tion between the cavity of the swelling and the venous system. On the release of the arteries the swelling rapidly recurred by pulsations.

On November 28th the radial artery was ligated in front of the wrist. This caused only a temporary decrease in pulsation, which on the day after operation was as marked as before. Unfortunately at this stage the patient developed a tonsillitis, with general symptoms, and further operation was considered inadvisable until after his recovery. At the end of a fortnight the swelling was larger and the pulsatile impulse more marked. The swelling could still be emptied when the ulnar artery was compressed, to fill by pulsation immediately the artery was released.

On December 12th the ulnar artery was ligatured in front of the wrist. This stopped all pulsation for good, and at the time of his discharge, on December 20th, there remained only a small hard lump in the first interosseous space.

Evidently in this case the primary condition was a pulsating haematoma which communicated with a vein,

forming a varicose aneurysm. Probably the vein was opened at the time of the accident. Although the aneurysm was at the radial end of the deep palmar arch, ligature of the radial was ineffective, and it was only after the ulnar artery also was ligatured that improvement took place.

In the second case the blood released into the hand showed no evidence of clotting, whereas in the first case clotting occurred to a degree sufficient even to control the flow from a large vessel like the femoral artery.

Summary

Two cases are reported of the results of puncture wounds of arteries. In the first, although there was a large hole in the femoral artery, the signs and symptoms produced were such that operative intervention was not considered necessary until over three weeks after the injury. In the second case a puncture wound of the hand caused a varicose aneurysm of the deep palmar arch, which was cured by ligature of the radial and ulnar arteries.

SODIUM EVIPAN ANAESTHESIA IN OPHTHALMIC SURGERY

WITH SPECIAL REFERENCE TO DISADVANTAGES

BY

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INFIRMARY

A history of medicine with special reference to therapeutic methods that have fallen into disuse would make a bulky volume. Some remedies are abandoned because the disadvantages of their use outweigh the advantages, some because the fashion has changed, some because they are superseded by better; while some, like a promising child, doomed to an early death through over-care, receive too kindly treatment at the hands of their originators and proponents. It is not at all unlikely that a few quite valuable therapeutic agents have been lost to medicine by such an untimely demise. Tannic acid in the treatment of burns is an example of a procedure which was dead, and would still have been lost to the profession had not someone stumbled on its grave, exhumed, and resuscitated it.

Sodium amytal is a drug whose death certificate it would be interesting to see. Some five years ago it was being acclaimed as the ideal anaesthetic. It could be given intravenously in bed, obviating the mental torture of the journey to the operating theatre and of the anaesthetic induction. Sodium amytal had ceased to count in the realm of anaesthetics long before sodium evipan, its double first cousin (being related both on the sodium and barbiturate sides), came on the scene. Is evipan to go the same way as the other, either from too much attention and praise, or from some weakness which, to carry our metaphor one step further, may be of a hereditary or familial nature? My opinion is that there is some value in the drug, both as an anaesthetic and as a therapeutic agent, and that, unless its disadvantages are clearly set out, surgeons will soon cease to use it when they find it less satisfactory than the enthusiasts make it out to be.

The writing of this contribution is provoked by an article entitled "The Advantages of Intravenous (Evipan) Anaesthesia in Ophthalmic Surgery," by Lyle and Fenton,¹ in which "eighty-six cases are presented, showing very satisfactory results and no complications." As only one side of the subject is presented, it remains to complete it by showing the disadvantages attending this form of anaesthesia.

One must acknowledge the advantages, both general and special, give praise where praise is due, but qualify where qualification is necessary. Obvious advantages to the surgeon are the freedom of the patient's face from an anaesthetic mask, and the quick induction. The quick recovery is a distinct advantage for the nursing staff. From the patient's point of view a needle-prick is preferable to an anaesthetic mask, and the quick, easy oblivion is a blessing to a nervous person. If post-anaesthetic vomiting and discomfort are obviated we have perfection for the patient. The element of safety must be considered, of course. The disadvantages will be dealt with under the three headings "Undesirable Reflexes," "Post-operative Effects," and "The Problem of Safety."

Undesirable Reflexes

Of undesirable reflexes at the time of operation we have had sneezing, coughing, twitching or jerking, and resistance. Lyle and Fenton mention sneezing, but pass it over very lightly. When the patient sneezes, strong muscular contraction raises the head and trunk into a semi-sitting posture, from which the patient falls flaccidly and heavily back to the table unless someone is ready to support him till the next sneeze arrives. The sneeze is repeated several times, and after a wait of a minute or two the operation may usually proceed. The incident gives concern to surgeon, anaesthetist, and theatre staff; especially so to the surgeon if the eye be one in which a sudden rise of tension is undesirable or dangerous—for example, in glaucoma, in elderly persons with arteriosclerosis, and in cases of ruptured globe. In spite of the report that evipan lowers the intraocular tension, a hearty sneeze must send it up to the limit of safety, or, in a diseased or injured eye, beyond the limit.

