TREATMENT IN GENERAL PRACTICE

This article is one of a series on the management of some lesions of the nervous system met with in general practice.

INJURIES FROM ELECTRICITY AND LIGHTNING

BY

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An account of the treatment of electrical and lightning accidents is naturally divisible into various heads: (1) liberation of the victim from the circuit; (2) emergency treatment for shock and "apparent death"; (3) treatment of the unconsciousness; (4) treatment of the burns, fractures, and tissue necroses; and (5) management of complications.

Removal of the victim from the live installation is the first duty. The patient may be lying unconscious with some part of the body still in contact with the current-bearing wire or terminal. Or the victim may be conscious but unable to release himself from the live wire. Whether it is quicker to shut off the circuit by closing the switch than to remove the victim depends upon the circumstances. If the latter is attempted great care must be exercised by the rescuer to avoid sustaining a shock himself. No one should grasp the victim or the victim's clothes with the bare hands. Rubber gloves should be worn, or, if these are not available, the hands may be protected by wrapping many layers of cloth or paper around them. It may be simpler to push the victim away from the apparatus by means of a wooden stick or pole. Cutting the wire is a rapid method of interrupting the circuit, but is a dangerous procedure unless a heavy axe with a stout wooden shaft is used.

Artificial Respiration

As soon as the victim is released artificial respiration should be begun if he is unconscious or apparently dead. This should be instituted before the doctor is summoned, and if only one person is present he should start artificial respiration without delaying to send for a doctor. Even if it is believed that the man is dead artificial respiration should be carried out. Either the Schafer or the Sylvester method can be employed. The former is usually advocated in this country and in America; the latter in Austria. Artificial respiration should be continued for some hours—in fact, until cooling or some other unequivocal evidence of death becomes obvious. This rule ensures the safety of those cases in which the circulation is not completely arrested, the ventricles being in a state of fibrillation; it is just possible that in such artificial respiration may act in the same way as cardiac massage and restore a normal rhythm. Such patients, although "apparently dead," must obviously have some measure of circulation intact, though not apparent to superficial examination. Almost certainly revival after complete circulatory arrest is impossible after an interval of half an hour. Above all, it is necessary to avoid panic and to act coolly. Jellinek once contrasted seven patients with injury from low-tension current, five of whom died, with eight patients who had sustained grave injury from high-tension currents and all of whom recovered. In the former group the emergency treatment was inadequate; the bystanders hesitated as to what should be done and neglected to institute artificial respiration. Even such an obvious act as to switch off the current was forgotten.

The outcome of clinical and experimental evidence is that artificial respiration is the most effective means of

resuscitation. Other measures, such as inhalation of O_2 and CO_2 , the use of the pulmotor, etc., are suggestive of possible benefit, but seem on the whole less effective.

Method of "Counter-shock"

Laymen are often advocates of the so-called McLaglan's system, or "counter-shock," in restoring a victim of electricity. Thus by violent jarring, pummelling, or shaking they attempt to restore animation to a victim apparently dead. In the *Mining Electrical Engineer* for 1923 we read that "the unconscious victim should be placed in a sitting posture and the nerves of the pectoral arch and diaphragm digitally stimulated." At the same time the rescuer should deliver a violent blow with his knees over the region of the victim's seventh dorsal spine "... in order to stimulate the pneumogastric nerves," and, furthermore, he should emit loud shouts for the purpose of "exciting the auditory apparatus." There is a certain amount of clinical and experimental support for the efficacy of this procedure. It has been stated that a victim falling hard after a shock is likely to recover more quickly than one who does not fall. A baby who had touched a badly insulated lamp was apparently lifeless, but recovered after its mother had shaken it frantically. The laboratory animal whose heart is thrown into a state of ventricular fibrillation by means of a moderate current may recover after the application of a second and stronger current.

The evidence is far from being convincing, however, and scarcely warrants the deliberate adoption of a dangerous method of treatment. Recent careful work by A. Campbell and L. Hill and by Urquhart suggests that counter-stimulation has no beneficial effect on electrocuted laboratory animals.

The treatment of victims shocked and unconscious after lightning-stroke differs in no way from the foregoing. One may refer to a superstition which still survives in parts of the U.S.S.R.: it is believed that persons struck by lightning become highly charged with electricity and that this can be extracted by burying them in earth up to the neck. A recent Press account tells that a doctor in the Ukraine buried six persons struck by lightning, leaving only their heads exposed. Five are said to have survived.

Treatment of Coma

Cardiac stimulants may be necessary as soon as spontaneous respiration is restored. The patient's temperature should be raised by means of hot bottles and blankets. Rectal hot coffee may be of service. In Austria it is customary to apply counter-irritants over the praecordium and the anus. Medicinal treatment is traditionally carried out, though its efficacy is open to question. Thus injections of strychnine, camphor in oil, adrenaline, pituitrin, and ether are conventionally prescribed. In the case of laboratory animals with electrically induced ventricular fibrillation recovery has sometimes followed the intracardiac injection of adrenaline, urethane, strontium chloride, herudin, or intravenous pilocarpine. Such measures, which have to be supplementary to cardiac massage, are, of course, impracticable in human industrial cases.

During the stage of coma supervening upon severe electrical or lightning injuries the treatment will follow in the main that of acute cranial injury. One clinical difference is of importance in that gross intracranial bleeding is not likely to be present. The chief morbid change

will consist of severe cerebral oedema with an associated high intracranial pressure. Again, it is customary at this stage to prescribe hypertonic salines, whether in the form of intravenous injection of saline (30 per cent. solution, 30 c.cm.) or rectal magnesium sulphate (4 oz. in 8 oz. of water). Recent experiences with acute head injuries have abundantly demonstrated the drawbacks—if not the actual dangers—of hypertonic medication, by pointing out that an excessive rise in intracranial pressure usually follows rapidly upon an initial decrease.

