The above case is still a surgical one, but it is recorded here to illustrate the marked healing power of histidine, even in a case complicated by pyloric stenosis. So far the lapse of time since these cases were treated is too short to make dogmatic statements. One case has already relapsed, but it is interesting to note that only four injections have been necessary to effect again a clinical cure, and there is no radiological evidence of ulcer in less than three weeks' time.

A question that obviously arises is: If there is an absence of histidine, or a failure of its utilization, is cure at all likely to be permanent? It seems that some means of maintaining the supply of histidine must be considered, and that relapse will only be prevented by a continued administration either orally or by injection.

Treatment by histidine has some beneficial action, however that is brought about, and further trial and study are indicated.

FIG. 4.

Summary

1. A plea is advanced for greater co-operation in the quest for truth relating to peptic ulcer.
2. Treatment based on a new aetiological theory is indicated.
3. Criteria of diagnosis and case histories are detailed.
4. The method of treatment is stated and a synopsis of the results obtained is given.
5. The healing power of histidine is discussed, and an illustrative case is recorded.

REFERENCES

- ¹ St. Bartholomew's Hospital Reports, 1934, lxxvii.
- ² Aron, E.: *Les Editions Universitaires de Strasbourg*, 1933.
- ³ *Ann. of Surg.*, 1932, lxxvii.
- ⁴ Bogendorfer: *Munch. med. Woch.*, 1934, lxxxii, No. 33.
- ⁵ Weiss, A. G., and Aron, E.: *Presse Méd.*, 1933, No. 93, p. 1880; Weiss, A. G.: *Praxis*, 1934, No. 21.
- ⁶ Deloyers, L.: *Nouvelles Médicales Illustrées*, 1934, i, No. 9.
- ⁷ Hessel, G.: *Munch. med. Woch.*, December 6th, 1934, p. 1890.
- ⁸ Bulmer, E.: *Lancet*, 1934, ii, 1276.

A NOTE ON CLOSED METHODS OF ANAESTHESIA IN THE SURGERY OF THE CHEST

BY

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Thoracic surgery demands from anaesthesia something more than the mere production of unconsciousness. The patient must arrive at the table in a quiet frame of mind; this must be accomplished, however, without recourse to excessive premedication, with its post-operative disadvantages. Next a quiet induction must be assured, and an anaesthesia of sufficient depth without anoxaemia in those whose pulmonary ventilation is usually below normal. Thus only can the surgeon be shown a quiet operating field and a patient who is not unduly distressed.

These ideals are approachable by various methods, more recently through the newer anaesthetic agents, cyclopropane and divinyl ether. Their administration by the closed method is essential, and while it would appear that they open up new fields and a nearer approach to the ideal, their use is still in the experimental stage. Nitrous oxide and ethylene, on the other hand, have proved their worth, and it is the use of these gases by the closed method which is the object of this note.

Action of Nitrous Oxide and Ethylene

1. Nitrous oxide and ethylene are respired unchanged, and produce their characteristic effect by simple oxygen displacement from the blood. Ethylene has a slight lipid solubility, and gives, therefore, a 15 per cent. deeper anaesthesia.

2. Nitrous oxide 85 per cent., oxygen 15 per cent.; ethylene 80 per cent., oxygen 20 per cent.; are recognized as average gas quantities required in the production of anaesthesia, but with continuous or intermittent flow machines the gas percentages found in the bag are nitrous oxide about 75 to 80 per cent., carbon dioxide and oxygen in varying proportions making up the rest. With ethylene the oxygen percentage is slightly higher. Thus the addition of the expired carbon dioxide brings the levels of successful anaesthesia with no oxygen lack and anaesthesia with anoxaemia very close in those with normal pulmonary ventilation. In "thoracic" patients these levels often overlap. By the addition of premedication, local and regional anaesthesia and chloroform, a compromise can be reached. This, however, is at the expense of a slower recovery, and a heavier burden is thrown on the patient's metabolism in their elimination. The immediate neutralization of the carbon dioxide in the closed machine allows of a higher oxygen percentage being used, and if the depth of anaesthesia is insufficient, the smallest trace of chloroform or ether added to the gas and oxygen with positive pressure at once overcomes the difficulty.

