THE Advantages
Of
Intubation of the Larynx
Over
Tracheotomy
In
Laryngeal Diphtheria
With
Twenty Five Illustrative Cases
By
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INTRODUCTION

The subject of this thesis is one of great importance and deep interest, more especially to those who are concerned with the treatment of diphtheria, and other causes of laryngeal obstruction. I offer it as a plea for the more general introduction of intubation in preference to tracheotomy.

In other countries including the continent of Europe and America, intubation is very largely practised and with excellent results. In this country, the older operation is still in general use, except in a comparatively few isolation hospitals including Leicester, where I have had considerable opportunities for studying this subject. In the Leicester Isolation Hospital it is customary, in the first instance to perform intubation, whenever signs of laryngeal obstruction render operative interference desirable. Only when this method fails to give relief is tracheotomy resorted to.

During the winter months of 1912 – 1913, no fewer than twenty five cases of diphtheria admitted, were of the laryngeal type, with more or less dyspnoea at the time of their admission, or soon
afterwards, requiring immediate attention.

To one with the necessary experience, introduction of the intubation tube is generally an extremely simple matter. For this reason one need not delay in performing intubation — no advantage is gained by delay, and difficult laboured breathing certainly adds to the exhaustion of the patient. When this method is not used, one prefers to delay as long as possible, in the hope that dyspnoea will diminish, and often before tracheotomy is performed the patient may be in a very serious condition. Relatives do not object to intubation as they so often do to tracheotomy — there is no cutting and consequently no subsequent unsightly scar.

Introduction of the intubation tube is generally a simple matter — but only to one who fully understands the process. There is a "knack" in doing it which is only to be attained by practice. Hereafter I shall describe how the operation is performed, and endeavour to show its advantages and disadvantages as compared with tracheotomy.
The names of Klebs and Loeffler are intimately associated in connection with the bacillus of diphtheria, and those of Roux and Yersin in connection with the toxin and antitoxin. In like manner at a much earlier period were the names of Bretonneau and Trousseau in connection with tracheotomy, and later on, those of Bouchut and O'Dwyer in connection with intubation.

Before the time of Bretonneau, the prognosis in laryngeal diphtheria was extremely grave, and through various useless methods were applied in the hope of preventing asphyxia, such as repeated bleedings, application of large blisters over the throat etc., the result almost invariably proved to be—death from suffocation. To Bretonneau, we are indebted for the introduction of tracheotomy for the relief of dyspnoea in laryngeal diphtheria. This operation he first performed with success at Tours in the year 1825. This was the beginning of a new era in the treatment of diphtheria, and its adoption undoubtedly proved the means of saving many thousands of lives. The probability however is, that but for Trousseau, tracheotomy, like intubation later, might have fallen
into disuse. Probably only the fame of Trousseau kept the operation alive. Trousseau, whose fame even to this day remains unabated, was a pupil of Bretonneau and among his works, that on diphtheria stands pre-eminent. His description of this disease is strikingly exact, practically nothing being omitted except the pathological agent. He was among the first to realise the value of tracheotomy as the only certain means then known, of relieving laryngeal obstruction. Like all great discoveries, tracheotomy was subjected to a vast amount of adverse criticism. At this time, of course, antitoxin was quite unknown, and the case mortality in diphtheria was very high. In laryngeal diphtheria it approached close to 100 per cent. Though this figure was considerably reduced by means of tracheotomy, still the operation did not meet with the appreciation which it merited. For many years following its introduction it was repeatedly attacked with very great bitterness, by its numerous opponents. Many affirmed that it actually increased the mortality in croup: and among those, in 1858 was Bouchut, the discoverer of intubation. Still Trousseau to the end of his life persevered in maintaining the value and practice of this operation, in the face of all opposition.
In 1858 Bouchut discovered another, and perhaps a better means of relieving obstruction due to laryngeal diphtheria, namely that of intubation. He also devised tubes, and apparatus for inserting them into the larynx, so that respiration might take place "per vias naturales". Unfortunately, opposition to this new method was as bitter as it had been against tracheotomy. Acting on a report by Trousseau, the Academy of Medicine prohibited this operation, though it must be remembered that Trousseau does not suggest that any of the cases treated by Bouchut, were in any way damaged by the insertion of his tubes. The decision however, was a most unfortunate one for Bouchut. Had he but received encouragement which he so thoroughly merited, intubation would, at a much earlier period have attained the position it now holds, and the credit would have been entirely his. He himself however, had only performed the operation seven times when, becoming discouraged, he abandoned it.

It was left then to O'Dwyer of America, in 1885, to re-introduce this method. He invented a more perfect tube and a simpler instrument for its insertion. It is practically O'Dwyer's apparatus which is in use today, the changes in tubes etc., being simply modifications of his; that of Bayeux (1895) having
shorter tubes is probably the most satisfactory and most generally used.

DESCRIPTION OF APPARATUS

The instruments necessary for intubation are

1. The intubation tube.
2. The pilot, which fits into the lumen of the tube.
3. The introducer, to which by means of a bolt, the pilot can be rigidly fixed. The introducer has attached to it an arm, which can be moved by the operator's thumb, in such a way as to release the tube from the pilot.
4. A gag.

The eye in the head of the tube should be threaded with a piece of silk 18 to 20 inches long, and the ends tied together so as to form a loop.

The intubation set is supplied in a case with a series of graduated tubes, and besides the instruments already mentioned, there is an extractor for the removal of the tube.

The O'Dwyer intubation set is a good one, but
Bayeux's modification is more satisfactory, and in more general use. The advantages of the latter over the former are that Bayeux's tubes are shorter and consequently much more easily introduced. They are for the same reason, more easily extracted by means of the extractor, or they can be removed by "expression", without any instrument at all. Being shorter, they are less likely to become obstructed. In O'Dwyer's apparatus, the pilot is fixed to the introducer by means of a screw, instead of a bolt and slot; and the tubes are detached from the pilot by a different mechanism from that described.

It is to be noted that O'Dwyer's tubes can be obtained in either metal or vulcanite. The latter has the advantage that it is less likely to cause ulceration from pressure. Unfortunately, as far as I am aware, Bayeux's tubes cannot be obtained in vulcanite.
TECHNIQUE OF OPERATION

Intubation should be performed with the patient lying flat on his back, either in bed, or if in hospital, preferably on the operating table, which stands higher, so that the operator need not stoop so much. A good method of preventing the child from wriggling is to surround him with a sheet or blanket so that the arms are fixed to the sides of the body. It should extend from the upper part of the chest to well below the feet. This keeps the arms and hands of the patient out of the way. Two assistants are desirable, one to hold the head of the patient in such a way that the face looks directly upwards, the other holds the lower limbs and steadies the child.

