I have had practically no experience of the treatment of furunculosis and carbuncles, though other workers seem to have experienced good results, particularly in the former condition.

Schreus has noticed that irradiation of boils in one area (one and one-fifth skin dose with 2 mm. aluminium at 20 cm. anticathode skin distance) has resulted in gradual decrease of the number of fresh ulcers appearing in other parts, until finally the condition has cleared up entirely. He suggests that the changes in the irradiated skin are probably due in the first place to the destruction and absorption of the staphylococci and diseased tissue cells. This tends to result in a form of auto-vaccination, with the production of specific protecting bodies, and the creation of some degree of resistance and immunity. This so-called immunizing action of the rays may be further reinforced by the use of autogenous vaccines.

SUPERSOFT RAYS.

In conclusion, the recent work in the treatment of skin diseases by means of supersoft rays is of such importance that this paper would be incomplete without a brief reference to this method of treatment.

Several experiments by Bucky and others have been carried out in this field, dating from 1912, and have culminated in a paper on "Supersoft Röntgen rays in dermatology," by J. J. Eller, which was read before the New York Röntgen Society in 1927. These rays were produced by means of a specially constructed transformer unit and a Müller tube, and were of the length produced by a kilovoltage of 8 and a milliamperage of 8. One unit dose was considered the dose which was necessary to produce a mild erythema within twenty-four hours at an anti-

cathode skin distance of 6 cm. Working under the above conditions this was accomplished in three minutes.

It is claimed that the use of supersoft rays has certain advantages over the rays of shorter wave-length in general use. Supersoft rays are similar to medium x rays in that they produce an erythema, have penetration, may produce pigmentation, and have cumulative effects from successive treatments. They differ from the biological effects of harder rays in that erythema may appear almost instantaneously—that is, within two or three hours, or even less (compare three days to fourteen days with harder rays). Penetration of supersoft rays is much less, hence one or two erythema doses can be given without temporary or permanent epilation.

Following larger doses Schultz reported cases in which actual ulceration occurred. These ulcerations were painless and healed without atrophy of the surrounding skin after fifteen months. No atrophy of the skin, telangiectases, or malignant manifestations have been noticed two years after marked erythema doses, though these, of course, may appear later on.

Among many skin diseases treated, mention is made of acne vulgaris. The results of treatment in this condition were not particularly good, certainly no better than by the present-day methods of treatment. Good results, however, are reported in the case of sycosis, paronychia, and carbuncles.

This method of treatment by supersoft rays is at present in its infancy, but it will—in the opinion of workers in this field—ultimately find an important place in the treatment of dermatological conditions. It is believed, however, that these rays will never replace entirely the medium rays as used at the present day.

RECTAL ETHER-OIL ANAESTHESIA, WITH SPECIAL REFERENCE TO BRAIN SURGERY.*

BY

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It is surprising to find that the administration of ether per rectum was first described as early as 1847. The method employed then and up to about 1910 was that of pumping ether vapour into the bowel, and, though the results were encouraging, the method was acknowledged to be more complex than that of ordinary inhalation anaesthesia.

The properties and action of ether in oil per rectum were first investigated by Dr. Gwathmey of New York, who read a paper on the subject in London in 1913, since when this method of administration has been taken up and proved by many anaesthetists. Dr. Gwathmey himself inspired me to try this method, and during the past two years I have used it in over seventy cases, using a modification of his technique.

The uses of rectal ether-oil in general surgery are very wide, and its very safety has made it the anaesthetic of choice in all bad surgical risks in my hospital practice. But for the lack of time I would use it far more extensively. Of the cases selected for the use of this method I have records of umbilical hernia, cholecystectomy, cholecystostomy, exploratory laparotomy, nephrectomy, appendicectomy, total and subtotal hysterectomy, and breast operations. The method was employed on account of the following conditions: debility, extreme nervousness as in hyperthyroidism, obesity, heart conditions with failing compensation, chronic lung conditions, and anaemia.

It will be seen from the range of operations quoted and the relative seriousness of the conditions which determined the choice of a rectal anaesthetic that this method should have a wide application in operations which impose a prolonged strain on the patient. In looking over a series of more than fifty cases of brain operations I am quite convinced that in this particular branch of surgery rectal anaesthesia is invaluable.

