situated at the pylorus and had all the appearances of scirrhus; it was adherent to the surrounding parts and was of the size of a small cocoa-nut.¹ The patient left the hospital some two months after the operation, and has been seen periodically until the time of her death from apoplexy in November, 1900.

At the post-mortem examination, conducted by Mr. C. N. Barton, the stomach was found to occupy practically its normal position, but there was a constriction about its centre forming a typical hour-glass contraction (see illustration), the

Diagrammatic sketch of a case of gastro-jejunosomy. Death 11 years after operation. A, Larger pouch of stomach measuring 5 x 4 inches. B, Smaller pouch, 3 x 3 inches, containing opening of pylorus. C, Jejunum. D, Left lobe of liver. E, Cicatricial band of adhesion between liver and stomach which by contraction caused division into pouches A and B. F, Site of operation (gastro-jejunosomy). G, Pylorus.

point of constriction being firmly adherent to the left lobe of the liver. The jejunum was seen to be fixed to the anterior wall of the stomach at the seat of operation in the lower part of its distal pouch. The duodenum was of its normal calibre and apparently had continued to a certain extent in conjunction with the gastro-jejunal opening to perform its normal functions. On opening the distal pouch of the stomach the opening between it and the jejunum was found to be large enough to admit two fingers. At the constricted portion of the stomach the opening between the two pouches was very small, barely admitting one finger. The pyloric opening situated immediately behind the constriction admitted one finger with difficulty. The constricted portion was hard and firmly adherent to the left lobe of the liver. This was the only remaining sign of the large growth found at the time of the operation. The stomach walls were normal; there was no thickening. All the other organs were healthy.

There are many points of interest in this case. First, at the time of operation the tumour had all the macroscopical appearances of a case of carcinoma of the pylorus causing obstruction. At the necropsy the pylorus was found to be patent although somewhat constricted, the mucous membrane covering it being apparently quite healthy; the pyloric orifice was situated immediately behind the constriction, which undoubtedly represented the seat of the tumour, so that possibly the tumour being in this position by its size blocked the pylorus which apparently was not implicated in the growth, and as the growth became atrophied and the obstruction removed the opening again became available for the passage of food. Secondly, it is most remarkable that this growth should have so completely disappeared leaving only a small contracted cicatrix adherent to the liver to indicate its position. There had never been any vomiting of blood or other indications to account for its disappearance. Indeed, the tumour was quite prominent and had been demonstrated on several occasions after the operation up to within about two years of the patient's death when only a slight thickening could be detected. Thirdly, although evidently food had passed by the pylorus, yet the opening between the stomach and

jejunum formed the main opening for the passage of the food from the stomach into the intestine. The communication between the proximal and distal pouches of the stomach formed by the contraction and cicatrization at the seat of the tumour was very narrow, barely admitting the index finger, and it is difficult to understand why the patient did not suffer more inconvenience than she did from the passage of food from the one pouch to the other.

A somewhat similar case is recorded by Dr. Demoulin and Dr. Tuffier.² It was that of a naval lieutenant, aged 32 years, who suffered from severe dyspeptic symptoms early in 1897. In 1898 a hard swelling developed in the epigastrium; all medical treatment was of no avail and the patient became emaciated. The swelling was as large as an orange. Malignant tumour was diagnosed and Dr. Demoulin operated on Dec. 1st, 1899. A soft tumour was found situated around the pylorus and the adjacent parts of the stomach and the duodenum and it felt like a fatty growth; there were no enlarged glands. The patient was so exhausted that pylorotomy was considered impracticable; Dr. Demoulin therefore performed gastro-enterostomy. The patient made a slow recovery. On the twentieth day after the operation Dr. Demoulin palpated the epigastrium and to his surprise the tumour could no longer be felt, its site being marked by a little thickening which vanished within ten days. In May the patient was again on active service.

The case is also of interest read in conjunction with the case of Hour-glass Stomach and Pyloric Stenosis; Gastro-enterostomy, Death, recorded by Dr. Sidney Martin and Dr. Bilton Pollard.³

For the outline drawing of the specimen I am indebted to Dr. C. Davis, house surgeon to the Cancer Hospital, Brompton.

