nothing significant after the transfusion of fresh blood. Since all those examined had a normal liver no excretion of urobilinogen in the urine would be expected (Watson, 1938). None was found in Case 1 when 21-day-old blood was transfused.

Discussion

The fact that the level of serum bilirubin rises somewhat after the administration of stored blood but not after the administration of fresh blood suggests that at least some of the cells of stored blood are more readily broken down in the body than those of fresh blood. Since the increased pigment in circulation is bilirubin, methaemalbumin not being found in demonstrable amounts, it seems probable that the breakdown is an intracellular one. The excretion of urobilinogen was, however, unaffected to any appreciable extent by the age of the blood given or by the level of the serum bilirubin. It must therefore be concluded that, though some of the red cells of stored blood are more rapidly broken down than the red cells of fresh blood, the pigment is retained and used by the body. This is also borne out by clinical observations, appreciable rises in haemoglobin being noted in patients transfused with stored blood (Brewer *et al.*, 1940).

Mollison and Young (1940) have shown that the survival rate of cells stored in a glucose-citrate mixture is little inferior to that of fresh blood. The increased bilirubin figures recorded here are presumably due to the presence of a few effete cells in stored blood, which are immediately removed from the circulation and broken down, with liberation of bilirubin. The fact that the bilirubin level returns so rapidly to normal suggests that further undue destruction does not occur—thus substantiating the figures of Mollison and Young.

Conclusions

Observations on serum bilirubin and faecal urobilinogen following transfusions with fresh and stored blood are recorded.

Transfused red cells appear to be broken down by the cells of the reticulo-endothelial system rather than by an intravascular mechanism.

Immediately after transfusion of stored red cells there is an increase in serum bilirubin which is transitory. This increase does not occur with fresh blood, and is presumably due to the destruction of a proportion of the older cells.

Since no gross difference in pigment excretion was found with the use of either fresh or stored blood it is suggested that the pigment which is rapidly liberated after transfusions with stored blood is to a large extent retained and used by the body, at least in normal individuals.

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H. Gaudin (*New Zealand med. J.*, 1941, **40**, 367), registrar for statistical research, New Zealand Division of the British Empire Cancer Campaign, states that among 4,610 cancer patients during a period of ten years in a general hospital, of whom only 71 were untraced, 256 (5.5%) showed the presence of multiple primary carcinomata. The majority of these cases were those with a primary lesion of the skin, and only 27 were classified as multiple primary lesions of other organs than the skin. J. L. Tullis (*J. Lab. clin. Med.*, 1942, **27**, 588) states that 21 necropsies revealed multiple malignant lesions at the Bellevue Hospital, New York, among 1,044 necropsies with malignant lesions—an incidence of 2%: 17 were males and 4 females, with a combined average age incidence of 58.4 years. Tullis maintains that multiple malignant lesions occur more frequently than can be explained by mere coincidence, and recommends that the clinician should discuss freely with the patient's family the possible familial tendency of the disease.

ANAESTHESIA FOR AIR-RAID CASUALTIES*

BY

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We are now on the crest of a wave of advance in anaesthesia. But for the war, this forward surge might have been of yet greater magnitude. Gas-oxygen came out of the war of 1914-18; much has come since—evipan, vinesthene, and cyclopropane—and it remains to be seen what will evolve from the present conflict.

In civil practice we have been accustomed to forestall shock by the early recognition of the prodromal signs; but in air-raid casualties we are faced with established shock as the cardinal problem. In May, 1941, we in Liverpool became all too familiar with the shock syndrome, and observed the earthy pallor, the profound muscular weakness, the sweating, the sighing or spaced respiration, and the dilated pupils, and knew the significance of the thin, thready, or bounding pulse. The pathology underlying these signs and symptoms is a fall in blood pressure due to a diminution of the circulating blood volume. Apart from haemorrhage, the blood is probably in the capillaries of the relaxed muscles.