Before going on to a description of the technique used in brain surgery I should like to mention what appear to

me to be a few of the advantages of this method. First, in a brain operation access to the patient's face is necessarily difficult owing to the position and towels, etc.; this makes an inhalation anaesthetic difficult to administer, particularly if the patient does not tolerate ether vapour well. Under a rectal anaesthetic it is not necessary to look at the patient's face, if in the original position his airway is quite clear. The quiet even breathing makes it very rarely necessary for the anaesthetist to interfere, as the jaw is not sufficiently relaxed to obstruct the air passages. Secondly, the dose of ether compares very favourably with the amount used by any inhalation method. Six ounces of ether will give a four hours' anaesthesia. I do not know exactly how much ether I have used in giving a similar length of anaesthetic by intrapharyngeal ether vapour, but it is nearer 16 ounces. Thirdly, while the patient is under the influence of rectal ether the anaesthetist has time to take observations and to chart them during operations. In all brain cases I have records of the systolic and diastolic blood pressure, pulse, and respiration taken every ten minutes. The stage of operation is noted and correlated with these. The chart is completed with an account of the induction and all the pre-operative drugs and the amount of anaesthetic. This record forms a very valuable indication of the patient's condition during operation and is a guide as to how far the operation may proceed without undue strain on the patient. Operative shock can be detected in its earliest stages and treated accordingly.

Technique.

The ordinary rectal ether-oil technique has to be adapted to these brain operations, owing to the length of time which the operations take and to the special conditions which exist.

The actual technique of administration of the mixture per rectum is exactly the same for brain work as for general surgery, but for the fact that morphine in any form is strongly contraindicated because it tends to congest the tissues of the head. This unpleasant fact changes the whole picture. It is comparatively simple to give a rectal anaesthetic with morphine, but it is a very difficult matter without it, owing to the varying effect of ether on the individual.

The technique which I am going to describe is fairly constant, and is the outcome of work on over fifty cases.

* A paper read in the Section of Anaesthetics at the Annual Meeting of the British Medical Association, Manchester, 1929.

Pre-operative Treatment.—The preparation of the patient is almost the same as that of any case for surgical treatment. Two days before operation an aperient is administered. The day before operation the patient is kept on light diet, an enema is given in the morning and a bowel wash-out in the evening. The important point is that all preparation should be done in time to enable the patient to have a good night's rest.

The Day of Operation.—One and a half hours before operation the patient receives the first rectal injection; this consists of chlorotone 20 grains, ether $\frac{1}{2}$ oz., paraldehyde 2 to 4 drachms, paraffin 1 oz. Forty-five minutes before operation he receives the second rectal injection; this consists of a 75 per cent. mixture of ether in paraffin. The maximum dose is administered—that is, ether 6 oz., paraffin 2 oz. Atropine is given as a routine in case it is necessary to use any supplementary ether vapour.

The patient is usually drowsy before the time for the second rectal injection; he may even be sound asleep. If this is the case it is a fairly easy matter to run in the mixture, which is generally well tolerated, in about ten minutes. Towards the end of the second injection the patient may complain of the taste of ether; he will be sleepy in twenty minutes from the time of the beginning of the injection, asleep or possibly analgesic in thirty minutes, and anaesthetic in forty minutes. These times vary considerably in different patients.

In patients who have discomfort and even pain and difficulty in retaining the second rectal injection, I find it a good plan to give a few drops of chloroform on a mask at the same time as the ether mixture is being run in. It is surprising how quickly they go to sleep. The ether mixture can then be run in quickly, and the chloroform sleep seems to last till the ether takes effect. There is very rarely any excitement during induction.

It must be understood that rectal anaesthesia is a *controlled anaesthesia*. In suitable cases and wherever possible the rectal injection of ether alone is relied upon to produce sufficient depth of anaesthesia. Ether, like other drugs, affects various individuals differently, and one is never able to tell beforehand whether more anaesthetic will be necessary. It is my custom to supplement the rectal ether with intrapharyngeal ether vapour. There are many other methods of control, but under the conditions obtaining in brain operations this is the most convenient. It is rarely necessary to give the ether vapour throughout the entire operation. The pre-anaesthetic medication, chlorotone-paraldehyde, etc., does in one sense control the anaesthetic, or rather tends to intensify the action of ether, and certainly prolongs the post-operative period of sleep.

Type of Anaesthesia.

The anaesthesia produced by the injection of rectal ether is very light; sometimes it amounts only to an analgesia. It has been proved that, whatever the oily vehicle, the rate of absorption of ether is the same, about one and a half to two ounces being absorbed in an hour. This even absorption of ether from the bowel produces a perfectly smooth anaesthesia without danger of overdosage. The patient presents a typical picture. He appears to be sound asleep, the face is slightly flushed, the breathing is quiet but audible, the jaw is seldom so much relaxed that the breathing is obstructed, but an airway is well tolerated. The pupil reacts briskly to light, and the amount of dilatation gives a very good indication of the depth of anaesthesia. The pulse is slower than in an inhalation anaesthetic. Slight movements may occur, but if the relaxation is sufficient for the surgeon's purposes these do not indicate that the patient is too lightly anaesthetized.

