THE RESPIRATOR-INHALER.

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THE respirator-inhaler is designed to facilitate the use of topical applications to the respiratory tract, and the administration of remedies by absorption through the pulmonary surfaces. It consists of a shallow tin box, of the size and shape of the ordinary respirator. The top and bottom are perforated with holes like the lid of a pepper-box. The box is fitted with some porous material (tow, oakum, or very open flannel), and the top lifts off with a hinge, to permit the renewal of the porous material and the addition of whatever drug the prescriber may wish the patient to inhale. Five, ten, or more drops of some volatile drug are dropped on the porous material, and the box is closed and fastened on, like a respirator, by means of elastic bands drawn round the ears.

The instrument, thus charged, is worn for fifteen, thirty, or sixty minutes several times a day; and additional quantities of the drug are introduced into the porous material from time to time as may be deemed necessary. The porous material also requires renewing occasionally.

The object aimed at is to obtain the effects of small quantities of the drug, slowly and continuously applied, either for the purpose of a topical application to some part of the respiratory mucous membrane, or for direct absorption of the drug into the blood. Of course, only volatile remedies can be used in this way. As the patient continues to breathe to and fro through the drug-charged porous material, the contents of the box become warmed, and the volatile ingredient is vaporised and passes with the breath into the air-passages, and comes into contact with every part of the breathing surfaces.

The following are the substances I have hitherto used to charge the respirator-inhaler, according to the effects it was desired to obtain: Turpentine, oleum pini sylvestris, spirit of camphor, the oils of sandal wood and eucalyptus, compound tincture of benzoin, creasote, carbolic acid, iodine, and chloroform.

My experience is, as yet, too limited to enable me to formulate conclusions as to the probable value of the instrument; but I will relate a few examples in illustration of the way in which I have used it.

1. An apyrexial patient had a patch of congested lung under the right shoulder-blade, from which he continued to spit blood, in spite of sundry remedies, for some weeks. He was directed to inhale six drops of oil of turpentine from the respiratory inhaler for an hour three times a day. This was almost immediately followed by the cessation of the hæmorrhage. When the dose was increased to ten drops, the patient complained of a transient feeling resembling intoxication. In a second case of hæmoptysis, of tuberculous character, cessation of the hæmorrhage almost immediately followed the inhalation of turpentine in a similar manner.

2. A phthisical patient with cavities in both lungs, from which he expectorated large quantities of pus, inhaled four drops of creasote for an hour three times a day, with the apparent effect of reducing the quantity of pus to less than one-half.

3. Another phthisical patient inhaled, in a similar manner, six drops of the liquor iodi (*P. B.*), with great apparent benefit.

4. A patient with advanced laryngeal phthisis, under the care of my former pupil Mr. Hunt, appeared to derive relief from the inhalation of fifteen drops of a mixture of equal parts of chloroform and oil. The pain in swallowing and the tickling cough were markedly alleviated by the application.

5. In several other cases of advanced phthisis, with profuse purulent expectoration, I have failed to observe any good effects from the inhalation of carbolic acid and of iodine by means of the respirator-inhaler.

6. In cases of bronchitis, I have seen the best results follow the inhalation of the compound tincture of benzoin and the oleum pini sylvestris. Coal-tar and wood-tar would appear likewise suitable for cases of chronic bronchitis.

In apportioning the dosage, I have sought to avoid provoking cough or catching of the breath, using only such small quantities of the drug as the patient could inhale without a feeling of irritation. It is otherwise manifestly impossible to obtain a prolonged contact of the remedy with the respiratory surfaces.

The advantages which this method of inhaling appears to have over the ordinary methods consist in its being less burdensome to the patient, and in the prolonged contact of the remedy with the affected surfaces. The instrument may likewise be worn for the purposes of an

ordinary respirator, and it is sufficiently cheap to be within reach of the humblest patient.

