

Annandale (Thos.)

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INTUBATION OF THE LARYNX AND AIR PASSAGES,

WITH A

Description of a New Instrument as an Aid to Certain Operations.

By THOMAS ANNANDALE, F.R.C.S.,

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I desire to consider the subject of intubation of the air-passages as concisely and as practically as possible, and, in order to do so, I propose to study the procedure under four heads. I cannot say that I have much that is new or original to tell; but, as the subject is now attracting considerable attention, I hope that this short note of the practical and clinical facts connected with it may not prove uninteresting.

1. *Intubation as an Aid in certain Operations.*—In operations involving the mouth or naso-pharynx, in which bleeding may take place into the air-passages and interfere with the respiration, or in operations in which the respiration is not satisfactory during the administration of an anæsthetic, preliminary tracheotomy or laryngotomy, with or without plugging of the throat, is a useful and well-recognized procedure. Experience has, however, taught me that intubation of the trachea through the mouth can, in the majority of instances, be substituted for tracheotomy, and is a simpler and safer means of aid. I give a note of the following case in illustration. About nine months ago a man was brought to the infirmary from the country suffering from great difficulty of respiration, caused by the pressure of a very large and malignant tumor of the thyroid gland. The larynx and trachea were completely buried in the tumor, and after some search I was only able to feel the top of the upper part of the thyroid cartilage, and it was upon a level with the lobe of the left ear. It was necessary at once to do something to relieve his breathing; and I, accordingly, administered chloroform, with the intention of cutting down upon the thyroid cartilage, opening into the larynx, and introducing a tube. Before operating I had provided myself with a gum elastic catheter (No. 10), having an opening at the extremity and an efficient mouth-gag. It was well I did so, for during the operation his breathing ceased, and it was only by introducing the catheter through the glottis that his respiration was restored. Through this catheter the anæsthetic was further given, and the operation completed with success. I have since employed a similar plan in operations attended with a risk of bleeding into the air-passages. The tube used in these cases was, as has been stated, a gum elastic catheter, and it is as well to have in it a stilette of strong wire—the point of which should not project through the opening at the end—as a certain amount of rigidity makes the introduction of the tube easier.

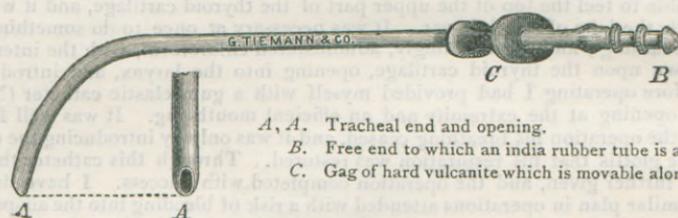
Dr. Macewen, of Glasgow, appears to have been the first surgeon to use intubation on the principle I have just detailed, and I would refer you to an important and practical paper by him upon this subject in the *British Medical Journal* for July 24th and July 31st, 1880. Dr. Macewen's first operation was performed on July 5th and 6th, 1878.

2. *Intubation as a means of Restoring or Carrying on Respiration in Cases of Sudden Obstruction in the Larynx or Trachea.*—There will, I think, always be cases of this kind, in which rapid laryngotomy or tracheotomy will most quickly, and consequently most successfully, restore the respiration; but many of these sudden emergencies can also be treated rapidly and successfully by the introduction of a tube through the mouth into the trachea, and this tube may, if necessary, be retained there for some time. A few weeks ago a young man was admitted into my wards, on account of a large swelling of the neck, apparently of glandular origin. The larynx and trachea were slightly displaced to the left side, but the respiration was not much interfered with. Two days after admission, a rapid increase, owing to an attack of acute inflammation, took place in the swelling, and the breathing became most difficult. Instead of performing laryngotomy or tracheotomy, operations which would have been difficult in this case, my house-surgeon, Dr. Simpson, introduced a tube into the trachea, through the mouth, and this at once relieved the patient. The tube was retained for twenty-four hours, until I saw him, when chloroform was administered through the tube, and a deep incision made, which gave exit to a collection of pus. This having taken off the pressure from the air-passages, the tube was removed and the man progressed satisfactorily. Still more recently, in a case of scald of the mouth and throat from inhaling hot steam, a similar introduction



