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## The Exposure method of burn therapy

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THE EXPOSURE METHOD OF BURN THERAPY

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## THE EXPOSURE METHOD OF BURN THERAPY

It is generally accepted today that the most orthodox and universally practiced treatment of burns is the occlusive or pressure dressing method. This method has long been in use, being modernized and popularized in this country by Allen and Koch (1). The occlusive or closed method has proved very satisfactory to date, having many recognized advocates.

However, with the possible impact of atomic disaster with its mass casualties, most of the required surgical technique of the closed method are impossible to carry out. To substantiate this view, a review of the single atomic explosion at Hiroshima revealed approximately 34,000 seriously burned persons. Pearse, in evaluating this, has estimated that for 34,000 patients, 170,000 professional persons and 8,000 tons of equipment would be needed. (2)

For this reason it would appear that a method of burn therapy requiring fewer professional persons and less equipment would be of immeasurable value in time of disaster whether as a result of atomic warfare or industrial mishap. During the past six years there has been a revival of the exposure method of burn management. This is the subject which I wish to review.

The exposure method of burn treatment is not new. The first reference of this method in the American literature

was that of Copeland in 1887 (3), in which he described two cases under his care. Both cases were treated by the application of bandages and cotton anointed with cosmoline. They were not doing well with this management. By completely exposing the burn surfaces to the air he found that on the next day the surfaces had become covered with a thin film of scab, which gradually thickened. When pus was found to be accumulating under the scab, a small opening was made at one edge, and the secretions were pressed out by means of a soft dry piece of lint. The cases progressed satisfactorily and speedily to a cure, with very little disfigurement. He felt that the methods, too often adopted, of daily washing off of burns or open wounds with water and removing the secretions, only broke up the delicate adhesions that had taken place since the last dressing, and kept up the irritation by pulling off and washing away the very substance with which nature was trying to repair the injury.

Reid in 1898 (4) used a modification of this method in which he put dressings over a wire cage surrounding the burned surface but left the surface exposed. He felt the results were extremely gratifying and he noted the absence of pain during treatment, and the absence of keloid masses and thick cicatrices which continually break down afterward.

Sneve (5), in 1905 noted that burns of the face, when

left exposed to the air, speedily crusted over and healed rapidly under Nature's own dressing; while burns of no greater depth or area on the trunk or limbs treated simultaneously with occlusive dressings, dragged along indeterminedly. With this in mind he treated such burns by dusting the surface with stearate of zinc and leaving them exposed to the air. Any pus forming under the scab was drained, the area rinsed with saline and dusted. Over seventy-five patients were treated in this manner by Jan. 1, 1905. He felt that the following facts made the results noteworthy. (1) Pain only lasted a short time. (2) Nothing further than keeping the wounds clean was required. (3) Stiffness in nearby joints did not develop. (4) The time required for healing was shortened about two-thirds as compared with the usual method. He was of the opinion that this method (without dusting) was the best preparation for a skin graft since the granulations became small, firm and healthy looking, and the borders from whence epidermization proceeded took on new life and activity. He was astonished by the small amount of pain experienced by these patients and its short duration as well as the character of the cicatrices after healing.

St. Johns in 1910 (6) was impressed by this method of aiding Nature in its natural reparative processes and was opposed to the dressings commonly used because they

were more or less painful, interfered with growth of granulation tissue mechanically, and caused destruction of granulations themselves by bleeding, etc..

Hass in 1915 (7) expressed his astonishment that the exposure method was not universally used. He listed the following advantages: (1) The method is simple. (2) It minimizes scarring and contractions. (3) Healing proceeds more rapidly than under dressings. (4) The shock of treatment is reduced to a minimum, as noted by the absence of pain, terror and psychic disturbance. (5) Nephritis would appear to be less frequent and less severe. (6) The patient's spirit and appetite are maintained. (7) At the termination of the treatment the appearance of the patient is quite different from that which one is accustomed to see. (8) The treatment can be carried out at home, inexpensively.

