Charts of Four Cases in which Hydrogen Peroxide was given Intravenously.

An arrow denotes an injection. R = rigor. The first case ended fatally, the others recovered.

2 oz. of H_2O_2 could produce these effects other than by its nascent oxygen, and this view is supported by a trial we made in a case of toxæmia arising from suppurating inguinal glands in which there was no question of anoxæmia. Here the general improvement which so rapidly took place could only be ascribed to direct oxidation.

The accompanying four charts will give some idea of the reactions obtained in one fatal and three recoveries; in the first it will be seen that four injections were given, the first two of which produced a rigor and temporary improvement. In the second two injections were given, each producing a rigor and some improvement both in pulse and respiration rate. In the third and fourth the injection was followed almost immediately by a rigor and subsequently by a crisis. In all these cases there was marked slowing of the respiration-rate after the injection.

Technique.

A strength of 2 oz. H_2O_2 in 8 oz. of normal saline was usually used. In one case 3 oz. H_2O_2 was used without any ill-effect. Fifteen minutes was allowed for transfusion and this was checked temporarily every four minutes, or whenever large bubbles of oxygen appeared in the cannula, or if the patient became at all restless. Small bubbles entering the vein did not appear to do any harm. In one case the patient struggled so violently in his delirium that the cannula slipped out and the distal ligature came off. On pressing the vein above two distinct streams could be seen to issue from the wound, the one above bright red and frothing, the other deep blue.

The epidemic ceased almost as suddenly as it had begun, so we were unable to try the method on earlier cases or to give a more extensive trial to repeated injections.

Conclusions.

From our experience we conclude that—

1. H_2O_2 can be given intravenously without gas embolism being produced.
2. The anoxæmia is often markedly benefited.
3. The toxæmia appears to be overcome in many cases.
4. The mortality (48 per cent.) compares very favourably with the 80 per cent. in similar cases not so treated, and more so when it is remembered that we only treated the most severe and apparently hopeless.

ANÆSTHESIA IN THROAT AND NOSE OPERATIONS.¹

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[THE author pointed out that operations upon the ear, nose, and throat are not generally serious in themselves, and that it is, therefore, of primary importance that the technique employed should be as free from risk as possible. After dwelling on the risks of chloroform and mixtures containing it and the comparative safety of ether, Mr. Rood advanced the following arguments in support of his contention that "ether is the proper anæsthetic for operations upon the nose and throat."]

The Degrees of Anæsthesia.

It will be necessary to speak of two degrees of anæsthesia—deep and light. I should like to define what I mean by this. In deep anæsthesia the respiration is regular, automatic, and shallow, the larynx and pharynx are absolutely paralysed and immobile, and respond in no way to stimuli; the recurrent laryngeal nerve is paralysed and the cords stand in wide abduction. The pupil is generally dilated and does not react to light. All reflex activity of the pharynx and larynx is abolished, a Brünings tube can be passed into the larynx, and there is no interference with the quiet rhythm of respiration and no spasm of the cords. The patient in this condition can take no active part in his own operation, he cannot cough. On the other hand, he cannot obstruct his own respiration by laryngeal spasm. If this degree of anæsthesia is induced with ether the patient is pink and rosy, with a full regular pulse of about 80–91.

By light anæsthesia I do not, of course, mean a struggling patient. There is general muscular relaxation, the respiration is regular, but certain

¹ Abridged from a paper read before the joint sections of Anæsthetics and Laryngology of the Royal Society of Medicine on Feb. 6th.

reflexes persist, the pharynx and larynx respond with a muscular contraction if stimulated. The patient can cough—and so can in this way protect himself from blood entering the air-passages—on the other hand, he can obstruct his own air-way by spasm of the cords. I assume that, before the administration of ether, atropin sulphate has been injected hypodermically. The contrast in the clinical picture of ether anæsthesia with and without this drug is too well known to need discussion.

An Alternative Method to the Use of Clover's Inhaler.

There are many ways of inducing anæsthesia with ether, but in order to obtain this deep type a method must be used which is capable of giving a high concentration of ether vapour. So a modification of the so-called open ether method has been devised. It consists of extemporising a bag from a towel as the anæsthesia progresses, and converting

the patient, although most profoundly anæsthetised, is pink and rosy, provided always that the even regular rhythm of respiration has not been obstructed by a too sudden increase of the strength of the ether vapour during the induction.

Special Application to Oto-rhino-laryngology.

Operations upon the nose and throat stand out in marked contrast to all others, in that blood can pass directly into the air-passages. It is this fact that has hampered the operator, as it may lead to hurry, may obstruct the view, and may necessitate a sudden alteration in position of the patient. No abdominal surgeon is ever called upon to operate upon a rigid and vomiting patient, nor is he generally handicapped by the necessity for speed.