Before attempting to insert the tube, it is advisable to make sure that it does not fit the pilot too tightly. It should be possible to detach it by merely pushing the thumb under the arm of the introducer. The projecting part of the head of the tube should point away from the handle of the introducer. The eye in the head of the tube should be threaded, as already described, with a piece of silk (or cotton) thread, and the ends tied so as to form a loop. The operator stands on the patient's right side and should have the
instruments (previously sterilised) at a table within easy reach.

While the nurses are preparing the patient, the operator selects a tube of a size depending on the age of the patient and fixes it by means of its pilot firmly on to the introducer.

When all is ready the first thing to do is insert the gag between the left molars and open it as widely as possible. If much mucus is present in the mouth and pharynx, this should then be removed by means of swabs wrapped round the right index finger. The throat should be cleared as thoroughly as possible. The operator now takes the introducer (with its pilot and tube attached) by the handle, in his right hand. The loop of thread should also be held in the right hand, the knotted end being twined once round the index finger. It should be held fairly tight so as to prevent a loosely fitting tube from slipping off its pilot, yet in such a way that it can be easily loosened when the tube is inserted.

The next step is to introduce the left forefinger along the dorsum of the tongue to the epiglottis. This, one often finds, is bent backwards, over the larynx, and must be straightened before the tube can be introduced. Having identified the epiglottis, the
finger is carried onwards over its posterior surface, until the arytenoid cartilages, and orifice of the larynx are felt. It is absolutely necessary that the operator should accurately locate these before attempting to introduce the tube. It may be necessary to pass the finger down to its utmost extent in order to identify these landmarks. The arytenoids, lying as they do immediately behind the opening of the glottis, it follows that if the operator keeps the tip of his finger on them, the laryngeal orifice is just in front and below the tip of his finger. The finger should be kept in this position, but not tightly, so as to allow as much air as possible to pass. The pilot with its tube are now passed carefully along the palmer surface of the curved forefinger, over the epiglottis till the end of the tube reaches the tip of the forefinger. This brings the end of the instrument immediately over the orifice of the larynx. The handle of the introducer is now raised so as to direct the tube, all of which should be in the middle line, into the larynx. As a rule it slips in easily, without pressure, but if there be any spasm present, gentle but continuous pressure soon overcomes it.

When fully introduced into the larynx, the head of the tube lies immediately below and in front of the tip of the finger. The tube is now released from the
pilot by means of the arm of the introducer, and the thread detached from the finger. While this is being done, the tip of the left forefinger must not be removed from the head of the tube, otherwise it is almost certain to be pulled out of the larynx. When the introducer and pilot have been removed, the operator should make certain, by means of the left forefinger, that the tube is in the larynx, the head of which will be resting on the arytenoid cartilages. Apart from the sense of touch one can generally tell that the tube is in position, because of the improvement which takes place in the breathing, together with an aphonic quality in the cough. Should the tube have been passed into the oesophagus, — a common experience with beginners,— breathing is in no way relieved, and phonation remains. In cases where the child does not cough spontaneously it is advisable to give a sip of water, or of whisky and water, in order to induce coughing.

Having now ascertained that the tube is in the larynx, the loop of thread may be cut, and (with the tip of the index finger holding the tube in position) gently withdrawn, taking care that the knotted end is not drawn towards the tube. The gag is now removed, and intubation is completed.
Some operators prefer to leave the thread attached to the tube, in order that, should it become blocked, it may be at once removed by a nurse. If left it may be passed round the ear, or attached by means of adhesive plaster to the cheek. Personally I always prefer to remove the thread. Apart from the possibility of the thread irritating the epiglottis, tongue, and angle of the mouth, it becomes necessary to fix the arms of the child with splints in order to obviate the extraction of the tube by the patient. This must considerably add to the discomfort of the patient. There is also the possibility of the thread being bitten through. Should the tube become blocked the probability is that it will be coughed out, but if not, the nurse can easily be taught to remove it by means of "expression". Though re-insertion may soon be generally required, at least two or three minutes elapses before the child gets into difficulties, - sufficient time to allow the resident doctor in a hospital to reach the patient in order to re-insert it.

REMOVAL OF THE TUBE.

This may be performed in two ways

(1) by "expression".

(2) by means of the extractor.
The former is extremely simple. It is best performed with the patient, (surrounded with a blanket) sitting on the nurse's knee. The head should be bent well back so that the larynx bulges forward. The operator places his right thumb upon the trachea, immediately below the larynx and presses backwards and upwards, and at the same time with his left hand on the occiput, jerks the head forwards. This movement causes the tube, in virtue of its shape, — that of an inverted truncated cone, — to be passed into the pharynx and so to the mouth, and the child generally spits it out.

The two accompanying drawings, taken from Bayeux the deviser of this method, serve to illustrate the modus operandi.

An objection to this method is at once apparent — the sitting position of the child, with its possible danger in cases of diphtheria where there is much toxaemia. It can however also be performed with the child lying on its side, when this danger is removed. This is an extremely satisfactory method where urgency is required.
PREMIER TEMPS D'ÉNUCLÉATION

La tête de l'enfant est relevée par la main gauche d'opérateur. Le pouce droit est mis en place.

DEUXIÈME TEMPS D'ÉNUCLÉATION

Le pouce droit a énucléé le tube. La tête de l'enfant est rapidement abaissée. Le tube est rejeté.
Extubation by means of the extractor may be done with the patient in bed, or preferably on the operating table. The gag should be inserted, the left index finger passed to the head of the tube and the extractor passed along the curved anterior surface of the finger in the same way as when intubating. The point of the extractor is guided to the opening in the tube, the beaks opened and the tube withdrawn.

Extubation is said to be more difficult when done with the extractor, than intubation. Personally I have never found any difficulty in removing a tube by this means. If the operator is careful and feels the head of the tube distinctly with the index finger, it is a simple matter to guide the point of the extractor into the opening of the tube, when removal is easily affected.

DIFFICULTIES MET WITH IN PRACTICE.

Not infrequently one finds that there is considerable swelling of the structures about the larynx, in which case it is, of course, more difficult to make out the arytenoids and it is not so easy to get the tube inserted.

If one has chosen too small a tube, the probability is that it will be coughed out immediately. A larger
size should then be tried, but it must be remembered that no force is to be employed, to insert an intubation tube. Should spasm be present, slight gentle and continuous pressure very soon overcomes it.