Herrman (8), and Tudor (9), in 1915 were also enthusiasts of the exposure method. Herrman felt that in the usual method of burn treatment with local applications, the removal of the dressings, besides causing great pain, destroyed the protective covering and fine granulations. Tudor believed that the open air treatment would doubtless be the method of the future. The feeling at that time was that the incidence of pain and psychic trauma in children from the changing of dressings was enough to



make anyone abandon their use in favor of the exposure method.

Pearse (10) in 1921 was impressed with the fact that the burn wound treated by the exposure method allowed frequent inspection which was not possible where pressure dressings were in place.

Pack and Davis (11) in 1930 devoted a whole chapter in a monograph on burns to the open-air technique, but it had already been discarded and relegated to the status of an interesting but historical fact. For the next twenty years there was no mention of this method of burn treatment in the standard textbooks used in medical schools of America.

It was not until 1947 that Wallace of Edinburgh re-introduced the exposure method. His first published results were in 1949 (12). Prior to this time he had employed the pressure-dressing method of treatment and found it one of the most generally and successful methods. At this time he made a departure from the pressure dressings for burns of the face and neck, the "exposure method" being evolved. The principles were: (1) to expose the burn to daylight and cool ward temperature; (2) to keep the raw area dry and so prevent the multiplication of surface-contaminating organisms (the organisms present on a dry surface are controlled by the body defenses); (3) to immobilize the part in order to prevent invasion of the tissues by infecting micro-organisms; (4) to administer penicillin systemically to counter any tendency to general and local infection; and (5) to render nursing care as simple as possible. Following cleansing, the burn

was dusted with penicillin powder. The dusting was repeated every four hours for the first twenty-four hours, thereafter when necessary, and the burns were not covered in any way but left exposed. Healing at room temperature appeared to be more rapid than at body temperatures. The ward temperature was registered twice daily and ventilation kept adequate but draughts were avoided. For the first twenty-four hours the crust was light brown, thereafter becoming progressively darker. There was a direct relationship between the clinical appearance of the burn surface and the temperature. For the first two or three days there were some areas of moisture with a slight reactionary blush. Such a local picture was accompanied by mild irregularities of body temperature. With the production of a dry surface the temperature invariably followed a steady course. Penicillin was administered every four hours, in doses of 500,000 units per diem. A composite bacterial growth on a series of incubated blood agar plates, following exposure at intervals throughout the twenty-four hours, indicated that all manner of organisms must fall on the burn, yet infection did not develop.

Prior to publication he had employed this method on a series of burns chiefly in babies and children. The areas affected were face, neck, chest, abdomen, back, buttocks, genitalia, upper and lower extremities. At this time his impressions were: (1) Superficial burns of moderate extent in any part of the body - the type which keeps the surgical wards occupied - respond favorably to suspension, immobilisation, air exposure, and dusting with

penicillin powder. (2) The dry nature of a raw surface exposed to daylight inhibits the multiplication of organisms and thus permits the body defenses to accomplish healing by first intention. Penicillin is probably retained in the dry crust with bactericidal effect. An antibacterial powder which does not antagonize the body's own defenses, directed against both gram-positive and gram-negative organisms, would be a useful additional precautionary barrier, especially in infected burns. (3) Ward temperatures (exposed burns) are probably more favorable to healing than body temperature. (4) Deep burns can be treated initially in a similar fashion, but within three weeks the slough is excised and a skin graft applied. (5) If the exposure method is attempted, nursing care must be rigorous. This is especially important in the first twenty-four hours. (6) It is too early to state the extent of burn which might be treated with safety by this method, but it is possible to combine the exposure method with intravenous therapy. (7) Benefits from pressure dressings probably are derived more from immobilisation and the absorption of moisture by the dressings and wool than from the actual pressure.

One year later Wallace and Kyle (13) regarded the exposure method as the treatment of choice for the local treatment of burns. They had worked out methods of exposing any burned surface and had compared the burns treated by this method with those treated by the pressure dressings with regard to progress, bacteriology and protein loss. Their findings suggest that: (1) by the exposure method the necessity for skin grafting can

be reduced, infection limited, and the healing time significantly diminished. (2) By treating extensive deep burns by exposure protein loss is diminished and the nutrition and general progress of the patient are thereby improved.

