EMERGENCIES IN GENERAL PRACTICE

ASSESSMENT AND EMERGENCY TREATMENT OF BURNS

BY

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There is some temptation for the general practitioner to consider the treatment of any but minor burns as outside his responsibility. Such an attitude is misguided, since, as in every other surgical condition, what the practitioner does can influence considerably the later course. He is a most important member of a burns team. First, he can give a lead in the prevention of accidents in the home; secondly, he can encourage a more intelligent and practical approach to first aid in his area; and, thirdly, he decides which patients can be treated adequately at home.

Types of Burn and First Aid

Burns vary in extent and depth. The small superficial burn, the type that is so common in the kitchen, seldom comes to the notice of the practitioner. It is best treated by the immediate application of a small sterile non-medicated dry dressing, which should be kept dry and left strictly alone until healing is accomplished, usually within one week.

Burns of greater severity will be seen from time to time in general practice and the family doctor must decide which require specialist care. The superficial burn of the forearm, leg, or foot can be treated adequately at home, but the following types, since they require specialized surgical care, must be treated in hospital at the earliest opportunity: (1) all superficial burns involving an area greater than the forearm; (2) all deep burns (with skin destruction); (3) flash burns of the face, scalp, and hands; (4) all inhalation burns; and (5) electrical and chemical burns.

The essential steps in first aid are directed towards limiting further tissue damage and its consequences. They can be summarized as follows: (1) put out flames; (2) prevent heat loss but do not overheat; (3) cover burnt area with clean material but do not apply any local medicament; (4) do nothing to a burn of the face; (5) elevate the affected part where possible; (6) in mines, apply absorptive dressing to hand burns; (7) if morphine is given for pain the dose should be modified (see below), and a note of the dosage and time of administration should be sent with the patient; (8) patients with extensive burns and a journey of over two hours to hospital should be transported with a plasma drip running.

Before elaboration of the individual points in treatment a clear appreciation of the reaction of the body to thermal trauma is essential. The practitioner should be able to follow the course of the burnt patient, both at home in the minor cases and in hospital in the more severe cases. The confusion in the present-day treatment of burns is due mainly to the failure to approach the problem from first surgical principles.

Body's Response to Trauma

After any trauma there follow, first, a biological response to injury leading to general effects, and, secondly, a local injury leading to both general and local effects. In simple terms, immediately after the trauma a neuro-hormonal influence comes into play. The posterior pituitary releases antidiuretic hormone acting on the renal tubules, and the adrenal cortex releases substances that cause profound metabolic disturbances. So far as water retention is concerned the changes in renal tubular function are maximal

from the start, but the other metabolic changes, although resulting from the trauma, do not reach their height for some time. The local injury itself, if severe enough, leads to a local reaction, with a disturbance of fluid distribution and a consequent swelling of the injured tissue. These changes may in turn involve the organism as a whole.

Fluid Shifts

The total body water is considerable and accounts for 50-60% of the total body weight. Body fluids are distributed in two phases, intracellular and extracellular. The electrolyte pattern of each phase is different: the extracellular fluid contains most of the sodium, and the volume of extracellular fluid parallels the total sodium content of the body, whereas most of the potassium of the body is intracellular. The extracellular phase is divided by the capillary membrane into two compartments—intravascular, containing about 5% of the body weight, and extravascular, with about 15%.

After an injury such as a burn there follow shifts in the distribution of the body fluid between the fluid phases and compartments. The primary fluid shift is from the intravascular to the extravascular space, and this occurs in the burnt tissues. As a result there is local oedema and diminution of the circulating blood volume. After the primary fluid shift there is a compensatory second shift from the extravascular space to the intravascular channels of the uninjured tissues. These shifts are the body's attempts to maintain an adequate circulating blood volume.

In extensive burning, in addition to these two shifts, the renal conservation of total body water resulting from posterior pituitary activity is followed by an increased production of metabolic water due to the catabolism of lean tissue and fat. This might be termed the third component, the water passing from the cells to the extravascular spaces.

In burnt patients the reduction in blood volume is proportional to the extent of the burn, and the loss is spread over the first forty-eight hours, being most rapid in the first eight hours. The reduction in circulating blood volume leads to an early state of anoxia which in turn leads to damage to the cells of the liver and kidney. In deep burns there is, in addition, an immediate destruction of red blood cells and in some cases haemoglobinuria.

