Some Practical Hints in connection with Intubation of the Larynx,

And a Résumé of 206 Cases operated on from 1886 to 1888.

BY

J. MOUNT BLEYER, M.D.

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SOME PRACTICAL HINTS IN CONNECTION WITH INTUBATION OF THE LARYNX,

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By J. MOUNT BLEYER, M. D.

Through the recent publications of our journals, particularly in New York, Chicago, and Philadelphia, we have been able to obtain by experience positive data upon which to base an estimate of the merits of intubation of the larynx. Every new therapeutical measure must be judged by its results, and if on extended use it can not produce better results than some older and tried remedy it deserves to fall into oblivion. According to these and the following statistics published up to the present time, we find that Dr. J. O'Dwyer's method compares more than favorably with tracheotomy as regards the saving of life, while certainly, to consider it from an æsthetic point of view, it is much to be preferred, and no doubt will prove itself a valuable addition to the medical discoveries and advances of the age.

I have long taken great interest in the subject which deals with the medical and surgical aspects of diphtheria. All difficult subjects are interesting, and this, one of the

most difficult, is therefore one of the most interesting that we are called upon to deal with. At present we know little or nothing of the essence of diphtheria, although it is being studied closely; until we do, I take it that our treatment will have to be directed against the effects rather than against the disease itself.

I have found it to be of special importance to make a laryngeal examination in all children that are presented to me for intubation. Few having the experience of the laryngoscope will decry the practical lessons taught by its revelations, or its certainty as a means of differential diagnosis, but still it seems that this method has not yet been fully appreciated in all its aspects by the general physician and surgeon. The importance of such procedure is neither to be underrated nor neglected.

Why Laryngoscopy should be practiced before and after Intubation.—It should be urged upon operators practicing intubation to examine, by means of forced or normal laryngoscopy, every case which is presented. I have made this a cardinal rule previous to intubing.

With such means at my disposal, I see the position which the membranes occupy and the general conditions present, so that if membranes are in the way of the operating field they may be removed, and not pushed before the tube downward into the trachea. Forcing down the membranes before the tube, which is so much practiced, is the rule and not the exception.

The differentiation and diagnostication of other laryngeal diseases may be made out at the same time, and the extent of the diphtheritic or croupous lesion seen.

Suggestions as to how Forced Laryngoscopy is made.—Forced laryngoscopy is performed by means of my tongue tractor, gag, and a mirror. This tractor and gag have been described fully in the "Archives of Pædiatrics"

for October, 1888. An illustration of the tractor is seen below.

In children under five years of age it will be found most convenient, without losing any time, to envelop the child's body and arms with a strong towel, pinned closely about them, and then place it upon an assistant's lap, who takes the legs of the patient between his knees and holds the body well and firmly down upon his lap with the left arm and hand, while with the other over the child's forehead its head is pressed backward against the chest, and thus its attempts to turn it from one side to the other are resisted. The mouth is now opened by means of the gag, which has a wedge attached to the gagger for forcing its way in between the teeth and into the mouth. The alveolar rest has soft-rubber paddings to prevent the breaking of the teeth, or injuring the gums in those where no teeth are present; at this stage of the operation a five-per-cent. solution of cocaine is employed, with which the pharyngeal and laryngeal surfaces are sprayed, or without the use of cocaine, as I often do when the examination is of a short duration, as in the ordinary cases for inspection purposes. The operator passes the tractor down, guided upon the forefinger of his

left hand, and secures the base of the tongue, which, being drawn upon, favors partial elevation of the larynx. The tractor is to be drawn upward, outward, and downward. The downward motion depresses the tongue.

Often a very common difficulty is met with in the position of the epiglottis, as it is more or less depressed, overhanging the larynx, or compressed and rolled together at its sides. By forcing and steadying the epiglottis against the base of the tongue, this difficulty is nearly obviated, and the larynx and neighboring parts may be viewed and treated.

Examinations of the larynx can be made at any time during the wearing of the tube, in order to see the same, or to guard against any sudden or unforeseen circumstances, and thereby gain an immediate diagnostic point.