3. With ethylene a greater percentage of oxygen can be used, but to offset this advantage its odoriferous and endothermic properties must be reckoned with, and also the fact that nausea of varying severity is common after its employment. The use of the closed method obviates the first drawback, and although a sufficient number of cases have not been considered as yet, it would appear that the closed method certainly reduces the third disadvantage. The explosion risk is, however, always present.

4. Finally, whatever gas is used for the anaesthetic, the same gas must be used to produce a positive pressure when required. This varies with each case and also with each stage of the operation. With the intermittent method this variation presents no difficulty, nor does it with the continuous flow machine unless an alteration in the percentage of the gases is also required; then a good deal of rebalancing may have to be done with perhaps a loss of the necessary pressure when most vital. Whatever difficulties may arise by other methods they are non-existent when closed anaesthesia is used; the intrapulmonary pressure is constantly gauged and is infinitely and immediately variable at a touch.

Choice of Method and Machine

Two types of apparatus obtain at present, using as the absorbing medium either soda lime or caustic soda in solution. One is the single phase in which the respired gases pass backwards and forwards through the absorbent, the other the double phase, in which the respired gases are valve-directed and traverse the absorbing medium in one direction only. In practice the two-phase type, while possessing definite advantages, has been found to offer too great a resistance to respiratory excursion, a difficulty largely overcome in the uniphase machine.

In choosing the absorbent, both the above substances have points for and against their use. With CaCl_2 its granular form favours an easy portability and simplicity of apparatus, while a means of rapid replacement of exhausted material during operation time can be brought about. Against it there is the brevity of its useful life and the risk of dust escaping and lying free in the airways, a potent source of irritation to the respiratory passages. Its tendency to overdry the gases, the impossibility of accurately gauging the degree of exhaustion at any time, and a fairly high internal resistance in the apparatus used, are all points which must be considered as adverse factors.

NaOH used in solution produces no dust and can be readily tested for potency; it does not dry the gases, and, weight for weight, has a longer life than CaCl_2 , while having a more powerful affinity for CO_2 . The chief disadvantage to its use is the caustic nature of the solution and the difficulty of keeping the apparatus clean from the resultant carbonate mud.

An apparatus using NaOH made for the writer by A. Charles King, and used over a period of twelve months, has circumvented the combined disadvantages of both methods while keeping their good points. Briefly, it is of the uniphase type, showing a very small internal resistance to respiratory excursions, the absorbing medium is under constant view, its potency is tested by specific gravity, and a means of replenishing exhausted solution is provided without interference with the progress of anaesthesia or the existing pulmonary pressure. Finally, the apparatus is so constructed that cleansing can be undertaken without dismantling.

Linking up Patient and Apparatus

The success of all closed anaesthetic methods depends on the production and maintenance of a gas-tight union between the patient and gas supply. Often this can be attained by means of a well-fitting mask and Clausen's harness; in fact, in half the cases that come to the table this only is necessary. In others, where difficulty is experienced in the fitting of the mask or because of the demands of operative procedure, an intratracheal tube will be required with or without a supplementary suction tube. In these cases a small inflatable rubber bag fitting over a Mona Roberts airway is used to occlude the glottis after the tubes have been positioned.

Selection of Cases

From the anaesthetist's point of view cases for general anaesthesia automatically divide themselves into two classes practically irrespective of the operation to be performed. They are: the one, those with controlled sputum up to 25 c.cm. in twenty-four hours; the other class, those with larger or smaller amounts of uncontrolled sputum—that is, patients who cannot completely empty their air passages by a combination of voluntary and postural coughing.