Air-raid casualties are usually covered with dust and very often burned. On admission to hospital they are put to bed, given morphine, kept warm, and rested with the foot of the bed raised. After 1 to 2 hours the shock has abated somewhat in many of the cases. Those suffering from loss of blood are transfused with blood, those from shock with plasma. Occasionally patients require immediate operation. The injuries are usually multiple. Premedication with atropine is not essential, but if the patient will stand it a small dose of omnopon and scopolamine helps the anaesthesia. Good co-operation between the surgeon and anaesthetist ensures maximum efficiency. The more serious lesions are dealt with first as a rule. The anaesthetist should be in charge of the resuscitation measures and know when to apply them or to direct their application.

The Shocked Patient

There are three main precepts to be borne in mind before administering an anaesthetic to a shocked patient:

1. It should be realized that the patient is "nigh unto death," and, in consequence, deep anaesthesia in any form is contra-indicated. In everyday practice it is well known that the degree of shock produced by a long period of deep anaesthesia is equalled by that produced by a much longer period of light anaesthesia. At the same time it must be remembered that light anaesthesia, if inadequate, may itself result in shock by allowing the passage of noxious stimuli. My own opinion is that there is a certain stage in light anaesthesia which is just as effective in protecting the higher centres as is very deep narcosis. Certain reflexes are only partially abolished by deep anaesthesia. In these circumstances the combination of local and light general anaesthesia is rational when possible. The signs of light anaesthesia are more difficult to detect in shock. The eye signs are often of no value, but respiration changes are appreciated by those with a keen sense of observation. Slight tidal changes and occasional hesitancy are indicative of a plane of depth which is becoming too light. A pause in the operation may help the anaesthetist to deepen the plane sufficiently if he has been caught napping.

2. The same amounts of drugs that produce the effects of light anaesthesia in the normal patient may be sufficient for overdose in the shocked patient. The golden rule is to let the anaesthesia fit the patient and not the patient fit the anaesthesia.

3. The function of respiration must not be embarrassed by undue stimulation, by interference with the airway, or by suboxygenation.

If any anaesthetic agent is forced upon a patient in high concentration there may be a protective laryngeal spasm and an abnormal increase of secretions. When the spasm has been overcome an exaggerated type of respiration results. This condition might well be termed "traumatic anaesthesia." Gradual changes in concentrations are never so important as in shock.

* Being the substance of a paper delivered before the Liverpool Society of Anaesthetists in Jan., 1942.

Prevention of the free passage of respiratory gases makes the control of depth of anaesthesia impossible and sets up reflexes which may provide further hindrance. Chronic slight obstructions cause an increase in the muscular efforts of breathing which may conceal the onset of asphyxia. Anoxaemia is to be avoided at all costs as it is already present in shock. If it is found difficult to keep the airway free by simple mechanical means, then the larynx should be intubated without delay.

In a normal person, to limit the oxygen in the inspired air to 10%, even in the presence of a free airway, predisposes to a certain amount of shock. Pure gas-oxygen is such a weak anaesthetic that it may require this reduction in order to be effective. The addition of a minimal quantity of ether allows of an increase of oxygen to a normal percentage, and this combination is more rational than the former in shock. It is hardly necessary to have to condemn secondary saturation with gas-oxygen: it is a procedure of doubtful value in the most robust individual.

Light open ether anaesthesia can give very satisfactory results if the drops are properly regulated, the gauze is sufficient in quantity and quality, and the jaw is postured so as to allow a perfectly free airway. A tube from an oxygen cylinder can be placed under the mask and a trickle of oxygen given if necessary.

The Closed-circuit Method

Warmed ether, with Shipway's apparatus, was used extensively during the last war and, I believe, with good results. Nowadays other methods are employed, such as the closed circuit and partial rebreathing. If the operation is prolonged the value of carbon dioxide absorption technique is unquestionable, and the chief reasons are: (1) The prevention of heat and water-vapour loss by the pulmonary route. (2) The quiet breathing due to cutting down the carbon dioxide in the inspired air. Compare this with partial rebreathing in which, if the expiratory valve is closed sufficiently to cause slight positive pressure, the percentage of carbon dioxide may be about 4 or more. In closed-circuit work the carbon dioxide is in the neighbourhood of 0.5%, using the circle type of circuit, with the valves on the machine. With the valves at the face-piece the value may well be much lower. (3) Quiet breathing conserves the muscular energy. (4) Oxygenation is good. (5) It is relatively much easier to maintain a constant plane of anaesthesia.

