BURNS IN MY LIFETIME

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Mr. President-Elect, members of the American Burn Association, ladies and gentlemen:

Last year a new organization, the American Burn Association, was born and today it is baptized. One might expect that such a christening would demand from the man you have honored as its first President a formal address worthy of the intelligent ears of the highly dedicated people who make up this group. But the Association was not conceived so formally. It came into being after several years of meetings characterized by the free interchange of experiences, the stimulus of argument, and a few drinking sessions that forged a camaraderie far surpassing that of other organizations. As you well know, a burn demands greater sacrifices from the responsible personnel than any other disease entity. It is the most severe form of injury to which man is liable. It would seem fitting, then, that those of us profoundly committed to this common but difficult objective might be tremendously loyal to each other. So, out of this dedication and devotion came the American Burn Association.

We know where we stand in time, only about seven hours from the annual cocktail affair. But where do we stand in burns? Let us look at the story of burns for this generation, or more specifically, let me “tell it like it is” in my lifetime.

It was amazing when I looked at the scientific literature of my birth year, 1915, to find that burn surgeons were excited about their modern method of local care, namely open air treatment. In that year there were 5,740 deaths from burns, only a few less than our 7,000 per year at the present time. Surgeons were interested in flameproof clothing, and suggested that one soak the clothing of children in ammonium phosphate solution. They condemned the use of carron oil which was then terribly popular. It is an oil made of equal parts of linseed oil and lime water and named after an iron foundry in England.

Look how they told it then; it sounds like today. This statement from Dr. Lacey of Bessemer, Alabama, was made before the Southern Railway Surgeons in 1915: “Many dogmas about burns of today, given out as medical truths, are really no more than theories which may be abandoned tomorrow.” I know of no field where this is more apropos than in burns.

In 1923 Underhill demonstrated the striking concentration of the blood which accompanied burn shock. A little later this led to the use of plasma for fluid replacement. Two years later Davidson, at Henry Ford Hospital, promoted the

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use of tannic acid to dry the wound surface and check external fluid losses. This undoubtedly retarded progress in local care for many years and started the fateful era of escharotics. In 1935 Cruickshank, in Glasgow, demonstrated that most burns were infected by hemolytic streptococci.

In 1939, the year I was graduated from medical school, the surgical journals were filled with the use of a variety of local escharotics. These included 5% tannic acid, or tannic acid and 10% silver nitrate, later the triple dyes of Aldrich, and the use of 1% gentian violet combined with silver nitrate. All these agents had the property of forming a thick, leathery eschar beneath which bacteria flourished, and all burned patients with third-degree insults were terribly septic. In those days, 60% of the burned patients who died did so within the first 24 hours. It was the days of such greats in burn surgery as Roy McClure of Henry Ford, Grover Penberthy of Detroit, and Henry Harkins of Chicago. I found several articles by a young Atlanta surgeon, J. D. Martin, and another by Atlanta's Bill Hamm, then with Viray Blair and Barrett Brown in St. Louis.

We think of biological skin dressings, namely homografts or heterografts, as rather new life-saving measures for burns. They were considered in 1939. The following is a quotation from the American Journal of Surgery, 1939: "By covering the granulating surface with grafts from another individual of the same blood group the raw areas are temporarily healed. During this period the patient is saved the disastrous effects of septic absorption."

AFTER 1939

One of the milestones in burn care was the introduction of Vaseline® gauze pressure dressings, or more appropriately, occlusive dressings. At the beginning of World War II, Harvey Allen of Chicago popularized these dressings in the European Theater. The Cocoanut Grove fire in Boston in 1942 started studies at the Massachusetts General Hospital by Cope and Moore. They evaluated gauze dressings, characterized the rate and type of fluid losses, and developed a formula for estimating the amount of fluids in burns which was based on the hematocrit. In 1942 Henry Harkins published his book on burns, which was a real compendium of a variety of treatments being used in this country and abroad. At about this time Leonard Colebrook, at Birmingham, England, was emphasizing the use of sulfanilamide powder locally to combat infection with beta hemolytic streptococci.