We are familiar with old conditions of operation upon the mouth for malignant disease, in which the surgeon worked at a disadvantage and in a great hurry upon a patient sometimes struggling,

Illustrating the concentration of the ether vapour. The patient is allowed to inhale ether from the open mask for the few minutes necessary to abolish consciousness. A bag is then gradually improvised from a towel, and finally the vapour is still further concentrated by means of some thick substance—a blanket has been used in the illustration.

the open ether into a semi-closed method, practically into a Clover inhaler, but capable of giving more ether and without the disadvantage of the absolutely air-tight and possibly septic rubber bag. This method is extravagant both of gauze and ether—a whole 6-yard roll of gauze being used for each case, and from 6 to 8 oz. of ether according to the physique of the patient. But it produces in from 6 to 8 minutes a type of anæsthesia that I believe can be obtained in no other way. It requires, of course, some little practice to get the patient under quickly and quietly, and success depends upon a regular increase in the strength of the vapour, so that the patient is always inhaling the maximum percentage of ether that will pass the larynx without producing spasm.

Dr. H. G. Butterfield has kindly taken the photographs here given from actual cases. The first shows the commencement of anæsthesia. The gauze mask, soaked with as much ether as it will conveniently hold without dripping, is gradually lowered to the patient's face. The second shows how a bag is improvised by means of a towel, and the third how the percentage of ether is finally concentrated considerably by means of a thick substance—in this case to emphasise the point I have used a blanket, but of course a thick towel would do equally well.

Now, although this looks like asphyxiating the patient, the practical fact is that when the respiration becomes shallow in the deep stage of narcosis

certainly coughing up blood at intervals, and in danger of suffocation. Gradual evolution in the operative and anæsthetic technique has now produced a quiet patient, some form of mechanical air-way, allowing the operator ample time and opportunity to control hæmorrhage resulting in a practically bloodless operation, and a clear field for surgical manipulation. This general surgical principle may be extended to nose and throat operations, and I hold that this may be done with complete safety with some slight alterations in traditional methods.

As the technique of anæsthesia differs so materially in different cases, it will perhaps be an advantage to classify them according to the conditions present. For practical purposes we may consider that operations upon the ethmoid, intranasal operations for drainage of the frontal sinus, removal of portions of the inferior turbinates, and operations for drainage of the maxillary antra—both the intranasal and the radical Colver Luck operation, have one feature in common: blood is introduced directly into the nasal cavities and so into the naso-pharynx, whilst at the same time the patient's head is raised. It is obvious that gravity will allow blood to find its way directly through the larynx into the trachea and lungs. It appears that there are three alternative methods of preventing the blood entering the larynx:—

(1) To use light anæsthesia and allow the patient to cough up his own blood.

This is generally effective, but has disadvantages. The amount of blood collecting in the pharynx may become great, necessitating the interruption of the operation in order to mop it out. Furthermore, I have seen blood sucked into the trachea even with a coughing patient.

(2) To shut off the nasal cavities from the pharynx by means of a well-fitting post-nasal plug—using at the same time one of the many forms of mechanical breathing tubes, of which Hewitt's air-way is a type, in the pharynx.

There is an objection urged against this procedure. It is said that a post-nasal sponge, by preventing the blood running into the pharynx and confining it to the nasal cavities, causes it to flow from the nostril, so obscuring the view of the operator. But although it may sometimes be an inconvenience, if the blood is not confined to the nasal cavities it will run through the posterior nares into the pharynx, possibly slightly adding to the danger of the operation however lightly the patient may be under; and, furthermore, it will certainly make the patient cough and by collecting will once more introduce the necessity for a speedy completion of the operation. The advantage gained by the opportunity of a leisurely completion of the operation, with a patient who is absolutely safe from suffocation, even if it does increase the amount of mopping through the nostril, outweighs the transitory gain of a few moments' clear view, accompanied by an increasing collection of blood in the pharynx, which may at any moment give rise to a surgical emergency.

(3) The third method of preventing blood entering the larynx in those operations where the patient is in the raised position is by using the intra-tracheal insufflation of ether.

That it prevents blood entering the air-passages is admitted; it maintains an even regular degree of anæsthesia—and a mechanically perfect air-way whatever the position of the head. It will be interesting and instructive to hear the opinion of those who have used this machine for these cases. Personally I think that for operations upon the maxillary antrum for malignant disease or even for the radical drainage operation it is almost ideal—but for the more delicate intranasal operations I have noticed that the return blast of air through the nostril churns up the blood and appears to cause the operator more inconvenience than a post-nasal plug. I have often used this machine in conjunction with a post-nasal plug, which prevents the air blowing through the nostril, but the apparatus is bulky for universal use in operations of this nature, and I think that the results obtained with a post-nasal plug and an air-way are equally, if not more, satisfactory.

