REFRESHER COURSE FOR GENERAL PRACTITIONERS

RESUSCITATION OF THE APPARENTLY DROWNED

BY

E. J. GORDON WALLACE, M.B., D.P.H.

Medical Officer of Health for Weymouth and Melcombe Regis

Members of first-aid classes are often told—with a great deal of justification—that, apart from the immediate control of severe bleeding, artificial respiration is the one really life-saving procedure which a trained layman can carry out as effectively as a qualified medical practitioner.

What, then, are the practical problems of the doctor called to the apparently drowned body on the beach or river-bank? Where does he start, and what method of artificial respiration is he to use? Mechanical means for performing artificial respiration cannot be expected to be immediately at hand in such an emergency, in which it has been well said that “seconds count.” The first essential, therefore, is that every doctor should be thoroughly proficient in carrying out manual artificial respiration, so that he can either perform it himself or supervise its efficiency when carried out by others.

Asphyxia caused by drowning is due to immersion of the mouth and nostrils in water, thus preventing the passage of air to and from the lungs. The immediate effects of such obstructive asphyxia are depletion of oxygen and retention of carbon dioxide. Workers in Canada have shown that the oxygen saturation of arterial blood drops to approximately 15 volumes % during the first few minutes after submersion, falls to between 2 and 3 volumes % by the end of six minutes, and is almost at zero within seven to eight minutes. The aim of artificial respiration is to re-establish the flow of air through the lungs as quickly as possible so that oxygen may be carried to the brain and vital centres before these suffer irreversible damage. Various procedures have been elaborated to secure this.

Efficiency of Different Methods of Artificial Respiration

In this country Schafer's method has been most widely taught, and in practice it has saved many lives. Recent experimental work in America, however, would appear to indicate clearly that other methods are more efficient, particularly in inducing active inspiration—a process which in Schafer's method depends on the recoil of the diaphragm after release of positive pressure applied to the small of the back. It is now appreciated that in an asphyxiated person there is a rapid loss of muscle tone, and the amount of air passively inspired in Schafer's method is much less than in the more modern procedures. At the University of Illinois research work has been conducted under conditions which approximated as closely as possible to actual asphyxia in that the experimental subjects were healthy adult males in whom total apnoea was induced by intravenous thiopentone and curare. It was thus possible to evaluate the efficiency of the various artificial respiration procedures without the inevitable variations which must be expected when conscious subjects are used; the different methods were all carried out by the same operator. Not only were tidal air volumes measured but samples of blood were taken by arterial catheters for estimation of oxygen saturation. Tidal ventilation achieved by the various methods was as follows:

Schafer	..	..	485 ml.
Arm-lift-chest-pressure (Silvester)	..	..	1,069 ml.
Arm-lift-back-pressure (Holger Nielsen)	..	..	1,056 ml.

With the arm-lift-back-pressure (Holger Nielsen) method blood oxygen levels remained at about 90% saturation, while

with Schafer's method a dangerous degree of cyanosis developed in several instances. The Silvester method suffers from the disadvantage that the operator requires an assistant to hold forward the patient's flaccid tongue, which would otherwise fall back and block the oropharynx, while in an apparently drowned person the face-upward position does not facilitate the flow of water from the respiratory passages.

As a practical procedure the Holger Nielsen method can be easily carried out even by persons of frail physique. It can be quickly taught and effectively performed by first-aid students. This arm-lift-back-pressure method has therefore been endorsed by the American Medical Association, the American Armed Forces, the National Red Cross, and many other responsible organizations in the U.S.A. for use by the general public when dealing with cases of asphyxia. There would seem to be no reason, therefore, why the Holger Nielsen method should not be adopted in this country as the method of choice for carrying out manual artificial respiration.

Arm-lift-Back-pressure Method (Holger Nielsen)

The arm-lift-back-pressure method is essentially the same as the Holger Nielsen method, which has given highly satisfactory results in Scandinavian countries over the past 20 years. This method is therefore described first, but it must be remembered that before artificial respiration is started it is necessary to get rid of as much water as possible from the air passages. To do this, place the casualty prone, with his face down and head on one side. The doctor stands astride the casualty, across the thighs, stoops down, and clasps his hands under the patient's lower abdomen and raises the body, which is kept raised so long as water flows out. It is important to ensure too that the oropharynx is not obstructed by dentures or foreign bodies.

Artificial respiration is then carried out as follows: (1) Place the patient prone—that is, in the face-downward position—the arms overhead, and elbows flexed so that one hand rests on the other (Fig. 1, A). (2) Turn the patient's head to one side, so that the cheek rests on the uppermost hand. (3) Kneel on one knee at patient's head and put the foot of your opposite leg near his elbow. (4) Grasp the patient's arms just above his elbows and rock backwards, raising his arms until resistance and tension are felt at the patient's shoulders (Fig. 1, B). (5) Drop patient's arms, place your hands on his back just below the scapulae, and rock forward with your elbows straight, until your arms are approximately vertical, exerting steady pressure on his chest (Fig. 1, C and D).