Brook-street, W.

THE INFLUENCE EXERTED BY AIR UPON THE EXHIBITION OF ANÆSTHETICS.

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AIR governs the administration of anæsthetics, by it the patient is enabled to live while he inhales the anæsthetic, and by its instrumentality the dose of the anæsthetic is determined. No manner of administration that involves the curtailment of a patient's air-supply or that fails to direct the course traversed by the air on its way to a patient can ensure either accuracy of execution or limitation of results. Any patient can be reduced to silence and the stillness necessary for surgical procedure with facile certainty, and for that matter frequently is so reduced, by the least practised of administrators. Unfortunately, the power to force a patient to inhale an anæsthetic vapour is not always associated with the practised knowledge requisite to regulate it, and the patient suffers in consequence; not only does he incur the risk of being semi-asphyxiated or totally asphyxiated, but the risk of receiving an excess of anæsthetic and, if he survives, of being grievously sick for hours.

An enormous amount of literature has been produced from time to time dealing with the very important question as to what should or should not be considered the correct dose of any particular anæsthetic. Physiologists and others have told us the effects produced upon the human body as a whole, and upon different portions of it in particular, by the presence of ascertained proportions of anæsthetics. Probably no one will deny that all patients are dissimilar, that the conditions of every operation differ, that the methods of administration differ, that each administrator employing any particular variety of so-called method does so in a manner peculiar to himself, that practically the only constant factors present at an administration are the anæsthetic and the air, and that unless these two essential factors are under absolute and minute control no hope can ever be entertained that reliability of results will be secured or the true merits of the

¹ THE LANCET, July 12th, 1890, p. 68.

² Bulletin et Mémoire de la Société de Chirurgie de Paris.

³ Brit. Med. Jour., Dec. 8th, 1900, p. 1635.

different anæsthetics established. A uniform dose of any particular anæsthetic is no more likely to fit every patient than is a uniform size of boot, but that is no reason why the means employed to deliver the different anæsthetics in the form of vapour should not act with uniform precision, however much it may be desirable to control and vary their rate of action. It can hardly be contended, for instance, that pouring liquid ether on to a sponge, as with Ormsby's inhaler, or A.C.E. mixture on to a sponge contained in a Rendle's mask, or chloroform on to a towel or "piece" of lint, are in any degree accurate methods of developing and delivering the vapours of these fluids. Neither can it be contended that the quantity of vapour produced by evaporation and inhaled by the patient are under anything like an exact control. The fluid may be poured on to the evaporating surface in successive and carefully measured amounts and the size of the evaporating surface controlled, but the volume of vapour available for the patient at each inspiration cannot fail to be merely conjectural. The supply of vapour is indefinite at all times, it may be increased or diminished knowingly or unwittingly, but the variations that do occur are variations of unequal and undetermined increments.

It is not my intention to suggest that the allowance of anæsthetic vapour for each successive breath that a patient draws during an administration should be separately made the subject of an abstruse mathematical calculation and intricate fractional measurement, as that would be manifestly impracticable, but I do suggest the propriety of employing methods of administration which shall not curtail a patient's air-supply and that shall be capable of intentional variation but incapable of indefinite action. It is highly desirable that an administrator of an anæsthetic should be able to be conscious of the exact value of any variations that he may find it advisable to make during an administration, but it is not essential that he should think in figures if his arrangements are such that "more" or "less" means more or less of a definite substance. The sailor who "takes a pull" at the main sheet or "eases it off," as the case may be, does not use a foot rule every time he either gives more or less sheet, but the sheet is the same in length and strength throughout the voyage.

