A CASE
OF
LODGMET OF A TRACHEOTOMY TUBE
IN THE RIGHT BRONCHUS
AND ITS EXTRACTION.

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THE tube in this case was not an old one, which, thinned by chemical action and by friction consequent on long wearing, had broken away from the shield and fallen down the trachea, but a nearly new one, I believe, never previously used, of a pattern which I am informed is now more frequently supplied by London instrument makers than any other. As a warning, which may perhaps save some surgeon the anxiety which the accident gave me, but also and chiefly for any useful hint it may furnish to whom it may fall to have to treat a similar case, I venture to bring this case before the Fellows of this Society.

At 8 p.m. 30th July, Dr. King, in temporary charge of Dr. Greenhow's patients, requested me to see, with him, H. D—, æt. 37, a tall, thin woman, an ironer, who the day before had been admitted into Northumberland ward with laryngitis. Her history showed syphilis, a chronic chest complaint, and indulgence in drink. Difficulty of breath-

ing had come on rapidly four days before. We found her sitting up in bed, unable to lie down, restlessly and impatiently tossing about, speaking in a husky, scarcely audible whisper. Inspirations 36 per minute, shallow, with deep pitting of the infra-clavicular fossæ and of the epigastrium. Pointing to her throat, she begged by signs rather than speech that something might be promptly done to relieve her great distress, and signified her willingness to submit to any measures we advised. Dr. Greenhow, who also saw the case, concurred in the necessity of immediate tracheotomy.

Chloroform was given, the trachea opened, and a Karop's tube inserted. She at once breathed freely and she passed a quiet night, sleeping and occasionally taking milk without difficulty.

For a week nothing occurred which demands particular notice. Her relief was so complete that she spent much of her time reading, interrupted occasionally by cough, which was less annoying by day than during the night. On 7th August, the ninth day, the outer tube was withdrawn for the first time, for the purpose of cleaning it, and, being unprovided with a pilot-plug, some difficulty was experienced in replacing it; for this reason a Durham's, the only other equally long tube at hand, was substituted, the bluntly-conical end of its pilot-handle making the introduction easy. She found this tube, though externally of nearly similar size to Karop's, much less comfortable; the inner tube choked sooner and it required to be more frequently changed.

Three days later (August 10th), at 5.30 p.m., whilst the inner tube was being replaced after cleaning, the outer tube slipped through the collar and shield, and she felt it slide from the wound deeply into her chest.

The accident greatly alarmed her, and instantly provoked violent cough. Within a few minutes of its occurrence several attempts were made by the house-surgeon, Mr. Karop, to seize the tube with slender long forceps, but he could not feel it, though the forceps were very

deeply passed up to their rings. He then inverted the patient, and shook her, and smartly slapped her back, but failed by these measures to dislodge the tube. Half an hour later I myself repeated these manœuvres, unsuccessfully. Neither with forceps, nor with a loop of copper wire could I get metallic contact, perhaps because of the difficulty of manipulating with the former, and because the latter was too flexible for its accurate direction.

The paroxysm of cough had ceased before I saw her, and fearing to inflict more injury by prolonging my efforts, I decided, under the circumstances, to defer further direct interference. Trousseau's largest tube was inserted, and this she found very comfortable—much more so, she said, than the other, Durham's. She now breathed tranquilly without effort. She felt pain at the right of the lower part of the sternum, at a spot to which she signed that she had felt the tube glide down.

No indication of the presence of the tube, except a very slight relative weakness of the respiratory sounds on the right side, was discovered, notwithstanding repeated careful examination of the chest.

11th August.—She had slept fairly well, though cough was sometimes troublesome. She says she is comfortable, but her neck feels a little stiff and her throat sore when she swallows. The pain at the lower part of the sternum continues. P. 82, T. 98·9°.

12th.—Passed a restless night, harassed by cough, sputa copious. Has now pain in the left side on deep breathing. Respiration in left base feeble and percussion note impaired here; no friction or crepitation. At 7.40 a.m. she had a sensation as if the tube moved upwards to the neck, but the house-surgeon who was instantly called, explored the trachea with a forceps without feeling it. In the evening she had pain in the left shoulder. P. 96. T. 90·8° F.