For purposes of illumination, where gas can not be obtained, any lamp which gives a bright, steady light will suffice, and one practiced may obtain a good image even with a candle in a bull's-eye lantern, or with a carriage lamp. Several useful portable lamps can be procured for such work. In the absence of a condensing lens, a piece of white paper placed behind a lamp or candle will add considerably to the brilliancy of the light. If the patient lives in rooms where the sunlight is available, I prefer it for this use.

The degree of success will depend upon the skill and management of the laryngoscope by the operator. Small laryngeal mirrors—the No. 2 and No. 3—are the proper sizes.

The Daily Extraction of the Tube.—In my last fifty cases I have extracted the tube daily. This was done for the purpose of removing the accumulation of loose membranes, tenacious mucus, pus, etc., which might block up the tube or the pharyngeal and laryngeal surfaces. Often the child has not the power left, from repeated attempts, to expec-

torate or cough up these materials. After the employment of this measure it was found that the little patient was helped to rid itself of a large amount of blocking poisonous *débris*. When the tube has been extracted, irrigate the posterior nares, pharynx, larynx, and entire surface with a mild solution of bicarbonate of sodium, and half an ounce to fourteen ounces of lukewarm water. Half an hour later food is offered. I have then seen them take it ravenously. If I found any difficulty at this stage, the stomach-tube was at once applied.

Reintroduction of the Tube.—After the food has been given, the tube is reintroduced, and I have found, it advisable in some cases, where the stenosis is not so urgent, to wait for some hours before the reintroduction of the tube is again tried. In a large number of cases it was seen that the tube had done its service on the second or third day, and with but few exceptions it was not reintroduced again.

The Differentiation between the Tube being in the Larynx or Œsophagus.—After the tube has been introduced, remove the gag at once and wait a few seconds; now, if your tube has been passed into the larynx, you will immediately observe the difference in the breathing; the cyanosis disappears; a characteristic hollow-sounding cough, which, if once recognized or heard, you will be able to distinguish from all other coughs; this is then followed by a second sudden spasmodic cough, with a large amount of expectoration of muco-pus and membranes; if water is now given to drink, it will still increase this spasmodic cough, followed by still more mucous discharge from the tube.

The signs which present themselves if the tube has been passed into the œsophagus are different. Cyanosis increases, breathing is not relieved, the stenosis increases, the characteristic cough is absent, and the thread of eighteen inches long which is attached to the tube begins to disappear by

the gravity of the tube drawing it toward the stomach. Cough may also be present, due to irritation at an attempt of introduction, but without that special described cough.

If there is any doubt in your mind about the presenting signs, then, before the removal of the thread from its attachment to the tube, you had better replace the gag, pass your finger down upon the head of the tube, and feel for the surrounding anatomical parts. But the most certain way is to make a forced laryngoscopic examination, which will distinctly show you the tube in the larynx and relieve you from all further anxiety.

One should make himself thoroughly familiar with the anatomy of the larynx and all surrounding parts before he attempts to practice intubation.

The Removal of the Thread from the Tube.—The thread which is attached to the tube is removed last, after you are positive that the tube is in its right position; this is best accomplished by replacing the gag, so as to prevent the operator from being severely bitten; pass the index finger down upon the head of the tube, add slight counter-pressure upon it, while with the other hand draw gently on one end of the thread.

Selection of the Tube in every Case.—This depends more upon the judgment of the operator than upon the age of the child, as the size of the larynx differs very often at the same age. It will be found that a larger tube has to be inserted than the indication shows at the age. I generally pass the tube of correct size and, if coughed up for no other cause, introduce the next size larger.

A good plan is to have more than a single set of tubes on hand for those who are practicing intubation, or otherwise, if one of the set is lost, that is generally the tube most required when least expected. Carry in your intubation bag two of each size, so that you can at any moment replace

any of the missing ones. Also it is highly necessary to have on hand a few with a larger lumen; these ought to accompany every intubator, as you certainly will run across a case which will not be relieved by the tube with the small lumen.