I have said above that air governs the administration of anæsthetics. The fact that it does so may not be apparent at first sight (I refer here to chloroform and its mixtures, to ether, and to nitrous oxide gas) and I will endeavour to show how important a part the air plays in the process. No patient can live long without air. No patient can tolerate without injury, or at least discomfort, any deprivation of his natural air-supply. No anæsthetic can be continuously given in the absence of air. The presence of air is essential to enable the anæsthetic to be efficiently employed. Nitrous oxide gas administration well illustrates this; this gas cannot be given without air (or oxygen) for a period longer than it takes for a patient to become asphyxiated; the same holds good with ether and with chloroform; in the case of chloroform, poisoning would probably occur as soon as, or sooner than, asphyxia. The dose inhaled of each of the above-mentioned anæsthetics is regulated by the air-supply. Air cannot be withheld during an administration without simultaneously compelling the patient to breathe an atmosphere of pure and undiluted anæsthetic vapour. Air cannot during an administration reach a patient without conveying anæsthetic vapour—the air conveys the dose; the dose conveyed depends upon the amount of anæsthetic vapour taken up by the air *en route*. The opportunity the air has of taking up vapour depends upon the route that the air has taken; if it has passed over or under the evaporating surface it will contain vapour in proportion to the size of the evaporating area, but if it passes through the evaporating substance it will be saturated with anæsthetic vapour.

Take, for example, the method by which chloroform is administered from a folded towel, a Skinner's frame, or a piece of lint. When held over, but not touching, a patient's face the air entering from below and all round the face-piece takes up and conveys an amount of vapour proportionate to the rate of evaporation and the size of the free evaporating surface. This can in a loose way be depended upon to be more or less uniform. If from any cause the mask is permitted to descend and adapt its margins to the surface of the patient's face the air passes through instead of under the evaporating area, and the whole mass of inhaled air becomes instantly charged to

saturation with chloroform, an atmosphere that no living thing can withstand for more than a few seconds, as has frequently been demonstrated on the human subject. When a Rendle's perforated mask, packed with a sponge or other absorbent substance, is employed for giving chloroform mixed with other volatile substances the air regulates the dose in a precisely similar manner, the entering air either picking up vapour given off from the evaporating surface in varying but unknown proportions or becoming saturated with vapour if drawn through the moistened absorbent material. However, as the margins of the inhaler where in contact with the face are hard and cannot therefore fit accurately it seldom happens that all the indrawn air has the opportunity of becoming saturated unless the ingress of the air between the inhaler and the face is deliberately prevented by the administrator; fortunately this is a matter of some difficulty and one requiring time to accomplish. Most of these mixtures owe their fictitious safety rather to the part played by the air than to their composition. It has not been shown in the case of any one of them that the chloroform contained in them is less readily absorbed when inhaled, or when absorbed less potent. Were it so the utility of the chloroform in the mixture would not be obvious.

In order to ensure that the amount of anæsthetic vapour inhaled by a patient at any particular breath is the same as the administrator hopes it to be, it is necessary to employ a system of developing and of conveying vapour which shall not be liable to dangerous or spontaneous vagaries. In such a system it is desirable to work through the agency of some one instrument the action of which is constant. That instrument, fortunately, is invariably present—namely, the air. Air can only take up and convey at atmospheric pressure and at any given temperature and pressure (conditions that do not appreciably vary during any given administration) a definite maximum amount of any particular anæsthetic vapour, so that by controlling the amount of inspired air that is permitted to influence the supply of anæsthetic vapour the proportion of anæsthetic present in the air at each inspiration can be gently and evenly raised or lowered as occasion requires.