The respirator-inhaler may be had from J. and W. Wood, surgical instrument makers, King Street, Manchester. The instrument is made either plain or mounted with velvet. The plain instrument is the more useful, as it can be washed and cleaned in hot water; the mounted instrument is chiefly for outdoor use, as its appearance is scarcely more conspicuous than that of an ordinary respirator. The price of the former is three shillings and of the latter five shillings and sixpence.

The Messrs. Wood have also constructed a modification of this instrument, with an upward prolongation, to cover the nose as well as the mouth, like a chloroform-inhaler. This modification is designed for the use of children, and for persons who find it inconvenient to breathe for a long time through the mouth.

LARYNGOTOMY IN CHLOROFORM ASPHYXIA.

By J. T. CLOVER, F.R.C.S.

THE deaths under chloroform, recently reported, induce me, without further hesitation, to report a case in which death seems to have been prevented by laryngotomy; and to make some remarks as to the precise time when that operation ought to be performed.

A gentleman, aged 60, suffering from a large epithelioma of the tongue, had this removed last October, by Mr. Marshall, by means of the galvanic *écraseur*. A mixture of chloroform and ether induced sleep in six minutes. The patient was then kept breathing with light stertor five minutes longer before the face-piece was removed. From this time, chloroform without ether was given by covering the nose with a cap, supplied with vapour as the face-piece had been. In spite of this, the patient recovered sufficiently, during the arrangement of the *écraseur*, to become unsteady at the moment when the wire was heated by the galvanic current. I gave more chloroform-vapour by the mouth, also supplied from the same source as that which supplied the nose. In a minute or more, the patient was quiet and continued so, breathing steadily, for ten minutes. At this time, the patient moved his wrist, as if trying to get it away from my grasp. I slightly increased the strength of the chloroform, without, however, producing either cough or swallowing; and when the wrist became quiet, I decreased the supply of chloroform. Soon after this, I observed a pause in the breathing, and removed the chloroform-tube from the mouth; but, as his pulse was good, and as it was very important he should not struggle at this stage of the operation, I continued the supply by the nose-cap for a few seconds longer. The pause in the breathing was of short duration, but, as the succeeding respirations were feeble, I took off the nose-cap. There were but two or three respirations during the next thirty seconds, and they were feeble, and accompanied by a sound in the throat. Finding that his pulse remained steady and firm, and believing that one single gasp of fresh air would restore him as much as was desirable, I desisted from moving the chest until I perceived a lessening of the strength of the pulse. I now pressed upon the chest and abdomen, the patient being already lying on his back. As the pressure was removed, there was a sound of air passing through the larynx; but this sound gradually changed to a faint hiccup and then ceased. The tongue had been secured by a ligature at the beginning of the operation, and had been drawn forcibly forward, in order to apply the loop of the *écraseur*. We now tried the Silvester method, with a similar failure; for although the air passed through the larynx, at first audibly, after a few movements the sound became a short hiccup, and then ceased. After persevering for perhaps two minutes, in endeavouring to produce artificial respiration, but in vain, Mr. Marshall and I thought it prudent to have recourse to laryngotomy. The radial pulse could not be felt. After the laryngeal tube was inserted, the Silvester method answered admirably. Air immediately entered, and escaped freely through the tube; some hæmorrhage from the wound in the neck necessitating repeated cleansing away of frothy blood from the external aperture of the tube. At this juncture, it was evident that the artificial respiratory acts, produced by the persistence in the Silvester method, were now rendered serviceable in emptying and filling the lungs through the tube, instead of failing to do so, as before, through the glottis. This was the turning point in the condition of the patient. Very soon, however, perhaps in a minute or more, a gasp through the glottis occurred, followed by another in ten seconds. From this time, breathing went on without the mechanical assistance of the Silvester method; but both inspiration and expiration through the glottis were visibly supplemented by the free simultaneous entrance and escape of air through the laryngeal tube.