was most successfully practised. The patient was a child, aged five, who four hours before admission had attempted to drink out of the spout of a kettle filled with boiling water. When admitted the difficulty of respiration was great, and there was cough and great restlessness. The inhalation of warm vapor charged with benzoic acid was at once employed, but the symptoms became gradually worse, and at 2 A. M. next morning they were most urgent. Dr. Simpson accordingly inserted a No. 9 elastic catheter by the mouth through the glottis. The introduction of the catheter caused some irritation and coughing, and a considerable amount of muco-serous fluid was discharged through it; after this the child fell into a calm sleep, being only occasionally disturbed by the discharge of a similar fluid. About two hours after the introduction of the tube, the patient had an attack of vomiting, and the tube was withdrawn, as the respiration was much relieved. The symptoms continued favorable and breathing satisfactory for the next few days, and two weeks after the scald all anxiety in connection with the case was at an end, and a perfect recovery prognosed. In the paper already referred to, Dr. Macewen records several cases of oedema glottidis successfully treated in this way; but Dr. Huch, of Freiburg, had previously treated one case of acute stenosis of the larynx by introducing one of the tubes suggested by Dr. Schrotter. The intubation under these two heads is, in my opinion, best carried out by the long catheter, or similar tube, one end of which protrudes through the mouth. It has been suggested that such tubes should be passed through the nose; but it is much more difficult to pass a tube in this way through the glottis into the larynx and trachea, and therefore I prefer to pass it through the mouth.

One disadvantage of the gum elastic catheter or soft tube is its liability to be compressed, and its canal consequently obstructed by a twist or by the pressure of the teeth; and it therefore occurred to me that a special tube might be used, in order to avoid this risk of interference with the respiration, more particularly when it is being used in operations, or temporarily, as in cases of sudden laryngeal or other obstructions of the air-passages. Accordingly, when recently in New York, I asked Messrs. Tiemann & Co., the well-known instrument makers, to make for me an instrument which would carry out



- A, A. Tracheal end and opening.
 B. Free end to which an India rubber tube is attached.
 C. Gag of hard vulcanite which is movable along the tube.

this principle. Messrs. Tiemann & Co., with their usual ingenuity, have now constructed for me an elastic tube—not too pliable—shaped after Schrotter's one, and having an arrangement to prevent the compression of the canal from contact with the teeth or otherwise. To the end of the tube protruding from the mouth there is also attached a piece of India rubber tubing through which an anæsthetic may be administered, at a convenient distance, in the case of an operation.

3. *Intubation in Cases of Acute Inflammatory Affections of the Larynx, more particularly in Croup or Diphtheria.*—It is in connection with these affections that intubation has attracted and is attracting much attention; and already considerable experience of it, particularly in America, has been recorded.

In 1858 Bouchut read, before the Academy of Medicine, in Paris, a paper entitled, "On a New Method of Treating Croup by Tubage of the Larynx." Bouchut's few attempts were unsuccessful, and the operation was condemned by a committee of his colleagues.

In 1885 Dr. O'Dwyer, of New York, published a paper in the *New York Medical Journal*, for August 8th, 1885, and it is to him that we owe, as a result of observations and experiments carried on for five years prior to this date, the successful establishment of the operation. The principle of Dr. O'Dwyer's operation is to introduce into the larynx, through the glottis, a metal tube of a shape to fit comfortably in the canal, and of a size according to the age of the patient and capacity of the cavity, and to retain the tube as long as may be required, provided it allows the respiration to be properly carried on. In fact, it is proposed by this proceeding to relieve in many cases the laryngeal obstruction to respiration, instead of performing tracheotomy.

When attending the recent Congress of Physicians and Surgeons in the United States, I had an opportunity of listening to several papers on the subject, and also of dis-

Discussing the question with gentlemen who had had large experience of the operation; and although no one considered that intubation would take the place of tracheotomy in every case, there was a very general opinion that in patients under four years of age intubation gave better results than tracheotomy. Dr. Ingals (*New York Medical Journal* for July 2nd and 9th) reports that he had collected 514 cases, with 134 recoveries, or 26.7 per cent. Whereas the recovery after tracheotomy in patients under four is only 15 to 20 per cent.