Anæsthetic Technique in the Removal of Tonsils and Adenoids.

The next anæsthetic technique which I wish to consider is associated with the removal of tonsils and adenoids. I know that there is considerable difference of opinion upon this subject. It is apparent that the type and degree of anæsthesia to be used is intimately connected with the nature of the operation performed, and it is in this operation, I think, more than in all others, that a sympathetic coöperation between the operator and anæsthetist is essential in the interests both of safety and efficiency. I have said before that I personally believe ether should be used as the anæsthetic. That it is safer than CHCl_3 cannot

be denied. That any degree of anæsthesia can be produced and continued with ether and ether only in the most vigorous adult is a fact that can be verified at any time.

There are, from the anæsthetist's point of view, two methods—one with light anæsthesia, the other with deep anæsthesia.

The first, which I will describe as the rapid method, consists in the removal of both tonsils with the reverse guillotine, the patient either lying on his back or sitting up. After removal the patient is quickly turned into such a position that the blood may drain out of the mouth. Some operators remove the tonsil with the patient lying upon the side.

In the second type of operation a profound degree of anæsthesia is used. Mechanical means are adopted to prevent the entry of blood into the air-passages. The tonsils are removed either by the reverse guillotine or dissection. All hæmorrhage is stopped before the patient leaves the table, as in other surgical operations. This necessitates a modification in the traditional position. It was found essential in the interest of safety that gravity should no longer carry blood into the air-passages. To adopt that general principle of operative surgery of the mouth that if the advantages of a deep anæsthesia, together with a quiet field of operation and opportunity for a leisurely performance, are to be enjoyed some mechanical means must be employed to keep blood out of the air-passages.

In the operation under discussion this is secured in a simple manner. The shoulders are raised upon a sand-bag. The head is allowed to fall back and rest upon the vertex in such a manner that the front of the chest, the front of the neck, and the chin are all in one straight line. This position places the larynx well above the field of operation and converts the naso-pharynx into a dependent receptacle. In this position, and only in this position, deep anæsthesia may be used either for enucleation by dissection or by the reverse guillotine. The surgeon has all the facilities for which he asks—a perfect view, ample time, an immobile field of operation, and every opportunity to stop hæmorrhage. The pros and cons of the different types of operation are entirely a surgical matter, but the question of safety of the various procedures is relevant to the subject under discussion. The originators of the method adopted the position widely used for similar operations, such as those for cleft palate and for removal of small parts of the tongue. These are essentially the same as tonsil operations, and the conditions are identical. The operations used to be performed with the head slightly raised, causing considerable discomfort to the anæsthetist, together with much mopping and coughing. But a cleft palate operation in the head back position presents no difficulty or danger; the surgeon sitting behind the patient has ample time and perfect vision for a somewhat tedious operation. An occasional mop prevents blood collecting in bulk in the naso-pharynx. The patient is under, with even regular respiration, the palate is still, there is no anxiety or difficulty for the anæsthetist.

It is the same thing with the tonsil operation. Carried out by two people who are conversant with the details I do not think it is too much to say that it is mechanically perfect, and that if blood does enter the larynx it is due to a failure of technique and not to a defect in the principle of the method.

The Anæsthetic in Examinations of the Larynx, Trachea, and Oesophagus.

Another group of cases in which the anæsthetic plays a considerable part comprises direct examination of the larynx, trachea, and oesophagus by means of tubes. It seems to me that a profound anæsthesia is essential for these cases, anæsthesia so profound that the cords stand abducted, even in the presence of a tube in the upper opening of the larynx. Spasm of the cords and contractions of the pharynx are the difficulties the operator has to contend with, and I do not think it is too much to say that some of the delicate intralaryngeal manipulations are impossible should this persistently occur. Again, I think ether is the proper anæsthetic to employ. It is sometimes necessary, especially with an irritable larynx, to push it to an extreme degree, almost to the cessation of respiration.

Finally, there are operations upon the larynx for the removal of intrinsic carcinomata. From the anæsthetist's point of view the conditions present are precisely the same as in cases of malignant disease of the upper opening of the larynx, pyriform fossæ, &c. The air-passages are more or less obstructed by a tumour. There may be stridor, and there is possibly definite respiratory obstruction. But here we have a very different state of affairs compared with most other operations upon the nose and throat. The cases are of a really serious nature. An anæsthetic must be given, possibly in the presence of obstructed respiration, in order that a preliminary tracheotomy may be performed.