About this time Rhineland (14) in an experimental study into the physiological basis for therapeutic use of restrictive bandages in thermal burns, showing that loss of fluid and edema could not be prevented by any method.

Wallace (15) and (16), and Batchelor (17) made further studies of the exposure method in Edinburgh. In May of 1951 Wallace answered critics who maintained that the exposure method required more nursing, elaborate orthopedic beds and was non-applicable to deep burns. His studies showed that: (1) In fact, no additional nursing is required. (2) Elaborate orthopedic fittings are quite unnecessary, and special bed frames are not essential though they are convenient. (3) As to deep burns, we have treated many such cases by the exposure method, and are satisfied that it is the method of choice for deep as well as superficial burns.

Wallace (18) in speaking at the Symposium on Burns in Washington, D. C. (Nov. 1950) made an interesting observation. He expressed the opinion that the term pressure dressing was unfortunate and a better term would be absorptive dressing since the only part that should be compressed was the wool and not the tissues. He felt that an absorptive dressing method closely resembled drying by exposure because both methods en-

courage the formation of a dry surface and both procedures try to limit edema. In his opinion the two methods are interchangeable.

In 1949 Pulaski visited Wallace's clinic in Edinburgh and initiated the investigation of this method in the United States. Pulaski and others (19), (20), (21), at Brooke Army Medical Center and at the Tokyo Army Hospital treated over 200 patients with thermal burns from December 1949 to September 1951. They found that drying of the exudate of partial thickness burns was observed 12 hours after exposure to the air. A hard, dry, adherent crust forms in 48 to 72 hours and served as a protective dressing for the wound. As healing of a partial thickness burn proceeded, the crust desquamated spontaneously, leaving behind intact, new epithelium. Desquamation in the more superficial areas occurred in 7 to 14 days and in deep partial thickness burns in 14 to 28 days.

After 72 hours of exposure the injured dermis of the full thickness burn was dehydrated, contracted, and had become a dry, dark-brown eschar. In ten to fourteen days a thin yellow fluid, which was frequently sterile, could be found beneath the crust due to liquefaction of dead tissue; in many areas, however, the crust remained tightly adherent. After removal of the eschar the burn surface was usually ready for grafting.

The following procedures were employed by Pulaski and his group in the application of the exposure method: (1) Cleansing of the surface by gentle washing, (2) removal of all debris and devitalized epidermis, (3) systemic administration of antibiotics,

(4) exposure of the burned surface to room air, (5) placing the part at rest, and (6) elevation of the injured area to limit edema. On admission, the acutely burned patient was usually given porphine intravenously. Prevention and treatment of shock preceded local care. Tetanus toxoid and antitoxin were given. On completion of the local care of the burned surface, the patient was placed in bed on clean sheets in the position which best exposed, immobilized, and elevated the affected part.

Pulaski listed the following as advantages of the exposure method of treatment of burns: (1) Time consumption of application and expense of pressure dressings are eliminated. (2) Marginal skin surrounding the burn does not become inflamed, soggy, macerated. (3) Odor is absent. (4) Pyrexia is of relatively short duration. (5) The incidence of clinical infection is gratifyingly low. (6) Appetite and feeling of well being return rapidly. (7) After the coagulum is formed, nursing care is reduced to a minimum, and many patients become ambulatory. (8) Because infection is reduced, healing time is shortened and the hospital stay of the patient is lessened. (9) Finally there is less need for grafting. (21)

In explaining the effective control of infection, which he felt was the outstanding feature of exposure, Pulaski (20) stated, "Exposure appears to prevent the conversion of contamination to frank infection by providing a local environment which exerts a definite antibacterial action. The destruction of con-

taminating bacteria by these changes on the burned surface may also be aided by the so-called "lag phase" of bacterial reproduction. This represents the time required for metabolic adjustment to a new environment and is characterized by an absence of bacterial proliferation. The protection offered by a fully formed crust can be readily understood, for it is well known that the vegetative forms of most bacteria are killed by drying in the air and that daylight generally exerts an inhibitory effect on bacterial reproduction. The crust serves as a physiologic, occlusive dressing. The role of penicillin, which was used routinely in the study, is not clear."

The shortened healing time is graphically illustrated in figure one.

