PROCEDURES IN GENERAL PRACTICE

This is one of a series of articles contributed by invitation

TREATMENT OF DROWNING AND ELECTROCUTION

BY

REGINALD T. PAYNE, M.S., M.D., F.R.C.S.

In this country 781 deaths from accidental drowning occurred during the year 1937, and 806 deaths from suicide by drowning. During the same year there were seventy-nine deaths from technical electricity but none from lightning, though in 1936 nineteen persons met their death in the latter way. Under war conditions it is certain that there will be an increase in the number of deaths due to drowning and to electrocution. These two apparently diverse conditions are linked together as common forms of asphyxial death, as conditions of suspended animation in which all the ordinary clinical tests for death are entirely fallacious, and as conditions requiring immediate, prolonged, and persistent artificial respiration. If the essential underlying factors in these two conditions were more fully appreciated and the value of prolonged artificial respiration more generally realized many more lives would be saved by the efforts of medical men, first-aid workers, and trained workmen.

Apparent death due to drowning or electrocution is likely to happen suddenly, unexpectedly, and dramatically, at sea, by the sea, in the river or swimming-bath, or in the home, factory, or power station, etc. Such accidents occur under conditions in which onlookers are apt to lose their heads, and in circumstances far removed from those of hospital practice. For these reasons I have concentrated mainly on those methods of resuscitation which can be applied at once and on the spot, and which do not involve the use of complicated apparatus such as is hardly likely to be available under the conditions in which these accidents usually occur.

In apparent death from drowning or electrocution immediate, prolonged, and persistent artificial respiration is the fundamental method of treatment.

Artificial Respiration

The method most often employed in this country, France, and the U.S.A. is that introduced by Schäfer, while in Central European countries Sylvester's method is favoured. Members of the St. John Ambulance Brigade are taught how to use Schäfer's method. Experimental work certainly suggests that Sylvester's is the more efficient in terms of pulmonary ventilation, but this fact alone is not an entirely adequate reason for abandoning a method as widely known and well established as Schäfer's. The following are the advantages of Schäfer's procedure: It is simple; it can be carried out unassisted if necessary; the prone position favours the drainage of fluid from the lungs, etc., in cases of drowning; and it is not essential to hold the tongue and jaw forward as with Sylvester's method.

It is impossible to be dogmatic as to which method should be employed in any given case. The choice may vary with the condition for which artificial respiration is being carried out, the personal knowledge, skill, and ability of the rescuer, the number of assistants available, and the presence of associated injuries. Obviously the medical

man is likely to have more methods at his disposal than is the first-aid worker, who is usually conversant with one method only. It is more important that the artificial respiration be immediate, prolonged, and persistent than that any one particular method should be carried out.

The following details of Schäfer's method are based upon a paper by Bates, Gaby, and MacLachlan in the *Canadian Medical Association Journal* (1938, 39, 120).

1. Rapidly remove from the mouth any foreign material such as weeds, false teeth, and tobacco. If the mouth is tightly shut pay no more attention to it till later. Do not stop to loosen the patient's clothing unless it is obviously tight. Every moment is precious.
2. Lay the patient on his belly, one arm extended, the other arm bent at the elbow and with the face turned outward and resting on the hand and forearm, so that the nose and mouth are free for breathing.
3. Kneel straddling the patient's thighs. Place the palms of the hands on the small of the back with the fingers resting on the ribs and the little finger over the lowest rib.
4. With the arms held straight, swing forward slowly so that the weight of your body is gradually brought to bear upon the patient. The shoulder should be directly over the hand at the end of the forward swing. Keep the elbows straight. This movement should take about two seconds.
5. Now immediately swing backwards and completely remove the pressure.
6. After two seconds swing forward again. Thus repeat deliberately twelve to fifteen times a minute the double movement of compression and release—a complete respiration in four or five seconds.
7. Continue artificial respiration without interruption until natural breathing is restored, or until there are unequivocal signs of death, such as rigor mortis, cooling of the body, or post-mortem staining.
8. When the artificial respiration has been started, and while it is being continued, get an assistant to loosen any tight clothing about the patient's neck, chest, or waist.
9. *Keep the patient warm.*
10. Give nothing by the mouth.
11. To avoid strain on the heart, when the patient revives he should be kept lying down and not allowed to stand or sit up. Hot drinks may be given after revival and the return of consciousness.
12. Artificial respiration should be carried on at the nearest possible point to where the patient received his injuries. *He should not be moved from this point until he is breathing of his own volition.*
13. Should it be necessary, owing to extreme weather conditions, other injuries, etc., to move the patient before he is breathing normally, artificial respiration must be carried on uninterruptedly during the time he is being moved.
14. A brief return of natural breathing is not a certain indication for stopping artificial respiration. At times the patient after a temporary return of natural breathing stops breathing again. He must be watched and, if natural breathing stops, artificial respiration must be resumed at once.
15. In carrying out artificial respiration it may be necessary to change the operator. This change must be made without interruption and without losing the rhythm.
16. If alone with the victim do not neglect to start artificial respiration at once—the first few minutes are valuable.
17. In apparent death due to drowning or electrocution the ordinary tests for death, such as pulse, heart sounds, respira-