The two keys to successful closed-circuit work are the maintenance of a clear airway and the avoidance of leakages of gases from the circuit. The commonest site for leaks to occur is between the mask and the face-piece. The newer types of mask manufactured in America, having curves to fit the face, are almost indispensable.

There is one combination as to the value of which there is controversy, but which, in my cases, has been fully justified in its results. A small dose of intravenous barbiturate is injected slowly and cyclopropane is then given by means of carbon dioxide absorption. The cyclopropane raises the blood pressure, tending to counteract the barbiturate. Much less of this gas is needed when shock is present, but induction is rapid, oxygenation is increased, and respirations are not stimulated. Recovery is rapid and unpleasant sequelae are unusual. If the plane of anaesthesia is kept light, cyclopropane does not appear to affect the heart adversely. With local analgesia in addition this method is, I consider, excellent for abdominal cases.

For extra-abdominal cases intravenous pentothal is followed by gas-oxygen, and if this is insufficient cyclopropane is added rather than ether. The combination of ether and cyclopropane is unnecessary in shock, and the effects are worse than if either of these had been used alone. The modern tendency seems to be to avoid the lipid-soluble drugs for shock. Whether this policy results in greater safety than the old policy it is too early yet to pass an opinion, and much clinical trial is required. Certainly it appears that the newer anaesthetics are less harmful.

Intravenous barbiturate, provided the injection is made slowly and as soon as the patient is asleep and a safety pause of about 45 seconds is allowed to occur before further injection, is perfectly safe for the shocked patient. It may, alternatively, be given in conjunction with a drip saline. Oxygen should be at hand. If respiration fails, regular manual compression with a bag filled with this gas is nearly always successful.

Some Contraindications

The use of spinal analgesia for the air-raid casualty is contra-indicated if there is any degree of shock. Occasionally, however, spinal anaesthesia benefits a patient who is in great pain from injury to one or both lower limbs; in this way shock may actually be relieved. In the vast majority of cases, however, the patient has already undergone much mental suffering and is not willing to put up with any more—even though it be only a prick in his spine.

Local analgesia is best used in conjunction with light general anaesthesia, but more often than not is contraindicated owing to the risk of sepsis. One point is nevertheless worthy of mention. Gauze soaked in 1% novocain may be packed into a lacerated wound and left for about 10 minutes with good effect, and this avoids the spreading of infection by injection. Extensive infiltrations of novocain, even where there is no risk of sepsis, as, for example, in a brachial plexus block, may result in a lowered blood pressure and are therefore best avoided.

Chloroform was used in the war of 1914-18 in many cases of injury with shock. Its use in modern times is hardly justifiable at all in the shocked patient, and I think its only place is in cases of chest injury for which diathermy is considered essential. Even then it can be replaced with trichlorethylene in conjunction with an intravenous barbiturate. It has been said that while chloroform kills on the table, ether kills afterwards. I have little doubt that chloroform kills both during and after. In the hands of an expert, light anaesthesia may be effective, but there is always the danger of sudden cardiac failure.

Preparing for Immediate Operation

If immediate operation is necessary the possibility of a loaded stomach should be remembered. The Trendelenburg position must be adopted immediately vomiting occurs. A powerful suction pump should be at hand. Endotracheal insufflation should be practised prophylactically. Sterilized Magill tubes must be ready. I cannot urge too strongly upon anaesthetists the advisability of familiarizing themselves with the introduction of endotracheal tubes. In an emergency it is best to intubate by means of a laryngoscope, though it may well be that at the critical moment the jaw muscles are not relaxed enough. In this case blind nasal intubation may be successful. One further point: a Magill tube may not be easy to insert and a straight gum-elastic tube of the St. Bartholomew's or de Caux type will be easier to introduce. Of course, sometimes the tube may not quite fit the trachea, and it may be necessary to pack round the larynx with ribbon gauze. A Magill tube with balloon cuff is invaluable in some cases. Tracheotomy instruments should be sterilized and ready in this type of case. A Magill tube may be quickly cut so as to serve instead, and a safety-pin inserted into the proximal end to anchor it with tapes.