Coughing has much the same effect as sneezing, except that the muscular contraction is continuous, and keeps the patient in the semi-raised posture until the spasm is over. We have had four cases, in three of which the coughing was paroxysmal.

Muscular twitchings may be slight, or may amount to a lively jerking of the extremities (jactitation). "Muscular twitchings are another nuisance, both to anaesthetist and to surgeon, for they may either jerk the needle out of the vein or hinder the operative procedure. These movements are independent of stimuli, although they are accentuated and become vaguely purposive during skin incisions. Sedative premedication diminishes this trouble, however, and a further injection of a few [cubic] centimetres of evipan completely abolishes the movements."² Our experience accords fairly well with that of Slot and Galley

above, except in the matter of premedication, since our worst case of the sort was one that had had premedication (Case 6).

In two cases resistance was so active that ether was resorted to, and the amount required was little, if any, short of what would be required for ether anaesthesia without the evipan. In both cases the resistance was unexpected, since relaxation was early and the injection had exceeded the usual repetition of the full amount which had produced loss of consciousness. There is little doubt that a further injection would have secured complete anaesthesia, but one of the two cases had cardiac symptoms for several days following, either from the evipan or the ether, or the combination of the two (Case 5). In the other case the resistance was so determined and strong (one might almost say violent) that it is doubtful if further injection could have been accomplished (Case 7).

There is less likelihood of resistance if one waits about two minutes after the completion of the injection before inserting the eye speculum, but I doubt the advisability of leaving a needle in the vein for so long unless a little fluid is being run in. It would be quite a simple matter to have a second syringe filled with normal saline, and with this to keep the needle clear until the surgeon has waited the two minutes and then satisfied himself that the patient will not resist the speculum or the first grasping of the conjunctiva.

From Lyle and Fenton's report, and from our experience, it would seem necessary to be prepared to give more than one ampoule of 10 c.cm. of the solution in a few cases. The disadvantage of having to open and prepare another ampoule of solution would be overcome by having two sizes of ampoule, one size being sufficient to make, say, 12.5 c.cm. for use on patients who are likely to need the extra amount—that is, strong young adults of 12 st. or over.

Post-operative Effects

We have to report two cases of post-anaesthetic nausea and vomiting quite as depressing as after inhalation anaesthesia, but the vomitus was watery and frothy, and without visible coloration from bile. Chang reports two cases of vomiting.³ Both had had food shortly before the injection. Our cases had had light meals two to three hours before operation. Other post-operative complications were sleeplessness, headache, and cardiac weakness, as shown by weak, rapid pulse and extrasystoles.

The Problem of Safety

Although there is a high therapeutic quotient shown by animal experiment, and we can infer that the margin of safety in human beings is a wide one, evidence is accumulating that the use of evipan is attended with as great risks as any other anaesthetic. Slot and Galley give case records of nine deaths, three from their own experience, only one of which occurred while under the anaesthetic, and six from an outside source. While it is quite possible that death might have occurred under any other anaesthetic in most of these cases, a perusal of these case records leads one to the conclusion that there is a very real risk, and one that cannot always be foreseen. Alarming symptoms are described in several cases that subsequently recovered. Advanced arteriosclerosis was a factor in one reported death.⁴ An injection of 3 c.cm. was given to a patient with pulmonary tuberculosis and asthma. The injection was spread over six minutes, but breathing ceased, and was only restored after giving coramine 10 c.cm. intravenously and performing artificial respiration for some minutes.⁵ Liver disease is a definite contraindication to the use of evipan.⁶

On the question of premedication there is contradictory evidence, both from the literature⁷⁻⁹ and from our

experience. The first case given below would seem to contraindicate the use of morphine, as far as one may draw conclusions from one case. In the remainder of our cases completely satisfactory results find a greater proportion among those who had no premedication, and the percentage of complications is greater in the cases that had preliminary sedation (see Tables I and II).

