

THE EARLY MANAGEMENT OF BURNS

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The management of a thermal burn begins at the time of the injury and in the very severe burn continues for many years. Whether or not the patient survives the burn depends on the ability of the physician to overcome the shock of the early fluid imbalance, to prevent systemic infection, to treat it when it occurs and to replace tissues destroyed. The major problem in burn therapy is to overcome infection, the greatest cause of death.

The following comments are my feelings on the management of minor as well as severe burns.

CLASSIFICATION

The severity of a burn is related to the *Area* of the burn and the *Depth* of involvement of the tissues. The area can best be calculated by the use of a chart which is applicable to both children and adults. This chart (Fig. 1) is more accurate than the method of "the rule of nine's" so frequently used. It takes into consideration the changes in area of different parts of the body with development. The depth of a burn is related to the amount of the heat and the time for which it is applied. Thus, a flame of given temperature will probably cause a more superficial burn than water at the same temperature, which soaks clothing.

The most practical classification of burns is:

- (1) Partial thickness
The epidermis and part of the dermis are involved
- (2) Full thickness
All layers of the skin and/or deeper structures are involved.

Partial thickness burns usually heal by proliferation of the remaining skin structures. These include those showing erythema with or without blistering. The tissues are usually

pink or red and are sensitive to pinprick. The deeper partial thickness burns may be easily converted to full thickness burns by the addition of infection.

Full thickness burns must either heal by granulation and ingrowth of skin from the periphery or must be grafted. These burns are diagnosed by dryness and charring of the skin, a leathery feel to the skin which does not blister, and insensitivity of the skin to pinprick.

The extremes of these two groups are easy to diagnose but the border line group of burns is sometimes difficult to assess as to degree.

Burns may also be classified as:

- (1) Minor - Minor burns are those with partial thickness burn, involving less than five percent of the body area, not including the hands, face, feet or genitalia, or with full thickness areas less than one inch in diameter.
- (2) Moderate - Moderate burns are partial or doubtful thickness burns, involving five to ten percent of the body area, or burns involving the hands, face, feet or genitalia. Full thickness burns, larger than a fifty cent piece, but less than ten percent of body area, are considered moderate.
- (3) Major - Major burns are those which involve more than ten percent of the body area in children and fifteen percent of the body area in adults, regardless of depth.

THE MANAGEMENT OF MINOR BURNS

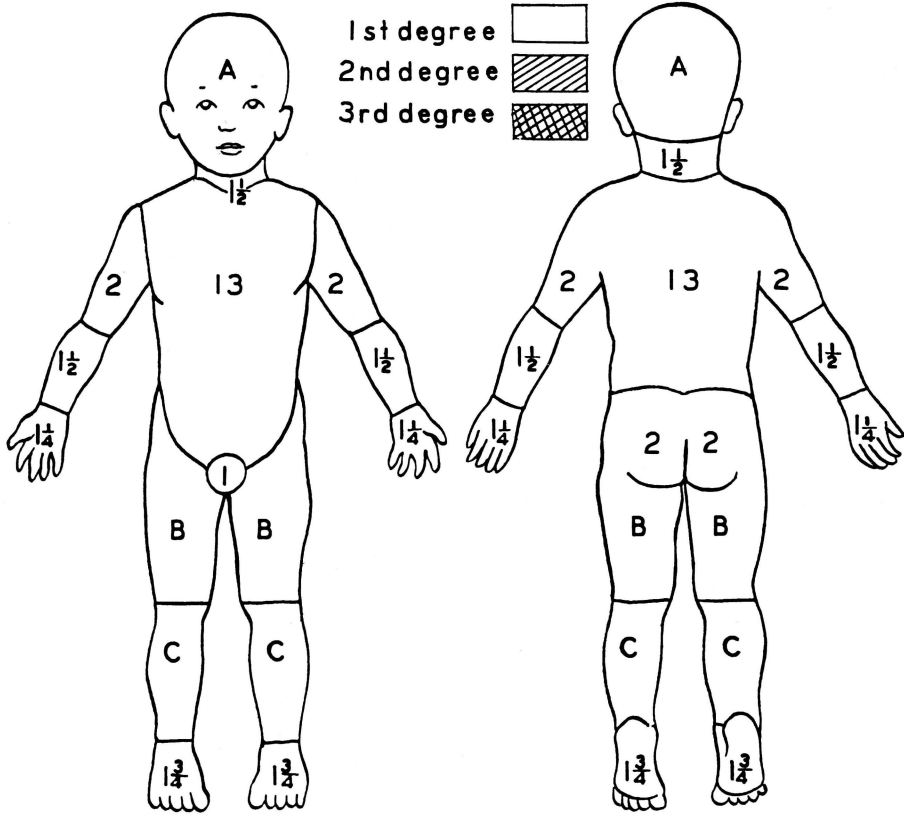
These burns can usually be treated on an Out Patient basis. The burned area should be cleansed with a detergent such as Cetavlon and then washed off with normal saline of Aqueous Zephiran 1:1000 solution. The burn is covered with a non adherent dressing such as "Telfa" or "Adaptic" in preference to the wider mesh vaseline gauze dressings. This is then covered with a gauze dressing and pad and the dressing is held in place by a