The phases of expansion and compression should each last $2\frac{1}{2}$ seconds, the complete cycle being repeated 12 times a minute. No time should be lost between the two phases of expansion and compression.

This method is, of course, only practicable when there are no gross injuries to the arms, shoulder-girdle, and ribs. Should such injuries be thought to contraindicate the Holger Nielsen method it is advisable to start Schafer's method (for which see the textbooks of the St. John Ambulance Association or British Red Cross Society) at once and send for a rocking stretcher apparatus. Indeed, Eve's rocking method is thought to be so much more effective than manual methods that the necessary apparatus should be immediately available at every ambulance station.

FIG. 1.—Arm-lift-back-pressure method of manual artificial respiration (after Holger Nielsen). A, placing hands for arm lift; B, arm lift; C, placing hands for back pressure; D, back pressure. (After Fig. 3 in an article entitled "Critical survey of manual artificial respiration," by A. S. Gordon, M. S. Sadove, F. Raymon, and A. C. Ivy, in the *Journal of the American Medical Association*, 1951, 147, 1444, by kind permission.)

Eve's Rocking Method

This method, evolved by Dr. F. C. Eve, of Hull, was proved to be most efficient during the last war and has been officially adopted for use in H.M. ships. Essentially it relies on a piston-like movement of the diaphragm when the body is rocked in a see-saw fashion, through an angle of 90 degrees. The apparatus consists of a trestle 34 in. (86 cm.) high, with a strong horizontal bar (preferably a $\frac{1}{2}$ -in. (1.9-cm.) metal rod) and a stretcher with W-shaped metal pivots permanently fixed below the centre points of both side-poles (Fig. 2). These notched metal pivots, which should be just shorter than the stretcher runners, prevent the patient's abdomen from sagging on to the trestle crossbar, as well as eliminating any sliding of the stretcher on

the crossbar while rocking is being carried out. Should such a prepared stretcher and trestle not be available, this sliding can be prevented by hammering two strong nails into the underside of each stretcher pole, the distance between each two nails being governed by the width of the improvised "trestle" to be used. The Riley rocking stretcher made by Siebe, Gorman & Co., Ltd., has been specially designed to enable Eve's method to be carried out easily and effectively.

Manual artificial respiration (preferably the Holger Nielsen method) must be carried out until the rocker stretcher is brought up alongside the patient and continued after he has been smartly lifted on to the stretcher bed (prone position) until his wrists and ankles have been secured to the stretcher handles by means of appropriate bandages. (With the Riley rocking

FIG. 2.—Apparatus for Eve's rocking-method, during expiration. (From *First Aid in the Royal Navy*, by kind permission of the Controller, H.M. Stationery Office.)

stretcher a special harness is used.) The stretcher is then quickly lifted on to the trestle, and rocking is begun with a head-down tilt (to ensure that water has been eliminated from the respiratory passages). Alternate head down and feet down "see-saw" rocking movements are continued at a rate of approximately nine double rocks a minute—four seconds head down and three seconds feet down. Each movement should start abruptly so as to ensure that the abdominal viscera begin to move early in each "rocking."

Administration of Oxygen

In the past it has been thought that carbon dioxide acts invariably as a stimulant of the respiratory centre, but it is now believed to be dangerous to give it, even mixed with oxygen, to anyone who has been asphyxiated. Carbon dioxide should therefore never be used in treating cases of drowning, and the administration of pure oxygen should be begun as soon as possible. This is best done by means of a Novox resuscitation apparatus, which should be available at all main ambulance or fire stations. Before using it a check should be made to ensure that the cylinder contains pure oxygen (white neck) and *not* a mixture of oxygen and carbon dioxide (green and white neckbands*). The by-pass valve should be opened carefully so that the flexible breathing-bag is not over-inflated, as this merely wastes oxygen.

The initiation of efficient artificial respiration and the administration of pure oxygen are thus the two procedures which must be begun without delay in the resuscitation of an apparently drowned person. Attention, too, must be directed to overcoming the shocked condition of the patient by removing wet clothing, drying him, covering him with blankets, groundsheets, or mackintoshes to prevent further heat loss, and by applying protected hot-water bottles, particularly to the nape of the neck. These steps, while important, must not be allowed to interfere with the continuous performance of artificial respiration. This must be kept up, by relays of helpers, for at least two hours, or until natural respiration begins, when the operator must synchronize his

*This is now being changed to white and grey.

movements with the patient's breathing, gradually reducing his efforts as natural respiration becomes stronger.

Stethoscopic auscultation over the trachea may give an indication that spontaneous breathing has begun, but the best indication of this is probably given by the Novox apparatus, the flexible breathing-bag of which—with the bypass valve slightly opened—will show faint movements with shallow spontaneous respirations. However, it is not recommended that artificial respiration should be momentarily suspended—so that this movement may be looked for—until it has been carried out for at least 15 minutes.