Now, if ether is administered to these patients, the rise of blood pressure during the induction may cause slight swelling of the mucous membrane and completely occlude the already narrowed airway, with the result that we have an asphyxiated patient, an emergency tracheotomy upon a patient not properly under, much explosive coughing upon the introduction of the tracheotomy tube, with possibly the aspiration of blood and septic matter.

Therefore I think that CHCl_3 is undoubtedly the proper anæsthetic, because in the broad sense it is safer than ether in these special cases. A degree of anæsthesia must be maintained sufficiently deep to permit the tracheotomy tube to be introduced without producing reflex coughing, because pneumonia following aspiration of septic matter is a very definite danger, and a proper degree of anæsthesia will always ensure a peaceful tracheotomy.

Summary.

In summing up I may say I have endeavoured to uphold the safety of ether; the danger of CHCl_3 as demonstrated, apart from all scientific considerations, by the records of the daily press; the improvements in the methods of administering ether so that the congestion, cyanosis, and salivation of other days have given place to an anæsthesia which has all the merits and none of the dangers of chloroform; and the gradual evolution of operative surgery of the mouth, from the rapid operation and coughing patient towards the ideal of a quiet patient free from all risk of suffocation, combined with every facility for a thorough and deliberate operation.

THE GILLSON SCHOLARSHIP FOR RESEARCH IN PATHOLOGY.—The Society of Apothecaries has awarded the Gillson scholarship for original research in pathology, of the annual value of £105, to Dr. A. L. Urquhart, of St. Thomas's Hospital.

A CASE OF HIRSCHSPRUNG'S DISEASE,
CAUSING ACUTE OBSTRUCTION.

BY I. TEWFIK, M.R.C.S. ENG., L.R.C.P. LOND.

THE following case is of interest both from the point of diagnosing the condition, which is rare, and also from the point of being simulated by an acute obstructive condition which seldom manifests itself in cases of Hirschsprung's disease. The method adopted in the operative technique is to my mind the most suitable, as it alleviates the shock, and gives a chance to the affected colon to recover and decrease in size—two essential factors in the success of the anastomosis after the resection.

S. L., aged 10, was admitted to hospital on Oct. 27th, 1918, with symptoms of acute intestinal obstruction. Temperature 99°F. ; pulse 120, rather feeble. He had been vomiting two days previously.

Previous history.—Five years ago he was admitted to one of the London hospitals, because "the child was always delicate, his stomach was getting bigger, and his bowels very constipated." Often his bowels did not act for a week or ten days. He was in hospital then for about six months with no apparent benefit.

Examination.—The child looked ill, with a furred tongue and the anxious expression indicative of an acute abdomen; his abdomen was protuberant and hard, especially in the lower half. On percussion a dull note was elicited over the greater part of the lower abdomen. The child otherwise looked quite normal.

Operation.—I decided to operate at once and the abdomen was opened through a right paramedian incision. The condition suspected was revealed straight away; in the abdomen was a reddish-blue mass which looked like a twisted ovarian cyst. The tumour really consisted of the descending and pelvic colons greatly distended and full of fæces; the colour was due to the stagnant fæces infecting the bowel wall. I decided to relieve the obstruction first and give the distended and infected diseased colon a chance to improve, and also to lessen the shock of the operation, a matter of vital importance. Through a left gridiron incision I brought out the proximal end of the descending colon, which was quite healthy, after cutting it away from the rest. The distal end was closed up securely with sutures and returned into the abdomen. By the help of my assistant, who dilated the rectum, I was able to empty the contents of the diseased colon. A Paul's tube was inserted in the colotomy. The child was infused through the axilla during the operation. Daily rectal washouts were given to disinfect the colon, which was obviously in an infected condition, and the child made an uninterrupted recovery. On Dec. 3rd I decided to complete the operation. The abdomen was opened through a left paramedian incision; subcutaneous saline infusion was given in the axilla. The diseased colon was found to have decreased in size and was in a much healthier condition. It extended far down in the pelvic colon, which made the resection and the subsequent end-to-end anastomosis rather tedious. The abdomen was closed in the ordinary way and a drainage-tube inserted through the old colotomy incision. Before closing the abdomen a stomach-tube was passed from the rectum past the anastomosis. The bowels acted regularly on the third day, and then daily afterwards till the ninth day, when fæces were noticed to appear through the old colotomy wound. The patient ran an irregular pyrexia for three weeks, beginning one week after the operation. His bowels still acted normally every day while the fæcal fistula was discharging, some days more than others. The fistula eventually closed entirely on March 27th, 1919, and remained closed till his discharge on May 19th. His bowels since the second operation acted normally and regularly every day; the child improved considerably, putting on weight, and looked altogether different. I have recently heard that his fistula broke down, but I presume it will soon close up again.

Rochester.