Case Reports

Case 1.—Female, aged 39, slight build, nervous, toxic, bad pyorrhoea alveolaris. Premedication—morphine and scopolamine. Operation—evisceration of the eyeball. Patient was drowsy on arrival in the theatre; only 2.5 c.cm. given; complete relaxation and perfect anaesthesia. Awake in twenty minutes. Up next day, but fainted twice, so was put back to bed. Examination revealed no organic disease. Sleepless for the next few nights.

Case 2.—Male, aged 53; pulmonary tuberculosis, unfit for chloroform or ether. No premedication. Operation—enucleation of eyeball. When 5 c.cm. evipan was given a fit of coughing dislodged the needle. Another 3 c.cm. was given; operation performed without inconvenience. On return to bed had frequent severe paroxysms of coughing, which caused deep cyanosis but did not waken him; heart only quickened by exertion. Awake in forty minutes. Complained of a taste of mutton fat, otherwise no discomfort.

Case 3.—Female, aged 61, well built. No premedication. Operation—enucleation. Stopped counting after 2 c.cm.; paroxysm of sneezing after 4 c.cm. Total injection, 7 c.cm. Pulse good throughout. Wakened forty minutes after injection and vomited clear, frothy fluid. Headache; vomiting at intervals through night and next day. At 10.30 p.m. the pulse rate was 96 with premature beats, which were noted again next day.

Case 4.—Male, aged 34, 12 st. in weight. Premedication—one allonal tablet. Operation—iridectomy and anterior chamber lavage. Evipan, 9 c.cm.; grasping of conjunctiva set up a paroxysm of sneezing; slight resistance during operation.

Case 5.—Female, aged 29, stout. Premedication—two tablets of allonal. Operation—enucleation. Lost consciousness very quickly; total, 7 c.cm. Very active resistance. Ether given by inhalation; required as much as ordinarily used. Next day pulse weak and rapid; coramine hypodermically. During the next few days had attacks of faintness with almost imperceptible pulse.

Case 6.—Male, aged 38, slight build. Premedication—two tablets of allonal one hour before operation (enucleation). Unconscious after 2.5 c.cm. evipan. After 6 c.cm. the head rose from the table about six inches, one slight cough was given, and the head fell back flaccidly. There was marked jactitation on commencing the operation. The remaining 4 c.cm. was injected while the arm gave occasional twitches. Operation completed without further difficulty.

Case 7.—Male, aged 47, medium build. Premedication—allonal, two tablets. Operation—enucleation. Unconscious when 3.5 c.cm. was given; total, 8 c.cm. Jaw dropped and body completely relaxed. On touching the eye patient had a paroxysm of coughing, followed by active resistance; struggled with arms and legs, and rolled head from side to side; impossible to give further injection. Ether.

Case 8.—Male, aged 20, slight build. Premedication—allonal, two tablets. Operation—enucleation. Unconscious when 6.5 c.cm. was injected; total, 8 c.cm. Perfect anaesthesia. Awake in fifteen minutes; no discomfort or after-effects.

TABLE I.—Summary of Cases

Operation	Premedication	No premedication	Total
Evisceration of globe ...	1	1	2
Enucleation of globe ...	8	3	11
Exploration of orbit ...	2	1	3
Iridectomy or abscission of prolapse	2	2	4
Dental extraction ...	—	2	2
Totals ...	13	9	22

Of the thirteen cases with premedication, seven (54 per cent.) had one or more unsatisfactory incidents or "complications." Of the nine with no premedication, three (33 per cent.) had complications.

TABLE II.—Complications

Complication	Premedication	No premedication	Total
Sneezing	1	1	2
Coughing	3	1	4
Muscular spasm	1	—	1
Resistance	2	1	3
Post-anaesthetic sickness	1	1	2
Cardiac symptoms	1	1	2
Total	9 (7 cases)	5 (3 cases)	

For details of technique and for general results the reader is referred to the report of 1,000 cases by Abel and Jarman.⁸ There, too, he will find a warning against using ether or chloroform with evipan, the opinion that it is better not to use another barbiturate (which, of course, includes allonal) as a preparation for evipan, and a strong warning against using evipan single-handed. This report accords with their opinion. In their experience no patient who has had evipan alone has vomited, but against that we record one case where this incident did occur.

Conclusion

The chief concern of this article is with evipan in ophthalmic surgery, in which it has been shown to have some special disadvantages as well as advantages. In this particular branch of surgery the number and proportion of cases requiring a general anaesthetic are small. Carefully administered retrobulbar anaesthesia diminishes the number still more. In the small remainder, and subject to the same restrictions as in general surgery, evipan is entitled to consideration.

It is concluded that sodium evipan has a limited use in ophthalmic surgery, which use would be greater if its action were more certain.