When spontaneous breathing is confirmed the Novox bypass valve may be closed, as the patient will then inhale an appropriate amount of oxygen by means of the automatic "lung-governed" mechanism. The air-admission valve under the Novox facepiece may then be opened gradually so that the patient breathes in progressively more atmospheric air and less pure oxygen.

When normal breathing and consciousness have returned the patient must be carefully watched, so that should his respiratory efforts again become feeble resuscitation measures may be resumed. On no account must the patient be allowed to sit up. A few sips of a warm drink may be given, and he should be removed—lying on his side on a stretcher—preferably to hospital, where observation can be kept for possible pulmonary sequelae.

Finally, with artificial respiration, as with all other practical procedures, it cannot be too strongly emphasized that practice makes perfect.

Next Refresher Course Article.—"Anaesthetic Explosions," by Dr. C. F. Hadfield.

MEDICAL BENEVOLENCE

The annual meeting of the Royal Medical Benevolent Fund was held on July 24 under the presidency of Lord Webb-Johnson, whose first announcement was that Her Majesty the Queen had graciously consented to be patron of the Fund. Lord Webb-Johnson, Mr. F. A. Juler, and Dr. R. Cove-Smith were re-elected respectively president, honorary treasurer, and honorary secretary.

£36,522 Distributed

In presenting the annual report, Dr. Cove-Smith said that the capital funds and reserve amounted to £435,900, the investment income for 1951 to £13,794, and the subscription income to £24,410. The amount distributed during the year in the form of grants, annuities, and Christmas and New Year gifts was £36,522, and the administration expenses were at the very economical level of 6.6%. An excess of expenditure over income of £4,859 was not a matter for serious anxiety in view of the substantial reserves, but if more members of the profession could be induced to subscribe the Fund could extend the scope of its benefits and would no longer have to work on such narrow margins. Some generous benefactions during the year included £500 from Lord Webb-Johnson on his re-election as president. The most outstanding source of financial support was the Medical Insurance Agency, which added £10,892 to the subscription income during the year. The Charities Committee of the British Medical Association was able to hand over £3,500 from earmarked and £2,197 from non-earmarked donations. The amount received in legacies—£18,114—was considerably less than in the previous year, but well up to the average. During the year 88 new applicants had been helped, many of them widows with young children to educate and maintain, and many others elderly and infirm, and the total number of beneficiaries on the books was over 600.

Dr. Cove-Smith urged the value of the seven-year covenant scheme, which ensured a regular annual income to the Fund and enabled some tax to be recovered by the Fund and put to good use without further cost to the subscriber.

Distinction Awards Received

Lord Webb-Johnson said that while £24,410 might seem to be a handsome subscription income it had to be set against the numbers in the profession, making it evident that a large proportion of medical practitioners never subscribed to the Fund. He referred with special praise to the generosity of a number of practitioners who had handed over to the Fund the amount of their "distinction award." In spite of the National Health Service and the greater dependability of the doctor's remuneration, there were still many hard cases. Medicine was a hazardous profession, and many practitioners died in the earlier part of their career before they had been able to make sufficient provision for their families. He suggested that the opportunity of Coronation year might be taken to make a wider appeal than usual, backed by various medical organizations. It was the solemn duty of members of the profession to subscribe up to their capacity and encourage others to do so.

LORD BOYD-ORR ON WORLD HUNGER

Lord Boyd-Orr was unanimously elected president of the Central Council for Health Education at the annual meeting held at B.M.A. House on July 24. In a brief address he referred to the value of the council in this country, and of the World Health Organization and other bodies in the international field, in informing and educating the public in the matters of health and nutrition.

Food Supply and Social Contentment

During the war a rationing and food subsidy system had been built up which ensured their proper share of available food supplies to the poorer as well as the richer members of the community, and above all aimed at preserving the health and nutrition of the rising generation. The question was whether that policy could be maintained and developed. Food supply bore a close relation to social contentment. Lord Boyd-Orr spoke of the "hungry forties" of the last century, the period just before the repeal of the Corn Laws, when the high price of foodstuff led to social unrest. During the half-century from 1800 to 1850 the population of this country rose from 10 million to 20 million, but there was no corresponding increase in food production. Half a century later, thanks to the opening up of vast areas overseas, the position was very different, but now food scarcity was again asserting itself. The population of this country at present stood at some 49 million, but the population of the rest of the world was increasing at an ever accelerating rate, and food production was not keeping pace. There was now less food per head of population than in 1938. World hunger was apparent, and, unless the efforts of United Nations could cope with the situation, would become acute. In this country, up to now so favoured, unless there was a big increase in home food production a severe pinch would be felt, for we still had to import half the food we consumed, and in a hungry world such importation became more and more difficult. The problem of shortage of food in Asia was now our problem. The world had become so small that the problems of any country now concerned all countries. Countries which used to send food to us were now actually themselves importing food and competing with us in the world's markets.

Sir Allen Daley, who, together with Dr. Charles Hill, M.P., was elected a vice-president of the Central Council, also addressed the meeting.