The operation was then continued, the patient in three minutes be-

ginning to move so as to require more chloroform, which was given through the nose and through the laryngeal tube, until the tumour, and also a small independent and suspicious nodule at the tip of the tongue, were removed. During this time, the laryngeal tube was in full action, admitting air to pass both ways. Except a few drops of blood from the puncture of the tongue, there had been no bleeding into the mouth.

The tube was now taken away, and the edges of the wound in the neck were brought together by plaister. The after-progress of the case was as satisfactory as could be, the patient leaving town on the seventeenth day.

The interest of this case relates to the question of opening the larynx. The results of this operation in chloroform accidents have not hitherto been favourable. Not only have most of such cases died in spite of it, but a large proportion of cases of chloroform asphyxia are restored by other means. It is probable that, in most of the unsuccessful cases, chloroform had produced cardiac syncope, and the circulation had ceased before the windpipe was opened.

In this case, however, I suppose that, when the first pause in respiration took place, the saliva, mucus, or perhaps a small clot of blood, got over the glottis and impeded, without altogether stopping, the passage of air during the respirations which followed; and further that, as the chloroformed air had not been removed from the nose, the small quantity of air which did pass contained enough chloroform to paralyse the actual movements of breathing. The rule which I should follow in any case where I did not fear the consequences of reflex movements, is to take away the chloroform during any intermission of respiration which is not evidently the result of voluntary effort.

The state of the glottis when asphyxia from an anæsthetic is impending is very different from its normal one. The muscles which dilate the opening are paralysed, and its sides lie closely together, so that a very little mucus or blood lying over that aperture would close the way. Probably, if a gasp had occurred, such as we noted a minute or so after the larynx was opened, this would have been associated with renewed action of the dilators of the glottis, and enough air would have entered to begin to restore the patient. Such gasps do, fortunately, generally occur several times when an animal is being nearly killed by chloroform; and, if the heart have not ceased beating, it usually recovers.

Drawing forwards the tongue has sometimes had the credit of producing these gasps, when, in fact, it merely preceded them. In the particular instance before us, both Mr. Marshall and myself were at the time, and are now, so impressed with the complete and sufficiently prolonged absence of all response to the persevering efforts to produce artificial respiration through the glottis, as to make us more than doubt whether it would ever have taken place. In truth, we despaired of its occurrence.

In an emergency of this kind, laryngotomy is, of course, a much simpler operation than tracheotomy. In this case, an incision was made by Mr. Marshall an inch long in the mesial line down to the cricothyroid membrane, and then a second short transverse cut through that membrane, when I immediately pushed through the opening a curved pointed trocar and cannula or tube. The size of the laryngeal tube employed in such a case need not be so large as when laryngotomy is performed for obstruction due to disease. The one used was of the size of a No. 11 catheter, and might have been smaller.

Although it is certain that laryngotomy in this case was an important factor in the patient's recovery, and most probably an essential one, I should regret if this record were to lead any one to open the larynx without sufficient necessity. I have never used the cannula before, although it has been my companion at some thousands of anæsthetic cases; and I should never use it so long as air could be made to pass by artificial respiration through the glottis, or so long as the pulse could be felt. Whilst the circulation goes on, the patient will almost certainly gasp, and, in gasping, I believe the larynx opens sufficiently to make laryngotomy unnecessary; but when, under artificial respiratory movements of the thoracic walls, *glottidean respiration ceases and no pulse can be felt*, the prompt admission of air through an opening in the larynx, coupled, of course, with perseverance in the Silvester method, appears to us an imperative duty, especially as the operation is so exceedingly simple, free from risk, and cannot do any direct harm.