Irrigation.—This is an admirable method of washing away the products of the local lesion. I use a No. 8 soft-rubber catheter which is attached to a fountain-bag syringe; the catheter is passed into the nostrils, first the right and then the left. The solution which is used is made by taking peroxide of hydrogen (Charles Marchand's), fifteen-volume solution, chemically pure, one ounce to twelve ounces of water. With this solution irrigate each nostril thoroughly. After this has been done, the next move is to wash out the mouth, pharynx, and larynx. If the child can be managed without forcing the mouth open, there is no need of the insertion of a gag; but if not, use it. The patient is to be held well forward over a basin for the reception of the returning fluid. Make a second mixture of the peroxide of hydrogen of the strength of four drachms to twelve ounces of water. The catheter is passed well down into the larynx, the surrounding parts, and thoroughly irrigated. The fluids are very seldom swallowed, and if this fluid mixture should be swallowed there is no danger of poisoning, as it is a perfectly harmless antiseptic. The fluid is generally immediately expelled by coughing. The mouth is to be kept wide open and the head well forward. By this mode of treatment, patches of membrane, inspissated muco-pus, etc., can be washed away without difficulty and without pain. My experience with peroxide of hydrogen for the last four years has made me familiar with its varied use in the treatment of the diseases of the nose and throat. From a consideration of the action of peroxide of hydrogen upon the deposit of diphtheritic membranes, and the rapid reproduc-

tion of bacteria, it will at once be evident that the earlier the application of the remedy is adopted the better. While the membrane is thin and friable, the action of this agent is thorough, quick, and effective; the deposit melts down before the contact of it like sugar in water, to be reproduced in a short time and again removed until the diseased tissue beneath can be plainly seen free from this characteristic covering. In this way also the spread of the membrane is checked and its limits often sharply circumscribed, until after some days, which it seems to me is within a week, the germinating power of the membrane is conquered and the poison ceases to produce its kind, no more deposit takes place, and the diseased tissues heal. In view of the rapid reproduction of bacteria already mentioned, it is evident that the applications should be no longer apart than two hours, or even less, according to the rapid reproduction of the membranes. Gargling may be practiced by those who are able, but irrigation is preferred, as a more thorough application is thereby made. Irrigation is easily learned by the nurse, and there is absolutely no danger connected with its use.

The peroxide of hydrogen should be kept at a temperature below 65° F., as it begins to decompose slowly at the above-mentioned temperature.

No metallic substance must come in contact with peroxide of hydrogen on account of its oxidizing power.

For internal use I give the preference to glycozone, which is chemically pure glycerin saturated with active ozone, or the formula $C_3H_8O_3 + O_2$. It is intended to be used as a substitute for bichloride of mercury, carbolic acid, permanganate of potassium, etc. This is the most powerful of all organic disinfectants and bactericides. The advantages that are claimed for it in comparison with other powerful antiseptic compounds are its non-toxic properties and inodorousness. I give to a child over two years of age a

quarter of a teaspoonful diluted well in water or milk every two hours, and under that age twenty drops.

Before adopting this compound I made use of the peroxide of hydrogen for internal use in diphtheria, but it was not tolerated by the stomach as well as this preparation.

Fluids and Feeding.—As a general rule, fluids are swallowed badly. This has been partially overcome by my false epiglottis tube. The child is placed upon the nurse's lap in a recumbent position and fed through a nursing bottle with such fluids as water and milk; shaved ice or ice-cream may be given in the natural way. Nevertheless, some of the fluids will pass into the tube unless great care is taken. I supply the system with fluids and semi-solid food mostly by the stomach-tube. The reason why feeding by the stomach-tube should be adopted is to avoid irritant substances entering the bronchi and tube. Water can be allowed to be taken whether it passes through or not. It is necessary that the intubated children should cough and expel whatever materials are lodged in the tube and air-passages. By feeding them without the stomach-tube you will certainly stop up the tube and favor *Schluckpneumonie*, thereby complicating every case.

The procedure of thoroughly irrigating the mouth, pharynx, and larynx as herein described has been found to act most beneficially in all cases, as then the child does not feel the want of fluid so much, but only has a desire to rid himself of the constant tenacious material which is always lodged in the passages during such a disease.

A Suitable Bed.—The best means to secure pure air for a patient with diphtheria or croup is by surrounding the bed by a pair of ordinary curtains. This should be done wherever it is possible; then the window can be freely opened, and thereby the room thoroughly ventilated. The curtains act as a protection to the patient from draughts; the air

can be kept immediately surrounding him at an equal temperature, and, with the assistance of the steam atomizer, the air within the inclosed bed can be medicated and disinfected.