For a well illustrated and excellent paper upon the performance of this operation, I would refer you to one, by Dr. Waxham, in the *British Medical Journal* for September 20th, 1888. Dr. Waxham has collected notes of 1072 operations performed in America, and out of these 287 recovered—about 27 per cent. He also gives an interesting table proving the advantages of intubation over tracheotomy in young children. Taking only one example from this table, it is found that, in children between two years and two years and a half, the recoveries after tracheotomy were 12 per cent.; after intubation 19.46 per cent. Dr. G. U. Gay, Surgeon to the City Hospital, Boston, U. S., has published, in the *Boston Medical and Surgical Journal* for October 11th, 1888, an interesting paper, in which he discusses fairly and independently the question of the "Comparative Merits of Tracheotomy and Intubation in the Treatment of Croup," and I think that the following quotation from the paper is important in connection with the consideration of the subject: "I have thus in a very important way endeavored to show that, while intubation is a most valuable operation, it is not as free from objections and complications, and is not so far superior to the old and time-honored operation of tracheotomy as some of its advocates would lead us to suppose. The method has great advantages. In favorable cases it is easily and quickly performed; there is no cutting, and hence no hæmorrhage; no anæsthetic is required, as it is not looked upon by the laity in the same light as an ordinary surgical operation, consent for its performance is more readily granted; it can thus be done earlier in the disease; many practitioners will undertake the new method, who would shrink from the old one; the tube takes care of itself; it is often coughed out when no longer required; it is easily adapted to young children. But, on the other hand, the operation may be difficult and even dangerous to perform; it may not relieve the dyspnoea; the tube may be coughed out or it may be swallowed; it may "gum," thus requiring frequent removals; it may become suddenly occluded, and unless quickly ejected or removed death may ensue; and there may be great difficulty in feeding the patient. Both operations are often attended with great difficulties and occasionally with danger; both are liable to complications; the mortality attending each is about the same; the fatal results in a majority of instances are due to the extension of the disease to the lungs, and this occurs after one operation as after the other; in neither case is the treatment the cause of the complication; nor does it prevent or cure it. In conclusion, I would say that, in a majority of cases of membranous laryngitis, intubation may be done with a fair prospect; that it will effectually relieve the dyspnoea for the time being; that it is to be preferred in young children and in all living at a distance from skilled aid, where the tube must be allowed to take care of itself; that it may be resorted to preliminary to tracheotomy; that it may be done for euthanasia, providing the operator is reasonably expert and can do it quickly without producing collapse. Tracheotomy is indicated in those cases in which intubation cannot be done, or in which it fails to give relief to the dyspnoea. In severe cases, situated at a distance, or under circumstances in which ordinary and not skilled assistance can be obtained in such an emergency, tracheotomy is the safer method. It is also to be preferred in those cases of intubation which cannot be fairly nourished, either in the natural way or by enemata, &c. It may resorted to when the O'Dwyer tube is frequently ejected, or when it requires frequent removal to prevent obstruction. I would repeat that, as regards patients residing at a distance, if competent aid is to be at hand during the convalescence, intubation is advisable, as it is if no care whatever is to be given to the tube. But if ordinary care and no other in case of accident can be commanded, and I mean by that a fairly good nurse, or any clever person, then tracheotomy is the better procedure."

It may be well to consider the advantages claimed for intubation in this class of cases, and then to consider any of its disadvantages as compared with tracheotomy:

1. No anæsthetic is required, and it can be done at once without shock or the risks attending tracheotomy, especially in young patients.
2. No external wound is made, and, as the breathed air passes through the mouth is so warmed, there is less risk of pneumonia or bronchitis.
3. No after-treatment is required when the tube is removed.
4. Consent of friends is more readily obtained than in cases of tracheotomy.
5. Tracheotomy can at any time be performed if intubation fails.
6. In many cases the tube can be removed early—third, fourth or fifth day.