tion, and corneal reflex, must not be accepted. Death should only be assumed in the presence of rigor mortis, cooling of the body, or post-mortem staining.

Drowning

Drowning accidents may be brought about by shipwreck or as the result of the victim's ignorance, foolhardiness, or fatigue; they may also be due to the onset of sudden illness or cramp or the presence of old-standing disease. But not all apparently dead persons die as the result of the drowning, as other causes may operate. Death from drowning is the result of asphyxia. Two modes of asphyxia are possible. In the one a small amount of water enters the larynx during the period of apnoea and leads to laryngeal spasm. Death is thus due to asphyxia. In the other group of cases spasm of the larynx does not take place, but a variable amount of water enters the trachea, bronchi, and lungs. The asphyxia in such cases results from waterlogging of the lungs. In other cases, again, there may be a combination of laryngeal spasm with some degree of waterlogging. In all cases blood is dammed back in the right heart and the venous system, while the left heart and arterial system are relatively empty.

In drowning accidents the victim is unconscious and not breathing, the pulse cannot be felt, and the heart sounds are inaudible. It cannot be too strongly stressed that in such cases the ordinary clinical signs of death are completely fallacious. In all cases the cardiac complexes remain for a considerable but undetermined period of time after the heart sounds have ceased to be heard with the stethoscope. For this reason the stethoscope is a poor guide for determining whether or not a drowned person is or is not beyond the possibility of resuscitation. Similar considerations also apply to apparent death after electrocution.

After what period of immersion in water is recovery possible? To this it must be admitted there is no exact answer. The popular belief that recovery is impossible after immersion for four to five minutes is entirely fallacious. Recent evidence suggests that it is possible to be submerged in water up to half an hour and still live.

Treatment of Drowning

Because of the physiological considerations which apply in cases of drowning and the fallacious nature of the clinical tests for death in such cases, all victims must be given the benefit of the doubt, and death never assumed until rigor mortis, body cooling, or post-mortem staining appears. After removal from the water all signs of life may be absent for hours, yet the person may ultimately recover. The following are some of the special details which apply to the treatment of drowned persons.

1. Lift up the victim by the waist and allow water to run out of the mouth, pharynx, stomach, larynx, trachea, and lungs.
2. Lay the victim face downwards, preferably on some slightly sloping ground, with the head rather lower than the feet, and in the position already described under artificial respiration.
3. Pay particular attention to clearing the mouth, etc., of all foreign material, as the victims of drowning are specially likely to have the passages obstructed by weeds, etc.
4. Start artificial respiration at once, as already described in the section devoted to it. Continue this until either recovery takes place or unequivocal signs of death appear, such as rigor mortis, cooling of the body, or post-mortem staining.

5. Apply such of the adjuvants to artificial respiration (described later) as can be obtained in the circumstances of the particular accident.

Electrocution

As Jellinek puts it, "People have been killed or injured by atmospheric or technical electricity, by low or by high tension, by direct or alternating current, by low or by high frequency, and others in similar circumstances have not suffered any injury whatsoever." Electrocution may thus be the result of lightning or of any type of electrical accident. In electrical accidents it is often too readily assumed that all that matters is the question of voltage, on the assumption that the risks to life bear a simple relation to the voltage. This, however, is largely fallacious. The voltage factor is only one of many factors which must be considered in connexion with the accident, some of the others being the perfection of the contact, the duration of flow, the condition of moisture of the clothing and skin, the resistance offered by the body, and even psychological factors, such as the awareness of the individual of the possibility of a shock. In the case of lightning the victim is likely to be caught out of doors, while in the case of technical electricity the accident may occur in the power house, on the electric railway, or in the home, office, factory, etc., or out of doors in connexion with repairs to or work upon electric mains or cables. A proportion of these accidents will therefore occur under conditions of shelter.