Mr. Marshall and I have consulted about the incidents and the bearings of this case, and we entirely concur in opinion as to the practical inferences to be drawn from it. As remarked by Mr. Marshall, artificial respiration, so called, is not artificial respiration unless air enters and passes out by the glottis; and the sounds produced by the air should, therefore, in all cases be carefully listened for. He also wishes me to add that, in a certain number of cases of asphyxia from

other causes than anæsthetics—as from carbonic acid, drowning, etc.—laryngotomy, performed as an accessory or even as a precursor to the Silvester method, could do no injury and might save life. Mr. Marshall promises to have a *résumé* of the results of laryngotomy or tracheotomy in chloroform or ether asphyxia prepared for publication.

EIGHT CASES OF EXCISION OF THE KNEE-JOINT, TOGETHER WITH A DESCRIPTION OF A NEW MODE OF PERFORMING THE OPERATION.*

By WILLIAM KNIGHT TREVES, F.R.C.S.,
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EXCISION of the knee-joint has got into bad odour of late. I believe the explanation is to be found in the fact that operating-surgeons either do not always sufficiently secure perfect immobility of the limb in the putting up, or leave the after-dressing to dressers or house-surgeons of limited experience.

It has been our custom not to remove the limb from the splint in which it was placed on the operating-table, till the wound is healed and union is believed to have taken place; measures being taken to prevent the soiling of the splint, so that removal may not be necessary. The splint has generally been left on for three months. In all these cases, the limb has been secured to the splint by gum and chalk or silicate bandage, so as to render rebandaging unnecessary. The splint used has consisted of moulded leather thigh and leg pieces, with iron interruption at the knee; the leather splint being put on damp, and secured by the fixed bandage at the time of operation. Sufficient slices have been taken off the bones to permit the excised ends to lie easily in a good position, and not to exercise any pressure against each other. All the cases have had an excision-bed, that is, two short mattresses separated by a square air-pillow, which is emptied for the use of the bed-pan, or to change the sheets. The limb has in each case been swung in a Salter's cradle. They have all, except the fatal case and one still in the hospital, been kept in till the wound has entirely healed, and they have been able to walk, run, and use the limb freely. Their average stay has been about six months after the operation. I have mentioned these particulars at the commencement to avoid repetition.

1. R. M., aged 17, female: disease of two-and-a-half years' standing; acute pain on movement, with partial dislocation outwards; excised March 17th, 1871—usual operation. The cartilages were found eroded, and there was grumous matter in the joint. This patient has remained perfectly well up to the present time. She walks long distances and leads an active life.

2. E. A., aged 11, male: disease of seven years' standing; complete dislocation of tibia backwards and perfectly useless limb; excised October 12th, 1871. In this case, I for the first time tried the side-incisions; but, difficulties arising from the malposition of the bones, I completed the incision and performed the ordinary operation. The result was good; he could run and play leap frog before leaving the hospital, and remained quite well a year afterwards.

3. H. B., aged 11, male; disease of two-and-a-half years' standing; operation August 29th, 1872; side-incisions and patella left. There were ulceration of cartilages and total disorganisation of the joint. The result was good, with a movable joint.

4. M. B., aged 23, female; disease of eight years' duration; operation October 19th, 1872; side-incisions; patella sliced. There were gelatinous degeneration of the synovial membranes and ulcerated cartilages. The result was good. She was leading an active life up to last Christmas.

5. G. W., aged 8, male. His knee had been excised at a London hospital, and he came down with the tibia completely dislocated backwards, the leg hanging like a flail to the thigh, without any bony union. I excised again, with a perfectly good result, as shown in the photograph.† This dislocation, I found reason to believe, might have been brought about by the muscular throes attending masturbation, to prevent which vice I removed the foreskin.

6. M. S., aged 20, female: operation August 20th, 1874, by side-incisions; gelatinous degeneration of the synovial membrane, with erosion of cartilage. This was a most promising case; but the patient died a fortnight afterwards from pyæmia, and there was reason to fear that she had been infected by a sponge which had been used in a case of septic poisoning. I have never used a sponge since.

* Read at Margate, at a meeting of the East Kent District of the South-Eastern Branch.

† Photographs were shown of all these cases, except the fatal one and that last excised.