The first class demands no more than ordinary precautions, but it is with the latter that the crises are met, and, incidentally, it is often these cases which benefit most from surgical intervention. They are always a source of anxiety while in one's care, but two maximum danger periods are constantly found: the first occurs during induction, where a sudden cough followed by deep inspiration may cause aspiration of secretion into the sound lung, setting up complications varying from drowning to aspiration pneumonia at a later date; the second period arises later, during the operation, when manipulation of the affected lung may bring about the same condition.

In these people the question of a preliminary bronchoscopic drainage must be considered for each individual. With a very debilitated or nervous patient the preliminaries may so tire his organism as to jeopardize the success of the main work. If endoscopy is decided upon it is preferably carried out under local or evipan anaesthesia, since the induction risk of general anaesthesia remains. It is appropriate here to mention the method of endobronchial anaesthesia advocated by Guedel and Waters¹, where the endotracheal tube fitted with an inflatable cuff is passed into the lumen of the main bronchus of the sound side. This is a fairly difficult procedure in the hands of an expert endoscopist, but cases are occasionally met with in which the intubation can assume the proportions of a major operation. From the surgeon's point of view, while he is assured that no migration of secretion can take place, he may be presented with a patient who is already in the first stages of shock. It is found by experience that McGill's two-tube technique will take care of practically every emergency, especially if preliminary bronchoscopy is resorted to in necessary cases.

Premedication

It is essential with thoracic cases that they should arrive on the table in a quiet mental condition, yet, on the other hand, it is as important that they should not have been so premedicated that a delayed return of essential reflexes will be shown post-operatively.

An almost perfect drug for this work has been discovered in evipan sodium, with its rapid effect and equally rapid elimination. Provided that a few essential points are borne in mind it is tolerated extremely well. It must not be administered in the presence of a low blood pressure or where other barbiturates have already been given. Its use in cachectic subjects is inadvisable, and care must be used where liver derangement is suspected.

The technique at present in use consists of bromidia on the night before to aid sleep, then one hour before operation 1/6 to 1/3 grain omnopon hypodermically. This is followed just prior to operation by sufficient evipan to allow of the introduction of the intratracheal tubes, or, when a mask only is to be used, by the minimum quantity required to produce unconsciousness. Cases which are considered unsuitable for evipan are given paraldehyde by the method advocated by Rowbotham.²

Induction

As has been indicated, the patient is brought to the table in an unconscious condition, and provided endotracheal intubation is not required the anaesthetic and operation proceeds. Should intubation be necessary it is advisable to introduce a dental prop before the administration of the evipan. He is on his back in slight Trendelenburg position, and the widest bore nasal tube possible is passed as far as the cords. It will be found that in most cases direct laryngoscopy will be necessary to guide the tube past the cords, as the reflex is still present. In some cases the cords and pyriform fossae may require cocaineization.

The main tube having been passed, a gum-elastic coudé catheter is next passed through the mouth, the bend of the catheter being carefully noted; the eye should be directed towards the sound lung. After the tubes are in position the nasal tube is connected to the machine by means of an angle-piece fitted with an adjustable expiratory valve. Finally, the airway carrying the occluding bag is put in place and inflated, and the mouth tube is joined up to the suction apparatus.

Position

Experiments by Gale³ show that vital capacity is least altered in the prone position, and if a slight Trendelenburg position is added to this a natural drainage of the lungs is possible with less danger of aspiration taking place. The arm and shoulder of the affected side are allowed to overhang the table, thus clearing the scapula from the site of operation. With cases operated on in this position the risks are certainly much less than with cases operated on with the sound side dependent. Coupled with this is the fact that the constant intrapulmonary pressure and the steadying of the sternum on the table reduce the risk of mediastinal flutter. It is, too, a simple matter to put the patient in this position after induction has been completed, care only being taken to see that the sound side is always uppermost and that excessive head and neck movements on the tube do not set up a spasm of coughing.

