RAPID DILATATION AND THE PROLONGED USE OF INTUBATION TUBES IN STENOSIS AND IN CICATRICAL OCCLUSION OF THE LARYNX. REPORT OF TWO CASES.*

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One of my chief reasons for reporting the first case is to call attention to the means which I employed to stretch the stenosed larynx.

Case 1.—Ernest L., Italian, aged 17 years, dealer in flowers, was admitted to the Massachusetts General Hospital on January 8, 1900. His family history was negative. He had had gonorrhea one month before entrance but no specific history could be obtained. He said he was well until June, 1899, when a lump appeared on the left side of his neck, which grew larger and was opened by an Italian doctor. During the latter part of July the patient noticed a spot over the thyroid cartilage which was soft and which on straining increased to the size of a marble. This was opened by the same doctor and air escaped and the patient breathed partially through this opening. Up to this time there was no change in the voice and no difficulty in breathing. The opening in the neck healed and the same expansile tumor appeared again. In the latter part of August this tumor was opened in the surgical out-patient department and a fistula established. This remained open until about the middle of November with hoarseness and dyspnea gradually increasing and cough at times paroxysmal. On December 9th tracheotomy was done on account of dyspnea and cyanosis. The patient was put on specific treatment at this time but nothing was done locally for the larynx. I saw him about six months later, in the summer of 1900, when he was wearing a tracheotomy tube. On closing the tube with his finger he could speak with considerable effort in a low whisper and apparently could get extremely little air through the larynx. His throat was unusually difficult to examine, but after several trials I succeeded in seeing the larynx. The chink of the glottis was extremely narrow, owing apparently to an infiltration of both sides of the larynx, the ven-

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tricular bands being also very much swollen. There was no evidence of ulceration or signs of there having been any, nor was there in any other part of the body any evidence of an active syphilitic process. For a time I attempted to dilate the stenosis with Schroetter's tubes without success. The infiltration was so firm and the stricture so narrow that I was unable to pass the smallest tube, using considerable force. I then determined to try the passage of intubation tubes under ether, with the intention of leaving one in, if I succeeded in passing it. There was considerable delay in obtaining the hard rubber tubes which I desired, but finally on December 26th he was readmitted to the hospital and on the following day I attempted intubation. My first difficulty was that the larynx was so far down, largely due, no doubt, to the fact that the patient had worn a tracheotomy tube so long, that I could not, try as I might, reach the arytenoids with my finger. I was thus unable to properly guide the intubation tube into the larynx and after several unsuccessful attempts was obliged to give it up. A few days later I had him etherized, then, while he was lying flat on his back with a pillow under his shoulders, I removed the tracheotomy tube. I then introduced a small female urethral sound, about No. 15, French, through the tracheal opening up into the larynx so that I could feel the end of it with my finger in the throat. I continued to pass the successive sizes in the same manner until I reached No. 37 French. The last few sizes passed with considerable resistance. The tissues seemed to stretch rather than tear and there was very little bleeding. I next tried to insert a large adult intubation tube in the ordinary manner, but without success, meeting the same difficulties as at my previous attempt to intubate. I then passed a pair of long, narrow, slightly curved forceps into the tracheal opening and up through the glottis. On this I put the intubation tube. Then pulling the forceps back through the tracheal opening and following the tube with the forefinger of my left hand, I was able to get it into place in the glottis. There was comparatively little reaction after all this manipulation of the larynx. The patient had a little difficulty in breathing and could take no food by mouth so was fed by enemata. On the next day (January 2, 1901), he took in addition milk by the mouth in small quantities. Evening temperature was 101° F. On January 4th his temperature was normal. He took milk and custard by mouth. Had no difficulty in breathing through the tube. On January 5th at 7:30 a. m. he coughed up the tube. Marked dyspnea came on at once and the