13th. (fourth day).—Cough more troublesome. She feels weak and very faint, and she has a sensation of tightness across the chest. Tubular breathing and moist crepita-

tion over the base of the left lung. At 7 a.m. T. 101·8° and at 10 a.m. T. 103·4 P. 114.

At 11 a.m. she had a severe paroxysm of cough, which expelled a large quantity of mucus; thinking that this might have been provoked by a movement of the tube the house-surgeon again examined the trachea with a forceps, but with no better success.

At 1 p.m. T. 103°, P. 120. The tube was evidently provoking inflammation. Its immediate removal offered the only prospect of rescuing her. Chloroform was therefore given, her head allowed to drop back, and neck stretched out. Trousseau's tube was withdrawn, and a long piece of German silver wire, one end of which was bent into a blunt hook, about one eighth inch long, and the wire again bent at about one and a half above this at an angle, roughly estimated at that which the right bronchus and trachea include, was passed through the wound down the trachea. The other end of the wire was bent in a large loop, the plane of which coincided with that of the tracheal end of the wire beyond the angle. This coincidence told the direction of the hook, and so enabled me to keep it in contact with the right side of the trachea and to guide it into the neighbouring bronchus. When the hook had been passed so deeply that I judged it must have reached the end of the trachea I distinctly felt it touch the tube; continuing to slide the hook onwards until from the known length of the tube, I thought it must be beyond it, and then withdrawing it, I was sensible, from the resistance, that the tube was hooked and was moving upwards. When it had almost reach the tracheal wound the hook became disengaged, but the tube was here easily seized with a forceps and taken out. Trousseau's tube was reinserted. At 9 p.m. her temperature had fallen to 99·4° Fahr., and her pulse to 96 per minute.

14th.—Next day, she felt, she said, very well. Her cough was less troublesome. She breathed with perfect ease, and had lost all pain and tightness in the chest.

From the time of the extraction of the tube all threaten-

ing symptoms disappeared, and on my return from my autumn vacation I found she had been discharged from the hospital, 15th September, convalescent, wearing, however, a tube the use of which it was thought she could not safely discontinue.

I did not see her again till 26th October, at which time her voice, when she temporarily stopped her tube, was so strong and clear that I thought she ought to try to do without it, and I took her into the hospital for a couple of days, in order that if dyspnœa followed the closure of the wound this might be immediately dilated, and a tube reinserted. In forty-eight hours the wound had so contracted that it would scarcely admit a small probe. She breathed easily and she spoke well. She continues, I believe, free from any tracheal embarrassment.

Epicrisis.—How the set-screw which, in Durham's tube, regulates the length of the part of the tube behind the collar, and secures it to this, became loosened—whether by overwinding or reversing—could not be learned, for neither nurse or patient were aware of having turned it. The screw ceasing to act, the collar no longer tightly embraced the outer tube, and, this not having a flange, there was nothing to prevent it slipping quite through the collar and being drawn down the trachea. This defect in the construction of the tube arises from the abruptness of its curve, which prevents the workman drawing on the collar over the tracheal end of the tube, and obliges him to pass it over the front or outer end, which for this purpose is designedly left without any projecting flange or out-turned shoulder. A few makers remedy this by subjecting the outer end of the tube, after the collar has been put on, to a strong pressure which slightly forces out its outer edge, but the projection thus formed is so very slight that a little wear would remove its efficiency. Most makers, however, do not adopt this precaution, but they leave the outer lip of the front end of the tube perfectly flush with the part behind it. This dangerous defect could be easily removed by having the