The tube should be passed into the oesophagus, but this will be recognised at once as the breathing is in no way relieved, and the cough retains its vocal element.

Occasionally the tube is coughed into the mouth and then swallowed. No harm results from this as it is passed by the bowel$ in the course of two or three days.

The dangers connected with intubation will be mentioned when comparing intubation with tracheotomy.

WHEN TO REMOVE THE TUBE.

Different operators have different ideas as to how long one should wait before removing the tube. Some de-intubate after 24 hours; others wait for 5 or 6 days.

Personally, if the temperature and respirations are satisfactory, I generally remove the tube on the second or third day after intubating, i.e. after it has been in position for 48 to 72 hours, and prefer to do this in the
forenoon, as breathing is less likely to be troublesome then, than in the evening. In the majority of cases, breathing remains satisfactory and it has not to be replaced. Occasionally though, breathing becomes so laboured a few minutes after its removal, that early re-intubation becomes essential. Or the child may remain comfortable for an hour or two, and then recession become marked, necessitating a re-insertion of the tube. If the temperature keeps up however, and respiration exceed 32, it is advisable to delay extubation for an additional 24 or even 48 hours. By this time the temperature and respirations will probably have fallen, but whether this be so or not, I think it is better to remove the tube. Should it be again required, it is advisable to use a tube of other make, in order that the points of pressure may be different.

INTUBATION AND TRACHEOTOMY COMPARED AND CONTRASTED

If it can be proved that intubation is a simpler and more satisfactory operation that tracheotomy, and that it saves as many lives as the latter, surely then intubation ought to be the operation tried first in all
cases of laryngeal obstruction requiring operative interference. In only a small proportion of cases has one to resort to tracheotomy because of intubation failing to give relief.

Tracheotomy has certain advantages over intubation — that no one denies — but these advantages certainly do not justify one's performing it as a routine procedure in the first instance. The advantages of intubation easily outweigh any disadvantages attaching to it.

On the Continent of Europe, in America and in Australia, this has long been recognised, and in many hospitals intubation is almost always attempted in the first instance, as in the Hôpital des enfants malades, and the Hôpital Trousseau, the two principal hospitals for diphtheria in Paris.

Intubation is an operation the knowledge of which might easily be acquired in the class of operative surgery by practising on the cadaver. Were this done there is little doubt that intubation would soon become the "operation of choice" in this country, as it now is in so many others.

Probably the reason intubation has not been more generally adopted here is that there is some difficulty in its performance; one has far more opportunities of seeing intubation on the continent, consequently
students see, and appreciate the great relief given, by simply inserting a tube into the larynx. In this country, comparatively few men have ever seen the operation done, and still fewer have ever performed it. The inexperienced generally fails to get the tube into the larynx. Once the technique is acquired, intubation becomes extremely simple in the great majority of cases. Certainly to one experienced in inserting a tube, intubation is much more easily performed than tracheotomy.

Those of us who have had experience in Isolation Hospitals, know that many children suffering from laryngeal diphtheria, are admitted to hospital in a moribund condition, due to suffocation, and it is by no means an uncommon thing for a child to die in the ambulance waggon during its removal to hospital. The reason is that comparatively few practitioners would dare risk tracheotomy at the home. With no assistance except perhaps that of the mother, tracheotomy is rather a formidable operation to undertake; and imagine what the mother's feelings would be, were she to assist at this operation which is, when dyspnea is great and lividity marked, characterised by a very free venous bleeding.

It is universally admitted that tracheotomy is a very difficult operation to perform.
In young children, with fat neck the difficulty may be much augmented, as the trachea lies so deep and is so soft and movable. If the veins are large and engorged, haemorrhage is likely to be free, the parts thus become hidden, and thus the surgeon is delayed. We have often heard of, and some of us have witnessed, nurses fainting while assisting at this operation. Few mothers could look on without being thus overcome. Tracheotomy is an operation which is extremely difficult to perform without skilled assistance. Special previous preparation of the patient is exceedingly important in order to prevent subsequent dangers. A good light is essential, which in many homes it is quite impossible to obtain. To perform this operation, the medical man must carry a tracheotomy set. It is as easy to carry an intubation set, but to see the child intubated, would not appear anything like so horrible to the parent as seeing the former operation. It looks as simple as merely swabbing the throat. If medical practitioners did carry an intubation set, and had the necessary skill at intubation, many lives now being lost would certainly be saved. This operation can be performed with the child in bed and without skilled assistance. No preliminary preparation is necessary. A good
light is obviously of no importance. The tube is guided home by the sense of touch.

Another advantage of intubation is that the operation can be very rapidly performed. Little if any time being lost in preliminary preparation - all that has to be done is to insert the gag, and perhaps swab the throat - not more than some fifteen or twenty seconds are needed for the insertion of the tube. This renders intubation the proper operation for an emergency. For tracheotomy, unless the condition is urgent and critical, it is preferable to administer an anaesthetic. Danger is thereby increased and time lost. To perform intubation no anaesthetic is necessary, there is comparatively little pain in inserting the tube, and relief is immediate.

Patients raise little or no objections to intubation as there is no cutting associated with it. For this reason intubation should be performed as soon as dyspnoea becomes troublesome. There is very little danger connected with it and nothing is gained by delay; in fact delay may prove very serious. The strength of the child is conserved. The exhausting struggle for breath is avoided, and the child soon falls asleep.

To quote from Bayeux "On risque de graves accidents, la mort même des enfants en tubant tard;
on ne risque rien en tubant de bonne heure.”

In the case of tracheotomy, one inclines to delay operation as long as possible. The relatives, as well as the doctor, dread this operation, and resort to it is not made except as a last resource—often when the strength of the child is entirely exhausted.

After intubation, there is no resultant scar such as is inevitably the case after tracheotomy—a point which naturally appeals to parents.

Another reason why intubation is preferable to tracheotomy is that in the former, air enters by the natural passages. It has been stated that pneumonia is not so common after intubation as after tracheotomy and this is given as the reason. Personally I have seen comparatively few instances in which pneumonia has followed intubation, though statistics, if reliable, seem to show that this sequela is as frequent after the one operation as after the other.

Shortly after the introduction of intubation in 1885, much was written on "Food Pneumonia", supposed to be due to food entering the lungs through the intubation tube. It is true that patients cough and choke a good deal while taking thin liquids, but at post mortem examinations no evidence of food has been found in the smaller bronchi. As far back as 1888 Dr. Northrup
reported on 107 autopsies made at the New York Foundling Asylum, in which special attention was paid to this point and no evidence whatever was found to show that the disease was due to the presence of a foreign body such as milk or other food. (Gay, Boston City Hospital)

Occasionally one finds that momentary insertion of the intubation tube into the larynx is all that is required. This loosens membrane which is at once expelled, after which breathing is easy.

