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BURNS
BIBLIOGRAPHY
1952 - 1962

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June 25, 1962 - June 24, 1963

Department of Surgery
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Galveston, Texas
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BURNS BIBLIOGRAPHY
1952 - 1962

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OCD REVIEW NOTICE
This report has been reviewed in the Office of Civil Defense and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Office of Civil Defense.
This report is one of five publications resulting from a study on "Evaluation of Burn Casualty and Treatment of Mass Burn Casualties," prepared under the direction of The Division of Health of the U.S. Public Health Service, Bureau of Health Education, and Welfare.

1. Simplified Standardized Treatment of Burns...
2. Textbook on Convalescent Burns
3. New Trends in Burn Research...
4. New Concepts in Burn Physiology and Burn Treatment
5. Burns Bibliography 1952 - 1962
INTRODUCTION

A preliminary bibliography on burns was prepared by the National Library of Medicine in conformity to a request from Garruth Wagner, M.D., Chief, Division of Health Mobilization and John J. Lang, M.D., Chief, Research Branch, Division of Health Mobilization. Seven hundred sixty-nine references were selected by Dorothy Bocker, M.D., the Medical officer who worked on the project, after an inspection of approximately 2,000 articles.

All references were checked with the actual articles for accuracy, co-authors' names, which were omitted in the original lists, were added, and short abstracts were prepared. A group of references which were not available in the library of the University of Texas Medical Branch for one reason or another have been included with the notation "Not reviewed. Available in the National Library of Medicine." A large number of additions were made to the bibliography as the result of a review of the literature in preparation for a chapter in Progress in Surgery, edited by Allgöwer (Progress in Burn Physiology and Treatment) and also for a chapter on Burns in the forthcoming textbook edited by John Converse. Papers presented at the First International
Congress on Research in Burns, in Washington in 1960, which were published in 1962, were also added to the series, as were a number of 1962 articles unpublished at the time of Dr. Bocker's work and other more recent publications which we felt would be of value for general reference purposes. To expedite the completion of the contract within the time limit set, it was decided not to prepare abstracts of translations of articles in German, Italian, Finnish, and Russian, etc., which were unavailable in abstract form in English. It is planned, however, to proceed with this work apart from the contract and eventually to prepare abstracts of all articles included herewith.

In addition to this bibliography, which has been organized according to general subject matter, following, in general, the categories submitted, a duplicate file has been prepared on index cards and alphabetized according to the senior author for ready reference and for convenience in keeping the file up to date from year to year by agencies interested in problems of thermal trauma and mass casualty preparation. Co-author's names have been added to the file.
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TEXTS, MONOGRAPHS AND REVIEWS OF THE LITERATURE

General text in German by well-known Swiss authority. Standard European reference Extensive Bibliography.


Regimen of management of pediatric burns at the Hospital "Manuel Arriaran" in Santiago. Well organized manual in Spanish, with charts, dosage tables and sections on anesthesia, dietary measures, intravenous techniques, tracheotomy, psychological treatment, physiotherapy, social service aspects, hospital charts.


Monograph based upon experimental studies at the University of Uppsala. Includes 1) biochemical and histochemical studies of the rat liver, 2) alterations in capillary permeability in burned and non-burned areas of the dog, 3) observations on permeability of
the glomerular membrane in man, and discussion of causative mechanisms of burn shock.


Standard textbook for students and practitioners by well-known authorities in the field of burns. Based upon wide experience at the Surgical Research Unit, Brooke Army Medical Center.


Handbook in Spanish by well-known authority for first-aid and emergency treatment of burns, including detailed lists of supplies, equipment and patient record forms.

Monograph reporting studies at Karolinska Institute in 3 sections: I. The Primary Treatment with Special Reference to the Mortality and Hospitalization Time, II. Dextran Concentration, Electrolytes, Blood Volume and Total Hemoglobin, III. The Serum Protein Pattern and Nitrogen Metabolism.


Text directed at student resident and practitioner. Section on Surgical Metabolism edited by Francis Moore and Albert Mackay.


Review of 5-years of clinical research in burns and 10-years of fundamental research in burns, shock and wound healing.


General review of literature on burn therapy and research, acute body injury, blood vessel replacement shock, blood and plasma volume expanders, enzymes, metabolism and nutrition, fat embolism, tetanus, infection and antibiotics.


Review of burn literature, 1950-1960, according to mortality, prevention, pathology, clinical course, early treatment, surgical programme, infection, immunotransfusion, homografts, fractures and bone changes, special areas, late repairs and keloids, burns in Russia, effects of thermal trauma combined with total body radiation.


Annual review of literature on burns and wound healing prepared for Canadian Armed Services general and local therapy, nutrition, homografts, electrical burns, mass casualties, experimental research in burns, therapy and infection of wounds, frostbite, experimental nutritional studies.


A review of the literature since 1945.

Chapter on Thermal and Irradiation Injuries (pp 182-213) written by Bell, J. (Burns and Irradiation), Lewis, R. B. (Local Cold Injury) and Leroy, G. V. (Nuclear Radiation Injuries).


Outline of types of thermal injury, general systemic response and principles of treatment. Detailed study of recent progress and developments in the field of thermal trauma, including fundamental research.


Summary of burn pathophysiology and regimen at the Medical College of Virginia.


Historical review of Vitamin E research followed by chemistry, biological activity, commercial preparations, methods of assay, metabolism, distribution and intake, physiopathology, human requirements and role in healing of wounds and burns.

Summary of general principles according to Birmingham regimen.


Comprehensive study from University of Uppsala, including in Part I a review of therapy, discussion of streptococcus pyogenes (beta hemolytic strep.), staphylococcus aureus, pseudomonas pyocyanea, proteus, minor and mixed infections with reviews of literature and author's studies in 99 patients. Part II, discusses materials, methods and data with regard to guinea pigs experiments employing thermal trauma, X-irradiation and experimental invasive infection alone and in various combinations. Reviews of the literature included in each section.