These accidents, whether due to natural or to technical electricity, bring about their results in three ways. First, by the passage of the current through the central nervous system they produce unconsciousness and an acute bulbar palsy; secondly, they produce electrical burns; and, thirdly, fractures may result from the violent and spasmodic contraction of muscles. From the point of view of first-aid treatment in these cases it is to the injuries to the central nervous system that attention must be directed.

The victims of these accidents are often rendered unconscious by the passage of the current, or they may still be conscious but unable to release themselves from the contact. They are, however, rarely killed outright as the result of the electric shock. If unconscious they are really in a state of suspended animation. Respiration has ceased, the pulse is absent, the heart sounds are inaudible, and the normal reflexes can no longer be elicited. According to the ordinary clinical tests they are apparently dead; but in fact they are not dead, though they will certainly die if left untreated. Death is the result of an acute bulbar palsy which may lead to failure of the heart or of the vasomotor or respiratory system. As in the case of drowning, electrical conductivity of the heart persists for a considerable time into this phase of suspended animation, and normal rhythmical activity may be restored by prompt artificial respiration. Cerebral oedema may rapidly develop in some of the cases and be responsible for the motor agitation and for the prolonged periods of artificial respiration which are necessary at times.

Treatment of Electrocution

In the case of electrical accidents treatment will involve a consideration of the following aspects: freeing the victim from electrical contact; treatment of suspended animation; treatment of cerebral oedema; treatment of electrical burns; treatment of fractures and other injuries. Here the subject will be dealt with primarily from the point of view of first-aid treatment, and other aspects only considered briefly.

Freeing the Victim from Electrical Contact.—This will only apply in cases of injury from technical electricity. The victim must be freed as rapidly as possible. This will involve cutting off the current or removing the victim from the contact, whichever is quicker. Many fatalities can be prevented by cutting off the current the moment the accident is recognized. If this is not possible the victim must be dragged away from the contact, the greatest care being exercised or would-be rescuers may be electrocuted also. This may be carried out by the use of rubber gloves, with the hands carefully padded with newspapers, or by means of non-conductors such as a dry stick, broom handles, dry rope, or a dry coat. But in all cases this freeing must be done quickly and carefully. In cases where this is impossible it may be necessary to sever the source of electrical energy with an insulated tool such as an axe with a long wooden handle.

Treatment of Suspended Animation.—Immediately the victim is freed from the electrical contact artificial respiration must be started. The details of this have already been described. This artificial respiration must be continued systematically and rhythmically till normal respiration is established or until unequivocal signs of death occur. The victim of an electrical accident is in a state of suspended animation due to an acute bulbar palsy, a state from which recovery is highly probable if immediate, prolonged, and persistent artificial respiration is carried out. No attention or consideration should be paid to the information that the voltage producing the shock was a particularly high one or the knowledge that artificial respiration has been carried on for several hours without result. Bates has recorded a case of recovery from an electrical shock of 26,000 volts after artificial respiration had been carried out for eight hours. So far as I am aware this is the longest case on record. The victim must always be treated on the spot and no attempt be made to move him at this stage. At the same time such adjuvants to artificial respiration (described later) should be applied as can be obtained in the circumstances of the particular accident.

Treatment of Cerebral Oedema.—Many workers, especially Jellinek, have stressed the importance of carrying out lumbar puncture in cases which do not rapidly respond to artificial respiration and in cases in which either motor agitation or coma persists after the establishment of normal respiration. In electrical accidents the pressure of the cerebrospinal fluid may rise rapidly, and this may be one of the factors delaying successful resuscitation. The risks of lumbar puncture in these cases are negligible, since there is no tendency to bleed from cerebral vessels. It will be obvious that lumbar puncture can only be carried out in suitable surroundings and with medical assistance.

Treatment of Electrical Burns.—The extent and nature of the local lesions in electrical accidents vary greatly from case to case. These burns may include deep local lesions at the point of contact, surface burns of varying degree, and extensive charring of limbs or other parts of the body. When these burns are dealt with must depend upon all the circumstances attending the accident and the fact that nothing must be allowed to interfere with the continuance of artificial respiration. Superficial burns may be treated with tannic acid just as for burns from other causes. The deep eschars at the point of contact with the current may be similarly treated, though Jellinek, who has had considerable experience of these, favours conservative methods and the use of a lanolin dressing. In these deep electrical burns good healing occurs after

separation of the dead tissue, and spreading infection is very rare.

