DIAGNOSTIC USE

- (1) For fundoscopy, phenylephrine is usually the drug of choice because of its swift action and short duration. Pro-Banthine is not good for this as its effect lasts for 6 to 7 days.
- (2) For retinoscopy in young children, atropine is usually the drug of choice as it causes almost complete cycloplegia which is desirable because of the strong accommodative power of children. Pro-Banthine is not useful for this as it causes usually little cycloplegia.
- (3) For retinoscopy in adults, either homatropine or phenylephrine is used as the duration of their effect is short and patients are not handicapped in doing their usual work. For this also Pro-Banthine is not of much use as the mydriasis lasts for 6 to 7 days.

In short, Pro-Banthine is not a suitable drug for diagnostic purposes.

THERAPEUTIC USE

- (1) In mild cases of chronic iritis, Pro-Banthine may be used in place of atropine because of its marked mydriatic and mild cycloplegic effect.
- (2) It can be used as a substitute in all cases of atropine allergy.
- (3) In central cataract, particularly in bilateral cases, the patients are very much handicapped. Homatropine is sometimes prescribed, one drop to be instilled daily in the morning, and glasses are prescribed which suit the patient with the pupils dilated. This is done when the vision is better after dilatation than before. This treatment is continued until one of the cataracts becomes nearly mature. For this purpose, Pro-Banthine is the ideal drug as it is necessary to instill it only once in 5 days and there is little cycloplegia. Phenylephrine is less useful because of its short duration of action.
- (4) Pro-Banthine can be used as a mydriatic after cataract extraction, when marked cycloplegia is not required.

Summary

Pro-Banthine is a synthetic parasympatholytic drug used for hyperacidity in the stomach. This trial shows that it may be used in ophthalmology. Local instillation of a 1 per cent. solution causes mydriasis beginning in 10 to 15 minutes, reaching its maximum in about 30 minutes, and lasting for 6 to 7 days. It rarely causes a significant cycloplegia. Two patients showing allergy to atropine were not allergic to Pro-Banthine.

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