Healing Time of 230 Partial-Thickness Burns		
Region	No.	Day Healed Post Exposure (Average)
Face	52	10.5
Hands	64	17
Upper Extremity	37	16
Lower Extremity	46	19
Trunk	31	16
Total	230	Av. 16 Days

fig. 1

In explaining the decreased need for grafting he stated, "Improved control of infection reduces conversion of partial to full thickness skin loss, and in this, we believe, lies the most important advantage of the exposure method. Many of the partial thickness burns might well have been converted to full thickness skin loss by treatment under dressings. It was particularly striking that deep partial thickness burns healed spontaneously under the cover of a good crust and that the need for grafting of such areas was definitely lessened." (20)

Blocker and others (22), (23), (24), and (25) at the University of Texas Medical Branch undertook to assess critically the open-air or exposure method of treating acute burns. They had observed a few cases being treated by Pulaski at Brooke General Hospital and decided to determine its feasibility as an initial approach to mass therapy of fire or bomb casualties. Their method and results differed little from that of Pulaski and Wallace, and they concluded that this was the only practical method yet devised of coping with large-scale burns during the emergency period before reconstructive centers can be set up. They believed that the conversion of the burned tissue into a dry slough to form a mechanical barrier against invasion by pathogenic organisms which require warmth and moisture for growth was based on sound physiologic principles. The advantages they listed in an article favoring this method include: (1) fewer require grafting. (2) healing



occurs in much shorter time than with pressure dressing.

(3) the period of temperature elevation is decreased.

(4) blood and protein requirements are less, and (5) length of hospitalization in the average case was considerably shortened. (24)

By 1952 this method was receiving world wide attention. Coates (26) in Australia expressed amazement at the results, and was impressed with its simplicity and with the relief of the staff as well as of the patient.

Rush (27) at the Osaka Army Hospital in Osaka, Japan, had treated 186 patients by the open air method by June of 1951. He listed as the advantages of the open air method, (1) Severly burned patients can be transported comfortably without dressings, between clean sheets. (2) Patients are more comfortable without bandages. (3) There is less infection in the burned area and less hypertrophic scar tissue. There is no foul odor. (4) Second degree burns heal faster and third degree burns become quickly demarcated and covered with a tough eschar which can be grafted immediately. (5) There is much less anemia and malnutrition with open air treatment. Patients eat better and require fewer transfusions. (6) Many areas which would appear to be deep second or third degree burns heal with good epithelium. There is definitely less scarring and infection. (7) Necrotic tissue may be excised or washed off in whirlpool baths and the clean surface will

form a tough eschar of dried plasma. (8) Burned hands should be soaked in warm saline baths and full range of motion established as soon as possible; between baths the hands should be covered with vaseline gauze to prevent hard crusts from forming which will limit motion. (9) Open air treatment may be used on any part of the body, but it must be remembered that the motion in all joints must be established and maintained. (10) Open air treatment is no contraindication to bathing, either in whirlpool, tub or shower. (11) Many severely burned patients can be treated at one time by few personnel. (12) Patients require less sedation and no anesthesia is necessary for changing dressings. (13) Patients, doctors and nurses all greatly prefer the open air to pressure dressings in the treatment of burns. The total period of hospitalization is diminished by this treatment.

In California, Kiskadden and Dietrich (28) adopted this method. They attempted to simulate the conditions which might be expected to prevail in mass treatment of burned patients - inadequate personnel and materials. Elaborate measures to immobilize burned areas were not employed. Their conclusions: (1) The exposure method is saving in time, material and personnel. (2) Ideal immobilization of the burned area is often impractical. (3) Satisfactory healing progresses with motion and even ambulation. (4) Infection was minimal, and there was less pain

or discomfort. (5) Intelligent, cooperative adults and older children with minor burns may be treated without hospitalization.

In May 1953 Rousselot and others (29) utilized this method on 94 consecutive patients with thermal burns, 52 of which were most severe. They concluded that this was a distinctly simpler procedure than the currently practiced closed form of treatment as attested to by the marked diminution in supplies and personnel needed to manage this regimen. They noted a marked diminution in hospital stay with morbidity and mortality rates comparing favourably with the rates in the use of occlusive dressings.