Fractures and other injuries must of course be dealt with on general surgical principles.

Adjuvants to Artificial Respiration

The extent to which other methods of treatment are applicable in the circumstances of suspended animation following drowning or electrocution must depend upon the individual case; but in considering these adjuvants to treatment it must be remembered that there is no possible substitute for efficient artificial respiration.

Warmth.—Keep the victim as warm as possible by the use of clothing, rugs, blankets, bottles, or other means.

Massage.—Massage of the limbs, especially the lower, towards the heart will help to maintain the circulation and to stimulate body warmth.

Drugs.—Coramine, 1 c.cm., may be given either direct into the heart or into a vein. Atropine, 1/50 to 1/25 grain, may be of some use in decreasing foam and oedema in cases of drowning and in lessening cardiac inhibitory impulses in cases of electrocution. A capsule of amyl nitrite is of value in improving the efficiency of the coronary and pulmonary circulations. The use of adrenaline is debatable, and many workers consider it dangerous. The advantage of drug therapy is that it can be readily applied if a medical man is available.

O₂, CO₂ Intubation.—These methods will only be possible in special circumstances. A mixture of 5 per cent. CO₂ in oxygen is a most valuable adjunct to treatment. It should be given at the rate of three litres a minute and preferably through a laryngeal tube. Before doing this any froth or mucus in the larynx and trachea should be aspirated.

Rectal Salines.—These will help to maintain body warmth and the volume of the circulation.

Respirators.—If the victim has been transferred to hospital a Drinker or other form of respirator may prove invaluable for maintaining artificial respiration for long periods.

Following the successful resuscitation of the victim of drowning or electrocution the next step is to ensure that nothing is done to increase the risk of subsequent complications. It is no use recovering a person from drowning if he is to be allowed to die from pneumonia as the result of inadequate care following successful resuscitation. What steps are necessary in the individual case must be determined by the medical adviser in the light of all the circumstances.

Summary

The victims of drowning and electrocution are in a state of suspended animation.

In such conditions the ordinary signs of death—namely, absence of pulse, heart sounds, respiration, and reflexes—are completely unreliable.

In the case of drowning recovery is possible after immersion for a considerable period, even up to half an hour or more.

In the case of electrocution the period of suspended animation may extend to eight hours or more and yet recovery still take place.

In electrical accidents do not be unduly alarmed by the knowledge that the voltage was very high, and do not be reassured by the knowledge that the voltage was relatively low.

In all cases treatment must be immediate and on the spot. Seconds may be valuable.

Treatment must be by artificial respiration, which must be immediate, prolonged, and persistent, and until natural breathing occurs.

The type of artificial respiration employed must be determined by the nature of the accident, the skill, ability, and experience of the rescuer, and the presence of complications.

Artificial respiration must be continued until the victim is breathing of his own accord or until unequivocal signs of death appear.

Adjuvant methods of combating shock and maintaining the circulation must be employed in so far as they are practicable in the immediate circumstances.

Nothing must be allowed to interfere with the efficiency of artificial respiration.

Team work may be necessary.

If it is decided to remove the victim to hospital there must be no interruption of artificial respiration.

In the suspended animation following drowning and electrocution the only certain signs of death are the development of rigor mortis, cooling of the body, and post-mortem discoloration.

The first-aid methods of resuscitation can be applied by a medical man, a first-aid worker, or a trained workman.

The methods of resuscitation which have been described are also applicable to asphyxia following poisoning by carbon monoxide or car fumes, etc., and to asphyxia following an overdose of drugs.

In all cases in which artificial respiration has been successfully carried out the victims must be guarded from subsequent complications by adequate care and nursing.

A KEY TO PSYCHIC CONFLICTS

BY

Sir WALTER LANGDON-BROWN, M.D.

Jung, like Freud, attaches great importance to the unconscious, but like Adler strongly believes in "holism," to use General Smuts's term. The upholders of either view are therefore apt to follow Freud in one case and Adler in the other. Consequently there has been a tendency to neglect the more nebulous psychology of Jung. This is unfortunate, for he of all men is best qualified to reconcile science with spiritual values. Man is more than a bundle of conditioned reflexes and behaviourism, and can never remain satisfied by psychology without the psyche. It has been suggested that it would be well to study the simpler Adlerian philosophy of social co-operation on the way to the study of Jung. For with him lies the future of a psychology that can best explain and meet the deepest emotional needs.

