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HYOSCINE-MORPHINE ANAESTHESIA IN MINOR SURGERY

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by

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CHAPTER I.

INTRODUCTORY REMARKS.

Since the introduction of General Anaesthesia it has been recognised that the administration of chloroform or ether is attended by risk to the patient, and almost invariably by unpleasant after effects, the duration of which may be brief or may be prolonged over a considerable period. So much so is this the case that to the patient the dread of having to undergo chloroform anaesthesia is often quite out of proportion to any fears he might entertain as to the risks attendant upon the operation itself.

With the many improvements in the technique of inhalation anaesthesia, these risks and after effects have been reduced to a minimum, with the result that the old fear of "having to take chloroform" is slowly but surely dying out, and inhalation anaesthesia, in spite of the many alternatives which have of late been introduced, still holds its sway as the most reliable method of inducing anaesthesia for surgical operations.

There are, however, cases in which one hesitates before administering chloroform or ether. The condition of the patient may be such as to strongly contraindicate their use. This may be due to grave systemic disease, or again the operation may be required to be performed before sufficient time can elapse for the/
the/

the necessary period of fasting to take place, or before the bowels can be attended to. More especially is this the case in the ordinary form of accident where operative procedures may require to be adopted very shortly after the patient has taken a meal.

The operator, as frequently happens in country districts, may find himself called upon to perform an operation where the conditions do not warrant his allowing the necessary time to elapse in which to send for skilled assistance. This is often the case in the remote parts of our Dominions, where very often there is no other medical practitioner within a radius of many miles.

The operator then, after inducing anaesthesia himself, hands over the mask to an unskilled individual, performs the operation, and at the same time directs the administration of anaesthesia, - a procedure which is neither beneficial to the patient nor to the surgeon.

In many cases, the minor nature of the operation hardly warrants the use of chloroform and ether, and again in certain conditions there is a distinct advantage in having the patient in a semiconscious state, for example in certain rectal and gynaecological operations where the patient may be required to bear down. Local anaesthesia is largely used in these types of cases. But local anaesthesia, to be effective, usually/

usually requires to be administered by one who has had considerable experience in this branch, and operations performed under a local anaesthetic upon a perfectly conscious patient must, in most cases, be accompanied by acute mental suffering, even if physical pains be completely abolished. There are also conditions in which the part to be operated upon is not easily accessible, and conditions of the integument where the injection of a local anaesthetic is apt to be followed by sloughing.

Considerations such as the above and the favourable reports one had received of the use of hypodermic injections of Hyoscine Hydrobromide combined with Morphia to produce narcosis in labour, or as a preliminary to General, Local and Spinal Anaesthesia, or to produce a profound narcosis during which surgical operations might be performed without the aid of any further anaesthetic, led one, while House Surgeon to the New Somerset Hospital, Cape Town, to give this mixture an extensive trial in the minor surgical operations which one performed.

The records of the cases operated upon cover a series of forty operations performed upon thirty-four patients. They are mainly of a minor nature and include such operations as the amputation of fingers, setting of fractures, cystoscopic and proctoscopic examinations, major surgical dressings, circumcision, dilatation/

dilatation of strictures, needling of the inferior maxillary nerve, etc. One will endeavour to show to what degree surgical anaesthesia was produced, where marked symptoms of poisoning were shown, the degree of unconsciousness produced, the presence or absence of recollection of the operation on the part of the patient, in how far the action of the drugs is to be relied upon, conditions in which their use is contra-indicated, and the necessary dosage.

In most of the cases hyoscine and morphine were used alone, in a few cases their use was combined with the local injection of novocain. The hyoscine hydrobromide used in all cases were Messrs Burroughs and Welcome's Tabloid Brand, and the morphine the usual Inj. Morphinae Hypodermica of the B.P.

In thirteen cases one injection varying from hyoscine gr. $\frac{1}{100}$ and morphine gr. $\frac{1}{6}$ to hyoscine gr. $\frac{1}{75}$ and morphine gr. $\frac{1}{4}$ was given.

In the remaining cases two injections were given, with an interval of an hour between. The dosage as a rule was hyoscine gr. $\frac{1}{100}$, morphine gr. $\frac{1}{6}$ - gr. $\frac{1}{4}$. I may here state my indebtedness to the Surgical Staff of the New Somerset Hospital for their assistance in giving me opportunities to carry out my observations.

CHAPTER II.PHARMACOLOGY.Atropine Series.

This consists of atropine and several other closely allied alkaloids, the chief of which are hyoscyamine and hyoscine or scopolamine. They occur in many of the plants of the Solanaceae order, several usually being found together.

The chief plants containing these alkaloids are the following:- *Atropa Belladonna*, containing varying quantities of hyoscyamine and atropine, hyoscine, and sometimes atropamine and belladonnine.

Hyocyamus Niger (Henbane) containing hyoscyamine and hyoscine, with smaller quantities of atropine.

Datura Stramonium (Thornapple), containing atropine, hyoscyamine, and some hyoscine.

Also *Duboisia myoporoides*, *Scopola Atropoides* and *Mandragora autumnales*.

These alkaloids all resemble each other closely in their effects upon animals. We will first describe briefly the group action and then take up the action of hyoscine in detail.

Group Action. In small toxic doses they cause dryness of the skin and throat, thirst, dysphagia, and hoarseness, the pupils dilate and there may be nausea and vomiting. Respirations are increased, the pulse is sometimes/

sometimes accelerated, sometimes slowed. After large doses, these symptoms are more marked: the heart may be extremely rapid, the patient becomes confused, later delirious, often maniacal. Marked muscular tremors may set in, and convulsions may cause death through failure of respiration. As a rule the stage of excitement passes into one of depression, the patient sinks into a deep sleep, which deepens into stupor and coma, the respiration and heart become slow, weak and irregular, and death eventually occurs from asphyxia.

These symptoms indicate stimulation of the central nervous system followed by depression. In atropine poisoning the motor area is more easily stimulated by the electric current than normally. The stimulation differs from that of strychnine, because the latter acts more especially on the lower parts of the nervous axis, while atropine acts more strongly on the higher divisions.

Atropine differs from caffeine, for under the latter the psychical functions are those affected first of all.

Most of the secretions are diminished by the application of atropine. This is due not to any action upon the secretory cells, but to paralysis of some of the nerve ends.

The kidney is unaffected by atropine as is the secretion/

secretion of lymph.

The movements of organs comprised of unstriated muscle, are lessened by atropine. Administered locally to the conjunctiva or given internally, atropine paralyzes the intraocular endings of the third nerve, causing loss of accommodation and dilatation of the pupil. It paralyzes the inhibitory terminations of the vagus in the heart, causing tachycardia. It is often used as a preliminary to chloroform anaesthesia to prevent cardiac inhibition.

It increases the blood pressure, causing constriction of abdominal arterioles, and dilatation of the skin vessels, producing flushing and rashes.

It stimulates and then depresses the respiratory centre, death being caused by depression in fatal cases of atropine poisoning.

Atropine often causes a rise in temperature, the cause being unknown.

Hyoscyamine is rarely obtainable in pure form. It is a stronger paralyzing agent than atropine, but in general conforms in its actions to those of its isomer atropine.

Scopolamine, or Hyoscine. It was formerly supposed to be an isomer of atropine, but lately has been shown to differ slightly in its composition which/

which is $C_{17}H_{21}NO_4$.

Hyoscine, while stable in the solid form, is very unstable in solution. In my series of cases I employed a fresh solution in all cases except one. In that case the solution was kept for some months and was found to be unreliable.

Messrs Burroughs & Welcome state that Tabloid Hypodermic Hyoscine Hydrobromide is prepared from the laevo-rotary salt only, this variety being found clinically to be the most active.

Fritz Sachs has investigated the properties of hyoscine after keeping and finds that in ampouls it is unaffected after some months, so far as its action on the central nervous system is concerned.

It resembles atropine closely in its peripheral action. Mydriasis is produced more rapidly than with atropine but lasts a shorter time.

In man the therapeutic dose is too small to paralyse the inhibitory nerves of the heart, and the pulse is therefore unaltered in rate or may be slower owing to the hypnotic action. "As a general rule, scopolamine produces a marked sensation of fatigue and drowsiness, and the patient moves about less and speaks less. Soon an overpowering desire to sleep is felt, and a condition in no way dissimilar to the natural sleep follows. In many cases, however, a short stage of excitement with giddiness, and occasionally symptoms exactly/

exactly resembling those produced by atropine follow the administration of hyoscine, especially if large doses are employed. Sleep generally lasts from 5 - 8 hours, and the patient may remain in a somnolent condition for several hours longer. As a general rule, after small doses no confusion is complained of on awakening, but dryness of the throat and thirst are often present. Larger doses do not cause deeper sleep but give rise to delirium and excitement resembling that following atropine. In one or two cases collapse has been observed after scopolamine. The vasomotor and respiratory centres do not seem to be stimulated as by atropine, the blood-pressure falling and the respiration generally becoming slower from the beginning." (Cushny)

The action of hyoscine differs from atropine in that the central nervous system is depressed, and its action upon the peripheral nerves is more marked.