The steam atomizer is to be recommended highly, as there is no doubt that by keeping the interior of the pharynx and larynx moist by means of hot steam, it tends to liquefy and loosen crusts of mucus, which favors expectoration of the membranes; or otherwise, without steam, there may be increased laryngeal obstruction. This will always be found a valuable adjunct in the treatment.

The Protection of the Operator's Eyes. — Never make any examination of the larynx, mouth, or pharynx of any suspicious nature without the eyes being protected by a pair of eye-glasses, for if a sudden cough or forced expectoration takes place and any particle of this happens to pass into your eyes, a great chance is run of losing the eyesight.

The Cleansing of Tubes and Instruments.—Before and after intubation a great deal of attention should be given to this in order that no contagion should be carried to another case which is to be intubated, and perhaps not suffering from the same degree of diphtheria or croup as the one previously operated upon. The remedy that I suggest is that all tubes and instruments used should be scrubbed and boiled before and directly after for ten minutes in a closed pot of water at 212° F., and then left for ten minutes longer in a one-to-forty solution of carbolic acid. In conclusion, I will say that I intended this paper essentially as a practical one, based on the experience of many cases of intubation of the larynx.

The following is a table, record, and *résumé* of my last 206 cases of intubation of the larynx, which shows a large percentage of recoveries. Out of 206 cases, 67 patients recovered—33 per cent. in all ages.

Table showing the Results of 206 Cases of Intubation of the Larynx.

Total number of cases operated on, 206.
Male, 137. Female, 69.
Recoveries, 67 (33 per cent.). Deaths, 139.

In the cases of recovery, the tube was:

Removed on the 1st day in 3 cases.
" " " 2d " 13 "
" " " 3d " 10 "
" " " 3½ " 6 "
" " " 4th " 12 "
" " " 5th " 11 "
" " " 6th " 3 "
" " " 7th " 4 "
" " " 9th " 2 "
" " " 10th " 1 "
" " " 15th " 1 "
" " " 20th " 1 "

UNDER THREE YEARS OF AGE.				OVER THREE YEARS OF AGE.			
AGE.	Number.	Deaths.	Recoveries.	AGE.	Number.	Deaths.	Recoveries.
6 mos.	1	1	..	3 years...	17	17	..
9 "	2	2	..	3 " ...	7	..	7
9 "	3	1	2	3¼ " ...	1	1	..
10 "	1	..	1	3½ " ...	9	9	..
10 "	1	1	..	3½ " ...	4	..	4
1 year....	9	9	..	3¾ " ...	3	3	..
1¼ "	4	3	1	3¾ " ...	9	9	..
1¼ "	1	..	1	4 " ...	6	..	6
1½ "	11	11	..	4½ " ...	3	3	..
1½ "	2	.	2	4½ " ...	8	..	8
1¾ "	13	13	..	5 " ...	4	4	..
1¾ "	5	..	5	5 " ...	3	..	3
2 years....	21	21	..	6 " ...	5	5	..
2¼ "	8	8	..	6 " ...	3	..	3
2¼ "	1	..	1	7 " ...	3	3	..
2½ " ...	10	10	..	7 " ...	5	..	5
2½ "	7	..	7	8 " ...	3	..	3
2 yrs. 10 m.	1	1	..	9 " . .	2	2	..
2¾ "	2	2	..	11 " ...	1	..	1
2¾ "	4	..	4	16 " ...	1	..	1
				18 " ...	1	..	1
Total....	107	83	24	31 " ...	1	..	1
				Total ...	99	56	43

Out of 107 there were 24 recoveries in children under three years of age, and in 99 three years and over there were 43 recoveries.

Causes of Death in 140 Cases.

Sepsis	11
Broncho-pneumonia	14
Heart failure	6
Pneumonia	23
Extension membranes to bronchi, or diphtheritic bronchitis	57
Bronchitis	11
Double pneumonia	1
Asphyxia—not being notified, and tube lost in the bed mattress.	1
Exhaustion	10
Scarlatina	1
Nephritis	2
Membranous croup	1
Hæmorrhage of the nose	1
Asphyxia due to closure of the tube by membrane	1

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