ON A CASE
IN WHICH A
FLEXIBLE INDIA-RUBBER TRACHEOTOMY
TUBE WAS REMOVED FROM THE
RIGHT BRONCHUS.

BY
HENRY G. HOWSE, M.S., F.R.C.S.,
SURGEON TO GUY'S HOSPITAL AND TO THE EVELINA HOSPITAL FOR
SICK CHILDREN.

Received March 12th—Read March 27th, 1877.

J. S—, æt. 43, was admitted into Guy's Hospital on December 25th, 1876. He gave us the following history. He had been in Guy's in September, 1866, under the care of Mr. Bryant, suffering from difficulty of breathing due to very extensive syphilitic ulceration about the larynx. Tracheotomy was successfully performed and he was sent out, wearing an ordinary double silver tube. He says that he continued to wear this for four or five years, occasionally taking it out to clean it. After this time it was worn much more irregularly, sometimes being left off for days or weeks. He confesses that these periods generally corresponded with times of commercial depression, when the tube used to find its way to the pawnbrokers', being redeemed again when money became more abundant. Once or twice in the ten years which

elapsed between 1866 and 1876, he had been readmitted into the hospital, and had had a fresh tube given him to replace the old worn-out one.

On October 21st, 1876, after a longer period than usual during which he had not worn the tube, he found it impossible to reintroduce it, and came again to the hospital for relief. Mr. Bryant enlarged the aperture into the trachea, and inserted at first a metallic tube, changing it a few days afterwards for one of the new india-rubber ones.

On November 3rd he left the hospital, having learnt the management of the new tube.

Everything went on satisfactorily until the morning of Christmas Day (*i. e.* seven weeks after commencing the use of the new tube), when in pulling it out to clean it, he felt something give way. He continued to pull rather harder, when the tube tore through near the shield, and then in a fit of coughing he felt the tube recede deeply into the trachea. He presented himself immediately for admission.

At 1.30 p.m. chloroform was given and a bent probe was introduced through the opening into the windpipe. This detected a foreign body lying about the bifurcation of the trachea. Loops of wire of various forms and size were at first tried, with the hope of catching the tube, but unsuccessfully. (We had none of the particular form of wire recommended by Mr. Hulke in his previous communication to this Society, and as it was Christmas Day, there was no hope of obtaining any.) After many futile efforts in this direction, the opening into the trachea was enlarged, and forceps of different size and shape were introduced. The left bronchus was now felt almost completely clear of obstruction, while the right evidently contained the tube. Our efforts were therefore directed to this side, and after some time and trouble, the tube was seized and brought to the surface, one blade of the forceps having fortunately passed into the mouth of the tube and the other blade externally, so that

they grasped it when closed. A silver tube was at first introduced; this was changed for a vulcanite one next day, and shortly afterwards the patient left the hospital, seemingly very little the worse for his accident.

On examining the tube (marked A in the specimens sent round) at the point where it had separated, it was found, when in the moist condition, in a very rotten state. It was quite easy to pick off small pieces of the rubber from the torn ends with the gentlest possible traction. A few hours later, when the tube had got dry, it was in a much more firmly coherent state. The reason of this change is not easy to understand, unless the tracheal mucus had had in this case a pernicious action on the rubber. The separation had taken place about a quarter of an inch from the shield, and it seems clear that the way in which it occurred was this. The tube had not been withdrawn for two or three days, so that a certain amount of contraction of the newly formed cicatricial tissue about the wound had taken place, causing the skin very tightly to embrace the tube. In pulling at it the first effect of the traction was to elongate that part outside the skin, hence to diminish the calibre of this portion of the tube, and consequently its strength. It would follow naturally from this that the tube would break at the stretched part. Hence the very elasticity of the tube would be an element of danger in the case.

It has been objected to this view that it would be impossible for newly-formed cicatricial tissue so to contract upon a tube as to hold it so tightly as this view implies. The analogy of a bougie or catheter in the urethra undoubtedly would lead one to suppose that the constant presence of such an instrument would tend rather to *dilatation* than to *contraction* of the surrounding tissue. It must, however, be remembered that the two cases are essentially dissimilar—that in the one case we are dealing with an epithelium-covered surface, and in

the other with a simple contracting cicatrix. Moreover, this was a syphilitic patient, where the tendency to vigorous contraction of the newly-formed tissue would be great. In the tube marked c (one of the first rubber tubes used at the Evelina Hospital), the contraction of the cicatricial tissue has had the effect of altering permanently the outline of the tube, if not absolutely diminishing its calibre. This may be well seen by holding it so as to examine it in profile.

Moreover, the size of the tracheal sinus, as we examined it before the operation, was altogether disproportionately small when compared with the size of the tube, so that it seemed absolutely impossible that such a tube could have gone through it. These facts seem to prove definitely the power of the contracting tissue in this case.

(A second tube in a very similar condition to the first as far as regards rottenness is among the specimens, marked b. It is from a child at the Evelina Hospital, and had been worn little more than a fortnight.)

It seems, therefore, quite clear that these tubes, composed of simple red rubber, as originally described, are not safe articles to trust a patient with outside a hospital. Influenced by these considerations I wrote to the manufacturer and asked him whether he could not construct one with a piece of canvas running from the shield down either side of the tube. This has since been done, and the tube (marked d) is constructed on this plan. It is *inelastic*, though flexible, and hence avoids the above-described danger. Being flexible, however, it answers all the purposes for which these tubes were first devised, *i. e.* it prevents all risk of the canula eating its way into the tracheal wall, and thus causing death from hæmorrhage. Nevertheless, even with this amended tube, the patient ought to be cautioned that when he sees cracks in the rubber, he ought to get a new tube, otherwise the mucus will gain access to the canvas and will gradually rot it.

Another precaution which should be taken with rubber

tubes, but which is very generally neglected, is to use glycerine as a lubricating agent instead of oil. The latter, when long in contact with even the best forms of rubber, is certain to rot it, while the former has little or no effect upon it, or even if it had, would from its solubility be washed or dissolved away by the natural fluids of the tissues.