Administration of Fluids

There is no doubt in my mind of the urgency with which fresh whole blood should be given in deep burns, and plasma in superficial burns involving over 10% of the body surface, irrespective of the haematocrit value. In replacement therapy fluid must be given immediately not only to replace that already lost from the circulation but to keep pace with further fluid loss. The general practitioner, whenever called to a burnt patient, should first note the extent and distribution of the burn. If the burnt surface is more than 10% of the surface of the body, he should anticipate the fluid loss that will take place and send the patient to hospital immediately. In superficial burns it has been our teaching to administer colloid and electrolyte fluids in equal proportion. Recent observations suggest that in the more extensive deep burns electrolyte should be limited, the proportions of blood, plasma, and electrolyte being 2:1.75:0.25. In patients with burns of under 10% of the body surface, the replacement fluids are given orally in the form of glucose water.

Transport of a patient with severe burns to a hospital over fifty miles away is safe provided an intravenous transfusion has been instituted. Calculators for fluid requirements like the pyrogram* are of considerable value, as they form a ready guide for prompt treatment. They are intended as guides only.

In addition to the replacement fluids, requirement fluids must also be given. Requirement fluids are those necessary each day to make up for fluid lost from the kidneys, gut, skin, and lungs. In patients with burns it is most necessary to meet the daily requirement; this fluid is given by mouth in non-electrolyte form—for example, as glucose water.

Improvement with fluid therapy is best assessed by observing the hourly urine output. In extensive burns the urine output may be reduced during the first two days, but this should not be a cause for alarm. A reasonably satisfactory output for an adult for the first forty-eight hours is 30 to 40 ml. an hour.

Renal Damage

In extensive deep burns severe oliguria or anuria may develop. The severely burnt patient experiences a number of aberrations in his fluid and electrolyte balance and an immediate destruction of red blood cells. The early reduction in circulating blood volume and decreased glomerular and tubular flow, plus the presence of free haemoglobin in the plasma, may lead to distal tubular damage and anuria. (It is difficult to understand why some patients develop this condition while others do not.) It is most important, therefore, that in every patient admitted to hospital with extensive burns a catheter should be passed, so that the urine may be examined for pigment. If there is severe oliguria or anuria, fluid intake must be accurately balanced against output by all routes. Even in the absence of pigment it is wise in very extensive deep burns to halve the estimated daily fluid requirement. With much skin surface destroyed the daily requirement fluid is less than normal.

Supportive Therapy

First comes the relief of pain. Contrary to the general opinion, I have not found pain to be a prominent feature in burns. Restlessness is not infrequent, but this is an indication for increased fluid therapy. Since the early danger in burns is from anoxia, the dose of morphine given for pain should be reduced. I prefer it to be withheld until after the intravenous drip has been begun; half is then given intravenously and half subcutaneously. In burns of the hands in miners or airmen, however, if the total area involved is not large there seems no real indication for reducing the first-aid dose of morphine.

Second comes the administration of oxygen in extensive burns to relieve anoxia. I have found this helpful in children.

Third is the administration of penicillin. During the first forty-eight hours this can be given intravenously if suitable muscle sites are not available for injection. Ideally, I believe that antibiotics should not be necessary in the treatment of burns, certainly never local antibiotics. The latter may delay healing, lead to drug sensitivities, and encourage the growth of resistant bacterial strains.

Three main phases are recognized in the healing of an open wound: (1) a phase of *traumatic inflammation* in which hyperaemia and exudation occur; (2) a phase of *destruction*, or cleaning, when the dead and dying cells are removed; and (3) a phase of *proliferation*, when fibrous tissue appears and epithelium regenerates. The first two phases are together known as the *lag or latent period*, because no actual repair takes place, and its length is largely determined by the time needed to eliminate necrotic material. In burns the duration of the phases of healing varies accord-

ing to the type of burn. In superficial burns the active third phase is complete within three weeks; in deep dermal burns there is a tendency to troublesome delayed healing; while in deep burns, with destruction of the covering skin, healing if left to nature would be considerably delayed. Clinically the distinction between superficial, deep dermal, and dermal burns is often difficult. Loss of pain to pinprick is not very reliable, but I have found daily colour photographs during the first week helpful in determining zones. Extensive flame burns are commonly deep.