Induction in Various Types of Case

One type of casualty requires special mention—the patient who has for some days been buried under debris. There will be shock and toxæmia in addition to starvation. In this type of case, if surgery has to be attempted, a glucose intravenous drip is best put up beforehand, and pure gas-oxygen will in most cases be sufficient as the surgery will have to be limited (perhaps completing an amputation, etc.). It will not be necessary to cut down the oxygen in most cases, and when this anaesthesia is not enough a minimal quantity of ether will suffice.

If a patient has to be extracted from wreckage by amputation of a limb, the problem of anaesthesia depends on which part of the anatomy is within reach. A choice has to be made from open ether, intravenous morphine, or a barbiturate. If morphine is the only drug available it is necessary to cleanse the skin thoroughly, apply antiseptic, and take a syringe holding 1/4 grain of the drug. Inject about one-quarter of the contents and observe the result. If this is judged to be insufficient, repeat the same quantity till the desired effect is produced. This is much safer than giving a single injection.

In facial injuries induction presents a problem. An intravenous barbiturate is useful where there is no danger of inhaling blood and where the veins are accessible. It is often essential to carry on anaesthesia by the endotracheal route. Blind nasal intubation may be out of the question because the bones of the face may be reduced to a pulp of lacerations. In this case open

ether anaesthesia will be the method of choice till a laryngoscope can be inserted. The induction is best performed with the mask at some distance from the face and by allowing the heavy ether vapour to fall. Gradually the mask is lowered till the patient tolerates the position.

Restoratives

With regard to restoratives and resuscitation it is the anaesthetist who is best equipped and best able to act as consultant. Where blood has been lost it must be replaced with whole blood. Where a patient suddenly becomes shocked without haemorrhage plasma is indicated. An intravenous injection of 50% glucose given in a dose of 40 to 80 c.cm. will draw fluid from the tissues to the blood stream in cases of failing circulation. Coramine may be useful to stimulate respiration in this type of failure, and veritol is a useful stimulant in failure of the circulation which is peripheral in origin. Carbon dioxide should always be used sparingly, preferably as a 5% mixture with oxygen. Usually carbon dioxide is contraindicated in shock as the respirations are laboured.

Oxygen given by the B.L.B. mask helps to safeguard the patient on his way back to the ward. This gas is particularly useful in shock because death, if it occurs, will be due to anoxaemia. True, the tissues may be incapable of utilizing it from the corpuscular elements of the blood, but if oxygen diffuses in the serum there is much more chance of its being used.

In the profoundly shocked patient who is already too far gone for surgery to avail, the oxygen tent may bring about recovery when it would not otherwise have taken place.

ASTHMA TREATED WITH PATIENT'S BLOOD SERUM

BY

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For a number of years I practised in a country where hay-fever was very prevalent, and many sufferers sooner or later developed an associated asthma. A fairly large number of cases were treated by giving injections of the patient's own blood serum. Every case showed considerable improvement or entire disappearance of symptoms after one course of treatment. Those who had repeated courses seemed to be permanently desensitized, as they continued to live for a number of years, free from symptoms, in the environment which had produced the hay-fever. Having these results in mind, it was decided to use this treatment in asthma not associated with hay-fever. In the following cases, the only ones so treated to date, the results were so spectacular that, in view of the previous results in allergic cases, it seems desirable to publish them in order that others may give this method a trial.

Case Reports

Case 1.—The patient, a woman aged 20, had had a cold in March, 1937, and began to have severe asthmatic attacks. Adrenaline hypodermically was necessary for relief. Attacks often recurred, usually several times in one day, and she was never free for more than 2 or 3 days. She had been under observation in a general hospital in June, 1937. Radiographs of the chest revealed no evidence of any pulmonary lesion. Skin-sensitivity tests gave strongly positive reactions to eggs and feathers. Avoidance of these two offenders did not result in freedom from attacks, which recurred in about the same numbers, but the eating of eggs or the use of a feather pillow appeared to precipitate more frequent and severe spasms. The condition remained about the same, adrenaline being necessary almost daily, until May, 1940, when appendicectomy was performed. For a few months afterwards the asthma seemed less severe, although still troublesome. At this time radiographs of the chest were repeated, but no evidence of a pulmonary lesion was found. On Dec. 12, 1940, the patient was sent to a tuberculosis dispensary because of increased cough and sputum and loss of weight. Radiographs disclosed dense shadows in the right upper lobe, and the sputum was T.B.-positive. She was admitted to the Glan Ely Tuberculosis Hospital on Jan. 25, 1941.