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Name _____

Age _____

Ward _____



Area	Age 0	Age 1	Age 5	Age 10	Age 15	Adult
A equals 1/2 head area	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2
B equals 1/2 thigh area	2 3/4	3 1/4	4	4 1/4	4 1/2	4 3/4
C equals 1/2 leg area	2 1/2	2 1/2	2 3/4	3	3 1/4	3 1/2

Probable 3rd degree depth Head___ Neck___ Body___ Upper arm___ Forearm___
 Hands___ Genitals___ Buttocks___ Thighs___ Legs___
 Feet___ TOTAL _____

Total Area Head___ Neck___ Body___ Upper arm___ Forearm___
 Hands___ Genitals___ Buttocks___ Thighs___ Legs___
 Feet___ TOTAL _____ %

firm gauze bandage such as "Kling" or "Con-form". No antibiotics are necessary and the dressing may remain undisturbed for five to eight days if there is no sign of suppuration. If infection occurs, then moist dressings must be applied and the local area sprayed with one of the broad spectrum antibiotics. These burns should all epithelialize by themselves. The small third degree burn will epithelialize from the periphery.

THE MANAGEMENT OF MODERATE BURNS

These patients should all be hospitalized. The full thickness burns should be excised on the day of admission and the area skin grafted. This will shorten the hospital stay and decrease the morbidity. Partial or doubtful thickness burns of moderate degree are best treated by the exposure or open method. The burned area is cleansed as above. The blisters are deflated and the dead skin removed. The patient is then nursed between freshly laundered sheets which need not be sterile. An eschar forms in forty-eight to seventy-two hours. If the burn is partial thickness, it will heal from the remaining structures of the dermis in from ten to fourteen days when the eschar will peel off.

In a burn of the hand, the fingers are dressed separately, and best treated by the individual dressing technique. The whole hand is encased in a large, bulky dressing with the hand in the position of function.

If partial thickness burns are converted to full thickness because of infection, they will require grafting when the slough has separated. In this doubtful group, the eschar may be separated earlier by the application of a wet dressing. Large gauze pads, soaked in a colloidal solution of equal parts half strength sodium hypochlorite solution and liquid paraffin are applied to the burns four times a day. The eschar softens and it then can be removed by scissors and forceps without anaesthetic. By diligent use of this method, the area can be prepared for grafting in approximately two weeks from the time of the burn.

THE MANAGEMENT OF MAJOR BURNS

All major burns are a threat to life and should be hospitalized in a major hospital, where modern facilities are available. If

the accident occurs at a distance from a major hospital, the first aid treatment should include intravenous therapy and sedation before the patient is transported. The patient should be given a litre of 5% glucose in saline rapidly. Sedation should be given intravenously in moderate dosage to relieve pain in partial thickness burns. The patient may then be sent to hospital.

On admission to hospital, an intravenous is started and blood taken for haemoglobin and hematocrit estimation. The patient is grouped and cross matched. A Foley catheter should be inserted in the bladder and the urine which is removed is examined for albumin, sugar, specific gravity, microscopic examination and the presence of haemoglobin.

When this has been completed, a careful history would be taken from the patient or from relatives regarding the following points:

- (1) the type of burn, for example scald or flame burn
- (2) the time the accident occurred
- (3) any treatment at the site of the accident before the patient was brought to hospital, e.g. sedation en route, local treatment to the burned area
- (4) the patient's past history with regard to any serious illness such as heart disease, renal disease, etc.
- (5) any history of allergies to drugs, etc.
- (6) whether or not the patient has been immunized to tetanus recently.