old tracheotomy wound had to be opened and a tracheotomy tube inserted. Later in the morning the intubation tube was reinserted under ether. The problem now was to devise some means to hold the tube in place so as to avoid any such accident in the future. This would have been just the case for the projecting retaining arm suggested by Rogers of New York and spoken of by Simpson in his very thorough paper on intubation in chronic stenosis of the larynx, read before this Association last year. Unfortunately I did not know of it at this time. Nor was I allowed any time to devise some means for retaining the tube, for the next morning the patient insisted, in spite of all that I could say, upon having the intubation tube removed and the tracheotomy tube replaced. He and his relatives had been so alarmed by the accidental coughing up of the tube that they became absolutely unreasonable. I was therefore obliged to give up the case and discharge the patient with the tracheotomy tube in as before. There seems good reason to believe that if I could have continued treatment I should have obtained a good result as far as the patency of the larynx was concerned. In this case the ordinary O'Dwyer extractor was not long enough to reach the tube and I was obliged to first raise it from below through the tracheotomy wound before I could remove it. I wish to call attention once more to the use of female urethral sounds in dilating this stenosis and to strongly recommend their use to anyone having a similar case. They could not have worked more satisfactorily if they had been made expressly for the purpose. It had been my intention to keep a tube in this larynx for at least six or eight weeks continuously, just as I did in the following case:

Case II.—Gertrude B., aged five years, was brought to see me at the Throat Clinic of the Massachusetts General Hospital in the latter part of April, 1900, wearing a tracheotomy tube. Her father gave the following history:

She was taken ill with diphtheria on December 25th, 1899, and was treated at a suburban hospital, where it was found necessary to do intubation. She coughed the tube out and it had to be reinserted several times. In the latter part of January the tube was removed temporarily, but when it became necessary to replace it it could not be done quickly enough. The child became cyanotic and tracheotomy was performed. Every attempt to dispense with the tracheotomy tube after this was followed by dyspnea and cyanosis. On laryngeal examination I found the vocal cords united together

for nearly their whole length by cicatricial membrane, leaving only a small open space at the posterior part of the glottis. It was found, however, on closing the tracheotomy opening temporarily with the finger that not the least breath of air entered the lungs through the glottis. It was consequently assumed, rightly as it proved, that there must be other cicatricial tissue below the cords which completely occluded the larynx. While I was endeavoring to make up my mind what was the best method of treatment to pursue in this case my attention was called to an article of Dr. John Rogers, Jr., in the *Annals of Surgery* for May, 1900, on the treatment of stenosis following diphtheria by the prolonged use of intubation tubes. I at once wrote him to obtain fuller information on some points and desire to express here my thanks for the interest which he showed in my case. There was some delay in obtaining the hard rubber intubation tubes required. But finally, on July 10th, the operation was performed. The child was etherized and placed in the Rose position. The tracheotomy tube was removed and Dr. Conant, into one of whose wards the child was admitted, made an incision upwards in the median line of the neck through the superior tracheal rings. The cicatrices in the trachea were divided as they were found. A probe was then passed up from below through the opening at the posterior portion of the larynx until I could feel it with my left forefinger passed through the mouth down to the larynx. The opening was then carefully dilated with hemostatic forceps under the guidance of my finger resting on the arytenoids. During these procedures the tracheotomy tube was reinserted to pass a 10-12 intubation tube, which proved too long to get by the angle formed by the roof of the mouth and the posterior pharyngeal wall. An 8-10 tube was inserted without using much force. The tracheotomy wound was partially closed with silk-worm gut sutures and a dry dressing applied. The child breathed with ease through the laryngeal tube. Salt solution enemata, ten ounces every six hours, were given and nutritive enemata, every six hours. Several unsuccessful attempts were made to feed by stomach tube, the child vomiting the liquid every time, some of which got into the trachea through the intubation tube. On the fourteenth day she was able to swallow soft custard without distress. The hospital record on July 31st says:

"Since last note child has been improving rapidly. Takes any kind of soft food but is unable to take liquids." August 7th—"General health excellent. Wears tube without discomfort. Is able to