The asthma was severe, and adrenaline was necessary for relief almost every day until Feb. 24, 1941. From that date one or more injections were necessary every day, and the patient appeared to be distressed continuously. In August I suggested the use of the patient's own serum. The first injection was given on Aug. 18, the amount being 1 c.cm. On the 19th 1.5 c.cm. was given, and the dose was then raised to 2 c.cm. and repeated every other day until 12 doses had been administered. From Aug. 22 to 27 no adrenaline was necessary. One injection of 5 minims of adrenaline was necessary for mild spasm on Aug. 27 and 29 and Sept. 1 and 2. Since then there has been no suggestion of asthma. Eggs have been eaten and a feather pillow has been used. On Nov. 4 the patient was still free from any asthmatic symptom. Unfortunately the tuberculous lesion progressed, and she died on Dec. 21.

Case 2.—The patient, a youth aged 19, was admitted to Glan Ely Hospital on Nov. 29, 1941, for tuberculosis of the spine. He gave a history of bronchitis and asthma since infancy (7 months), and on account of asthmatic attacks had been unable to attend school for more than 3 months in all. In hospital he had severe attacks, requiring repeated adrenaline injections. Treatment with his own serum, similar to that in Case 1, was started at once, and no asthmatic attack has occurred during the intervening 4 months. Cough and sputum, from which he could not remember being free, decreased, and both have been absent since the beginning of January.

Technique

By employment of a sterile syringe and test-tube, or preferably a vacuum venule, some 30 c.cm. of the patient's blood is drawn and allowed to clot at room temperature for about 2 hours. It is then stored in a refrigerator. Serum is drawn off the top as required and injected subcutaneously. It was noted in all cases treated, including the one reported, that a much firmer clot formed as the treatment progressed, and proportionately more serum was expressed. No local or general reaction has been noticed. Many patients who were treated for hay-fever by this method remained free from colds for long periods afterwards, although they had previously been very susceptible.

I wish to thank Dr. A. Brownlee, medical superintendent, for his co-operation and for permission to report these cases.

DISTRICT NURSING IN LONDON

The twenty-seventh annual meeting of the Central Council for District Nursing in London was held at County Hall under the chairmanship of Sir William Collins. The annual report stated that during the past year 176,000 visits had been paid by district nurses under the scheme of arrangement with the London County Council, and of this number 92,000 had been general nursing visits, and 84,000 had been for the purpose of giving insulin to diabetic patients. Despite the return of many people to the county of London, and the inclusion of supplementary pensioners, for the nursing of whom the L.C.C. has undertaken financial responsibility, the number of visits has not reached the pre-war total, and therefore the Central Council has deemed it unwise to press for an increase in the amount of the block grant of £4,400 per annum which is given by way of subsidy to district nursing associations. Work by nurses in school treatment centres has, at the request of the County Council, been resumed in certain areas by the associations. The scheme whereby King Edward's Hospital Fund pays associations for work in attending patients referred from voluntary hospitals has now been extended to include the whole metropolitan area, but the extra expenditure on district nursing brought about by the increase of the area, as well as by any higher rate per case that may be sanctioned, is not yet known. For the present year the sum of £2,000 has been distributed on this account. On the subject of nurses' salaries the report stated that the recognition that an increase was due had been hastened by present-day conditions, and the Ministry of Health's committee under Lord Rushcliffe has specifically included district nurses' salaries in its terms of reference. The Queen's Institute of District Nursing and the Ranyard Nurses have already adopted higher scales, but the matter will be difficult for some of the local associations unless they receive a State grant or increased amounts from their local authorities. To the eighty-four district nursing associations in the metropolitan area the sum distributed in 1941 was £11,707, of which nearly £7,000 came from the L.C.C.