I have seen two cases of laryngeal diphtheria where recession was extremely marked and intubation had to be performed immediately on admission. In each case this was followed by a violent fit of coughing and the tube was at once expelled together with a large piece of membrane, which must have been detached during the process of inserting the tube. Breathing after this was easy and no further interference was required. In each case, certainly if intubation had not been done, tracheotomy would have been essential. Surely in such cases it may be regarded as fortunate that the more serious operation of tracheotomy was not resorted to in the first instance.

This is a fairly common experience; the insertion of the tube detaches or partly detaches, membrane which may either be coughed out through the tube, or
else may so block it that both are expelled together, immediately, or soon after intubation is completed. Then if breathing is satisfactory, no more is needed.

In Bayeux's book we read "Les observations sont déjà nombreuses ou l'introduction même momentanée d' un tube dans la larynx a suffi à transformer une dyspnée cruelle en un etat calme presque absolu et souvent même définitif".

Ker, of Edinburgh states in the Scottish Medical and Surgical Journal (June 1907) that in four of his cases intubation was only momentary, the tube being coughed out with membranous casts, and complete relief being thus obtained. "I regard this possibility" he says "as one of the advantages of intubation over tracheotomy, such a satisfactory result being obtained with so little risk to the patient."

Scholes writes in the Australian Medical Journal (Dec. 1911) that of 122 patients intubated, 13 required the tube for less than one hour. He states that obstruction was not urgent until the membrane, loosened five or six hours after injection of the serum, began to occlude the lumen of the larynx or in most cases, the trachea. "Intubation then entirely freed the still somewhat adherent membrane and immediate removal was followed by expulsion of the cast."

All that is now desired in laryngeal diphtheria
is to tide the patient through a period, which often is of exceedingly short duration — thanks to the efficient use of antitoxin which rapidly liberates or disintegrates the membrane,— and for this reason it seems unnecessary to resort to such a serious operation as tracheotomy, with its attendant disadvantages.

It is true that occasionally in intubation, membrane may so block the tube as to render respiration impossible. Generally the blocked tube is coughed out, but if not it must be hurriedly removed. This can be done at once by the nurse if the thread has been left attached, or in a few seconds by the method of "expression".

But it is surprising how large a piece of membrane may be expelled through the intubation tube. Owing to the small size of the lumen as compared with a tracheotomy tube, it might be expected that only small pieces of membrane could pass. This is not so. J. Millard, in the Edinburgh Medical Journal, 1898, states that Bokai has photographed a piece of membrane coughed through an intubation tube, which formed a complete cast of the trachea and bronchi.

The probable reason is that more vigorous coughing is possible by the natural passages.
A possible danger during the operation is that membrane may be rolled up in front of the intubation tube, and so block the trachea. This would be recognised at once by the operator as respiration is rendered impossible.

This possibility has been urged as one of the chief objections to intubation. Yet it is only of rare occurrence. O'Dwyer states that he never had a single death from it in a series of 600 cases. Bokai asserts that out of 489 intubations, owing to this accident, 18 required immediate tracheotomy. (Millard)

Though such a contingency then is only of very rare occurrence, it is for such a reason as this, or on account of the fact that obstruction may be too low for intubation to give relief, that in hospital one should always have tracheotomy instruments ready at hand.

It has also been stated as an objection to intubation that there is a possibility of carrying a small piece of membrane on the point of the tube down to the trachea, and it thus causing infection of it. This objection might have had some force previous to the introduction of serum treatment but certainly not now, as we know that after a sufficient dose of antitoxin has been administered there is very little likelihood
of any further extension of membrane (Ker)

The laryngeal tube may irritate the larynx of trachea, and even set up ulceration. While this must be admitted, it has to be remembered that the tracheotomy tube may very similarly irritate the trachea and produce like results. The possibility of stricture of the trachea as a result of the incision must also be borne in mind.

These accidents are however admittedly rare, and are not serious unless the cartilage is exposed. They generally heal up completely without any permanent damage to the larynx. (Barlow)

The vulcanite tubes are less likely to cause ulceration. As already mentioned though, they are longer, more difficult to insert, and cannot be removed by "expression". I have never seen Bayeux's tubes in vulcanite, but believe that ulceration, though rare at present, would be still more rare were the "tubes énucléables" made of this material. The metal tubes are very satisfactory if only required for a few days, but in cases of "retained intubation tube", it is advisable to alternate a metal one for one of O'Dwyer's vulcanite tubes in order that the pressure may not be continuous on the one part.
As regards retention of tube, this does not appear to be more common than retention of the tracheotomy tube. At the Boston City Hospital, McCollum out of a series of 1200 cases of intubation only had one case where the tube was required for over \( \text{m.a.} \times 1904 \) a year. Scholes in his series of 135 cases of intubation performed tracheotomy in seven of them as a means of dispensing with a retained tube. In four of these cases, this procedure proved successful.

The use however of alum gelatin often proves helpful in dispensing with a retained intubation tube. Among 177 cases of intubation at Buda Pesth, Bokai reports 16 of retained tube which finally recovered without tracheotomy after the use of alum gelatin-coated metal tubes.

I have seen one case of retained intubation tube where owing to the fact that the tube was repeatedly coughed out, with resulting respiratory embarrassment on the part of the child of such a degree as to call for artificial respiration, tracheotomy was resorted to. The result was unfortunate. It was now found that the child could not dispense with the tracheotomy tube, and intubation was performed as a means to this end, but without success. During a period of six months during which the child was kept in hospital, many attempts were made to dispense with the tubes; but it
was found that unembarrassed respiration was only possible when one or other of the tubes was in position. Ultimately it was found necessary to discharge the patient with the tracheotomy tube inserted.

In this connection Ker states that "while there is considerable doubt if there is much use in performing tracheotomy to allow a patient to dispense with a retained intubation tube," I think much may be done by intubation to permanently remove a retained tracheotomy camula. I have not, however, "he adds" had sufficient experience on this point to speak with confidence, but my results have been decidedly encouraging."

The possibility of creating a false passage while attempting intubation is extremely slight, and only very few cases of such injury have been described. Barlow states in the M.A.B. report 1904 "with ordinary care the risk of such injury should be negligible, and is so regarded by most authorities. Among 370 intubated at Berlin, there was no case of false passage."