lip well shouldered. But Durham's tube has an inherent defect which, I think, outweighs any advantages of curve and power of altering its length, and which makes it inferior, I think, to many other tubes, particularly to Trousseau's. All must agree that in bronchotomy the greatest freedom of breathing is, so far as concerns the tube, attainable only by the insertion of the largest tube which the trachea will contain without risk of injury to its mucosa from undue pressure; and, also, that the efficient lumen of a double tube is that of its inner cylinder at its narrowest part. Now, the inner cylinder of Durham's tube has a jointed composite structure, which necessitates a much greater thickness of metal, reducing in a corresponding degree the efficient lumen. A comparison of a Durham's with a Trousseau's tube, their outer cylinders having the same diameter, will show a very appreciable excess of sectional area in favour of the latter. Again, one of the chief troubles in the first days after bronchotomy is the clogging of the inner tube by the accumulation and inspissation of mucus, requiring its frequent removal for cleaning. The longer the inner tube, and the smoother its surface, the the less often will this be necessary. Trousseau's tube has these merits, but the smaller lumen of Durham's, and particularly its jointed structure, makes this more easily clogged, for each joint when the cylinder is flexed, as it is *in situ*, presents to the lumen a projecting ridge on which the mucus may lodge. I do not advance these as theoretical objections, but from observation.

The difficulties attending the extraction of a foreign body from the lower part of the air-passages are only fully estimated when they actually confront us. The most useful instrument in each case will principally depend on the nature of the foreign body. Forceps, to be really useful, should be light enough to serve as a sound, and also sufficiently flexible to allow them to be bent to any desired curve. Such forceps, made of silver, Gross figured at p. 252 in his exhaustive treatise 'On Foreign Bodies in the Air-passages,' published at Philadelphia in

1854. From inquiries I have made they appear to be unknown to London instrument makers, whose forceps want the lightness and flexibility essential for adaptation to particular cases and for delicate manipulation. A long loop of very flexible wire has been used, I have been informed, with success, for the extraction of a worn-out tracheotomy tube from the trachea; but in this case it failed me, and I imagine that it will often do so owing to the inherent impossibility of imparting to it a definite direction when deeply out of sight in the trachea. For the suggestion of the particular sort of wire and hook, which here did me good service, I am indebted to Messrs. Weiss, who on a former occasion had made for me several loop-hooks of different sizes and curves for the extraction of a sixpence from the larynx, lodged in such a position that no forceps could grasp it. The case is recorded in our 'Transactions' (vol. xlviii, p. 201).

The qualities of the German-silver wire, in particular its flexibility, combined with sufficient stiffness—the latter increased by its angulated sectional figure—made it very superior to the cylindrical wires of brass, iron, or copper, I had previously tried.

The question may have occurred to some why I presumed the tube to be lodged in the right bronchus. Independently of the known greater frequency of foreign bodies lodging in the bronchus, the woman's sensations as the tube slipped down, and the fixed pain at the right of the sternum during the first two days, together with the immediate slight weakness of breathing on this side, weighed with me more than the later indications of inflammation on the left side which supervened on the fourth day. That the physical signs of the presence of the foreign body in particular weakness of breathing sounds on the right side, were not more strongly marked, was doubtless due to its tubular shape, which allowed air freely to traverse it.

Although the trachea was more than usually deep,

owing to much thickening of the overlying structures, the lower thyroid veins were turgid; the bleeding so often very embarrassing was here insignificant. This was owing to the adoption of a little manoeuvre which I learned from a German treatise on 'Tracheotomy' some three or four years ago, but the reference to which I have, unfortunately, mislaid. The author points out that the venous plexus overlying the trachea is enclosed between two folds of the deep fascia which pass upwards to the larynx. The veins also are much smaller above than lower down. If this fascia is fixed by pressing the nail of the left forefinger against the front of the cricoid cartilage, and a small cut be made upon this immediately above the nail, in a direction transverse to the axis of the trachea, both these folds of fascia will be divided. If now the lower lip of the cut fascia be seized with a forceps the fascia below, enclosing the veins (and isthmus of thyroid gland, if necessary), may be easily peeled down with the thin handle of the scalpel, exposing the front of the trachea by an almost bloodless dissection. The author reported that he had tried this in many cases of tracheotomy in children and in adults, and already from my own more limited experience I can speak strongly in its favour. I cannot learn that it is generally known here.

Since this paper was read my attention has been called to the record of a case in which Mr. Davy removed, with a hooked probe a broken tracheotomy tube from the trachea of a patient in the Westminster Hospital ('Brit. Med. Journ.,' 1876, vol. ii, p. 47.)—J. W. H.