AFTER WORLD WAR II

In the early postwar period, great emphasis was placed on fluid therapy. In going over a large number of charts of patients who had died from burns, Charles Fox and I found that the majority died from inadequate or inappropriate replacement therapy. In 1950, Everett Evans of Richmond suggested the first fluid formula based upon size of the patient and extent of the burn. His contributions to the burn field are legion. For many years he served as Chairman of the National Research Council Committee on Burns, and developed a center for the study and care of burns at the Medical College of Virginia. About the same time
a burn center was developed under the auspices of the Medical Research Council of Great Britain by Leonard Colebrook at Birmingham, England, and Blocker developed a burn unit in a special plastic surgery section at the University of Texas Medical Branch at Galveston.

Research in burns at this time was somewhat limited. In 1950 Colonel William Stone, now Dean of the School of Medicine at the University of Maryland, was head of the Research and Development Board, Office of The Surgeon General. He conceived the Army Burn Unit when he was asked by a congressman, "What would you do if you had 10,000 burns from an atomic attack?" He recognized that not enough information was available about burns, and therefore suggested that the Surgical Research Unit develop special studies to advance the knowledge of burns. At that time Colonel Edwin J. Pulaski was the commanding officer of the Unit and I was a ward officer on 7-A. Colonel Joseph R. Shaeffer was Chief of the Surgical Service, and with Colonel Pulaski provided the leadership for the development of the Surgical Research Unit and the Army Burn Center. Burn studies were initiated with the aid of Eric Reiss, John Davis, and Irving Gray.

One of the early developments at the Unit was the design of the Rule of Nines by Colonel Pulaski and a plastic surgery consultant, Dr. Charles Tennison. The young group interested in burns in the Unit received a great stimulus with the appointment of the second commanding officer, Colonel William Amsagher. He was one of the younger full colonels in the Army Medical Corps, a wonderful surgeon, and a sage administrator. His incentive gave the Army Burn Center its real start.

During one of the reviews of the Virginia Burn Unit, it became evident that infection was an outstanding problem. Following this the Army Research and Development Board sent Colonel Pulaski to Birmingham, England, where special studies were being conducted on infection in burns. Colonel Pulaski investigated a special dressing technique and the use of penicillin cream at the Birmingham Unit. He had heard about a new type of local care being conducted by Mr. A. B. Wallace at Edinburgh. Time did not permit him to visit Mr. Wallace, but he did make a telephone call to learn about the reintroduction of exposure as a method of local care. Mr. Wallace pointed out its ease and healing with diminished infection. When Colonel Pulaski returned to the Surgical Research Unit from the trip, he spoke about this new local treatment, but not with great enthusiasm. Some of his young officers felt that it should be tried. One Sunday afternoon, while Colonel Pulaski was out of town, his young officers exposed three patients with second-degree minor burns. These patients did extremely well, and study of exposure was started in this country at the Surgical Research Unit. Captain Eric Reiss led the detailed metabolic study in burns with the aid of a highly competent Army dietitian, Elinor Pearson. Later these studies were extended by Soroff. At about the same time the Brooke Fluid Formula, now so popular in this country and abroad, was devised. It really was a minor modification of the formula Dr. Evans had proposed a few years earlier. The Brooke group favored a little more lactated Ringer's solution and a little less colloid. As the Army Burn Center developed, many surgeons participated in the studies. Various
surgeons and investigators were assigned to the laboratory and to the ward of the Surgical Research Unit for 2-year periods. These reserve officers were specially selected. Most of them came from superior training programs. Each brought to the team a critical mind and knowledge from the discipline of his past training. The intelligent skepticism of new clinicians provided a means of testing and retesting the validity of various concepts and techniques. From this atmosphere came the exposure of donor sites, exposure of skin grafts, infection as the primary cause of death in burns, and the team concept in the care of burns.

In the early days of the Unit several surgeons had an opportunity to evaluate the electric dermatome. This is one of the greatest advances in the care of burns in my lifetime. Before the electric dermatome, it was difficult for the average surgeon to obtain cover for the wound. Many wounds were allowed to remain open for weeks and months waiting for epithelium to grow over the granulating surface or in between small inadequate grafts. With the electric dermatome, the precursor of the current air-driven one, came a new era when any physician could obtain large strips of split-thickness skin with great ease.

In the middle 1950's it appeared that the primary cause of death in most burns was septicemia due to *Staphylococcus aureus*. One group in America, namely that at the Massachusetts General Hospital, did not experience such a large number of deaths from septicemia, but noted that most of their patients died from pulmonary complications. They believed that most burned patients who died inhaled noxious agents, and that death was due to irritation of the respiratory tract. This difference of opinion has now become somewhat resolved because we have learned that pulmonary complications occur not only from inhalation of noxious agents but also from changes that go on in the lungs following severe injuries such as burns.