The aim in the treatment of all wounds is to convert an open wound into a closed one, so as to allow rapid healing, and with both superficial and deep burns the open and closed wound concept is the proper approach. The superficial burn is an open wound. The quickest and most certain method of closing it is to allow the surface plasma exudate to clot. Once this occurs the wound becomes closed, irrespective of whether a dressing is applied or not; a dressing by itself never closes a wound. A plasma crust is a biological cover and second only in value to skin; it is an all-sufficient dressing until healing is complete. Organisms found on or in the crust do no harm.

The deep burn is at the time of its infliction closed, the cover being the coagulated skin or eschar. This "dressing" remains intact for ten to fourteen days. About this time the eschar will begin to separate from the living tissues beneath, moisture will appear at its edges, and the wound will become open. This must be anticipated and prevented by sufficiently early excision of the eschar and immediate grafting. Excision alone is inadequate. The best time for grafting depends on the condition of the patient, but it should be before the twelfth day. Clearly, if the patient has only a localized deep burn and little shock then the proper time is soon after admission. If the eschar is excised in the "open" state, spreading infection can prove troublesome. This is another reason why it is so important to send all patients with deep burns to hospital at once.

Deep dermal burns are by definition superficial burns in so far that certain remaining epithelial remnants are capable of providing final cover. But the dead dermal material in the wound prolongs the lag period, and in the third and fourth weeks moist exudate encourages infection which may destroy virtually all the remaining viable epithelial elements. In many instances, therefore, prompt excision of deep dermal burns gives much more satisfactory and earlier results than delaying tactics.

Treatment at Home

For patients treated at home a good form of dressing after any blisters have been snipped is to apply dry gauze and wool or, better, a sterile gamgee pad fixed with a conforming bandage. The dressing should be kept dry, with all of its outer surface exposed. Care should be taken to avoid external pressure on any part, as this will lead to local soginess. The dressing should not be changed for at least twelve days.

Throbbing pain in the burnt area, accompanied by a rise in pulse and temperature, indicates infection, and the patient should be referred to hospital. Infection is most often due to the dressing becoming and remaining moist, early interference with a satisfactory dressing, or too early movement of the affected part.

Pressure Effects of Oedema

Two early complications of burns—namely, pressure effects and oedema—deserve brief mention. The crust or eschar of circumferential burns of the neck, fingers, and arms may form an inelastic cover, so that when oedema develops it leads to distal ischaemia and, in the case of the neck, to pressure on the trachea. In the past two years we have had to perform three tracheotomies for this reason within the first eighteen hours of admission. If there is also damage to the mucous lining of the upper respiratory passages, this will increase the urgency for tracheotomy.

* The pyrogram, a pocket calculator, is supplied by Messrs. Allen & Hanburys Ltd., London. It provides the following information: replacement fluid, requirement fluid, urine output, dose of morphine, etc.

Careful nursing and supervision of burns of the face and neck are therefore essential, especially during the first day. Circumferential burns of the hands and arms also need careful watching during the first twenty-four hours, and this is one of the reasons why I do not advise covering them. In the past two years we have had to carry out multiple incisions in at least four such patients, afterwards applying absorptive dry dressings to encourage the formation of a secondary crust and a closed wound. The effects of this can be dramatic, and in no way does this procedure jeopardize the maintenance of a dry surface.

The second danger is oedema. It forms very quickly and is a natural response to injury. Control should be taught as a first-aid measure, because if oedema is not treated from the first by posture it can become a troublesome complication. Infection is not a natural complication. It is almost a measure of improper care and of the inadequacy of the surgical technique.

Principles of Early Care

The main points in the early care of burnt patients may be summarized as follows.

Minor Cases Treated at Home.—(1) Cleanse and snip blisters; (2) apply absorptive dressings and keep dry (closed wound crust); (3) elevate affected part; (4) do not re-dress for ten to twelve days; (5) if burn is on lower extremity, put patient to bed.