Small quantities, about gr. $\frac{1}{100}$ or even less, depress the brain sufficiently to cause sleep. A certain degree of tolerance is produced after repeated use, so that an increase of dosage may later be required. Hyoscine antagonises morphine in some respects but acts as an adjunct in others. It lessens the excitability of the respiratory centre. If hyoscine and morphine be used together, a deeper sleep is produced than when hyoscine is used alone, and there is/

is a certain definite depressant action which would be opposed by atropine.

Formerly it was thought that hyoscine produced a fatty degeneration of the liver and kidneys. Nicholson gave hyoscine in fairly large doses to the lower animals, such as the rat, for fourteen consecutive days and found that fatty degeneration never occurred. And he further stated that the dose of hyoscine to produce any toxic effect is very considerable. "We know from a very large number of cases that scopolamine as such does not produce toxic effects upon human beings, except in such doses as would never be employed at the present day. The toxic effect it would produce would reveal itself by affecting the respiration; there would be cyanosis and eventually a profound toxæmia akin to that of morphine. Upon metabolism it has this effect: large doses produce an increase in the solid constituents of the urine, evincing that there is an increased tissue change. It is worth while to compare the depressant action of the alkaloids. Morphine comes first as being the most depressant. We then have conine, narcotine, and at the other end of the pole we have strychnine." Dudley Buxton.

Buxton's conclusions with regard to the action of large doses of hyoscine are, then, that it is largely akin to morphine. This is important as we see that in combining the use of hyoscine and morphine we are combining/

combining two drugs the chief danger of which - i.e. respiratory depression - is the same.

Poisoning from Hyoscine.

Cushny states that it does not seem to be so dangerous as the others of the series, for a dose of 5 mgms. ($\frac{1}{12}$ gr.) has been recovered from in man, and avers that half a gramme ($7\frac{1}{12}$ grs.) administered to a small cat did not kill it.

There are few cases on record of fatal poisoning by hyoscine. In the famous Crippen murder case, Crippen administered hyoscine to his wife. There have been, of course, cases of poisoning by Henbane.

Dixon Mann states that in many respects the symptoms produced by hyoscyamus are identical with those of belladonna. The face is flushed, the surface hot and dry, the mouth and throat parched. The pupils are enlarged and insensitive to light, vision is impaired, the pulse is quick and small, the respirations are of a sighing character, and in the early stage there is delirium. The tendency to busy, wild delirium is not as great as with atropine. In later stages the patient is comatose and collapsed, there is greater tendency to sleep and insensibility with hyoscyamine and hyoscine than with atropine. He mentions the case recorded by Worrall, in which gr. $\frac{1}{100}$ caused faintness, widely dilated pupils, palpitations, weak, rapid pulse and cold, clammy skin. Four injections/

injections of pilocarpine were given and after ten hours the patient recovered. In Dr. Given's case complete recovery took place in eleven hours after a man had swallowed one thirteenth of a grain of hyoscine hydrobromide. The stomach was washed out, strychnine and subsequently morphine injected subcutaneously, and brandy and black coffee given by the stomach and rectum. The symptoms were profound coma with stertorous breathing, the pulse was small, the conjunctival reflex was abolished, and there were some twitchings of the arms and legs.

In Taylor's "Medical Jurisprudence" a case recorded by Dr. Morton is mentioned. A woman put two drops of a 1% solution of hyoscine into each conjunctival sac. Five minutes later she complained of giddiness and a feeling of lightness in the head: she staggered and had to be assisted to bed. The symptoms became worse. She became unconscious with complete muscular relaxation. The breathing was slow and occasionally deep and sighing. The face was flushed. This unconsciousness lasted for four hours and was succeeded by a period of semiconsciousness and mild delirium lasting two hours. She then dropped into a sound natural sleep, which lasted one and a half hours. When she awoke she remembered nothing of the events of the night further than being assisted to bed. There were no evil after effects.

The/

The case recorded by Zimmerman is worth mentioning as it resembles, in some particulars, three of my cases.

The patient suffered from a right sided inguinal hernia. At 9.30 a.m. he was given .0007 gms. of scopolamine and .02 gm. of pantopon. Half an hour later the pantopon was repeated. After the second injection he soon fell asleep, and became deeply narcotised. When at 10.15 the operation was about to be begun, it was decided on account of the slowness of his respiratory movements to examine him immediately. Before this could be done the breathing stopped, and artificial respiration was resorted to for fifteen minutes, after which a few irregular respiratory movements took place. By means of energetic friction to the skin the respirations were stimulated and at 10.40 they were 9 per minute.

The following observations were then made. The corneal reflex was not lost, the pupils were widely dilated. The deep reflexes of the limbs were present. The superficial ones were lost. The pulse was 112, strong and regular.

At 11 a.m., respirations were 10, the pulse 100. He was given one litre of 0.85% saline solution subcutaneously to promote diuresis.

11.30 a.m. The pupils gradually began to contract. The pulse rate sank to 80.

12 noon. The iris was 2.5 m.m. in width.

3 p.m. The patient gave the first intelligible answer and a quarter of an hour later spoke to the sister. The pulse was still rapid, being between 100 and 120. The pupils reacted to light.

The urine contained no sugar or albumen.

A number of deaths have been reported as having followed the use of hyoscine when combined with morphine. These deaths have been investigated by Dr. Nicholson of Philadelphia. He divided them into two classes: first, those in which an autopsy had been made. Of these he found that none could be attributed to the employment of hyoscine. And in the second class of cases, in which there was no autopsy, he found that there was definite evidence that many factors were at work, so that it was impossible to arrive at any accurate decision as against hyoscine.

Morphine.

It will only be necessary to give a very brief description of the pharmacology of morphine. It is quickly absorbed in the mouth, causing diminution of the secretions, with thickness of the voice and some thirst. On entering the stomach it may cause nausea and vomiting. Its action on the bowel is anodyne and paretic. Acting on the nervous system it causes excitement, then depression. Impressions made on the afferent nerves do not affect the centres, pain is thus abolished/

abolished; the subject becomes drowsy, and finally sleeps. With large doses, deep coma from which the patient cannot be raised, is produced.

The ganglia at the base of the brain are affected with resultant contraction of the pupil and disturbed accommodation. The motor centres are first stimulated, then depressed.

The vital centres in the medulla are markedly affected. The respiratory centre is at first unaffected, then depressed, the respiratory movements become slow and shallow, and when death takes place it is due to paralysis of this centre.

The vascular centre is depressed but not to a dangerous extent. The heart is at first accelerated, later slowed. The blood pressure falls.

Hepatic and general metabolism are reduced in activity, the amount of urea, and probably of carbon dioxide being diminished.

The temperature rises for a time and then falls.

CHAPTER III.Hyoscine Morphine Anaesthesia.

When Schmidt separated scopolamine from the scopolia japonica, its identity with hyoscine was not recognised, and it was believed to be a separate alkaloid possessing a greater power of producing narcosis. In 1900 Schneiderin, aiming at producing a deep degree of narcosis, with a relative amount of safety to the subject, first advocated the use of scopolamine in conjunction with morphine to produce anaesthesia. It had been known that morphine could produce anaesthesia in animals, and he added scopolamine to safeguard the patient from the dangers of morphine. He held that he had found a safe anaesthetic for cases where chloroform and ether were contraindicated. During the past fourteen years a vast amount of work has been done in connection with the use of these alkaloids in anaesthesia. On the Continent, especially in Germany, they are extensively employed to produce narcosis during parturition, and to produce narcosis as a preliminary to the administration of chloroform or ether.

In this country their use has found many enthusiastic advocates, and they are widely used, especially to allay the pangs of childbirth. Their popularity, however, has never been as great as in Germany.

Despite/

Despite the claims of a few enthusiasts, their use as an anaesthetic, apart from obstetrical work or as a preliminary to chloroform and ether, has never been general.

Of late years there has been a tendency to add atropine to the mixture, thereby reducing the depressant effects somewhat. Various preparations of opium have been substituted for morphine; in fact every new opiate which the manufacturing chemist places upon the market immediately finds its supporters, who claim that its use in conjunction with hyoscine will obviate all the toxic symptoms for which the hyoscine-morphine mixture has been blamed.

Pantopon has been a favourite substitute for morphine, as it is said to be less likely to cause depression and nausea. Recently narcophine has been strongly recommended.

As the scope of this thesis is limited to the effects of hyoscine-morphine anaesthesia in minor surgical operations, where its administration has not been followed by chloroform, or ether, it would be out of place to enter to any great extent on its use either in labour, or as a preliminary to inhalation anaesthesia. After dealing at some length with the results obtained by some of the more recent authors on hyoscine-morphine anaesthesia in surgery, brief reference will be made to its use in obstetrics and as a prelude to chloroform or ether.