The immediate after-care of a child who has been intubated is comparatively simple. The cough if
present, is the only troublesome feature. A special nurse is not essential. From the point of view of nursing all that is required is to see the tube is not coughed out. How different is the immediate attention with a trachectomised child, who requires almost the constant attention of a special nurse in order to keep the tube clean.

It is true that the intubation tube, when coughed out, cannot be replaced by the nurse, and this is undoubtedly a disadvantage. In hospitals, where medical attendance is always at hand, this objection does not hold good. In private practice, where the child is not to be removed to hospital, it makes one hesitate as to which operation should be performed. Under the latter circumstances, the decision should depend on the state of the patient. If the case is an early one and recession slight, it is probably better to intubate, and give a large dose of antitoxin. It is far safer to do so than to leave the child without operation, especially where the medical attendant lives some distance away, as spasm may become severe at any time, and death might take place before the arrival of the doctor. The condition might certainly have improved without intubation, but no harm is done by inserting a tube. There is always of course the possibility of the tube being coughed out, and the child
getting into difficulty before the doctor's arrival. The other alternative is to perform tracheotomy. In an early case of laryngeal diphtheria, though one feels that something may be required, very few men would feel justified in performing the more serious operation, on the chance of the patient's becoming worse. In a bad case, with severe laboured breathing and deep recession, if the child is to be sent to hospital, immediate operation may be necessary to save its life. In such a case intubation should be done. If the child is to be treated at home, and a doctor not available within a few minutes, then tracheotomy would be the safer operation performed.

It is generally acknowledged that a tracheotomised moist child requires at first an artificially warmed atmosphere, as the air passes directly into the trachea. For this reason the steam tent is almost invariably used after tracheotomy. In intubation, as the air passes to the lungs through the natural passages, many do not consider that steam is required. I have however repeatedly found that breathing is more satisfactory, and cough less troublesome, when the intubated child is kept in steam, and am of opinion that the tube is more easily dispensed with when this has been used; so now
I generally adopt the steam tent for intubated as well as tracheotomised patients.

As regards the feeding, there is certainly more difficulty with an intubated child, than with one subjected to tracheotomy. But the average time during which the tube is required is 3 to 4 days, so the trouble with diet cannot be regarded as a serious objection.

A child having an intubation tube in position, coughs violently when given thin fluids such as milk or water. Thickened fluids are much more readily taken. The majority of the cases described hereafter were fed on Benger's food made to the consistence of cream, supplemented occasionally with jellies. One method of getting over the difficulty as regards diet (which was used in a few of the cases referred to) is by means of nasal feeding, — a method which has been adopted as a routine practice in several hospitals where intubation is regularly performed. Rectal feeding too, can always be resorted to if necessary.
Case 1.

Boy aet. 4 years. Onset stated to be 16th. Oct 1912. Admitted 17th. On admission. General condition poor. Breathing laboured, face and lips slightly cyanosed. Intubated at once with No. 3 metal tube, after which breathing was easy. Examination of throat then showed presence of membrane on each tonsil, and considerable swelling of fauces. Anti-diphtheritic serum (A.D.S.) 6000 units injected. Pulse 138. Tmp. 99.2. Resp. 30. Fell asleep immediately on being put to bed.

18th. Condition satisfactory. Tmp. 98.4. Pulse 120. Resp. 24. Given other 4000 units A.D.S. Strychnine (gr. 1/6) 4 hourly.


20th. Tube removed. No subsequent difficulty with breathing. Convalescence prolonged owing to paralysis. Result - recovery.
Case 2.

Boy aet. 4 years 11 months. Onset stated to be 25th October 1912. Admitted 26th.

On admission, breathing difficult and recession marked. Lips rather blue. General condition poor. Intubated immediately with a No.4 short metal tube. This was coughed up in a few minutes, together with a small piece of membrane. Breathing easier after this and tube not required. Fauces and tonsils congested and membrane present on left tonsil. Given A.D.S. 8000 units. Pulse 120. Temp. 99.6. Resp. 32. Strychnine gr. 1/8 4 hourly.

27th. (6. a.m.) Child very restless and recession marked. Intubation at 6.15 a.m. after which breathing was satisfactory and child fell asleep. 10. a.m. condition satisfactory. A.D.S. 4000 units. 2. p.m. Some slight recession which passed off by 2.15 p.m.


29th. Coughed up tube. Breathing satisfactory and tube had not to be re-inserted. Convalescence uninterrupted. Result — recovery.

Case 3.

Boy aet. 3 years. Onset stated to be 6th Nov./12

Admitted 15th. On admission general condition poor. Membrane on each tonsil. Fauces very much congested.
Membrane on right. Recession slight. Put to bed (steam tent). Given A.D.S. 12000 units (2000 had been given before admission). Temp. 100.4. Pulse 144. Resp. 40. Later on a small dull area was detected at base of right lung. Strychnine gr. $\frac{1}{4}$ 4 hourly. Five hours after admission, breathing became exceedingly difficult, and recession marked. Intubation then performed with No 3 tube. Instant relief obtained.


19th. Tube removed. Slight recession about one hour after this, which gradually passed off. Convalescence slow, but uninterrupted. Result - recovery.

Case 4.

Girl age. 1 year 6 months. Onset stated to be 4th Dec. 1912. Admitted 5th.


Pulse 140. Temp. 99. Resp. 32. Put in steam tent
A.D.S. 8000 units. About 2 hours later the recession became marked, and colour poor. Intubation performed with No 2 metal tube, and breathing ceased at once. Tube removed by thread. Found to be plugged with membrane, and piece of membrane coughed out.

Breathing easier after this. Tube not re-inserted. 6.30 p.m. Pulse 150. Temp. 101. Resp. 39. Recession again marked. Intubation again performed. One hour later tube coughed up. Found to be plugged with membrane. Given other 6000 units A.D.S. Recession marked again by 11 p.m. and tube re-inserted. Comfortable night followed.

6th. Tube coughed up at 1 p.m. together with large piece of membrane. General condition still poor. Breathing fairly easy till 7.30 p.m. when intubation had again to be performed. Tube was again coughed up at 9.30 and had to be re-inserted at midnight.

7th. Tube retained till 8.30 p.m. when it was coughed up. No further difficulty with respiration after this. Convalescence satisfactory. Result recovery.

Case 5.

Put to bed and fell asleep almost at once. Pulse 160
Temp. 98.8°. Resp. 28. Only a small piece of
membrane was present on the right tonsil. Fauces very
red.