Ether given in this way seems to have very little effect on the blood pressure, even after prolonged administration. There is generally a slight rise of the systolic blood pressure when the ether begins to be absorbed, but it tends to remain very steady throughout the many hours of actual operation, provided there is no sudden haemorrhage or pre-existing intracranial tension. If the blood loss is slight and continuous over a long period there will be a gradual fall in pressure till the main part of the operation is done. During the closure of the head, which may take one to two hours, the blood pressure tends to rise, and at the end may be the same as at the beginning. Most of the varia-

tions in blood pressure are due to the operative procedure and to existing conditions, such as high intracranial tension. If a patient is troublesome at first, requiring more anaesthetic than is usually necessary, and has a varying systolic blood pressure which tends to be high, it will generally be found that the intracranial pressure is the cause of the difficulty. After tapping the ventricles, cisternal puncture, or opening of the dura he will generally settle down well. It may be necessary to tap the ventricle at an early stage in the operation to obtain a satisfactory state of affairs.

It stands to reason with this method of administration that there is little if any interference with the proportion of oxygen and carbon dioxide in the inspired air. The quiet breathing in itself demonstrates the fact that the carbon dioxide is not increased sufficiently to affect the patient.

It is important that the metabolism of the patient should be disturbed as little as possible in a brain operation, when his staying power is, in some cases, taxed to the uttermost, and I venture to state that a rectal anaesthetic gives rise to less disturbance than an inhalation anaesthetic of a prolonged type. I have no scientific proof to give, but I draw my conclusions from the study of records and from the post-operative condition of the patients.

Post-operative Clinical History.

It is most noticeable in the period immediately succeeding operation that the patient's colour is good, the pulse and general condition are very satisfactory; and the look of exhaustion so often seen after severe operations is not present. There is a period of quiet sleep, which lasts from two to four hours or more, and there is seldom any vomiting. I have never seen any respiratory complications directly attributable to a rectal anaesthetic even in elderly patients. In all the cases of rectal ether that I have done I have seen only one with some irritation of the bowel and slight haemorrhage. Whether this was due to pre-existing disease I do not know. Haemorrhoids are not a definite contraindication to the administration of rectal ether, but they are apt to be painful during the injection of the ether and oil. The preparation by enema and wash-out probably tends to congest the bowel, and therefore makes the haemorrhoids more painful.

To illustrate various points I have made I would like to record two or three cases in which rectal anaesthesia only was employed.

CASE I.

The patient was a woman aged 44.

First Operation.—Lateral bone-flap and decompression. Time occupied three and a half hours. The systolic blood pressure, which before operation was 140, after transfusion fell to 115, but at the end of operation had risen to 135.

Second Operation (six days later).—Removal of tumour. Time three and a half hours. At the beginning of operation the systolic blood pressure was 140; during the operation it fell to 110, and at the end was 115. There was no transfusion during this operation. Five hours later the temperature, pulse, and respirations were normal.

CASE II.

A woman, aged 53, was operated on for the removal of a meningioma. The time occupied by the operation was six and a half hours. The amount of ether used was 9 ounces. The systolic blood pressure was 140 at the beginning of operation, throughout which there was considerable haemorrhage, so that the patient had to be transfused twice; the blood pressure fell to 102, but at the end of the operation it had risen to 128. Respirations were steady at 28, the pulse was very irregular but never rose above 120. Five hours after operation the temperature was 98.4°, pulse 88, and respirations 22; the systolic blood pressure was 112.

CASE III.

The patient was a man aged 65. Operation consisted of a frontal bone-flap and removal of a suprasellar cyst. The time occupied by the operation was four hours. The patient seemed older than his years and his normal blood pressure was low. At the commencement of operation the systolic blood pressure was 112; it fell to 100, at which it remained at the end. The patient made an uneventful recovery; he was up in ten days, and out of the home in a fortnight.

Conclusion.

I have not attempted to prove anything in this short description, but I hope I have conveyed the impression that rectal ether-oil is a safe and very easily controlled anaesthetic, which through its very safety can be given to bad surgical risks, and will leave the minimum of bad effects in cases involving many hours of operating, and which, above all, gives the anaesthetist a quiet mind.