Dirk records a series of 260 cases in which hyoscine and morphine were used. He did not aim at producing complete anaesthesia, but to leave very little for chloroform or ether to do. In 29 of these cases, however, the hyoscine and morphine alone sufficed. Of the 260 operations, 188 were laparotomies. Three of his cases died. He used a .1% solution of hyoscine and a 2% solution of morphine. Two hours before the operation he injected 0.5 gm. of the former, and 0.75 gm. of the latter, and one hour before gave 0.5 gm. of each solution, so that the patient received .001 gm. and 0.025 grms. respectively. At times he gave a third injection, bringing the total quantity of the two drugs to .0015 and .03 gm.

The advantages he claims are:-

1. The physical gain, especially in nervous patients.
2. The imperceptible going off, there is no feeling of fear or choking.
3. It supplies a quiet equable narcosis without salivation.
4. After the operation the patient sleeps for a considerable time and does not feel any pain.
5. There is an absence of vomiting.
6. It is possible to put patients quietly to sleep when chloroform or ether would, in all probability, be dangerous to life.

Israel lost one out of three hundred and thirty two patients by this method.

Ferrier and Desjardins, giving their first injection/

injection four hours before operation, a second two hours, and a third an hour before operation, and using 0.001 gm. hyoscine and 0.01 gm. of morphine, obtained a sufficient anaesthesia in twenty six of one hundred cases. If anaesthesia was insufficient, they gave a few whiffs of chloroform in preference to ether.

The disadvantages noted were:-

1. The uncertainty of its action.
2. Its vasodilator action, which necessitated very careful haemostasis.
3. Retraction of the abdominal wall which persisted in spite of chloroform.

Whitacre, Vernon and Marcel condemn the use of this combination as dangerous.

The former acknowledges that given the right sort of subject very satisfactory results are to be obtained, but holds that there is a large element of uncertainty in their action, which is a serious obstacle to the use of these drugs as a means of obtaining anaesthesia.

The two latter record twenty five deaths, and many non-fatal accidents in two thousand cases. They declare the death rate to be higher than that of chloroform.

Following on these adverse reports, Kronka in 1908 discussed the means available to make hyoscine anaesthesia more reliable. He pointed out that:-

1. The preparation may be impure.
2. That pure preparations show slight differences in their chemical and physical properties, e.g. as regards melting point, and optical activity.

3./

3. That old solutions may undergo changes, both physical and chemical.

The preparation may be contaminated with apoatropine, an alkaloid which, as Kobert showed, produces convulsions. The presence of this substance is shown by adding a drop of potassium permanganate solution, when a brown precipitate is formed.

He recommends that on no account should old solutions containing morphine and hyoscine be used, and that only optically inactive hyoscine should be used.

Boesch considers that Schneiderlin's expectations of producing a slumber deep enough for the performance of surgical operations have been falsified, and that the production of so deep a coma is accompanied by a certain amount of danger, and that it is not advisable to administer more of the drug than is sufficient to produce a drowsiness as a preliminary to a general anaesthetic.

Segelkin in 1908 recommended extension of morphine-scopolamine narcosis to ophthalmic surgery. The preparation he used was that of Riedel, of Berlin, sold under the name of Scopomorphin in sterilised ampouls. Each contains $\text{gr. } \frac{1}{50}$ of scopolamine hydrobromide, $\text{gr. } \frac{1}{2}$ of morphine hydrochloride in M XXX of distilled water. He injected $\frac{1}{3}$ of this solution three hours before operation, and a third more one and a half hours later. If necessary, he injected the remaining/

remaining $\frac{1}{3}$. He found that usually the drowsiness produced by the first injection was converted into a deep sleep by the second. When this was deep enough, he instilled cocaine into the conjunctival sac and the operation was proceeded with. He concluded that its administration was not wholly free from danger, especially in old people, but that it was worthy of trial. In this connection it is perhaps as well to remark that in ophthalmic surgery the dangers of chloroform administration are increased owing to the limited access the anaesthetist has to the pupils, and conjunctivae.

H. J. Williams, in 1912, read a paper before the South African Medical Congress upon "Some Observations on the use of Scopolamine and Morphine anaesthesia in Surgery, Gynaecology, and Midwifery." He recorded an experience of nearly two hundred surgical and gynaecological cases, and one hundred and fifty midwifery cases. He states: "The method has been used in all classes of patients ranging from 12 - 17 years of age, and in highly neurotic, hysterical women, cases with heart lesions, and kidney difficulties, and others who were almost moribund; and still others upon whom surgeons had refused to operate fearing death on the table from general anaesthesia. In none of these cases have we seen any untoward symptoms whatever."

He/

He recommends the injection of hyocine gr. $\frac{1}{128}$, and morphine gr. $\frac{1}{5}$, followed in half an hour by a similar dose. In cases between 12 and 16 years of age, he halves the dose.

He describes cases of haemorrhoids, fistula in ano, strangulated femoral hernia, curettage, etc., performed under hyoscine, and morphine anaesthesia with eminently satisfactory results. Combining its use with infiltration and regional anaesthesia, he has obtained perfect results in many different varieties of abdominal and other operations. He also describes cases where the injections were given as a preliminary to spinal anaesthesia, and to ether anaesthesia.

Lionel E. C. Norbury describes six cases in which he used hyoscine, morphine and atropine as a general anaesthetic. He thinks that there are great possibilities for the mixture, especially in patients suffering from diabetes, phthisis, severe bronchitis, sepsis, and severe cardiac disease. The dose given was morphine tartrate, gr. $\frac{1}{6}$, hyoscine hydrobromide, gr. $\frac{1}{75}$, and atropine sulphate, gr. $\frac{1}{50}$. This was given two hours before operation and was usually sufficient, but if necessary a further injection of morphine tartrate was given fifteen minutes before operation. In three cases, local infiltration of the skin with novocaine was resorted to. In one case it was necessary to give a little gas for the preliminary incision. There was/

was no shock or pain after the operation, and the patients slept for some hours afterwards. In one case the respirations dropped to 8 per minute and were Cheyne-Stokes in character, but the patient quickly responded to an injection of strychnine.

Wilfred Harris found Hyoscine-morphine anaesthesia very useful in cases of trigeminal neuralgia in which the various branches of the fifth nerve were injected with alcohol. The pain inflicted on some patients in searching for the foramen ovale is quite intolerable. He therefore at first made it his practice to perform the operation under chloroform anaesthesia. He has now discarded this because he found that it is impossible to be quite certain when the needle reaches the foramen ovale, if the patient is unconscious, and also because the amount of alcohol injected is quite arbitrary and is not determined by the amount of anaesthesia of the lower lip and jaw produced. He now gives morphia, gr. $\frac{1}{3}$ with hyoscine gr. $\frac{1}{150}$ twenty minutes before commencing the injection process, and finds that when the needle reaches the foramen ovale the patient usually shows some signs of sensitiveness. When the nerve is pierced, a characteristic sensation of burning is felt along its distribution. He finds the combination extremely useful in cases of neuralgia of the 1st, 2nd and 3rd divisions of the 5th nerve.

He says that patients will lie quite quiet, and
answer/

answer questions regarding the skin tests for anaesthesia.

In the case of a patient over seventy years of age, to whom morphine gr. $\frac{1}{3}$, and hyoscine gr. $\frac{1}{130}$ had been given, respirations became temporarily slowed with cyanosis one and a half hours after the injection, but she recovered completely later.

Having found that the hyoscine-morphine mixture is not entirely free from danger, H. Offengeld substituted omnopon for morphine. In the Deutsche Medische Wöchenschrift of 1912 he records his results in support of his contention that the mixture is safe, reliable, and efficacious. His experiments are divided into three groups, according to the doses given. In all cases he injected 0.04 gm. of omnopon, and he varied the dose of hyoscine from 0.0004 gm. to 0.0006 and 0.0007 gm. The effect of the smaller doses was a quieting, but sleep was not produced. The medium doses effected a drowsy state, with complete amnesia. The full doses were given for major, and prolonged surgical procedures, and were usually associated with the inhalation of another anaesthetic. The quantity of the latter, however, was extremely small, and in a few cases the sleep was sufficient without any at all. A few cases of respiratory disturbances were met with. Myocarditis appeared to be the most dangerous complication. He had two deaths, one five days after the/

the operation from acute heart failure, and one from sepsis. In one patient no drowsiness at all was produced.

That this mixture is not entirely free from danger is shown by Zimmerman's case quoted in the preceding chapter.

From these extracts from the literature of hyoscine-morphine anaesthesia, it will be seen that there is considerable diversity of opinion as to the results obtained, that many observers do not consider it safe, and many condemn its use entirely.

The doses vary considerably with different operators. To avoid unnecessary duplication the dosage, results, and toxic symptoms produced will not be dealt with here, but will be discussed in the analysis of my own cases in Chapter V.

Hyoscine-Morphine Anaesthesia in Labour.

It is a custom with many obstetricians to inject small doses of hyoscine and morphine during the early stages of labour. It has been found that if injected during the first stage the woman does not feel the pains, but that the uterine contractions go on uninterruptedly. The woman sleeps between the contractions and wakes up while they are taking place. At the conclusion of labour the mother usually remembers nothing of what has happened.