With the advent of synthetic penicillins, the number of patients dying from staphylococcal septicemia diminished, but many patients with extensive burns continued to die because of infection. It was Monerief, Teplitz, and Order who pointed out the changes that occur in burns with pseudomonas organisms. Thus, as control was gained of staphylococcal septicemia, overwhelming pseudomonas sepsis took over as a major cause of death in burns.

There was a great interest in immediate excision of the burn eschar in extensive injuries. Cope had pointed out several years earlier that a small full-thickness burn could be treated best by initial excision and cover with a skin graft 4 days later. MacMillan and Monerief in this country, and Jackson in England, embarked upon an evaluation of excision of 30% to 50% of the body surface in extensive burns. Such excision was a very major procedure, and left a wide open surface. There were a few dramatic results from this technique, but the mortality was really not any better than by conventional means. This technique was abandoned with the advent of local antibacterial agents.

Replacement therapy in burns has remained essentially the same for many years. Fox has emphasized the value of adequate amounts of sodium bicarbonate. Baxter and Shires of the Parkland Hospital, following in the footsteps of Moyer, recommend the use of large quantities of lactated Ringer's solution. Their studies have brought forth the regimen of 4 ml of lactated Ringer's per kg of body weight
per cent of burn in the first 24 hours. This is a tremendous amount of fluid, and is usually followed by severe edema. It is currently used in some centers, but it is not nearly so popular as the Brooke formula.

LOCAL ANTIBACTERIAL AGENTS

It was always recognized that the primary problem in the third-degree burn was the proliferation of large numbers of bacteria immediately beneath the eschar. The primary organism in recent years has been *Pseudomonas aeruginosa*. Colebrook, at the end of World War II, used penicillin locally in a cream base; but this agent did not seem to penetrate the eschar.

Lindsay, after the Korean conflict, studied massive, destructive muscle wounds in goats at Walter Reed Institute of Research. He attempted to determine the effect of local antibacterial agents in high velocity muscle wounds in the goat. He found that one of the best protective agents was Sulfamylon®. On further investigation, this antibacterial agent was unique in that it penetrated dead tissue. Utilizing this information, Lindberg and Moncrief tested Sulfamylon in a bland cream, later to be known as “Sulfamylon butter,” in a pseudomonas rat model at the Surgical Research Unit. It appeared to be very effective, and thus the new era of local antibacterial agents was launched with the application of Sulfamylon cream to deep burns. Moncrief reports that over the years the mortality at the Surgical Research Unit in burns between 30% and 60% of the body surface has dropped from 60% before Sulfamylon to 26% with Sulfamylon.

At about the same time Sulfamylon was coming into use, Moyer proposed the use of 0.5% silver nitrate wet dressings. He found that this protected against the growth of bacteria in and beneath the burn wound. Thus silver nitrate soaks became a very popular method of treatment. They were inexpensive and readily available. Certain complications were noted, such as hyponatremia and hypochloremia, especially in children. This technique would not control infection unless the soaks were applied carefully twice each day. This method has become less popular in the past 2 years because it is hard work, and the silver nitrate blackens bed clothing, nurses’ uniforms, and the patient. Silver is now being used in other forms. Monafo is testing a colloidal silver preparation, Butcher a silver acetate preparation, and Fox is conducting clinical trials with silver sulfadiazine.

Stone has used gentamycin cream and ointment. It has been effective against the pseudomonas and other gram-negative organisms. It can be used as a cream on exposed burns, and both the cream and ointment are used under dressings. It is undoubtedly one of the best agents for local use when the area must be treated by dressings.

HOMOGRAFTS AND HETEROGRRAFTS

Homografts have been used for years as life-saving measures in the extensively burned patient to cover the wound until autografts are available. More recently homografts have been used as biological skin dressings to protect the wound after the eschar has started to separate until it is ready for a skin graft. Fresh homografts are best, but postmortem homografts work extremely well. Since there has been some difficulty in obtaining homografts at the time they were needed,
heterografts have been tried. Currently the most commonly used heterograft seems to be white pig skin, and its popularity is increasing.