As I said before, it is the air which ultimately determines the amount of anæsthetic inhaled, but—and herein lies the difference between the methods usually employed and the system which I now advocate—in the former the air is excluded from, or admitted to, the patient without regard to the influence exerted by the air upon the magnitude of the dose of the anæsthetic employed; in the latter the air is not excluded from the patient, and its natural properties are purposely employed to govern and limit the output of anæsthetic vapour, and the anæsthetist manages the anæsthetic by means of the air rather than in defiance of it. Until it is recognised that during the administration of any anæsthetic every alteration that occurs to a patient's air-supply produces simultaneous alteration in the dose of anæsthetic inhaled the dangers that arise from unsuspected variations are likely to continue. He who administers an anæsthetic has two widely differing tasks to perform. Firstly, he has to exercise his judgment both as to the limited effects he wishes to produce upon the patient by the anæsthetic and as to the variations in dosage requisite to keep his patient in a satisfactory condition; and secondly, he has to act up to his judgment, and, therefore, unless he is in a position to dispense his anæsthetic vapour with accuracy his performance must of necessity be uncertain. The dangers that do arise from unsuspected or uncontrolled variations are not rendered less frequent by the very prevalent custom of regulating the dose according to the effects produced (in contra-distinction to regulating the effects by the dose). This custom has, especially when the equipment which is employed to exhibit the anæsthetic vapour is in the least degree indefinite in its action, the great drawback that very undesirable effects are liable to be established prior to their becoming apparent to the administrator whose subsequent efforts to regulate his dose may be too late. There is another drawback to this custom—namely, that unpractised administrators are prone to give their patients the most that they can stand short of their exhibiting actual symptoms of poisoning, rather than to restrict their administration to the limits of efficiency—a proceeding requiring the exercise of considerably greater judgment.

The system of administering anæsthetics by means of the air is simple and has the advantage that it is equally

applicable to all anæsthetics. It consists, not in attempting to control the output of vapour by varying the copiousness of the source of supply, which under this system is a matter of indifference, but in regulating the amount of fresh air that is permitted to take up fresh anæsthetic vapour at each inspiration, this amount being, although definite in composition, variable in quantity at discretion, and it becomes added to the fresh air which completes the inspiratory volume. The essential points in respect of the equipment employed for utilising this system are that it should be absolutely incapable of spontaneous alteration in either shape or condition—of being varied in action by the patient—or of automatic action. Specially constructed apparatus is not necessary when these conditions are present. I should like to emphasise the fact that administration by means of air is only a system for providing a patient with the vapour in a definite manner; the amount administered must, as in the case of all therapeutic agents, be a question entirely of judgment; but of one thing I am certain, and that is that the system cannot, until nature changes the property of air, play its employer false. Personally I use, when carrying out this system in its entirety, apparatus of my own devising—namely, an inhaler for chloroform, an open apparatus for nitrous oxide gas, a special form of stopcock for use with nitrous oxide or for use when employing Clover's ether inhaler, whether with or without gas. These were made originally for me by Mr. J. H. Montague of 101, New Bond-street, W.

Old Burlington-street, W.

THREE CASES OF ACUTE ASCENDING PARALYSIS.

By T. A. GREEN, M.D. EDIN.

ACUTE ascending paralysis is a condition of great interest, not only because of its comparative rarity, but also on account of the very diverse opinions which have been held as to its causation. The first published cases of the disease (10 in number) were contributed by Landry in 1859—hence it often goes by the name of Landry's paralysis; and since then many other examples of the disease have been continuously put on record. The most extensive contribution to the literature of the disease in this country was made by the late Professor James Ross of Manchester who, in 1889, in a series of articles on "Peripheral Neuritis" collected and discussed 93 cases in the *Medical Chronicle*, vols. x. and xi. In February, 1896, a paper on "Idiopathic Acute Ascending Paralysis," by Dr. Reynolds, appeared in the same journal, and several cases have been narrated in the various medical magazines. It has been my fortune to see three cases of the disease in my own practice and to these I am able to add a fourth—a most interesting case—which occurred in the practice of a friend. I propose to give an account of three of these cases and I trust at some future time to be able to discuss the condition in order to bring out some points which I think worthy of note. In order to do this I shall take full advantage of the series of cases collected by Ross which will be found in tabulated form in vol. x. of the *Medical Chronicle*, p. 358. A somewhat different explanation of the disease to that advocated by Ross can, I think, be given.

My cases are as follows.