Minor Points in Technique

The form of suction employed is of little importance provided it is efficient. The writer uses a double-action foot pump made by A. Charles King, which has the advantage of being gas-tight and is capable of exerting a very powerful extractor action. Suction is only required intermittently, and naturally small amounts of gas must be run in to take the place of that removed by the pump. Care must be exercised, if work is being done with pressures much over 10 mm. Hg, that gas is not forced into the stomach owing to the pharynx being held open by the inflatable bag. It is advisable to leave the intratracheal tubes in position after the operation until the patient's reactions and type of breathing are considered satisfactory. Direct oxygen may be required for the first few hours, and possibly drainage.

Conclusions

The closed method of anaesthesia would appear to offer the nearest approach to an ideal in the surgery of the chest, as it gives a sufficient depth of narcosis with a quiet fully oxygenated subject and a rapid recovery.

The method is subject to certain technical disadvantages, but it is claimed that these have been to a large extent overcome.

With newer anaesthetic gases, because of their intrinsic properties and initial cost, its use is essential.

A technique has been indicated by which the risks attendant on (a) the conversion of the respiratory system into a closed circuit, and (b) thoracic surgery as a whole, have been to a large extent minimized.

REFERENCES

- ¹ Guedel, A. E., and Waters, R. M.: *Anesthesia and Analgesia*, 1928, vii, 238.
- ² Rowbotham, S.: *British Medical Journal*, 1931, ii, 693.
- ³ Gale, I. W.: *Journ. Thoracic Surg.*, 1934, iii, 393.

LOCALIZED NON-SUPPURATIVE ENCEPHALITIS OF OTITIC ORIGIN *

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Upon the basis of three cases personally observed and of three cases, in children, recorded by Adson of the Mayo Clinic under the title of pseudo-brain abscess, C. P. Symonds contends that a localized non-suppurative encephalitis constitutes a distinct intracranial complication of otitis media. The following case corroborates his view.

Case Report

A youth, aged 16, suffered from right suppurative otitis media since childhood. Otherwise his health was perfect.

May 23rd: Severe right-sided headache, vomiting, insomnia, anorexia, and diarrhoea.

May 25th: Admitted to hospital under the care of Dr. J. Dowling, Tipperary, who, owing to the patient's progressive deterioration and partial loss of consciousness, had him transferred to Cork on May 29th as a possible case of brain abscess. Upon examination I found that, though semi-conscious, the lad complained of pain about his right ear. A small amount of thick, fetid pus was found to be coming from a posterior superior marginal perforation in the otherwise intact right tympanic membrane. Fistula symptom was absent. Mastoid tenderness and cervical rigidity were absent. The left knee-jerk was exaggerated. There was hemiplegia of the left upper and lower extremities, with left lower facial paresis. The left plantar reflex was extensor. The left pupil was sluggish and dilated, the right normal. There was no papilloedema. Kernig's sign was doubtfully positive on the left side. There was slight evidence of bronchitis. Incontinence was present. Temperature 99.2° F., pulse 120, respirations 24.

May 29th: Complete mastoid operation with intentional removal of the tegmen antri and tympani. No plastic operation. No sutures.

May 30th: Hemiplegia more marked. Babinski and Kernig signs more positive. No rigidity. Spinal puncture. Fluid normal to tests. No growth on culture. Temperature 102°, pulse 112.

May 31st: Patient's condition deteriorating. Exploration of temporo-sphenoidal lobe from the mastoid wound in three directions with brain forceps; negative result. The lateral sinus and cerebellar dura were then exposed, the former occluded above and below by gauze plugs, and direct exploration of the cerebellum was undertaken with negative result. Temperature 99°, pulse 112.

June 1st: Spinal puncture. Fluid under moderate pressure, but otherwise again normal. Slow rotatory nystagmus to right, probably post-traumatic. Morphine freely used to control shouting and extreme restlessness. Temperature 99°, pulse 110.

June 2nd: Drinks refused. Trephination of right squamous temporal (1 inch). Crucial incision of congested dura. Cerebrum explored with expanding forceps in four directions, with negative result. Rectal salines. Morphine necessary. Temperature 100°, pulse 108.

June 3rd and 4th: Condition unchanged. Temperature 98°, pulse 100.

* Read before the Cork Clinical Society, May, 1935.