10th. Coughed up tube at 4. a.m. and slight recession
soon appeared. Put in steam. At 11. a.m. recession
marked and tube had to be re-inserted. Child kept in
steam. Cough still very croupy. Colour good. Pulse
140. Temp. 101°. Resp. 28. Other 4000 units A.D.S.
injected. Fairly comfortable day followed.

11th. Tube again coughed up at 4.30 a.m. No more
recession, breathing very satisfactory. Cough not so
croupy.

12th. Condition improving.
Convalescence prolonged owing to paralysis. Result —
recovery.

Case 6.

Girl aet. 3 years 4 months. Onset stated to
be 5th Dec. 1912. Admitted 8th.

On admission. General condition extremely poor.

Lividity of face, hands and feet. Breathing laboured and recession deep. Given

Strüchnine gr. $\frac{1}{3}$ hypod. Intubated at once with No. 3
tube. Artificial respiration performed and breathing
relieved. Examination of throat then showed presence
of membrane on both fauces, soft palate and uvula.
Given A.D.S. 12000 units. Pulse about 170\(^{\text{and}}\) very weak. Resp. 42. Temp. 99.6. Two hours later, pulse almost imperceptible. Strychnine hypod. repeated. Pulse however did not improve and child died 2\(\frac{1}{2}\) hours after admission.

Case 7.
Boy aet. 3 years. Onset stated to be 6th Dec. 1912. Admitted 10th. On admission. Great difficulty in breathing, and marked recession. Colour extremely bad. Face and lips livid. Given strychnine gr. \(\frac{1}{2}\). hypod. Intubated immediately. Breathing relieved at once, colour gradually improved. Examination of throat then showed reddening of fauces, but no membrane (Swab taken proved positive) A.D.S. 8000 units injected. Child put in steam tent. Pulse 156. Temp. 100. Resp. 30. Fell asleep almost immediately. 6 p.m. Condition satisfactory, child appears comfortable. Other 8000 A.D.S. injected. Strychnine gr. \(\frac{1}{4}\). 4 hourly.


12th. Pulse rate 120. Resp. 22. Tube removed and no further difficulty with breathing.
Convalescence satisfactory. Result - recovery.

Case 8.
Boy aet. 3 years 7 months. Onset stated to be...

On admission. General condition fairly good, though recession was marked. Intubated at once with No. 3 metal tube, which gave instant relief. Examination of throat then showed that both tonsils and fauces were covered with membrane. A.D. S. 12000 units injected. Pulse 140. Temp. 100.2. Resp. 28. Put in steam tent. Fell asleep in a few minutes. At 8 p.m. other 6000 units A.D.S. injected, and strychnine gr. to given 4 hourly.


18th. Tube ejected at 10 a.m. No further trouble experienced with respiration. Convalescence satisfactory. Result - recovery.


On admission. General condition fairly good, though breathing laboured and recession marked. Cough croupy. Intubated at once with No. 3 metal tube. Examination of throat then revealed slight congestion of the fauces but no membrane. There was a purulent nasal discharge, from which a positive swab was obtained.
Put in steam tent. A.D.S. 8000 units injected.


6 p.m. given & another 6000 units A.D.S.


On admission. General condition very poor. Lividity general. Recession fairly marked. Strychnine gr. 1/100 injected hypod. Throat cleaned as much as possible. Membrane present on both tonsils, fauces and soft palate. Intubated with No. 2 metal tube. Recession only partly relieved. 12000 units A.D.S. injected. In a few minutes tube was coughed up together with membranous cast. Breathing still laboured. Tube re-inserted. Child fairly comfortable after this and recession disappeared. Put in steam tent. Pulse 156. Temp. 99.2° Resp. 32. Given Strychnine gr. 1/100 4 hourly
10 a.m. Other 8000 units A.D.S. injected. Condition unsatisfactory. Colour still bad. Pulse very weak and irregular. Given Strychnine gr. $\frac{1}{6}$ every 2 hours.

26th. Condition still unsatisfactory. Breathing easy but pulse and colour bad.

27th. Pulse gradually failed, and child died at 11.15 a.m. of heart failure, with tube in position.

Removed post-mortem.

**Case 11**


On admission. General condition fairly good. (Had had A.D.S. previous to admission) Breathing easy.

Cough croupy. Throat considerably injected and raw looking. No membrane present. (a positive swab was obtained on 29th. Jan.) Pulse 140. Temp. 99. Resp. 24.

Put in steam at once. Given A.D.S. 8000 units.

5th. Child remained fairly comfortable till 6.30 a.m. when she vomited, and recession commenced, and soon became marked. Was intubated then with No 4 metal tube, which gave instant relief. Condition then satisfactory.

6th. Had a comfortable day except for cough which was still rather croupy.

7th. Coughed up tube at 4.15 a.m. Cough still croupy
Steam continued. No further trouble with breathing. Tube had not to be re-inserted. Convalescence was interrupted by pneumonia which developed on 9th. Result - recovery.

**Case 12.**

Girl act. 5 years. Onset stated to be 7th. Feb. 1913. Admitted 9th. On admission. General condition extremely bad. Breathing was laboured and recession marked; cough very croupy. Some general lividity. Intubated at once with No. 4 metal tube which gave great relief. Examination of throat then revealed that fauces were uninvolved. Put in steam tent. Give A.D.S. 8000 units and later on, other 6000.

10th. Child remained fairly comfortable until 5 p.m. when breathing became rather laboured. At 9.50 tube was coughed up, and had to be re-inserted in a few minutes. This did not give relief so tube was removed at once by thread when a large piece of membrane was immediately expelled, which must have been detached during re-intubation. This gave relief and tube had not to be re-inserted.


12th. Some recession reappeared, but gradually passed
Case 13.

Girl aet. 3 years 9 months. Onset stated to be 9th Feb. 1913. Admitted 11th.

On admission. General condition poor. Lividity of face, lips and extremities. Breathing very laboured and recession marked. Intubated at once with No. 3 metal tube, which gave instant relief, and colour soon improved. Examination of throat then showed a small patch of membrane on each tonsil. Pulse 138. Temp. 99.2°F Resp. 24. Given 6000 A.D.S.

12th. Condition satisfactory. Breathing easy. Pulse fairly good. Given other 6000 units A.D.S.

13th. Tube removed, but in 20 minutes, breathing became so difficult it had to be re-inserted.

15th. Tube again removed, but had again to be put back in 35 minutes.

17th. Tube removed, this time without further trouble. Convalescence satisfactory. Result - recovery.

Case 14.

Boy aet. 2 years 7 months. Onset stated to be 19th Feb. 1913. Admitted 20th.