CASE 1.—The patient was an unmarried girl, aged 19 years, living at home with her parents. Her father and mother were alive. The father suffered from chronic bronchitis. The brothers and the sister of the patient were healthy; one aunt had had "swelling in the neck and went off in a decline." Until two and a half years previously there was nothing of importance—no rheumatism or syphilis. For two and a half years she had suffered from Graves's disease in which all the usual symptoms of that condition had been displayed. During this time her menstrual periods became irregular and finally they ceased five months before the present illness. Subsequently to their cessation, however, she had suffered from periodical attacks of epistaxis. On June 30th, 1894, the patient came to consult me and complained of general

weakness, severe headache, sickness, and constipation; in addition she was suffering from one of her attacks of epistaxis. On inquiry I found that she had been under treatment at the local infirmary for some months for her "goitre." This had been progressing favourably and on her last visit there (June 21st), nine days previously, she was very much better. Hurrying off to the station, however, she missed her train and received a severe chill and had felt ill ever since.

On examination the symptoms of goitre were well marked. The heart was enlarged and there was a systolic murmur at the base. In the lungs there was chronic bronchitis with purulent sputum but no consolidation. On July 4th I was called in to see the patient and I found that the general weakness was increasing, especially in the lower limbs. She was sitting in a chair, but was quite unable to stand or to walk by herself. Epistaxis still continued at intervals, as did also the sickness. She complained of violent pains striking from each side of the neck down into the shoulders and the arms, worse on the left side. Vision was good; the pupils were equally dilated and reacted to light. The pulse was 120 and weak and the temperature was 99° F. The sickness and epistaxis gradually became relieved, but the muscular weakness still progressed and attacked the upper limbs—first the muscles of the shoulder and the upper arms, then the muscles of the forearm—and she was obliged to take to her bed. On July 7th the neuralgic pains returned at intervals and on this day the patient had a sharp attack of palpitation and dyspnoea which lasted about 10 minutes and then passed off, leaving her in a very exhausted condition. She also complained that her eyesight had gone and the eyeballs seemed more prominent. On the next morning (July 8th) I found that she had passed a very restless night with delirium and was in a very exhausted state. The lower limbs were completely paralysed and she was lying propped up in bed. The upper arms were quite helpless, but she could with difficulty raise the forearms off the bed. The grasp of the hand was very feeble. Sensation was unimpaired, superficial reflexes could be elicited, but ankle-clonus and knee-jerk were absent; there was no wasting of the muscles. Her eyesight had improved, but from this time her power of vision varied from day to day. Attacks of dyspnoea came on three or four times a day. From this time she continued to get weaker; the muscles of the trunk became gradually paralysed and by July 15th she could only swallow liquid nourishment with difficulty. Her tongue became dry and brown and sordes began to collect on the teeth. Delirium was now almost constant. On the night of the 15th she complained of pain in the chest and her temperature was 100°. Next morning I found that she had had a very bad night, with restlessness, pain in the chest, and attacks of dyspnoea. Her breathing was difficult and on auscultation the action of the heart was found to be very laboured and galloping. The temperature was 101°. She gradually became worse and died at 11.30 A.M. from paralysis of respiration. The sphincters acted normally until just before death when there was some incontinence of urine. There was no post-mortem examination.

CASE 2.—Dr. J. Scott Taggart, who was assisting me at the time, greatly helped with the notes of this case. The patient previously to this illness had been a strong, healthy man. His age was 23 years and he was married and had one child. He was a quarryman by occupation, was well known as a football player, and was a very temperate man. His previous illnesses had been restricted to obstinate constipation and slight accidents at football. One of the latter had happened four months before the present illness, when he received a kick on one shin, and a troublesome little ulcer, deeply injected and never larger than a shilling, formed and did not heal for five or six weeks. On May 20th, 1895, he was quite well, but on the following morning he began to suffer from pain in the calves of the legs. These pains became so severe that he gave up work at noon and then the pains extended through his legs and back. On the next day (May 22nd) he was worse and he sent for me. He now complained of pain in his head (both back and front), in his back, and in the muscles of his thighs and legs.

On examination the tongue was found to be coated with thick white fur, the mouth was sore inside, the teeth were bad especially on the left side, and his appetite was bad. The heart and lungs were sound. The temperature was normal and the pulse was 60 per minute. There were slight redness of the conjunctiva and watering of the eyes. The pupils reacted to light and accommodation. There was