take soft solids without difficulty but cannot swallow liquids except cracked ice which she allows to dissolve in mouth." August 15th—"Salt solution enemata omitted as patient can now swallow liquids without difficulty." On September 4th, the tube having been in about eight weeks, I determined to remove it. The child was etherized and placed in the dorsal position with a pillow under the shoulders. The tube was then withdrawn. It came away with some difficulty and there was some hemorrhage. The respiration became noisy and labored and finally ceased, the chest wall moving spasmodically up and down without entrance of air. Tracheotomy was at once performed through the old scar and artificial respiration soon started the breathing and the color became normal. The child was up and about the ward the next day with no symptoms. Six days later, on September 10th, I removed the tracheotomy tube and found that she breathed partly through the larynx. A small valve-like piece of granulation tissue, situated above the tracheotomy wound was removed and the wound drawn together with crepe lisle. On September 14th, when the tracheal wound was nearly closed the respiration again became labored and noisy and color poor, necessitating immediate opening and dilating of the wound and reintroduction of the tracheotomy tube, as there was no one on hand who could put in the intubation tube. On September 17th I again put in the 8-10 tube under ether. It went in with some difficulty, showing that there had been already some contraction. Thinking that a tube of larger diameter would be better I had the 10-12 tube shortened to the length of the 8-10 and introduced it on September 21st in place of the latter. The patient was now allowed to go home with the tube in. After being in a little more than a month I removed this tube. There was some bleeding but the child soon breathed easily. In six days I was obliged to replace the tube, owing to rapidly increasing dyspnea. I left it in for five weeks and then removed it. It came out with some difficulty and there was a slight amount of hemorrhage. This time it was out for nearly two weeks and then had to be reinserted. After being in for five weeks it was again removed on February 1, 1901, again with some hemorrhage. On February 11th, I passed the 8-10 and 10-12 tubes but did not leave them in. On February 25th I went through the same procedure. I began now to be somewhat encouraged and let the patient go nearly a month without treatment. On March 22d I thought I had better pass the tubes again. On attempting this under ether I found that there had been

so much contraction that I had to begin with a 4-5 tube. I stretched the strictures up to an 8-10, which went in with so much difficulty that I did not attempt the larger tube. On the next afternoon I was hastily summoned to the hospital, where I found my little patient breathing with great difficulty. She had begun to breathe badly at 6 o'clock that morning. I introduced the 8-10 tube and left it in, and a week later I substituted the 10-12 for it with ease. This was removed in a week. Breathing again appearing slightly obstructed at the end of three weeks, April 24th, I again passed the tubes, beginning with the 4-5 size and leaving the 8-10 size in. On May 3d I substituted the 10-12 size for this, leaving it in two weeks. On its removal there was almost no bleeding. A week later, finding that there had been some contraction, I left this tube in again after passing the two smaller sizes. On June 14th I removed the tube, and there was practically no bleeding. Up to the present time, over eleven months, the child has breathed naturally through the larynx. The appearance of the larynx is now as follows: The glottis is free from cicatricial membrane. The left vocal cord is held in position of extreme abduction, probably as a result of the scar formation. Below this cord the tracheal wall appears swollen and somewhat redder than normal. The right vocal cord appears to move freely, but not sufficiently so except by great effort to come in contact with the abducted left cord. The patient, consequently, speaks only in a whisper, except when by an effort she makes a low gruff tone.

I have reported this case in full in order to show more graphically than I could in any other way its obstinate character and the frequently recurring contractions of the cicatricial tissue until at times I begin to despair of ever being able to dispense with the intubation tube. The bleeding which occurred at each removal of the tube I believe came from a granulating surface, and the fact that there was no bleeding at the last removal I take to mean that this surface had healed. I think I might have curtailed the time of treatment in this case if I had put in the shortened 10-12 tube at first. I hardly think it would have been possible to have put in a tube a size larger if I had had one, as the 10-12 tube seemed to fit very snugly. The cicatricial tissue in this case was the result of ulceration due more probably to the diseases than to the frequent intubation. Northup's case reported by Rogers is similar to mine. In his case frequent auto-extubations finally necessitated a tracheotomy. Death followed in about a month from pneumonia and at

the autopsy the larynx was found completely occluded by a cicatricial diaphragm. Rogers says: "The commonest cause of post-diphtheritic stenosis necessitating long continued intubation is hypertrophy of the subglottic tissues accompanied by a chronic inflammation. Intubation is in no way the cause of this, as it occurs irrespective of the operation. Less often there is an ulceration, and subsequently the formation of a greater or less amount of cicatricial tissue and contraction. This likewise is not the result of the intubation except in rare and practically unavoidable instances." That stenosis of the larynx following diphtheria, especially the variety due to the formation of cicatrices is rare, statistics show most conclusively. Out of about 800 intubations during the last seven years at the Boston City Hospital, Dr. McCollom informs me that he has seen but one case and that recently. This case was a child four years old, in whom there was apparently a complete occlusion of the larynx, no air coming through it. The child is still wearing a tracheotomy tube, as the mother refused to have anything done. Roger's paper makes mention of only two reported cases in which the presence of cicatrices was actually proved. Summing up the experience of a number of observers whom he quotes, he concludes that "a reasonable estimate of its (chronic stenosis) average frequency would therefore be not far from one in every 100 intubations." I have been unable to find in medical literature since the publication of Roger's paper any report of a case like the one which I have just presented.