In August 1953 Pemrick and Musselman (30) listed ten points in favour of the exposure method: (1) Increased awareness of, evaluation of, and attention to the wound. (2) Reduced pulmonary complications - better ventilation. (3) Allows dissipation of body heat. (4) Encourages mobilization. (5) Eliminates warm, moist environment for bacterial growth. (6) Reduces invasive infection. (7) Reduces destruction of skin and permits earlier wound closure. (8) Simplifies care and saves material. (9) Eliminates the uncomfortable, fetid dressings. (10) Eliminates anesthetics for, and laborious changes of dressings. In figure 2. Pemrick and Musselman have made a comparison of the closed and open methods.

A Comparison of the Closed and Open Methods of Treatment

Extent of Burns	No. Pts.	Mortality	Survivors		
			No. Grafted	Hospital Stay (Days)	
				Grafted Pts.	Non-Grafted Pts.
Closed Method 73 Patients					
0 - 10%	32	0	11 (34%)	38	27
10 - 30%	32	3	18 (56%)	78	33
30 - 60%	7	3	4 (57%)	89	0
60 - 100%	2	2	0	0	0
Totals	73	8 (11%)	23 (46%)	Av. 64	Av. 30
Open Method 81 Patients					
0 - 10%	22	0	7 (32%)	35	13.5
10 - 30%	52	1	25 (48%)	39	20.5
30 - 60%	5	3	3 (60%)	74	0
60 - 100%	2	2	0	0	0
Totals	81	6 (7.4%)	35 (43%)	Av. 13	Av. 17

Fig. 2

Artz and others (31) and (32) at the Surgical Research Unit, Brooke Army Hospital, Fort Sam Houston, Texas have continued the work started by Pulaski. By June of 1953 they had treated approximately 350 burn patients by the exposure method, and found that this method is not only practicable in the event of catastrophe but also worthy of consideration in the treatment of burns during peacetime. Their evaluation of this method is in itself a summary of the conclusions of the many contributors to this form of burn therapy. In their words, "The loss of exudate from the burn wound is approximately the same with the use of the exposure method as with the use of

occlusive pressure dressings. The average healing time for second degree burns is 16 days. Third degree burns are usually ready for grafting when the surrounding partial thickness burns are healed. Most eschars over the joints of the hand and other flexor surfaces should be excised by the twenty-first to the twenty-sixth day.

#### Indication for Exposure

1. All burns that can be adequately exposed and put at rest.

#### Contraindications for Exposure

1. Circumferential burns of the trunk.
2. Patients requiring immediate transportation.
3. Ambulatory outpatients.
4. Coexisting soft-tissue wounds.

#### Advantages of Exposure

1. Rapidly accomplished with minimal expenditure of effort.
2. Facilities for aseptic technic and elaborate materials for dressings are unnecessary.
3. Effective control of infection.
  - a. Reduction of conversion of deep dermal to full thickness skin loss.
  - b. Less grafting required; hospital time shortened.
  - c. No unpleasant odor.
  - d. Minimal fever, good morale.

#### Disadvantages of Exposure

1. Not applicable to all burns by virtue of the several contraindications.
2. Unpleasant sensation of pain and cold before crust formation.
3. Positioning of injured areas is sometimes difficult."

Artz (31) concluded that in times of disaster, adequate numbers of dressings and conditions suitable for their

proper application would probably not be available. Exposure would then be the only feasible method of treatment, and it was therefore, particularly gratifying to know that excellent results can be achieved by its use. However, he felt that the exposure method was not fool-proof, and like all other forms of therapy, it demanded careful attention to the body's physiologic requirements and to details of management.

The following are case reports of Artz (31) and (32), Wilson (33) and Kleitsch (34):

#### Case I.

A 20 year old airman sustained partial thickness burns of the dorsa of both hands when his clothing caught fire from a gasoline explosion. The burns of both hands appeared to be of approximately the same depth and extent. Both hands were cleansed with soap and water. All blisters were broken and the devitalized epithelium was cut away. Penicillin, 300,000 units daily, was given for five days. Artz (32), Fig. 3, 4, 5, and 6.