I wish to thank Mr. G. F. Haycraft and Mr. H. Campbell Orr for permission to use evipan on their patients, and for their interest and co-operation.

REFERENCES

- ¹ Lyle, T. K., and Fenton, F. G.: *British Medical Journal*, 1934, ii, 589.
- ² Slot, G., and Galley, A. H.: *Ibid.*, 1934, ii, 201.
- ³ Chang, C.: *Chinese Med. Journ.*, 1934, xlviii, 577.
- ⁴ Moerl, F.: *International Abstract, Surg., Gynecol. and Obstet.*, 1934, lviii, 71.
- ⁵ Feldweg, P.: *Munch. med. Woch.*, 1934, 257; *Lancet*, 1934, i, 1300.
- ⁶ Jarman, R., and Abel, A. L.: *Lancet*, 1933, ii, 18.
- ⁷ Medical Research Council: *Ibid.*, 1933, ii, 43.
- ⁸ Jarman, R., and Abel, A. L.: *Ibid.*, 1934, i, 510.
- ⁹ Moncrieff, A.: *Proc. Roy. Soc. Med.*, 1934, xxvii, 5, 615.

J. H. Rabinovici (*Thèse de Paris*, 1935, No. 45), who records an illustrative case in a man aged 50, states that staphylococcal septicaemia may assume any form, from a fulminating attack which proves fatal in twenty-four hours, to a protracted illness which may last with remissions for years. The form with an acute onset is not necessarily fatal, but may take on a protracted course. Secondary localization in the bones or joints may occur at a later stage, and be from the first very extensive, with a tendency to necrosis without suppuration and to last for a considerable time. Treatment usually consists, according to the type of arthritis, in puncture, arthrotomy, or resection, but sometimes lesions of the joints and bones may be cured by immobilization alone.

EVIPAN IN OPHTHALMIC SURGERY

FURTHER EXPERIENCES

BY

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Since writing our article on the advantages of evipan in ophthalmic surgery (*British Medical Journal*, September 29th, 1934, p. 589), we have gained further experience in the use of this form of anaesthesia, and would like to emphasize the following points.

Over 200 operations have been performed under evipan anaesthesia at this hospital during the past twelve months, and our previous experience that evipan was an ideal anaesthetic for ophthalmic operations is definitely confirmed. We have not experienced any ophthalmic operation requiring general anaesthesia where evipan has not been far superior to any other general anaesthetic from all points of view, except perhaps for small casualty operations, where ethyl chloride or "gas" may be more convenient.

Happily, in our whole series of cases, we have not experienced the slightest anxiety at any time during the period of narcosis or subsequently. Independent observers have reported similar results. Dr. H. Klitzsch, assistant surgeon to the Eye Clinic of the University of Halle, speaks very highly of evipan as an anaesthetic for ophthalmic operations in a paper based on his experience in over 100 cases.¹ Mr. Cashell, ophthalmic surgeon of Reading, reports that evipan is used as a routine anaesthetic in his work at the Royal Berkshire Hospital.

Practical Points

Several points of practical importance are worthy of mention.

1. *Premedication.*—We have recently introduced pre-operative medication with omnopon and scopolamine injections in selected cases. This has proved very satisfactory. The amount of evipan required as compared with the amount where no premedication is given is materially reduced, and reflex movements of the patient, which sometimes occur with evipan alone, are diminished. This is of particular value in operations for squint in children, where, in an excitable child, with evipan alone, reflex twisting movements are sometimes troublesome, even with large dosage of the drug. With a preliminary injection of omnopon and scopolamine, this feature is usually abolished, the patient lying immobile, even with a materially reduced dosage. The "sneezing" reflex appears to be less liable to occur. Owing occasionally to mild post-anaesthetic vomiting where omnopon and scopolamine has been given in adults, it is perhaps advisable to omit this premedication where a cataract extraction under evipan is contemplated. As regards dosage, we have found that 1/3 grain of omnopon with 1/300 grain of scopolamine for patients over 12 years, and half that amount for children from 6 to 10 years, is satisfactory, given half to one hour before operation.

2. *Cataract Extractions.*—One cataract extraction was performed under evipan on an uncontrollable male patient in whom local anaesthesia, as indicated by a previous preliminary iridectomy, appeared inadvisable. No difficulties were encountered, and the patient was discharged with a satisfactory eye. Mr. Cashell of Reading reports that he has performed a successful cataract extraction under evipan at the Royal Berkshire Hospital.

¹ *Klinische Monats. f. Augenheilkunde*, May, 1934.