The/

The chief disadvantage is the apnoea and cyanosis of the newly born child so often met with.

Much work has been done on this subject at the Simpson Memorial Hospital, and a large series of records taken by Dr. H. Ruthven Lawrence when working under Sir J. Halliday Croom is recorded in the Edinburgh Medical Journal. The favourable opinion which one formed, when a student at the Simpson Memorial Hospital, of the use of these alkaloids in labour, led one to take a wider interest in the subject of hyoscine-morphine anaesthesia.

Hyoscine-morphine Narcosis as a preliminary to
Inhalation Anaesthesia.

Many anaesthetists administer a preliminary injection of hyoscine and morphine about an hour before proceeding to obtain complete anaesthesia by means of chloroform, or ether.

One's own experience is that the shallow respirations, and interference with the pupillary reflexes render the anaesthetist's task more difficult. Especially is this the case where chloroform is used. In the case of ether the respirations usually become deeper from the ether stimulation. The action in diminishing salivary secretion is sometimes of use during ether administration. With patients in whom the fear of the approaching operation is not very marked/

marked, the disadvantages referred to above far outweigh any advantages, and anaesthesia is more easily produced by induction with chloroform followed by maintenance by ether. In highly neurotic patients, with whom danger is anticipated on account of their terrified condition, one has found great advantage derived from the administration of sufficient morphine and hyoscine, to produce deep slumber and then to administer ether by the open method.

Great care must be exercised lest the patient inhale vomited matter or buccal secretions, and at the completion of the operation the nurse in charge must be warned of these dangers.

It has been stated that the prolonged sleep following the operation is an advantage. This is certainly so in some cases, but in abdominal operations the pain due to meteorism following the paresis of the intestine by the morphine is usually quite in excess of the pain one has alleviated by one's preliminary injection. Morcom finds that abdominal relaxation is more difficult to produce where hyoscine and morphine have been given. This has not been my experience. Leopold has pointed out that there is an increased tendency to pulmonary complications.

Chloroform is an extremely dangerous drug to use where at all a deep degree of narcosis has been produced by hyoscine and morphine, as the respiratory and/

and vascular centres are further depressed, and the anaesthetist can place no reliance upon the reactions of the pupil. Many observers, however, make a routine use of hyoscine and morphine before administering chloroform.

CHAPTER IV.Cases of Hyoscine-Morphine Anaesthesia.

The cases recorded below are those in which observations have been made on hyoscine-morphine anaesthesia.

The capitals H and M stand for hyoscine and morphine respectively.

In recording the effect upon the respirations the term normal is used to signify the slightly slowed, rather shallow respiratory movements which are to be expected in the case of an individual under the influence of a narcotic.

Case 1. Female, aged 28.

Disease. Perforated Appendix: oozing into wound during operation. Wound very tightly plugged.

General condition toxaemic.

Dosage 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Plugging removed half hour later; considerable force used. During this patient was unconscious and quiet. Later muttering delirium set in.

Pupils dilated. Sleep lasted two hours.

Respirations not markedly affected.

Memory. Had no recollection afterwards of having been/

been dressed.

Result good.

Case 2. Female, aged 65.

Disease. Malignant Ascites.

General condition. Cachetic: very nervous and afraid of being hurt.

Dosage. 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$ 8 p.m.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$ 9 p.m.

Operation 9.30. Abdomen punctured with trocar.

Patient comatose. Twitching movements of hands present.

Pupils widely dilated.

Sleep. Slept from quarter an hour after first injection till three hours after operation.

Respirations. Patient breathed stertorously, puffing out cheeks. Respirations slowed.

Memory. No recollection of operation.

Result. Slight morphine-hyoscine poisoning.

Case 3. Male, aged 44. Coloured.

Disease. Injury to nose from kick of a horse: nose flattened. Anterior end of septum dislocated towards upper lip. Long tear along right ala nasi.

Dosage. 1st H. gr. $\frac{1}{100}$, M. $\frac{1}{4}$ gr. Internal 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{2}$.

Operation. Sluggish in movement and speech. Answered questions intelligently. Edges of wound freshened.

Anterior/

Anterior end of septum replaced and stitched. Wound sutured. Nose plugged.

Pain. Apparently felt pain to some extent and appeared to be conscious of what was going on.

Pupils contracted. Respirations depressed.

Sleep. Slept for several hours afterwards.

Memory. No recollection the next day.

Result. Fairly good as far as anaesthesia is concerned. Slight toxic symptoms.

Case 4. Male, aged 44, coloured.

Dosage 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation three quarters of an hour later. Cystoscopic examination lasting half an hour.

Semiconscious. Felt no pain.

Respirations normal. Pupils medium.

Result good.

Case 5. Male, aged 30, coloured.

Disease. Fracture middle third of right femur also a Pott's fracture.

Condition. Very muscular.

Dosage 1st H, gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. Attempt to reduce fracture half an hour later quite unsuccessful on account of absence of muscular relaxation. C H Cl₅ administered.

Result. Quite unsuccessful.

Case/

Case 6. Male, aged 35, coloured.

Disease. Three fingers completely pulped by steam hammer.

Condition. In great pain; throwing himself about.

Dosage. 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Novocaine and adrenalin solution injected along digits and 1st, 2nd and 3rd fingers amputated.

Pain. Felt slight pain during amputation of 1st finger.

Sleep. Slept quarter of an hour after first injection, woke up and slept for one and a half hours after operation.

Respirations normal.

Memory. No recollection of suffering pain.

Case 7. Male, aged 44. European.

Disease. Perineal abscess of considerable extent.

Condition. Suffering great pain: unable to sleep.

Dosage. 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation 25 minutes later, abscess opened by incision radiating from anus by Hilton's method. One pint of pus evacuated.

Unconscious. Pains Absent. Pupils dilated.

Respirations depressed. Memory: Complete amnesia.

Result good.

Case/

Case 8. Female. European.

Disease. Rectal stricture with ulceration.

Dosage. 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.
2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. Sphincter ani dilated, proctoscopic examination. Stricture dilated.

Semiconscious.

Pain. Showed slight signs of discomfort.

Respirations normal.

Memory. Patient had a very hazy notion as to what had happened.

Result good.

Case 9. Male, aged 53, coloured.

Disease. Urethral Fistula.

Condition good.

Dosage. One injection, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{2}$.

Operation. Urethra dilated: catheter tied in: sinus freely opened, scraped and carbolised.

Consciousness. Woke up during cutting.

Pain. Showed signs of pain during cutting and scraping.

Respirations normal. Pupils contracted.

Memory. When told that he had been operated upon without chloroform was indignant, as he had no recollection of the occasion.

Result good.

Case/

Case 10. Male, aged 45, European.

Disease. Perineal abscess, and stricture.

Condition. Severe septic poisoning.

Dosage. 1 injection, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. Attempt to pass instruments failed.

Abscess opened. Bladder tapped supra-pubically.

Slept during operation.

Pain. Signs of pain during tapping and during instrumental manipulations.

Pupils medium. Respirations slowed.

Memory. No recollection.

Result. Unsatisfactory.

Case 11. Male, aged 28, European.

Disease. Double Pott's Fracture.

Condition good.

Dosage. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation half an hour later. Both fractures reduced and put up in box splints.

Pain. Patient moaned during manipulations.

Sleep. Slept for several hours after operation.

Respirations normal.

Memory. Remembered the reduction of the fractures, but had no recollection of having suffered pain.

Result good.

Case 12A. Male, aged 47, European.

Disease. Oblique fracture upper third Femur below Trochanter/

Trochanter.

Condition. Delirium Tremens.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.
2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. Fracture reduced and placed in double inclined plane.

Patient quiet.

Pain. Occasional groan. Respiration stertorous.

Pupils contracted.

Slight morphine poisoning later.

Case 12B. Some days later.

Patient saner to-day.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{12}$.

Patient became abusive and restless. Refused to keep quiet. The limb was placed in a Hodgens splint.

Result. Condition rendered worse.

Case 13. Male, aged 34, coloured.

Disease. Terminal phalanx of first finger crushed.

Condition good.

Dosage. 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.
2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation 20 minutes later. Amputation through the middle phalanx. Woke up during operation.

Pain. Felt skin incision, and use of bone forceps.

Pupils medium.

Sleep. Slept for a few hours.

Respirations/

Respirations normal.

Memory. Denied having felt pain. Remembered operation.

Result satisfactory.

Case 14. Male, European.

Disease. Kidney abscess. At operation muscles had been very extensively cut and the wound tightly packed to prevent haemorrhage.

Operation Dressing.

Condition. Suffering from shock.

Dosage. 1st. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.
2nd. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation half an hour later. Patient was unconscious, woke up on being turned on side. Felt pain slightly.

Plug removed.

Sleep. Two hours after.

Respirations normal.

Memory. Very faint recollections of operation.

Result. Fairly satisfactory. Marked paresis of bowel later.

Case 15. Male, aged 65, European.

Disease. Stricture and Balanitis.

General Condition. Arteriosclerosis and Cystitis.

Dosage. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Then skin of prepuce was infiltrated with novocaine.