The neglect of Jung's views compared with those of Freud and Adler in this country is partly due to the paucity of expositors. Since the death of Dr. Constance Long, Dr. Baynes has been almost alone in the field. We therefore welcome his *Mythology of the Soul*.¹ Although he freely acknowledges Jung as the father and "onlie begetter" of the book he elaborates a technique for exploring the unconscious, and in his introduction makes a fascinating contribution to the diagnosis of present-day discontents by a study of the schizophrenic make-up. This is a legitimate procedure which has been helpful in other branches of medicine. Just as the description of fully developed myxoedema was followed by the recognition of minor forms of thyroid defect, so a study of the full-blown schizophrenic reveals similar characteristics in states and persons who presumably regard themselves as sane. In Dr. Baynes's opinion schizophrenia raises a vital question not only for the individual but for Western civilization—namely, the stability of consciousness when threatened by the archaic forces of the collective unconscious. The renegade in the psyche is nihilistic, seeking violence involuntarily as an insecure ruler seeks war. To-day there is a schizophrenic doubt developing at the

very root of our way of life, concerning the value and meaning of the whole civilizing experiment. It is impossible to live in the modern world without being affected, as by a contagion, with a condition of the collective psyche not unlike the state of severance and dissociation found in the schizophrenic individual. Acute transitional phases in history have always offered occasion for the biased fanatical personality to assume leadership, just because the collective psyche of the time demands these very qualities. The relative popularity of systematized schizophrenic material, such as James Joyce's *Ulysses*, and a considerable bulk of surrealist painting and poetry points to the existence of a large number of individuals who discover themselves best in a pathological looking-glass. Symptoms presenting an unmistakable analogy to schizophrenic pathology are widespread, arising from narrow, one-sided ideologies that must for ever seek to annihilate the other half of mankind, for collective fanaticism cannot live without scapegoats.

All the absolute collective values which ruled the world up to 1914 have undergone a wholesale landslide; standards which to our forefathers were absolutely binding have been doubted and reduced by the all-pervading principle of relativity. Nations as well as individuals adopt an almost cynical opportunism towards long-standing obligations; people have become hardened to the most shameless persecutions, betrayals, and predatory invasions in the name of the deified modern State. Yet underneath the constantly shifting surface of this moral avalanche there is a profound longing for deliverance and for some undeniable realization of truth. The cataclysm of 1914 marked the end of an epoch and the beginning of a vast spiritual migration. Christendom received a terrible lesion, as though a sudden and violent storm had sundered man from his ancient roots, leaving him at the mercy of irrational collective forces. These changes are too near to us for accurate understanding. Dr. Baynes feels that the best that can be attempted is to express the situation by analogy with schizophrenic pathology, and this he proceeds to do with the aid of a special technique.

His method is to encourage the patient to try to draw pictures illustrative of the ideas which are surging up from his unconscious, just as the modern psychotherapist encourages the child patient to express his problems in his play. It appeals to us as a sound plan, for it is well recognized that artistic impulses come from the unconscious. In the first case the patient had no technical skill, but it is of great interest to observe that while some of his pictures are exactly like those drawn by children, others at once recall the type of paintings executed a few years ago by two well-known artists during their mental eclipse. There is also the recurrent drawing of cones and vortices such as are commonly seen in the decoration of the most primitive pottery. All three points are therefore characteristic of regression. Almost always there is an actual split in the design, until the latest drawing, which in its unified pattern symbolizes the resolution of the patient's conflict. It is worth observing that this patient was a medical man who had read Freud; this may account for the frequent recurrence of Freudian idioms and for embryological similes which could only occur to one with a biological training. It recalls Adler's remark that nothing is so entirely conscious or unconscious as we imagine, and adds point to Dr. Baynes's preference for the term "autonomous psyche." The second patient had much greater technical skill. Yet it is of interest to observe the varying amount of distortion introduced into his drawings at certain stages in the analysis—also the surrealist style of many of them. In one the "split mind" is symbolized by a zigzag crack diagonally across the drawing.

When Dr. Baynes speaks of the patient's amazement at discovering the door through which he can gain access to the world of the unconscious we are reminded of H. G. Wells's striking tale, *The Door in the Wall*, an artistic representation of the same idea. It suggests an answer to a puzzling question: If schizophrenia is psycho-

¹ *Mythology of the Soul. A Research into the Unconscious from Schizophrenic Dreams and Drawings.* By H. G. Baynes, M.B., B.Ch.Cantab. (Pp. 940; 53 illustrations. 32s. 6d.) London: Baillière, Tindall and Cox. 1940.