On admission. General condition poor. Considerable lividity of face and extremities. Marked obstruction to breathing and recession deep. Intubated at once
With No. 3 metal tube which immediately relieved
breathing, and colour began to improve. Pulse 138.
Temp. 99. Resp. 24. Examination of the throat
showed redness of tonsils and fauces, but no membrane.
Given 8000 units A.D.S., then 6000 later.
21st. Breathing laboured and considerable recession.
Tube removed, and found to be partly obstructed with
membrane. As recession continued tube was re-inserted.
Comfortable after this. Pulse rather weak.
22nd. Comfortable day. Looking much better.
23rd. Tube removed, but had to be put back half an
hour later. Before tube could be inserted, while
patient was on the table, face became quite livid and
respiration absolutely failed. Tube was rapidly
inserted and artificial respiration performed. Strychnine
gr. $\frac{1}{8}$ given hypodermically. After 2 or 3 minutes
breathing became spontaneous.
26th. Tube removed, but had to be re-inserted in
a few minutes. Child then comfortable.
2nd, Mar. Tube removed. Slight recession, which
gradually passed off.
Convalescence then satisfactory. Result — recovery.

Case 15.
Girl aet. 2 years 9 months. Onset stated to be
On admission. General condition poor. Laboured

29th. Looking much better. Resp. 28.

3rd. Mar. Tube removed, but owing to difficulty in breathing had to be re-inserted in 10 minutes.

5th. Mar. Tube again removed. Had again to be re-inserted. Child comfortable while tube in position but in difficulty a few minutes after its removal. Cough still rather croupy.

8th. Tube removed. Had to be re-inserted in half an hour.

11th. Tube removed, but recession again became marked and tube was replaced 20 minutes later.

14th. Again attempted removal, and again had to replace tube. Child comfortable while tube in position.

17th. Tube removed and this time child was comfortable for about 2 hours. Then breathing became laboured and recession deep, necessitating intubation half an hour later.

19th. Tube removed. Slight recession soon after, but this time it did not become severe, and tube had not to be re-inserted.

Convalescence then satisfactory. Result — recovery.
Case 16
Girl aet. 3 years. Onset stated to be 2nd Mar. 1913. Admitted 3rd.

4th. Had a fairly comfortable night, but pulse still very weak and irregular. Colour still poor. Breathing rapid but easy. During the day pulse became weaker and weaker and at 6.30 p.m. child died of heart failure.

Case 17.
Girl aet. 2 years 2 months. Onset stated to be 1st Mar. 1913. Admitted 3rd.
relief. Colour rather improved.
Convalescence satisfactory. Result - recovery.

Case 18. Girl aet. 3 years 8 months. Onset stated to be 2nd. Mar. 1913. Admitted 3rd.
Temp. 100.2. Resp. 30. Three hours after admission respiration became laboured, Intubation performed. Relief immediate. Put in steam tent.
Convalescence satisfactory. Result - recovery.

Breathing very laboured. Recession deep. Lividity of face. Intubated at once. Tube only momentarily inserted. On removing it, a large piece of membrane was coughed out, and difficulty with breathing ceased. Strychnine gr. 1/6 injected hypod. Only small piece of membrane present on left tonsil. Fauces and right tonsil uninvolved. A.D.S. 12000 units injected. Tube not re-inserted. Pulse 140. Temp. 99.4. Resp. 36.


7th. Condition satisfactory.

Convalescence uninterrupted. Result - recovery.

Case 20. Girl aet. 4 years. Onset stated to be 9th March 1913. Admitted 10th.


11th. (5 a.m.) Recession gradually appeared,
and breathing became laboured. At 5.30 a.m. intubation performed. Immediately tube was inserted it was coughed out, together with a large piece of membrane. Respiration then unembarrassed. Tube had not to be replaced. A comfortable day followed.

12th. Child looking much better. Condition very satisfactory.

A normal convalescence followed. Result - recovery.

Case 21.
Boy aet. 3 years 8 months. Onset stated to be 12th. April 1913. Admitted 13th.
Pulse 140. Temp. 100. Resp. 30. Given A.D.S. 8000 units. Breathing rather laboured and became more and more difficult, requiring intubation half an hour later. In four hours tube was coughed out together with a small piece of membrane. Breathing remained satisfactory, and tube not again required. Other 4000 units A.D.S. injected.
Convalescence prolonged because of paralysis. Result - recovery.

Case 22.
Girl aet. 2 years 6 months. Onset stated to be 16th. April 1913. Admitted 20th.
On admission. General condition - good. Small membraneous patch on each tonsil. Pulse 136. Temp. 100. Resp. 24. Very slight recession. Put in steam tent. 8000 units A.D.S. injected. Five hours later recession became marked, and intubation was performed with No. 3 tube. Slight recession remained for 2 hours after intubation, and a piece of membrane was expelled through the tube, and breathing became easier. Given other 8000 units A.D.S.

21st. Tube coughed out. Recession soon became marked, and tube was replaced in 45 minutes. Child comfortable after this.

22nd. Tube coughed out at 1 a.m. Breathing'easy for about 3 hours, when it became laboured, and tube had soon to be re-inserted.

24th. Tube ejected at 3 a.m. Slight recession occasionally during the next 24 hours, but intubation not again required.

Convalesence satisfactory. Result - recovery.

Case 23.

Boy aet. 3 years 8 months. Onset stated to be 20th April 1913. Admitted 21st.

On admission. General condition poor. Recession marked. Intubated at once with No. 3 metal tube. No relief obtained. Tube removed and vulcanite tube
inserted, but breathing still unrelieved. Put in steam tent. Pulse 140. Resp. 32. Temp. 100.2°. Given A.D.S. 8000 units. Examination of throat showed both tonsils covered with membrane. Half an hour later, as breathing had in no way improved, tracheotomy was performed, and intubation tube removed. Strychnine gr. $\frac{1}{4}$, 4 hourly. Some relief obtained, though breathing still laboured. Other 6000 units A.D.S. injected.


27th. Tube removed. Child comfortable for a few minutes only, when tube had to be re-inserted.

29th. Tube removed, but had to be re-inserted in about an hour.

30th. Tube again removed. Recession again marked necessitating tube in 2 hours.

1st. May. Tube removed, but child in difficulty 2 hours later. On this occasion intubation was again performed, in order to dispense with tracheotomy tube. Breathing easy after its insertion.

2nd. May. Intubation tube removed, and though slight recession appeared soon afterwards, neither tube had to be replaced.

Result: - recovery.
Case 24.

Boy aet. 2 years 6 months. Onset stated to be April 20th. Admitted 22nd.