Operation. Prepuce slit up.

Pain/

Pain. Nil.

Sleep. Three hours.

Mental. On waking became slightly delirious.

Respirations normal.

Memory. Complete amnesia.

Result good.

Case 16. Male, aged 34. European.

Accident. This patient, while suffering from delirium tremens, jumped from a balcony and fractured outer wall of left frontal sinus, roof of left orbit, right femur, both palællae, left olecranon process and right radius.

General condition. Marked delirium tremens.

1. 4. 13. Dosage, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Patient quietened and was examined and limbs placed in splints. That evening the injection was repeated to keep him quiet.

Result good.

5. 4. 13. Recovered from delirium.

Dosage, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$, slept 45 minutes, later attempt to reset femur failed. Quarter an hour later, injection repeated.

Operation quarter of an hour after. Fracture reduced.

Sleep. Patient slept, waking up occasionally during manipulations, which lasted one hour.

Pain. Almost absent. Respirations normal.

Pupils medium. Memory: complete amnesia.

Result. Very good.

Case/

Case 17. Male, aged 28. European.

Disease. Light stricture membranous urethra.

General condition. Cystitis.

Preliminary notes:-

3rd March. Patient extremely nervous. All attempts at passage of bougie failed. Patient very excited and would not keep still: interfered with Surgeon. Attempt abandoned owing to resistance.

5th March. Ch Cl₃. Took anaesthetic very badly. Attempt to pass bougies failed.

11th March. Urethra cocained. Patient very nervous, gave surgeon no chance.

13th March.

Dosage, 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.
 2nd do. do.

Operation. Patient asleep. Attempts with metal and filiform bougies were made for about an hour. He woke up when instruments reached stricture: groaned slightly. Sleep. Slept greater part of operation and for few hours afterwards.

Respirations normal. Pupils slightly dilated.

Pain absent. Memory: Amnesia complete.

Result. Good.

15th March.

Dosage, 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.
 2nd do. do.

Operation/

Operation. Procedure repeated. Resisted slightly.

Pain present. Pupils medium.

Respirations normal. Sleep absent.

Memory. Slight recollection of events.

Result. Unsatisfactory.

Case 18. Male, aged 18, European.

Disease. Abscess of elbow joint.

Dosage, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Three quarters of an hour later skin infiltrated with novocaine. He was then awake and drowsy and felt the needle.

Operation. Did not feel skin incision, felt pain very acutely on bone being touched.

Sleep nil. Pupils medium.

Respirations normal. Pain acute.

Memory unaffected.

Result unsatisfactory.

Case 19. Male, aged 64, European.

Disease. Urethral strictures.

General condition. Cystitis and retention of urine.

Previous attempt at dilatation failed owing to pain.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.

2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation quarter of an hour later. Stricture dilated.

Pain nil.

Sleep. 1st injection, nil. 2nd injection, asleep at operation: woke up during operation: lasted three hours/

hours after operation.

Pupils normal. Respirations stertorous.

Mental. Slight aberration while awake during operation.

Memory. Remembered nothing of operation.

Result good.

Case 20. Male, aged 40, coloured.

Disease. Stricture of urethra and retention of urine.

General condition. Marked septic poisoning.

Dosage, 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval $\frac{3}{4}$ hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. For three quarters of an hour attempts were made to pass bougies, finally a filiform one was passed and the bladder tapped suprapubically.

Sleep. No sleep after first injection. Patient went to sleep five minutes after second, sleep passing into deep coma from which he could not be roused.

Was roused three hours after second injection.

Pain nil.

Pupils slightly dilated greater part of the time.

Respirations. Severely embarrassed. Long, slow, sighing breathing. Caused anxiety for $2\frac{3}{4}$ hours.

Patient was given hot coffee per rectum.

Result. Dangerous degree of poisoning produced.

Case 21. Male, aged 17, European.

Accident. 1st and 2nd fingers crushed.

General/

General condition good. Suffering great pain.

Dosage, 1st H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.

2nd H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Fingers infiltrated with novocaine.

Operation. Terminal phalanges of 1st and 2nd fingers removed.

Pain. Felt injection of novocaine.

Sleep. Slept five minutes after first injection.

Woke up while novocaine was being injected. Slept during operation.

Respiratory and Circulatory Systems unaffected.

Pupils slightly dilated.

Memory. No recollection of operation.

Result satisfactory.

Case 22. Male, coloured.

Disease. Hip disarticulated two days before.

General condition. Shock.

Dosage. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Dressed half an hour later, woke up and felt great pain.

Sleep. Few minutes.

Memory. Full recollection of dressing.

Result. Failure.

Two days later.

Dosage. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Dressing three quarters of an hour later. Felt pain acutely/

acutely, and remembered events perfectly afterwards.

No sleep.

Result. Failure.

Case 23. Female, aged 40, coloured.

Disease. Safety pin from colostomy operation firmly embedded in abdominal wall.

Dosage. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation half an hour later. Patient woke up and groaned a few times. Pin removed with considerable force.

Pain very slight.

Sleep. Slept greater part of operation and for $2\frac{3}{4}$ hours after.

Respirations normal. Pupils slightly dilated.

Memory. Complete amnesia.

Result good.

Case 24. Male, aged 32, coloured.

Disease. Whitlow tendon sheath of finger.

Dosage. H. gr. $\frac{1}{75}$, M. gr. $\frac{1}{4}$.

Operation ten minutes later. Incised and dilated.

Pain. Did not feel incision. Felt dilatation.

Sleep. None after incision. Respirations slowed.

Pupils contracted. Memory unaffected.

Case 25. Male, aged 35, European.

Disease. Septic tonsil. !!

Dosage/

Dosage. H. gr. $\frac{1}{100}$. M. gr. $\frac{1}{4}$.

Operation quarter of an hour later. Nail sprayed with Ethyl Chloride and removed.

Pain. Felt pain.

Sleep. Asleep before operation, woke up and did not sleep again.

Respirations normal. Memory unaffected.

Result unsatisfactory.

Case 26. Male, aged 18, European.

Disease. 3rd and 4th fingers crushed left hand.

Dosage, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Fifteen minutes later attempt to operate failed.

Twenty minutes later H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Fingers amputated.

Pain acute after first injection, absent after second.

Sleep. Deep for about one hour after second.

Respirations normal.

Mental. Delirious for about an hour after waking.

Memory. Amnesia.

Result. Good.

Case 27. Male, coloured.

Disease. Syphilis and phimosis.

General condition. Abscess of neck, condylomata, etc.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval $\frac{3}{4}$ hour.

2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Circumcised quarter of an hour later.

Pain/

Pain. Felt cutting and stitching.

Sleep. Awoke during operation. Slept for two hours after.

Pupils slightly dilated. Respirations normal.

Mental. Slight aberration during operation.

Memory. Remembered details of operation.

Note. The hyoscine in this case had been in solution for over a month.

Case 28. Male, aged 35. European.

Disease. Neuralgia of Inferior Maxillary division of fifth nerve.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.
2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. Attempt to inject nerve at Foramen ovale with alcohol. Partially successful.

Sleep. Drowsy during operation, slept for three hours afterwards.

Pain slight. Respirations normal.

Memory. Remembered operation.

Result. Successful.

2 weeks later.

Dosage, 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.
2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation. Procedure repeated.

Pain. Very great.

Sleep. Slept before operation. Afterwards did not sleep until pain passed off.

Result unsatisfactory.

Case/

Case 29. Male, aged 51, European.

Disease. Stricture of Urethra.

General condition. Cystitis, Emphysema and arterio-sclerosis.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.
2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Stricture dilated twenty minutes later.

Sleep. Awoke during operation. Slept for some hours afterwards.

Pain. Felt pain not very severely.

Pupils dilated.

Mental. Excited. Interfered with operator continually.

Respirations normal.

Memory. On awakening would not believe that his stricture had been dilated.

Some weeks later.

General condition rather worse. Respirations 22.

Dosage, 11 a.m. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Slept.

12 noon. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

12.30 Deeply comatose.

Respirations 12, breathing stertorous.

Operation. Stricture dilated, slept, felt no pain.

1.30. Respirations 8. Enema hot coffee.

2 p.m. Respirations 12. Cannot be roused.

3 p.m. Cannot be roused.

4 p.m. Respirations 14. Roused slightly.

5./

5 p.m. Quite conscious. Knows nothing of operation.

Result. Severe poisoning.

Case 30. Female, coloured.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$. Interval 1 hour.

2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Cystoscopic examination lasting $\frac{3}{4}$ hour.

Pain. Very slight.

Sleep. Slept most of time during operation. Lasted $2\frac{1}{2}$ hours.

Respirations slowed.

Result good.

Case 31. Male, aged 45, European.

Disease. Dupuytren's Contractions.

Condition. Good.

Dosage. 1st, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$. Interval 1 hour.

2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

Operation quarter of an hour later. Multiple incisions made through fascial bands and tendons to 4th and 5th digits.

Pain. Slight, did not cry out.

Sleep. Awoke during operation, but drowsy.