#### Case II.

A white girl, 1 year of age, was burned when a hot water heater exploded. The burns extended over 23 percent of the body surface. There was a deep burn on the face. Penicillin, 200,000 units daily, was given for 12 days. Artz (32), Fig. 7, 8, 9, and 10.



Fig. 3. Thirty hours postburn. An occlusive pressure dressing was placed on the left hand, and the right hand was permitted to remain exposed to the air. The patient was encouraged to hold his right hand in a position of function.

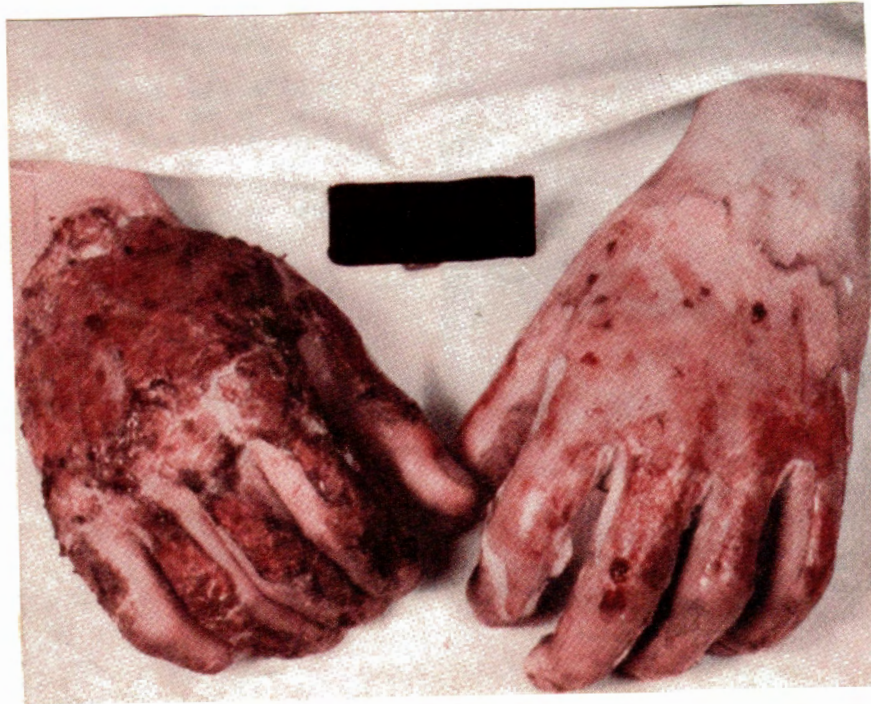


Fig. 4. Nine days postburn. The dressing has been removed from the left hand. A firm protective crust has formed on the dorsum of the right hand. Infection is not evident in either hand. The left hand was placed in a position of function and redressed with an absorptive dressing.



Fig. 5. Twenty-three days postburn. The crust on the right hand has desquamated from a well epithelized surface. The left hand likewise is almost completely healed with the exception of a few deeper areas on the fingers. The right hand was less comfortable during the first two days, but much more comfortable during the remainder of therapy.



Fig. 6. At the time of discharge both hands had healed well. There is no evidence of scarring on either hand. Function returned to normal in approximately the same period of time.



Fig. 7. Eighteen hours postburn. Note the marked edema of the eyelids and lips. The hair has been shaved from the head.

Fig. 8. Fourteen days postburn. All edema has subsided. A small area of superficial burn can be seen on the ear. The protective eschars are tightly adherent and there is no evidence of infection.



Fig. 7. (left)



Fig. 8. (right)

Fig. 9. At twenty-one days postburn. The eschar on the face has been removed. This was accomplished, beginning on the fifteenth day, by the use of wet dressings. Partial thickness burn areas are healed, but a large portion of the right side of the face is full thickness injury. Strips of skin 0.012 inch in thickness, taken with an electric dermatome, were placed over the denuded areas and a large, firm, bulky dressing was applied.

Fig. 10. At the time of discharge, all the grafts have taken well and scarring is minimal.