The patient is then given a thorough physical examination and the burn is estimated as to area and depth.

FLUID THERAPY

The early phase of a major burn should be treated completely by fluids given intravenously because of the common occurrence of paralytic ileus. For the patient's comfort, it is best to do a cutdown on a peripheral vein and insert a polyethylene catheter. The ankle or wrist are the most convenient sites.

There are several methods for estimating the amount of fluid required during the first forty-eight hours following the burn. These methods all have their advantages but the main thing to remember in all these methods is that they are a guide and not the final answer to the type and amount of fluid required. The formula which I use is: (Evans')

FLUIDS FOR THE FIRST TWENTY-FOUR HOURS

Colloid	1 c.c. per percent burn (up to fifty percent) x the weight in kilograms.
Electrolyte	1 c.c. x the percent burn (up to fifty percent) x the weight in kilograms.
Water	as 5% dextrose in water, 2000 c.c. for the average adult or 50-60 c.c. per pound in children.

FLUIDS FOR THE SECOND TWENTY-FOUR HOURS

The amount of colloid and electrolyte is decreased by one-half in the second twenty-four hours. To this is added the standard water maintenance as five percent dextrose and water. This fluid should be given over a twenty-four hour period.

COLLOIDS

The most physiological colloid is plasma. When available in quantity as single batch units, it is the fluid of choice. Serum albumen, Dextran, can also be used. Whole blood should be given in all burns over 30% partial thickness or 10% full thickness.

ELECTROLYTES

Sodium chloride as five percent dextrose in saline is probably the most commonly used. If all the electrolyte is given as such, there is a tendency for a hyperchloremic acidosis to develop. If therapy is continued over several days, Ringer's lactate solution can be substituted and is effective in overcoming the acidosis.

RATE OF FLUIDS

One half the total fluid in the first eight hours	} From the time of burn
One quarter the total fluid in the second eight hours	
One quarter the total fluid in the third eight hours	

ESTIMATION OF ADEQUACY OF FLUID THERAPY

(1) The patient's general condition. Return of the pulse and blood pressure to a normal range, peripheral warmth and mental orientation are good signs of adequate therapy.

(2) A dropping haemoglobin and hematocrit to a normal range indicates good rehydration. High levels of haemoglobin and hematocrit suggest inadequate fluid therapy.

(3) A urine output of 20-30 c.c. per hour in a child and 30-50 c.c. in an adult are good indications that the kidneys are receiving enough fluids to function. The specific gravity should be checked and should show a fluctuating range. A fixed specific gravity is an indication of impending renal failure. There are usually some albumen and sugar in the urine in the first days of therapy.

Renal failure is very uncommon in burn patients who have had early and adequate therapy. The usual causes are haemoglobinuria with resultant lower nephron nephrosis or failure associated with hypotension due to hypovolemia.

LOCAL BURN CARE

This should not be carried out until after the anti shock treatment is instituted and the patient is showing signs of responding to therapy. The patient should be taken to an operating room where the burned area is cleansed gently with a detergent such as Cetavlon. The area should then be rinsed thoroughly with saline and dried with a sterile towel. The blisters should all be deflated and if the exposure method is to be used, the blisters should be excised. A culture should be taken from the burned surface.

The exposure method or the closed dressing method should then be started. The arguments for and against these methods are too lengthy to be included here. If the exposure method is used, the patient is nursed between two clean, but not necessarily sterile sheets. If both sides are burned some form of frame on which to nurse the patient should be used. If no frame is available and the patient is difficult to turn because of size, then the closed method is the method of choice. The position change is important to allay the chances of the development of a hypostatic pneumonia. The open method is the method of choice in face and perineal burns.

The closed or dressing method depends on the application of a close mesh vaseline dressing as described previously. This is covered with gauze and dressing pads and then bandaged firmly.

ANTIBIOTICS

I prefer to defer the use of antibiotics until there is some evidence of an infection clinically. If an antibiotic is used, the broad spectrum ones should be deferred until they are needed.