Respirations, normal. Pupils dilated.

Memory. Remembered being brought into theatre and operated upon. Said that he had felt no pain.

Result good.

Case/

Case 32. Female, aged 30, coloured.

Disease. Polypus of cervix uteri.

Condition. Good.

Dosage. H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Operation. Curettage of cervix. Dilatation unsatisfactory.

Pain. Marked.

Sleep. Present at onset of operation, woke up as soon as a dilator was inserted.

Respirations normal. Pupils dilated.

Memory. Remembered operation.

Result. Unsatisfactory.

Case 33. Female, aged 14, coloured.

Disease. Burnt arm.

Condition good.

Dosage. 1st, H. gr. $\frac{1}{150}$, M. gr. $\frac{1}{6}$. Interval 1 hour.

2nd, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$.

Did not sleep after first injection, slept lightly after second.

Operation 15 minutes later. Attempt to cut skin graft failed and operation was proceeded with under chloroform.

Pupils were normal.

Case 34. Female, aged 25, European.

Disease. Large fluctuating abscess behind and in front of the angle of the jaw on the left side.

Oedema of left side of face, closing mouth.

Dosage/

Dosage. 4.30, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$
 5.30, H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$.

6. Abscess opened and pus evacuated. During operation patient was entirely unconscious, breathing stertorously. Respiratory rate 10 per minute. At 6.30, the respirations were 5 per minute. There was manifestly respiratory obstruction. The expirations were long drawn out and stertorous. The inspirations short and sharp. The pause was lengthened. There was indrawing of the intercostal spaces during inspiration.

She was given Strychnine, gr. $\frac{1}{30}$, hypodermically, and an enema of hot coffee. Ice bags were applied to her neck.

The pulse at the time of operation was 150, small and of low tension.

She was cyanosed.

The pulse at 2 a.m. was 114 and the respirations 16. During the night the pulse and respiration records were as follows:-

| | Respirations. | Pulse. |
|-----------|---------------|--------|
| 8.50 a.m. | 10 | - |
| 10 p.m. | 12 | 136 |
| 1 a.m. | 16 | 120 |
| 2 a.m. | 16 | 120 |
| 6 a.m. | 20 | 104 |
| 7 a.m. | 20 | 104 |

At 5 a.m. the patient spat up mucus and perspired profusely. Between 5 and 6 a.m. the breathing became much easier but there was slight difficulty in expiration until the middle of that day.

CHAPTER V.Analysis of Cases.

The cases detailed in the previous chapter will be discussed below, and the results obtained compared with those of other workers, under the following headings:-

Dosage.

Interval before operating.

Age.

Sex.

Race.

Degree of anaesthesia produced.

Amnesia.

Sleep.

Effect on pupils.

Vomiting and nausea.

Paresis of the Bowel.

General condition of the patient.

Depression of the Respiratory Centre.

Operations performed.

Dosage/

Dosage.

The cases may roughly be divided into those in which one injection was given and those in which two injections were given.

One injection. Thirteen cases come into this group. The doses given and the results obtained are shown in the following table.

In this and following tables the heading "satisfactory" is used where either no pain was felt or where the pain was not sufficiently pronounced to interfere with the course of the operation.

Cases receiving 1 injection of Hyoscine and Morphine.

| Dose. | Number of cases. | Satisfactory. | Unsatisfactory. |
|--|------------------|---------------|-----------------|
| H, gr. $\frac{1}{100}$, M. gr. $\frac{1}{6}$ | 4 | 1 | 3 |
| H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{4}$ | 6 | 3 | 3 |
| H. gr. $\frac{1}{75}$, M. gr. $\frac{1}{4}$ | 1 | 1 | |
| H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{3}$ | 1 | 1 | |
| H. gr. $\frac{1}{100}$, M. gr. $\frac{1}{12}$ | 1 | | 1 |
| Totals | 13 | 6 | 7 |

It will be seen that this group includes over fifty percent of failures.

The results improved in proportion to the increase in the dosage. There were no toxic symptoms produced in any of these cases.

One injection of hyoscine, gr. $\frac{1}{100}$, morphine gr. $\frac{1}{4}$, was sufficient in only half the cases, showing that this/

this is too small a dose to produce an efficient anaesthesia.

Cases receiving two injections.

There were twenty-seven cases in this group, the results were as follows:-

Table II.

| 1st Inj. gr. | 2nd Inj. gr. | No. | Satisfact- ory. | Failures. | Toxic Symptoms. |
|--|--|-----|--------------------|-----------|--------------------|
| H. $\frac{1}{150}$ M. $\frac{1}{6}$ | H. $\frac{1}{100}$ M. $\frac{1}{6}$ | 1 | | 1 | |
| H. $\frac{1}{100}$ M. $\frac{1}{6}$ | H. $\frac{1}{100}$ M. $\frac{1}{6}$ | 10 | 8 | 1 | 1 |
| H. $\frac{1}{100}$ M. $\frac{1}{4}$ | H. $\frac{1}{100}$ M. $\frac{1}{4}$ | 16 | 10 | 2 | 4 |
| Totals | | 27 | 18 | 5 | 5 |

These injections were given in almost all instances with an interval of one hour between. In a few cases there were variations of from ten to fifteen minutes in the intervals between the doses.

It will be seen that with the smaller dose of morphine, there were two failures in eleven cases, and that in one case, No. 2 on the list, poisoning was produced. This was, however, slight.

In the group of cases in which two injections of hyoscine, gr. $\frac{1}{100}$, and morphine, gr. $\frac{1}{4}$, were given, ten out of sixteen were satisfactory, in two the degree of anaesthesia was not sufficient, and in four symptoms of poisoning of varying intensity were produced.

It/



It may therefore be taken that one injection of hyoscine, gr. $\frac{1}{100}$, morphine, gr. $\frac{1}{4}$, is insufficient to produce anaesthesia. That two injections of that strength are fairly reliable for the purpose of producing a partial anaesthesia, but their use is accompanied by considerable danger. That two injections of hyoscine, gr. $\frac{7}{100}$, morphine, gr. $\frac{1}{6}$, are rather less reliable for the purpose of inducing anaesthesia, and are not entirely free from danger.

Interval before operating.

In the first series of cases this was:-

| | |
|------------|----------|
| 15 minutes | 3 cases. |
| 30 minutes | 2 cases. |
| 45 minutes | 2 cases. |

No definite conclusions can be drawn here as to the most satisfactory interval to allow to elapse before commencing operation. Taking the series of cases receiving two injections the operation usually followed half an hour after the second injection. They vary, however, from ten minutes after. In three of the five unsatisfactory cases the operation was fifteen minutes after the second injection, in one twenty minutes, and in one half an hour. This shows that the operator probably is safer to wait for half an hour, thus giving the drugs time to act.

The following table shows the dosage used by the authors/

authors quoted in Chapter III.

Table III.

| Author | NO. of injections. | Total Dose | | Intervals before operations. |
|-------------------------------|--------------------|--|---------------------------------------|------------------------------|
| | | Hyoscine | Morphine | |
| Dirk | 2-3 | $\frac{1}{60}$ gr. - $\frac{1}{50}$ gr. | $\frac{1}{3}$ gr. - $\frac{1}{2}$ gr. | 1 hour. |
| Ferrier) (Desjardins) | 3 | gr. $\frac{1}{64}$ | gr. $\frac{1}{6}$ | 1 " |
| Segelkin | 2-3 | gr. $\frac{1}{75}$ - gr. $\frac{1}{50}$ | gr. $\frac{1}{3}$ - gr. $\frac{1}{2}$ | $1\frac{1}{2}$ - 1 " |
| Williams | 2 | gr. $\frac{1}{64}$ | gr. $\frac{2}{5}$ | $\frac{1}{2}$ " |
| Norbury * | 1-2 | gr. $\frac{1}{75}$ | gr. $\frac{1}{6}$ - gr. $\frac{1}{3}$ | 1 " |
| Harris | 1 | gr. $\frac{1}{150}$ | gr. $\frac{1}{3}$ | 20 minutes. |
| Offengeld | 1 | gr. $\frac{1}{150}$ gr. $\frac{1}{100}$ gr. $\frac{1}{75}$ | Omnopon gr. $\frac{5}{8}$ | |

From this table it will be seen:-

(1) That most observers prefer to administer several injections, usually two, and to commence the operation from twenty minutes to an hour after the last injection.

(2) That the dosage adopted by most observers approximates that found to be most reliable by myself, namely about gr. $\frac{1}{50}$ of hyoscine, and gr. $\frac{1}{3}$ of morphine. Some use more morphine and less hyoscine. Harris uses one small dose, but he does not aim at producing a state of complete unconsciousness. Offengeld found that with/

* with atropine gr. $\frac{1}{150}$.

with the two smaller doses of hyoscine an insufficient degree of narcosis was produced.

As it is well known that individuals react in different degrees to the effects of hyoscine, and morphine, the wisdom of so large a dose as hyoscine gr. $\frac{1}{50}$, and morphine gr. $\frac{1}{3}$, in two injections, will be apparent. The operator is enabled to study the effect of his first injection, and should any untoward symptoms arise, the second injection may either be diminished or withheld.