Probably the safest—as well as the most effective—measure for the reduction of cerebral oedema after electrical injuries is the prompt withdrawal of cerebro-spinal fluid. This can be repeated as often as required. It must be strongly emphasized, however, that the precise tension of cerebro-spinal fluid should always be determined by means of a spinal manometer at every lumbar puncture. The chief merits of lumbar puncture in electrical coma are: (1) cerebral hypertension and coma are rapidly reduced; (2) the cerebro-spinal fluid itself may be at an excessive temperature; (3) the cerebro-spinal fluid may possibly contain toxic products of electrolysis; (4) there is no danger, as in cases of cranial injury, of starting or restarting dangerous intracranial bleeding.

In cases of motor agitation and delirium accompanying the unconsciousness lumbar puncture should be followed by attempts at sedation. The room is to be darkened and the bed reinforced by padded sideboards. If necessary the patient's limbs can be padded and bandaged, so as to protect himself against injury. An icebag to the head is impressive but probably useless. Purgation is a slipshod method of reducing cranial tension, and is much less effective than lumbar puncture. Injections of morphine or of hyoscine are often efficacious but dangerous; they are better replaced by the newer and safer drugs such as rectal nembutal, avertin, or paraldehyde, or intramuscular injections of somnifaine or luminal.

Burns

The special features of electrical necroses which influence treatment include: (1) the unusual depth of the lesions and their circumscribed nature; (2) the rigidity and friability of the surrounding blood vessels; and (3) the tendency of the lesions to spread.

Two widely divergent views are held as to the correct management of electrical burns: conservative measures are enjoined by Jellinek and others, while Wells advocates immediate radical treatment. Jellinek teaches that early amputations and tissue resections should never be adopted. Except in the rare cases in which dangerous toxæmia has developed, it is better to leave the areas of necrosis alone. The innate healing propensities of electrical burns are stressed, and applications of simple antiseptic vaseline dressings and the use of a splint are suggested. Sometimes, in order to accelerate the separation of slough, Jellinek induces active hyperæmia by means of benzene compresses applied for fifteen minutes and repeated daily.

Blue advocates the following treatment in cases of electrical burns. After thorough cleansing of the wound with soap and water, followed by lavage with sterile water, dressings soaked in ice-cold solutions of aluminium acetate (1½ oz. to the pint) are supplied. Dead and charred tissue should not be removed. During the stage of repair various dressings may be employed. Dusting with an antiseptic powder may be sufficient; lint soaked in paraffin (or paraffin with picric acid or flavine) may be applied. Some prefer to cover the injured limb with a cradle in which electric light bulbs are suspended. Skin grafts or plastic operations may finally be necessary. Tannic acid applications prove as satisfactory in electrical lesions as in other types of burn or scald.

Wells differs widely from Jellinek in advocating strongly an immediate resection or débridement of the necrosed

tissue. He claims that in this way healing takes place more rapidly and with less ultimate deformity. Resection *en bloc* of the eschar—sparing, of course, such structures as large vessels, nerves, and joints—is followed either by primary suture or by immediate skin graft. Haemorrhage, apparently, is not as difficult to control as might be anticipated. J. P. Tourneaux advocates a similar resection of diseased tissue in electrical burns of the cranium. By trephining the skull beyond the involved areas it is claimed that cranial wounds will heal in one-seventh the time. Blue, however, considers this treatment worse than the disease.

Whichever line of treatment is adopted—radical or conservative—complications are to be expected within the second or third week. Owing to the morbid fragility of the blood vessels surrounding the burns there is a grave danger of reactionary haemorrhage. This complication should never take the nursing staff unawares, for during the third week haemorrhage should be anticipated and instruments and dressings should be close to hand. Ligations of the principal blood vessels is usually required, but it should be emphasized that the ligation must be applied at some distance proximal to the bleeding point, owing to the diffuse spread of the degenerative vascular changes. In the same way, where amputation is necessary, it should be carried out well above the limits of the necrosed area. Otherwise the spreading nature of the burn may cause the flap to be invaded and produce severe secondary bleeding.

THE OUT-PATIENT PROBLEM AND HOSPITAL CONSTRUCTION

THE NEW WESTMINSTER HOSPITAL

BY

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The problem of dealing expeditiously with out-patients still awaits solution. There will always be a great deal of "waiting" for some ambulatory patients between the first examination and the complete diagnosis. Time must be allowed for pathological and radiological examinations, and in preparation for certain forms of investigation, and for some forms of treatment. That is inseparable from the fulfilment of the purpose of the visit. But the waiting associated with preliminary sorting and classification in the out-patient department subjects many patients to undesirable fatigue, and ought to be minimized as far as possible. One of the difficulties in effecting this reduction of waiting time arises from the structural plan hitherto employed, which necessitates grouping all the visiting patients in a common out-patient department irrespective of their ultimate destination.

A plan under consideration for the new Westminster Hospital seeks to secure the attention of the same permanent personnel for a patient throughout the whole of his hospital career, first as an out-patient and later as an in-patient. By bringing the patient from the first attendance into the knowledge of one sister and one clinical registrar it is hoped to secure much saving of time and some saving of current expense.

Individual Out-Patient Departments

To effect this each unit or firm, with certain exceptions, will have its own out-patient department on the same floor as its wards, and adjacent to them, though reached by a separate corridor. Thus the senior and junior members of the honorary staff will be working in the same part of the hospital, though generally at different times, so as to reduce the intermittency of their presence in the unit.

There will, as in the past, be a "front surgery" on the ground floor and adjacent to it a sorting department under the charge of semi-permanent medical officers of registrar status, but there will be no extensive out-patient