DEVELOPMENT OF BURN CENTERS

After World War II a few burn centers developed in this country, and more were developed in European countries. The Army Burn Center at the Surgical Research Unit demonstrated the great value of a special unit for the study and care of burns. In 1960 the Ancient Arabic Order of the Nobles of the Mystic Shrine of North America became interested in burns in children. Their philanthropy had developed a most successful program in the Shriners Hospitals for Crippled Children. On July 4, 1962, in Toronto, their Imperial Council adopted a resolution to enter into the development of institutes for the care and study of burns in children. They have now built three institutes associated with medical schools in Galveston, Cincinnati, and Boston. These institutes have been highly successful, and have further established the thesis that extensively burned patients are best cared for in a special center.

Other centers have been established, some in medical schools, some in large municipal hospitals, and others in large community hospitals.

CONFERENCES ABOUT BURNS

In 1952, and again in 1953, the Navy held small conferences concerning burns. In 1955 the Brooke Conference, which brought together about 50 scientists interested in burns, was hosted by the Surgical Research Unit at San Antonio, Texas. This type of conference was continued annually in the other centers throughout the United States under the name of the National Burn Seminar. At Dallas in 1966 it became obvious that the group interested in burns was too large for small conferences, and that some type of society should be formed. Dr. Charles R. Baxter, the host at that meeting, appointed a planning committee. This committee set forth its plans and proposed a set of bylaws for the new association at the conference hosted by Dr. Alan R. Dimick in Birmingham in 1967, and thus started the American Burn Association.

The Department of Defense supported the first International Congress on Burns, which was held in Washington in 1960. Five years later, at Edinburgh, Mr. A. B. Wallace hosted the International Congress, and an organization known as the International Society for Burn Injuries was formed. This organization will meet again in 1970.

THE FUTURE IN BURNS

A major problem in the extensively burned patient is the dead eschar. In no other condition does the surgeon allow dead tissue to remain without immediate removal. When there is gangrenous bowel from obstruction, it is imperative that it be removed. When there is dead muscle from trauma, it must be excised. The development of some type of nontraumatic method for the removal of the hard full-thickness eschar is badly needed. Perhaps it will be a better enzyme for dissolution of the eschar, tangential excision, or possibly even a sand-blasting technique. Although homografts and heterografts are proving advantageous as
biological skin dressings, some type of synthetic skin would be highly beneficial. Someday we may have the permanent take of homografts, which means that an abundant amount of skin will become available for permanent cover in extensively burned patients.

There is a great need for improved methods of intravenous nutrition. The protein and caloric losses in an extensively burned patient are so great that it is impossible to keep up with them by oral means. Some type of high caloric protein solution for intravenous use would be very beneficial.

New research is needed in energy metabolism. Often the burned patient dies because he “runs out of gas.” If we had a better way of measuring energy losses, we could predict them as we predict losses of sodium and potassium today. With increased knowledge of energy metabolism it would undoubtedly be possible to conserve energy in a seriously burned patient, and then new methods of repletion could be developed.

It would be expected that better means of delivering care to the burned patient should be devised. There is a need for expansion of burn centers, and about them should be scattered satellite burn units in community hospitals. There should be cooperation between the center and its satellite units. Moderate burns could be treated in the community burn ward, and major burns would be managed in the larger centers.

CLOSING REMARKS

And now a final but personal comment. Your loyalty and friendly regard in electing me the first President of this attractive Association have given me a tremendous thrill. It is an honor which I have mentally accepted in the name of many of you, because we have all shared together the trials and tensions of burn care, its advancement in the past two decades, and the development of this organization. For your contributions to burns, for our pleasant and productive association over the years, and for the salutary privilege of this office, I thank you.

And in closing, I would like to accept this honor in the name of Lucy Artz. She regrets more than you know that she cannot be here, and I fully share that sorrow; but the removal of that malignant right lung in November has her temporarily grounded. Burns have been her life too, and she has never been jealous of that mistress. She has felt the tensions associated with the difficult patient, eased the sorrow and frustration when patients died, enjoyed the chaos of argument in our living room, and filled the glasses while burn surgeons dreamed. During our many years at the Surgical Research Unit, burns were paramount to her. In fact, many of the developments now well accepted in the burn field were conceived at her kitchen table with several in this audience. Her deep affection for many of you is well known, and no less her interest and compassion for the burned patient. Forgive me, but I would like publicly to salute her not only for her wit, ideas, devotion, and, not the least, her hard work in our life together, but especially today for her contribution to burns. Her concern for the burned patient is best exemplified by one of her favorite prayers, one which at this time in history might serve as a guidepost for all of us: “Lord, keep me ever mindful of the needs of others.”