Age.

The ages of patients varied from fourteen to sixty-five. Case 33, aged fourteen, received hyoscine gr. $\frac{2}{125}$ morphine gr. $\frac{1}{3}$, sleep was not produced and the anaesthesia was less satisfactory than in any other case.

The numbers in the various decades, with the total dosage employed and the results, are represented in the following table:-

Table IV/

Table IV.

| Decade. | Cases. | Dosage. | Satis- factory. | Fail- ures. | Poisoned. |
|---------|----------|---|--------------------|----------------|-----------|
| 2nd | (2 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{2}$ | 2 | 1 | |
| | 3) (1 | H.gr. $\frac{2}{125}$, M.gr. $\frac{1}{3}$ | | | |
| 3rd | (1 | H.gr. $\frac{1}{100}$, M.gr. $\frac{1}{4}$ | 1 | | |
| | 6) (3 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{3}$ | 3 | | |
| | (2 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{2}$ | 1 | | 1 |
| 4th | (1 | H.gr. $\frac{1}{100}$, M.gr. $\frac{1}{6}$ | | 1 | |
| | (2 | H.gr. $\frac{1}{100}$, M.gr. $\frac{1}{4}$ | 1 | 1 | |
| | 10)1 | H.gr. $\frac{1}{75}$, M.gr. $\frac{1}{4}$ | 1 | | |
| | (1 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{6}$ | 1 | | |
| | (5 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{2}$ | 3 | 2 | |
| 5th | (1 | H.gr. $\frac{1}{100}$, M.gr. $\frac{1}{4}$ | | 1 | |
| | 7) (6 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{2}$ | 4 | | 1 |
| 6th | (1 | H.gr. $\frac{1}{100}$, M.gr. $\frac{1}{3}$ | | 1 | |
| | 3)1 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{3}$ | | 1 | |
| | (1 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{2}$ | | | 1 |
| 7th | (1 | H.gr. $\frac{1}{100}$, M.gr. $\frac{1}{6}$ | 1 | | |
| | 3) (2 | H.gr. $\frac{1}{50}$, M.gr. $\frac{1}{3}$ | 1 | | 1 |

In the cases of seven patients the ages are not recorded. This table shows:-

- (1) That there is not much variation produced on account of age between the second and fifth decades.
- (2) That patients in the sixth and seventh decades apparently do not tolerate large doses of hyoscine and morphine/

morphine, as well as younger adults.

This was pointed out by Segelkin, and Harris.

Sex. Nine of the patients were females, and twenty-four were males. No variation in action was noted which could be ascribed to sex.

Race. Nineteen patients are classified as European and fifteen as coloured. These latter are of mixed European, Hottentot and Bantu descent. Roughly the results may be tabulated as below taking, for the sake of uniformity, the two largest groups according to dosage, viz., hyoscine gr. $\frac{1}{50}$, morphine gr $\frac{1}{2}$ and gr. $\frac{1}{3}$. The patients will be taken from those in the third, fourth and fifth decades.

Table of results obtained in patients between 20 years and 50 years of age, with (I) a total dosage of hyoscine gr. $\frac{1}{50}$ and morphine gr. $\frac{1}{2}$, and (II) a total dosage of hyoscine gr. $\frac{1}{50}$ and morphine gr. $\frac{1}{3}$.

Table V.

| Race. | Cases. | Successful. | Failures. | Poisoning. |
|--------------|--------|-------------|-----------|------------|
| I. European | 8 | 5 | 1 | 2 |
| Coloured | 5 | 3 | 1 | 1 |
| II. European | 3 | 3 | | |
| Coloured | 3 | 3 | | |

Discrepancies/

Discrepancies in numbers as compared with the table showing results according to decades are due to the fact that in some cases where the age is not stated patients were known to be between 20 and 50.

This shows that there was no divergence of results which can be ascribed to race.

Degree of anaesthesia produced.

Pain. Of thirty-five operations, no pain was felt in fourteen. In twelve there was slight pain, in five this pain was of quite a pronounced character, and in three it was acute.

The degree of pain produced in these cases, with four groups according to dosage, is represented below.

Table VI.

| Dosage. | No pain. | Pain slight. | Pain more marked. | Pain acute. |
|---|----------|--------------|-------------------|-------------|
| H,gr. $\frac{1}{100}$, M,gr. $\frac{1}{6}$ | | 3 | | 1 |
| H,gr. $\frac{1}{100}$, M,gr. $\frac{1}{4}$ | 2 | 1 | 1 | 1 |
| H,gr. $\frac{1}{50}$, M,gr. $\frac{1}{3}$ | 4 | 3 | 2 | |
| H,gr. $\frac{1}{50}$, M,gr. $\frac{1}{2}$ | 8 | 5 | 2 | 1 |
| | 14 | 12 | 5 | 3 |

The most which can be expected from this mixture, then, is a diminution of pain. Its action is unreliable. With small doses pain may be abolished entirely as in cases 11 and 23, whereas in case 33 with a moderately large dose, we find acute pain present. In case 29 we/

we find that on one occasion hyoscine, gr. $\frac{1}{50}$, and morphine, gr. $\frac{1}{3}$, was insufficient. A few weeks later severe poisoning was produced by a rather larger dose of morphine.

With doses of hyoscine, gr. $\frac{1}{50}$, and morphine, gr. $\frac{1}{2}$, which have already been shown to be dangerous, we find that in only eight or half the cases was pain abolished entirely, in five there was very slight pain, in two the pain was too severe to justify their use, and in one case, No. 28, very severe pain was experienced.

In the articles quoted previously we find that in a large number of cases chloroform or ether was resorted to. In Dirk's 260 cases, the hyoscine-morphine mixture sufficed in 29 cases. In Ferrier and Desjardin's cases it sufficed in 26 out of 100. In Norbury's six cases gas was resorted to in one instance.

From these and my own statistics only one conclusion can be drawn, and that is that the hyoscine-morphine mixture is in itself too unreliable to be used in safe doses for the purpose of producing complete anaesthesia, and that its use is only justifiable where a drowsiness is desired preliminary to the use of ether or local anaesthesia, or in cases where complete abolition of common sensibility is not aimed at.

Amnesia. It has been noted by most observers on the action of hyoscine that persons who have been placed under its influence, on recovery have as a rule no recollection/

recollection of what happened during the time in which its action was exerted. More especially does this apply to pain experienced.

Of thirty-four operations, the patients in twenty-one instances had either no recollections, or very dim recollections of having experienced pain.

In how far this is of advantage is a moot point. The multiparous woman who believes that her last delivery was painless, will certainly be saved much mental suffering as her next labour approaches. The individual with a urethral stricture is more likely to heed the warnings of his doctor, and submit to regular dilatation after the operation has been performed under hyoscine and morphine.

Sleep. The patients usually fell into a light sleep after the first injection. They could be easily roused, and often woke up while receiving the second injection. In five cases out of twenty-five no sleep was produced by one injection, the patient was usually, however, in a drowsy condition. A deep sleep was usually produced about ten minutes after the administration of the second injection. As a rule they woke up during an operative procedure which was causing much stimulation, offered some resistance, and then fell asleep again immediately. At other times they remained awake, usually in a confused, semi-delirious condition, muttering/

muttering to themselves, and sometimes interfering with the operator. In a few cases, such as 28A, the patient became perfectly conscious.

Patients in all cases, excepting the few in which severe toxic symptoms arose, could be roused and made to answer questions. The answers were given in a dull, confused manner and the patient forgot a few seconds later what had been said to him.

Most patients slept for some hours after operation. In sixteen cases the average duration of sleep after the operation was $2\frac{1}{2}$ hours. One patient slept for eight hours, two patients out of the sixteen did not sleep at all.

Pupils. The condition of the pupils varied. In some cases they were contracted, in some dilated, but in most were medium in size.

Delirium. A mild form of delirium was present in cases 1, 15, 19, 27 and 29A. The patients muttered and made movements with their hands, as if to hinder the operator. Cases 15, 19 and 29A were old men, the subjects of genito-urinary disease, and suffering from chronic cystitis.

A young adult, No. 26, became quite delirious about one hour after the second injection, and had to be held in bed.

Cases/

Cases 12B and 16 were suffering from delirium tremens at the time of operation. In the former instance the delirium was not quietened, in the latter it was.

Vomiting and Nausea. These were not noticed in any of the cases.

Paresis of the Bowel. In Case 14, where hyoscine gr. $\frac{1}{50}$ and morphine gr. $\frac{1}{3}$ were given to lessen the pain of a very large dressing after excision of a septic kidney, great difficulty was experienced in getting the bowels to act. The morphine had probably rendered the condition worse.

General Condition of the Patient.

In eleven cases the general condition of the patient was good, of these one, an exceedingly muscular kaffir, case 30, received H.gr. $\frac{1}{50}$ and M.gr. $\frac{1}{2}$ in two injections. After the second injection, he fell into a light sleep from which he quickly woke. When an attempt was made to reduce his fracture he became violent and abusive.