DISADVANTAGES.—1. When introducing the tube, the membrane may be pushed down and obstruct respiration. 2. The tube may be obstructed by membrane passing

into it. 3. Food may pass down the tube and cause pneumonia or other complications. 4. The tube may slip down the trachea. 5. The tube may be coughed up. 6. If the tube becomes displaced or obstructed, it is not easily reintroduced by a nurse.

The first of these accidents will in all probability give rise to symptoms, so that the membrane might be removed, either by means of laryngeal forceps or by the performance of tracheotomy. The second is a rare occurrence, according to the experience of operators, and can only be remedied by the removal of the tube and replacement after its canal has been cleared, or by the performance of tracheotomy, if the symptoms were urgent. To prevent the third, it is advised that food, especially fluids, be at first given in small quantities, and the nourishment assisted by nutrient rectal injections, or by means of a tube passed into the œsophagus. There is considerable difference in different patients in connection with the power of swallowing after this operation, and many swallow well after the first day or two. I believe much depends on the exact position of the tube, and the amount of interference with the action of the epiglottis. Dr. T. E. Waxham has suggested a modification of O'Dwyer's tubes, with the addition of a soft rubber false epiglottis, and still more recently Dr. J. Mount Bleyer has employed a tube more cup-shaped at its upper end, and having also a false rubber epiglottis. Dr. Bleyer is of opinion that these latter tubes have afforded him better results than he obtained by the O'Dwyer original ones. The fourth and fifth very rarely occur. The sixth point should not, I think, be a bar to the operation, for in such cases it is usual to have some skilled assistance on hand which should be able to replace the tube if required. If such skilled aid cannot be available, tracheotomy would be preferable.

I conclude this section of my paper with a brief note of a case (my only case as yet) recently treated by intubation. A little girl, aged three, suffering from great difficulty in respiration, the result of an attack of croup, was brought to me at the Royal Infirmary by Dr. Sloan, about 12 o'clock on the forenoon of November 9th. She was attacked with croup on the 6th, three days before, and although carefully treated, her symptoms grew worse, and the laryngeal obstruction became so marked that immediate relief was demanded. Instead of performing tracheotomy I at once introduced one of O'Dwyer's tubes. When the tube entered the glottis, there was a violent spasmodic cough, and a piece of membrane was ejected through it. Immediately after this, when the tube had been in position, the breathing was relieved, and ten minutes after, when I visited the child in the ward, she was respiring naturally, and was asking, in a whispering voice, for a "piece." For the first few hours there was a difficulty in swallowing, much of what was taken being ejected; but after this she was able to swallow with ease, and took milk in abundance. On the following day, the 10th, the respiration was more rapid, and the face flushed, but the tube was causing no irritation, and there was no laryngeal obstruction. The symptoms, however, pointed to commencing pneumonia. On the 11th the lungs were worse, but the tube was retained, and there were no signs of laryngeal obstruction. She had no difficulty in swallowing. On the twelfth she became much exhausted and died the same afternoon, the tube having been retained until the last. The *post-mortem* examination, which was confined to the throat, showed that the laryngeal condition had been quite relieved, and that the tube had caused no ulceration of the portion of the canal upon which it rested. Death was the result of pneumonia, which had probably been caused by the exposure of the patient when brought to the hospital. The points which convinced me of the value of intubation in connection with the experience of this case were: 1. The ease with which the tube was introduced; 2. The complete relief to the respiration when it had been properly adjusted; 3. The fact that the tube caused no irritation, although retained for some days, and carried on efficiently the laryngeal respiration; 4. The fact that after a few hours the patient was able to swallow fluids well; 5. The satisfactory condition of the larynx as proved by the *post-mortem* examination.

4. *Intubation for Stenosis of the Larynx, the Result of Chronic Inflammatory Conditions, or Accidental or Surgical Wounds.*—The introduction of O'Dwyer's tubes in this class of cases has been followed by better results than have been obtained by any other plan of treatment, and these tubes have been in the adult and also in the child for a week, without requiring to be changed, and in a few cases for several months. In one case, related by O'Dwyer, the tube was worn for ten months. Intubation in these cases not only relieves any temporary obstruction to respiration, but the permanent retention of the instrument, when it can be borne, is likely to have a beneficial effect in restoring the proper calibre of the canal.