Cases Admitted to Hospital.—(1) Obtain brief history, and establish time of accident and therapy given; (2) estimate and chart extent and depth of burn; (3) weigh patient on admission to ward; (4) if burn is extensive, catheterize patient on admission; examine urine and chart hourly output; (5) administer fluid therapy without delay; (6) do no further damage to the surface; (7) avoid factors extending the lag period; (8) take colour photograph of burn in first twenty-four hours; (9) watch for pressure effects (obstruction of airway or of circulation to limbs); (10) establish and maintain a closed burn wound.

Prognosis

Patients and relatives are likely to ask the doctor about the prognosis, and he must be able to advise them.

In general, superficial burns heal without scarring. Deep dermal burns, however, may show delayed healing as a result of low-grade infection, and may leave patchy prominent scars. Deep burns carry with them the chance of both scarring and deformity. Early grafting diminishes the risk of both.

Extensive burns, whether superficial or deep, may lead to early death from oligæmic shock. All burns of over 40% of the body surface, especially at the extremes of age, must be regarded as being very dangerous to life. Likewise, early haemoglobinuria signifies a bad prognosis. The earlier patients with extensive or deep burns are admitted to a burns unit, the lower will be the mortality and morbidity rates.

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BRITISH ORTHOPAEDIC ASSOCIATION

AUTUMN MEETING, OCTOBER 6-8

On the second day of its autumn meeting in Liverpool, under the chairmanship of its president, Professor BRYAN MCFARLAND, the British Orthopaedic Association debated the place of splints in the treatment of fractures, on a motion “That Lucas-Championnière was right.”

Lucas-Championnière and Splints

Professor GEORGE PERKINS (London) opened for the motion. Lucas-Championnière (1843-1913) had written a book on fractures, the basic theme of which, he said, might be summarized as, “To hell with splints.” While the speaker could not support this *in toto*, the idea was certainly more right than wrong. Splintage caused stiffness, and this did not always disappear with time. If a muscle was held in the shortened position it lost its ability to extend, and the only way to prevent this was to stretch it occasionally to the full; but splintage made this impossible. In most fractures into joints it was impossible to produce perfect reduction, but early movement moulded the joint surfaces and reproduced congruity. Avoidance of splints also prevented the muscles binding together from the organization of haematoma and exudate.

Professor Perkins divided splintage into two types—the “pure,” which was prolonged, uninterrupted, rigid, and extensive; and the “simple,” which was none of these things and was used only to maintain reduction where displacement would otherwise occur. The “splinters,” he said, subscribed to the tenet that because a few need splintage all do. Only three fractures needed “pure” splinting—those of the neck of the femur, the carpal scaphoid, and the mid-shaft of the radius, the latter because no other method would control rotation strain. Hinging movements and rotation were the causes of fibrous union, because they stretched the early callus, and the philosophy of “non-splinters” lay in their faith that with few exceptions muscles alone would prevent this stretching. There was no need to set a fracture if there was no displacement, if the displacement did not matter, or if reduction was impossible. The non-splinters’ creed should be: Don’t burden the patient with purposeless splints; a “simple” splint does less harm than a “pure” splint; only a few fractures need “pure” splintage; and reduce the use of “simple” splintage to the minimum.

Fix the Bone and Exercise the Muscles

Sir REGINALD WATSON-JONES (London), opposing the motion, said that Lucas-Championnière was a pioneer; splintage in his era was very complete and extensive, and he did not know that it was possible to hold bone still and yet continue to use the overlying muscles. Lucas-Championnière, claimed the speaker, had said that perfect reduction was neither possible nor desirable and had advocated massage and mobilization of all fractures. In Sir Reginald’s opinion, if a fracture was to unite with certainty it must be immobilized completely. All fractures would unite if they were immobilized for long enough. Non-union resulted from splintage that was physiologically not complete enough or not maintained for long enough. Surgeons should not fear the temporary resultant stiffness; if functional activity was maintained there was rapid recovery of a full range of movement. The immobilized knee or shoulder always recovered its movements if reliance was placed on active exercises alone. Many new hip operations were based on the fundamental, but in his view unfounded, fear of permanent knee stiffness if this joint was immobilized, but in 200 cases of hip arthrodesis with the limb in plaster for many months less than 8% had stiff knees. All the fears of Lucas-Championnière would have been put at rest had he had our knowledge of the need for maintaining muscle activity in a splinted limb.

The Seconders

Mr. NORMAN ROBERTS (Liverpool), seconding for the motion, maintained that what Lucas-Championnière had