THE EARLY EXCISION OF FULL THICKNESS BURNS

There is much controversy about the effectiveness of early excision and grafting of third degree burns. This is certainly the method of choice in small, third degree burns and should be carried out the day of injury. At this time the wound is sterile and a complete "take" of the graft should be expected. In the more severe cases, when the patient is in shock, I prefer to wait until the oligemic phase has passed (four or five days) and then to convert the large burn to a smaller one by excision and grafting, usually with a mixture of autograft and homograft. The graft is more likely to take on flattened surfaces such as the chest and abdomen. The excision can be carried out by the electric dermatome or by scapel dissection. This is a shocking procedure and a good supply of fresh blood should be available.

Grafting is sometimes delayed for forty-eight hours after removal of the eschar, if there is much bleeding of the body area. No more than 25% of the body surface should be excised at any one time. Two teams of surgeons working together can shorten the time of excision and anaesthesia.

Homograft coverage, although not permanent, will give a good physiological dressing for several weeks and will often get the patient over a difficult period in his recovery.

THE PROBLEM OF INFECTION

The main cause of death in burns today is infection. This usually takes the form of Septicemia with peripheral vascular collapse. Pneumonia and septic thrombo-phlebitis, with ensuing pyogenic abscesses are the other common forms of infection. Renal infection may be a problem when a catheter is in place for some time. The organisms usually present are staph pyogenes, streptococcus hemolyticus, bacillus pyocyaneous, proteus vulgaris and B coli Tetanus may rarely occur.

Infection is a problem from the day of the burn until the burned areas are grafted completely. It can be present locally as a topical

infection or may be masked under the eschar. When the wound has granulated and the slough has been removed, the granulation then gives some protection.

The main approach to this problem is to suspect infection and be ready to treat it early. Blood cultures will help to pick up a Septicemia and cultures and sensitivities can be ready in twelve to eighteen hours. The clinical picture of a high temperature, rising pulse, and mental disorientation should alert one to the dangers of Septicemia.

The problem of local infection can be lessened by the use of the broad spectrum antibiotic sprays. If infection does occur, the application of moist saline dressings to the infected area will prevent pus from pooling in these areas.

Cutdown areas should be looked after carefully. The operation should be done as a sterile surgical procedure with all the normal precautions.

Frequent physical examinations will help to pick up evidence of pneumonia or thrombophlebitis. Chest infections can be decreased by the frequent turning of the patient.

NUTRITION

The burned patient is in a phase of catabolism until the burned area is completely healed. Initially he should be fed completely intravenously until the return of bowel function. The caloric intake by this method is small and inadequate. The patient should be started on fluids of high caloric value. These should be rich in carbohydrates at first and then protein and fat added as the patient can tolerate them. Severely burned patients require five to six thousand calories per day and even this amount will not offset the tremendous tissue destruction. Food should be available at all times and the patient's whims should be catered to. Added vitamins are essential from the beginning. I usually give Vitamin C in dosage of 1000 mg. daily and some form of Vitamin B. Complex.

TRACHEOSTOMY

This is a procedure which is rarely necessary but which may be life saving. It may be necessary in burns which are associated with an explosion, with damage to the respiratory passages. It may also be necessary in patients unable to clear the respiratory passages properly.

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SKIN GRAFTING

Skin can best be taken with the Brown electric dermatome. The grafts should be taken ten to twelve one thousandths of an inch thickness so that the same donor sites can be used repeatedly. The donor sites will heal quickly and without infection if a dressing of 5% Scarlet Red impregnated in flannel is used. It is superior to any of the greasy dressings in my experience. In severe burns, stamp grafting may be necessary but where possible sheet grafting is preferable, because of the better cosmetic appearance.

Alternating auto and homograft strip grafting is an excellent method of closure when skin is in short supply. The exposure of the skin graft without dressings except a tulle gas is my preference in most of these burns, particularly those which are grafted

on granulation. The percentage of take is higher when this method is used, because any infection which does occur can readily be seen.

TETANUS

All burned patients should be immunized against tetanus. This is done by the injection of 3000 units of tetanus antitoxin and 1 c.c. of tetanus toxoid in different sites. The tetanus toxoid will have to be repeated at monthly intervals for two further doses. The antitoxin should not be given if the patient has been previously immunized within the past two years.

Reprinted

From The Nova Scotia Medical Bulletin, June, 1962



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