Fig. 9. (left)



Fig. 10. (right)

### Case III.

A 21 year old Negro Air Force sergeant received burns of the hands, face, buttocks and right thigh when gasoline exploded while he was refueling an airplane. A large area on the anterior aspect of the right thigh showed a deep second degree burn. He was placed in bed so that the area remained completely exposed to the air. Artz (32), Fig. 11, 12, 13, and 14.

### Case IV., Case V., Case VI.

These cases are from a reprint of Artz (31). See legends accompanying pictures.

### Case VII.

A white girl, two and one-half years of age, was burned when an explosion in a paint shop burned several members of her family. She received first, second and third degree burns of the face, neck, upper extremities, anterior and posterior thorax and abdomen, lumbar region and both legs. On admission the burned areas were debrided and vaseline gauze and pressure dressings applied. Five days postburn the dressings were removed and the face with deep second and third degree burns of forehead, nose and cheeks was left exposed to the air. Two weeks postburn grafting was started. Pressure dressings were applied following grafting, but after one week the grafted areas were exposed to the air. Wilson (33), Fig. 18, 19, 20, and 21.



Fig. 11. Twenty-four hours postburn. The exudate on the surface has started to dry, but a crust has not formed. The exudate from the wound can be seen at the edges.



Fig. 12. Six days postburn. A good crust formed in 72 hours. By the sixth day all edema had disappeared and there was no evidence of infection.



Fig. 13. Twenty-eight days postburn, little crust remaining. On the twenty-first day, superficial burn areas began to desquamate. Epithelization time depends on depth of second degree burn.



Fig. 14. Forty days postburn. The surface is well healed, without scarring.

Case IV.

Fig. 15A. Flame burns 30 hours after burning and exposure. Face burns are partial thickness, but part of the neck, the axillas, and most of the chest are deeply burned. Neck extension has been obtained with the knee break of a Gatch bed.

Fig. 15B. Four days after burning. All areas are dry. The eschar on the chest is contracting. Though the patient had two episodes of delirium tremens and was very uncooperative on the previous day, there are no cracks in the protective covering.

Fig. 15C. Fourteen days after burning. All the edema fluid has been resorbed. There are small cracks in the right axilla and the neck. Some partial thickness areas on the face, neck, and shoulders have healed.

Fig. 15D. Fourteen days after burning. All eschars were excised. Four days later these areas were grafted and bulky compression dressings were applied. A 95 per cent "take" was obtained.

Fig. 15E. Fifty days after burning. Healing is complete. There are some contractures in the right axilla and in the neck. Chondritis of right ear is evident.





Fig. 15A.



Fig. 15B.



Fig. 15C.



Fig. 15D.



Fig. 15E.

Case V.

Fig. 16A. Partial thickness burn caused by boiling water 12 hours after burning and exposure. The exudate is beginning to dry.

Fig. 16B. Four days after burning. Crust formation is complete. There is no evidence of infection. Note elevation above intact skin characteristic of crusts.

Fig. 16C. Twelve days after burning. The injured areas have healed completely without scarring.



Fig. 16A



Fig. 16B.



Fig. 16C.

Case VI.

Fig. 17A. Flame burns with predominantly full thickness involvement of dorsum of both hands two hours after burning. Note deep dermal burn on right wrist, which weeps slightly, and contrast this with pearly-white appearance of the dorsum. Also note unburned area on left wrist, which was protected by a watch.

Fig. 17B. Twenty-four hours after burning there is some drying of the partial thickness burns on the right palm. The burned areas on the wrist are deep dermal and have already formed a crust.

Fig. 17C. Ten days after burning. Eschar on dorsum of right hand and crust on wrist immediately before excision.

Fig. 17D. Ten days after burning. Crust on palm of right hand and right wrist.

Fig. 17E. Ten days after burning. Appearance of right hand after excision of eschar on dorsum. Note that the crust of deep dermal burn on wrist has also been removed. The crust on the palm was not disturbed. Two days later skin grafts were applied. A complete "take" was obtained.

Fig. 17F and 17G. Photographs on discharge. Return of function is nearly complete.



Fig. 17A.



Fig. 17B.



Fig. 17C.



Fig. 17D.



Fig. 17E.



Fig. 17F.