Nervousness. Two patients were very nervous. It was found that they quietened down after the first injection. In each case the result was very satisfactory.

Sepsis. Ten cases suffered from septic absorption.
In/

In some of these the toxaemia was pronounced, being due in seven instances to chronic cystitis.

Urinary Sepsis. Case 20, suffering from retention of urine, with bladder and renal complications, and case 29, suffering from chronic cystitis, were both badly poisoned by the hyoscine-morphine mixture, the respiratory centre being depressed, with the production of cyanosis and dyspnoea.

Cases 7, 10 and 17, all subjects of genito-urinary sepsis, also showed a quite noticeable degree of respiratory depression.

Case 2, suffering from extensive malignant disease, developed stertorous breathing.

Delirium Tremens. Two patients suffered from delirium tremens, one was quietened, and in the other the condition was rendered worse.

Shock. Four patients suffered from shock. In one case, No.12, who later developed delirium tremens, the breathing became slow and stertorous. In one with a small dose very little effect was produced. In one the result was good.

Oedema of the Glottis. One patient, suffering from an abscess in the neck with cellulitis of the cheek, developed a dangerous combination of depression of the respiratory centre, and oedema glottidis.

These cases show:-

(1) That young muscular adults in good condition require/

require large doses of hyoscine and morphine.

(2) That hyoscine and morphine are useful in nervous patients.

(3) That hyoscine and morphine must be used with care in cases suffering from chronic septic absorption.

(4) That more especially is this the case if the patient be subject to chronic genito-urinary sepsis.

(5) That in cases where oedema of the glottis might supervene, hyoscine and morphine should never be used.

Depression of the Respiratory Centre.

Hyoscine and morphine, being both powerful depressors of the respiratory centre, it is evident that when they are used in conjunction, the respirations will in all cases be slowed.

In Dr. Given's case, where the patient took one thirteenth of a grain of hyoscine, the breathing became stertorous: in Dr. Morton's case it was slow and sighing. In Zimmerman's case, after receiving .0007 grm. of hyoscine, and .004 grm. of pantopon, the breathing stopped and artificial respiration was resorted to for fifteen minutes, and the respirations were below ten to the minute for three quarters of an hour.

Norbury, Harris and Offengeld all record cases in which respiratory depression occurred. Three cases of mine, Nos. 20, 29A and 34, exhibiting this phenomenon/

phenomenon in rapid succession led me to abandon the use of hyoscine and morphine entirely. Fortunately the results were not so bad as they might have been. In cases 20 and 29A it was recognised that far too deep a degree of narcosis was produced, but the condition of the patients never caused my colleagues and myself any real anxiety. Matters were different with case No. 34, who caused us great anxiety for some hours, and I cannot but think that we were exceedingly fortunate in not having lost this patient.

As it was owing to the ill effects of the hyoscine-morphine mixture upon the respiratory system that I abandoned its use a short review of the results in the cases in which toxic symptoms were produced would not be out of place here.

Case 2. Female, aged 65, the subject of advanced malignant disease. One injection of hyoscine, gr. $\frac{1}{100}$, morphine, gr. $\frac{1}{6}$, produced sleep, a second produced deep coma, the breathing became stertorous, and she slept for three hours. The poisoning was slight. Here the dosage was larger than the patient's age and conditions warranted.

Case 10. Showed slight depression after one injection of hyoscine, gr. $\frac{1}{100}$, and morphine, gr. $\frac{1}{4}$.

Case 12 contracted pupils and stertorous breathing with hyoscine gr. $\frac{1}{50}$, and morphine, gr. $\frac{1}{2}$.

Case 20. Received hyoscine, gr. $\frac{1}{50}$, morphine, gr. $\frac{1}{2}$.

He/

He was in a state of profound toxic poisoning. His breathing became slow, the respirations were long, slow and sighing. He could not be roused for two and three quarter hours.

Case 29B; Had received two injections of hyoscine, gr. $\frac{1}{100}$, morphine gr. $\frac{1}{6}$, some weeks before. He became slightly delirious and felt pain. On increasing the doses of morphine to gr. $\frac{1}{4}$, his respirations fell to 8 per minute one and a half hours after the second injection. He was given an enema of hot coffee, and half an hour later they had risen to 12. He could not be roused until four hours after the second injection.

Case 34 received in all hyoscine, gr. $\frac{1}{50}$, morphine, gr. $\frac{1}{2}$. Two hours later her respirations were 5 per minute. The expirations were long drawn out and stertorous. There was indrawing of the intercostal spaces.

She was given strychnine, gr. $\frac{1}{12}$, hypodermically, and hot coffee by the rectum. Her respirations did not rise to ten until four and a half hours after the second injection.

The three last cases were not suitable for hyoscine-morphine anaesthesia and the doses of morphine were too large, but we have seen that a few weeks before a slightly smaller injection had proved insufficient in the case of No. 29. The irregularity in action of the/

the mixture as shown in that case is sufficient to condemn its use.

The occurrence of such severe toxic symptoms during three minor operations out of forty shows that the mixture is more dangerous than chloroform and ether, and that its use can only be justified in selected cases, or in cases where a very small dose is used in association with local anaesthesia.

Operations performed.

Surgical dressings. There were five cases of major surgical dressings. In two there was a satisfactory degree of anaesthesia, in one the pain was greatly diminished, and in two there was great pain. The parietic effect of morphia on the bowels must be considered before doing an abdominal dressing under morphine and hyoscine.

Amputation of Fingers. Four cases were done.

Novocaine was usually injected. The long period of waiting for the alkaloids to act might be utilised for the purpose of preparing the patient for chloroform in cases of accidents. Local anaesthesia without hyoscine and morphine is usually sufficient.

Cystoscopic and Proctoscopic Examinations. These were carried out successfully in three cases. Provided there are no contra-indications, great benefit is/

is derived from small doses of hyoscine and morphine. The patient becomes drowsy, and much of the pain and unpleasantness of the procedures are lost to him.

Dilatation of Urethral Strictures.

Provided there is no pronounced degree of cystitis, hyoscine and morphine are exceedingly useful during dilatation of strictures. The patient is less highly strung than when the operation is done without an anaesthetic. The work of the operator is easier. There is less muscular spasm. The patient often forgets about the operation, and there is less probability of fear preventing him from having his stricture regularly attended to.

Of six cases, two were quite successful, two partially successful and two dangerously poisoned.

Setting of Fractures. In two cases the hyoscine-morphine anaesthesia was successful. In two it failed absolutely. The mixture is not to be recommended in these cases, as there is an absence of the complete muscular relaxation obtained by the use of chloroform.

Injection of the branches of the 5th Nerve with alcohol.

This operation was performed twice, once successfully, and once quite unsuccessfully. As complete anaesthesia is a disadvantage, and it is only desired to obtain partial anaesthesia, hyoscine and morphine narcosis/

narcosis should have a distinct sphere of usefulness in these cases. Using the dosage adopted by Harris, hyoscine gr. $\frac{1}{150}$, morphine gr. $\frac{1}{3}$, the nervousness of the patient would be overcome, there would not be too deep an anaesthesia, and there would be no danger to the patient.

A circumcision was performed successfully and the fascial bands were divided with complete success in a case of Dupuyen's contraction. The mixture has nothing to recommend it in these cases, as the doses have to be large, and it has already been shown that anaesthesia produced by large doses is more dangerous than chloroform anaesthesia.

There was one case each of removal of a toe nail, skin grafting and curettage of the cervix uteri. These were all unsuccessful.

There were various cases in which abscesses were drained. This is usually more safely, more rapidly, and more easily done under gas, with far less risk to the patient.

CHAPTER VI.C O N C L U S I O N S .

The conclusions I have drawn from the results obtained in my series of cases are:-

1. That hyoscine-morphine anaesthesia is unreliable.
2. That the dosage required to produce complete anaesthesia is often too large to be used with safety, and that with safe doses only a partial anaesthesia can be expected.
3. That the chief danger to be guarded against is excessive depression of the respiratory centre.
4. That this is more liable to be met with in patients subject to severe septic poisoning, especially in those suffering from chronic urinary sepsis.
5. That in all cases in which there is a possibility of the development of oedema of the glottis, the use of hyoscine-morphine narcosis is strongly contra-indicated.
6. That in the case of patients past fifty years of age, the dangers of hyoscine-morphine narcosis are increased.
7. That no variation in action can be ascribed to race, or sex.
8. That in no cases should a larger dosage than hyoscine gr. $\frac{1}{50}$ and morphine gr. $\frac{1}{3}$ be used.
9. That this dose is best administered in two subcutaneous injections, the first to be given one and a half hours before the operation and the second half an hour before operation.
10. That if no contraindications to their use be present, these alkaloids are of distinct advantage in producing a state of partial anaesthesia during such operations as the dilatation of urethral strictures, cystoscopic and proctoscopic examinations, and the injection of alcohol into the branches of the trigeminal nerve.
11. That after the operation the patient, in most cases, has no recollection of having experienced pain.

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