On admission. General condition very poor.
Marked cyanosis. Breathing very laboured, and recession deep. Intubated at once with No. 3 tube.
Only slightly relieved. Pulse 142. Resp. 46. Temp. 100.2° Given A.D.S. 10,000 units, and Strychnine gr. 1/6 hypodermically every 3 hours. Examination of throat revealed presence of membrane on both tonsils and fauces.
Put in steam tent. Four hours later, owing to increasing difficulty with respiration, Tracheotomy performed. Breathing very little better after this.
Obstruction evidently too low to be relieved by tracheotomy tube. Pulse very weak.

Child died at 10 p.m.

Case 25.

Girl aet. 1 year 6 months. Onset stated to be 28th April 1913. Admitted 29th.

Put in steam tent. Given A.D.S. 8000 units, and four hours later other 4000 units.

1st May. Tube removed. Breathing easy at first. Slight recession developed in 2 hours, but gradually passed off.

Convalescence satisfactory. Result — recovery.

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**SUMMARY AND RESULTS OF CASES.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>No. of times intubated</th>
<th>Tube in position</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>4</td>
<td>1</td>
<td>3 days</td>
<td>Recovery</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>4½</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>1½</td>
<td>5</td>
<td>2</td>
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</tr>
<tr>
<td>5</td>
<td>M</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>3¾</td>
<td>1</td>
<td>2½ hrs. Death</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>3</td>
<td>1</td>
<td>2 days Recovery</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>1½</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>5</td>
<td>1</td>
<td>3 days Recovery</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>F</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>F</td>
<td>3½</td>
<td>3</td>
<td>3 days Recovery</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>M</td>
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<td>4</td>
<td>4</td>
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</tr>
<tr>
<td>16</td>
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<td>3</td>
<td>1</td>
<td>1</td>
<td>Death</td>
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<tr>
<td>17</td>
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<td>1</td>
<td>2</td>
<td>Recovery</td>
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<tr>
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<td>19</td>
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<td>1</td>
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<td>2</td>
<td>Death</td>
</tr>
<tr>
<td>24</td>
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<td>2½</td>
<td>1 Tr.</td>
<td>2 days</td>
<td>Recovery</td>
</tr>
<tr>
<td>25</td>
<td>F</td>
<td>1½</td>
<td>1</td>
<td>2</td>
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</tbody>
</table>

In 14 of the cases, intubation had only to be performed
once. In four, twice. In 2, thrice. In 1, four times. In 1, five times. In 1, seven times.

TABLE SHOWING AGES OF CASES AND RESULTS.

<table>
<thead>
<tr>
<th>Age</th>
<th>Cases</th>
<th>Recovery</th>
<th>Death</th>
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<tbody>
<tr>
<td>1 - 2</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2 - 3</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3 - 4</td>
<td>10</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>4 - 5</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5 - 6</td>
<td>4</td>
<td>4</td>
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</table>

Two of the cases, had to have tracheotomy performed because of the intubation failing to give relief. Of these one died.

There were 4 deaths altogether, giving a Case Mortality of 25%.

Deducting the 2 cases submitted to Tracheotomy, gives a Case Mortality of 13 per cent in Intubation alone.
OPERATIVE CASES OF LARYNGEAL DIPHTHERIA
DURING THE YEARS 1908 - 1912.
IN LEICESTER ISOLATION HOSPITAL.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Operations</th>
<th>Intubation Deaths alone</th>
<th>Intubation Deaths followed by Tracheotomy</th>
<th>Deaths by Tracheotomy alone</th>
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<tbody>
<tr>
<td>1908</td>
<td>7</td>
<td>7</td>
<td>-</td>
<td>-</td>
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<tr>
<td>1909</td>
<td>10</td>
<td>1</td>
<td>-</td>
<td>9</td>
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<td>1910</td>
<td>13</td>
<td>8</td>
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<td>3</td>
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<tr>
<td>1911</td>
<td>31</td>
<td>21</td>
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<td>6</td>
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<tr>
<td>1912</td>
<td>25</td>
<td>16</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>66</td>
<td>55</td>
<td>7</td>
<td>20</td>
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</table>

It will be seen by a glance at this table that out of 55 cases on whom Intubation alone was performed only 7 died. Of the 20 submitted to Tracheotomy, 11 died. Of the 11 Intubations followed by Tracheotomy, 6 died.

The high Case Mortality after Tracheotomy in this series, is explained by the fact that only in the most severe cases, or in those in which Intubation failed to give relief, was Tracheotomy performed.

Statistics in relation to Intubation and Tracheotomy prove extremely littl as the Case Mortality in Intubation for diphtheria is given as from 5 to 40 per cent. In Tracheotomy it varies from 20 to 40 per cent.

There is no doubt that in many cases when intubation is performed very early, recoveries might have
occurred spontaneously. This alone can explain such a low case mortality as 5 percent for cases of intubation. A very great deal depends on the condition of the patient at the time of operative interference. As Barlow, in the M.A.B. report, 1904 says "The severity of the malady is the potent factor, the patient dies from the disease in spite of measures used to counteract it". Of Scholz's 140 intubated cases already referred to, 13 died, making the Case Mortality 9.2 per cent.

Contrasting this with Ker's 70 cases, (1904 - 7) 9 died giving a Case Mortality of 27.1 per cent. This is probably explained by the fact that Ker postpones operation as long as possible with patients under observation in hospital.

McCollum (Boston City Hospital, Medical and Surgical Reports) states that "A careful consideration of the course of the cases, the manner of death, and results of autopsies justifies the conclusion that in children, in the vast majority of cases, intubation is the better operation to perform." (M.A.B. 1904.)
CONCLUSIONS

I consider that intubation is the better operation because:

1. In the great majority of cases, it is much more easily performed than tracheotomy.
2. If general practitioners were better acquainted with intubation, many lives now lost would unquestionably be saved. The operation can easily be performed in the home.
3. No preliminary preparation is needed.
4. No anaesthetic is required.
5. Skilled assistance is not essential.
6. As there is no cutting, and no subsequent scar, the consent of the parents is readily obtained.
7. The operation can be very rapidly performed, even with the patient in bed, and without good light.
8. In the great majority of cases, it entirely relieves dyspnoea.
9. In those cases where relief is not perfect, it may allow a sufficiency of air to enter. If dyspnoea is not relieved, no harm is done; tracheotomy can then be performed.
CONCLUSIONS CONTINUED

10. The after-care, so important in Tracheotomy, is a simple matter.

In the words of Landouzy "Intubation is the operation of choice; Tracheotomy, that of necessity."

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