Fig. 17G.



Fig. 18. Posterior view showing degree of involvement with circumferential burns of trunk and extremities.



Fig. 19. Anterior view of lower extremities. Legs and hands were left exposed after eighteen days. Pressure dressings were applied for one week following grafting and then areas were exposed.



Fig. 20. Anterior thorax and face. Face was exposed after five days of occlusive dressings. There was third degree burns of the lower portion of the mouth, the chin, and the anterior neck. The face and chin were grafted with split thickness grafts held by silk suture 18 days postburn.



Fig. 21. Anterior view showing healed second degree areas and debrided areas of third degree involvement.

Case VIII.

A twenty-nine year old white male with burns of face and back obtained while escaping from a burning house. The back was covered with blisters and drying serum crusts. There were blisters along the hiles of both ears. The majority was second degree with questionable third degree involvement of the posterior aspect of the right arm. Furacin gauze dressings were applied. Approximately three days later the dressings were removed with the exception of that portion adherent to the forming eschar. There was no evidence of infection. The surface was exposed and the patient seen at weekly intervals on an out-patient basis. The eschar completely separated and no skin grafting was necessary. Kleitsch (34), Fig. 22, 23, 24, and 25.

This is an example of the decreased hospitalization obtainable with this method, as stressed by Kleitsch. (34)





Fig. 22. Patient on admission. Notice flash pattern over shirt from explosion of gas stove.



Fig. 23. Patient after three days furacin gauze dressings.

Fig. 24. Posterior view of burned area after removal of all gauze not adherent to the forming eschar.

Fig. 25. Anterior view of patient. Notice eschar on helix of ear.



Fig. 24. (left)

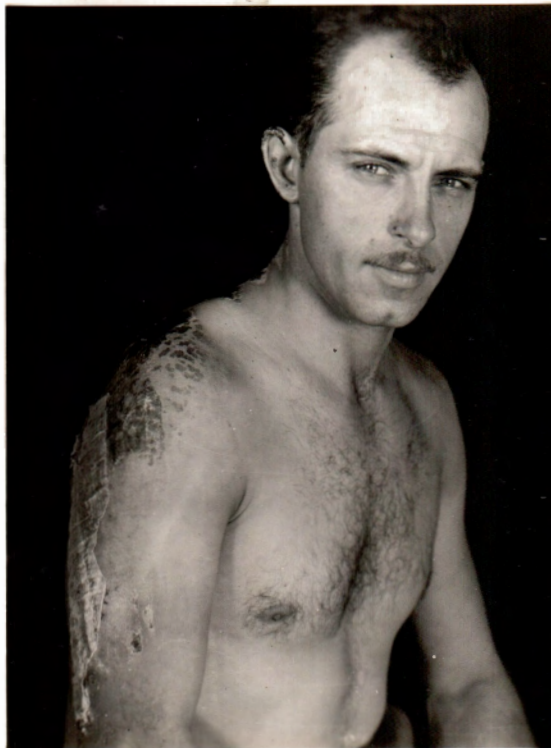


Fig. 25. (right)

### Summary

1. A brief review of the literature concerning the history and development of the exposure method of burn therapy has been presented.
2. Eight cases, representing this method and comparing the open and closed technique are reported.
3. The advantages and disadvantages of the exposure method of burn management, as proposed by various authorities, are listed.
4. The value of this method of burn treatment and its application justify its more extensive use as presented in the conclusions.

### Conclusion

It would seem apparent that the exposure method of burn management has several distinct and important advantages over the pressure dressing method. It is my opinion that this method is the best therapy available in the advent of mass burn casualties. This is well substantiated by the advantages noted. However, I feel it is false thinking to relegate this method to that situation alone.

Every clinician should become familiar with this procedure, preferably under the direction of someone using this method. Exposure offers, to the practicing

physician, a type of therapy which should be used individually on burn patients in conjunction with current methods. The results of the intensive application of exposure in burns, since 1949, bear out the conclusions of its early proponents. Certainly such evidence can not be over-looked again.

This method not only obtains equally good or better results in the majority of cases, but does so with the expenditure of less time and equipment to the professional personnel and less expense and discomfort to the patients.

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