Monograph covering therapeutic routines at Walter Reed Army Institute of Research and status of knowledge of burn problems generally.

Monograph summarizing previous studies on infection and related problems in burns.


Review of literature on thermal burns and wounds and trauma prepared under auspices of Canadian Defense Research Board (first of annual reviews in Medical Service Journal of Canada).


Annual review of English literature on burns and trauma prepared for the panel on Management on Burns and Wounds of the DRB Panel of Canada.

Discussion of burn management on the basis of 4 phases:
1) Burn edema, 2) The wound, 3) The upswing, and
4) maturation of new skin and rehabilitation. Sections
on the troublesome variants, notes from the literature,
case histories and atomic injury.

October 1956 to September 1957. Med Serv J Canad 14, 79-110,
1958.

Annual review of literature prepared for Canadian
Defense Research Board, continuation of previous
reviews. Introduction lists journals surveyed for
first time (all in English language). Burn therapy,
radiation, research. Also wound healing, shock,
trauma.

October 1957 to September 1958. Med Serv J Canad 15 1-41,
1959. 442 refs.

Annual survey of English literature pertaining to
Burns (Treatment, complications, electrical and
radiation, research, intravenous fat emulsions,
emergency rooms and mass casualties), Trauma,
wounds, and wound healing.

Continuation of previous reviews of English language journals on burns, wounds, shock, etc.


Classification, history, disturbed physiology and therapeutic principles.


New handbook on burns by British authors. Contents include scope and treatment of burn shock, local treatment, general care of patients with burns and scalds, burns of special areas and types, out-patient treatment of minor burns scars and contractures, administrative problems, mass casualties.

Review of present trends with emphasis upon vigorous supportive care, mechanical cleanliness, gentleness in care, use of whole blood as indicated with salt-solutions and other colloids, early grafting, light, safe anesthesia.


Standard reference text covering biophysics of burns, histopathology, classification and healing criteria, mortality, shock, toxemia, metabolic, endocrine and individual organ response, complications and specialized types of thermal trauma.


Section on fluid and electrolyte therapy in Burns written by J. F. Eagle (pp 172-182) and section on Surgical Treatment of the Burn Portal written by C. R. DeHaan (pp 182-192).

Detailed summary of present status of burns including the following subjects: prevention, prognosis, Civilian Defense planning, replacement fluids, complications, debriding agents, early excision, grafting and homografting, nutrition, hydrotherapy and present status of research.


Outline of early management and principles of reconstructive surgery.


Discussion of recent trends in surgery of cleft lip and palate, ear deformities, cancer, plastic surgery techniques and burns, with emphasis in the latter section on the work of Derganc and Hinshaw on depth of burn, Cope, respiratory tract injury, Fozzard, myocardial injury, Moyer, thermo-regulation, Batchelor, resuscitation of the burned child, Topley, burn anemia, Jackson, MacMilland and Altemeier, extensive primary excision, Feodore and Skurkovich, immunotherapy, and Blocker, convalescent serum.


Papers from a Symposium on Burns held at the University of Iowa. Participants: Ziffren, Cullen, Blocker, Barrett Brown, Altemeier, Butterfield, and Bruner.
II

GENERAL CLINICAL STUDIES
II
GENERAL CLINICAL STUDIES
1) PEDIATRIC THERAPY


Prevention and therapy of burns in children with emphasis on closed methods, surgical excision of eschar and early grafting.


Short article based on case reports.


Report of sodium balance studies in 16 children (Edinburgh) indicating variation in initial urinary sodium retention in magnitude and duration with correlation more with the size of the child than with extent of burn. Discussion of early exudate sodium loss and late loss through open wounds.


Article from Burns Unit at Edinburgh on initial therapy including statistics on 81 cases. The critical burn area in a 12-year-old child is listed as 15%, 8% in an infant.

Case report of child treated with local hydrocortisone.


General and statistical article by Artz and associate covering experiences with 85 children in a 5-year period at the Surgical Research Unit, Brooke Army Medical Center.


Interesting case report.


Comprehensive article on all aspects of therapy.

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Excellent review article on pediatric burns.

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Plan for early fluid management. General article.

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Discusses special problems of this age group.

Review of therapy at Sick Children's Hospital in Toronto covering fluid therapy, general care, including nutrition, and surgical processes, tendency toward early debridement in suitable cases.


Brief resume' of therapy employing Evans formula for colloids, oral alkaline fluids where possible, exposure treatment as indicated. Details of nutritional program outlined.


Outline of solutions in current use with composition and indications for therapy.


Report on 250 pediatric burns at Great Ormond St. Hospital, London, over 12 year period. General regimen including Dextan and blood as replacement fluids, exposure therapy where feasible except for hand. Early physiotherapy.


Report of general treatment during the early phase following severe burns in children with charts for determining the extent of burn, for parenteral therapy and for maintenance fluids. It is noted that severe shock may develop in infants with burns of 8% or more body surface, and in children with 12% or more.

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Practical approach to treatment of burns and other trauma. Rationale and program of fluid therapy in burned children. Warning against excessive use of (1) saline, (2) blood, (3) alkalis which may lower ionized calcium and produce tetany. Urges avoidance of (1) potassium until urinary function is adequate, (2) subcutaneous infusions. Advocates nothing by mouth for 48 hours, a balanced salt solution, and small blood transfusions. Chart of intake and output by age.

Report on excellent results obtained with the use of a specially trained social worker who in a series of home visits interpreted for the family the emotional problems of the burned child following hospitalization and helped also to resolve the mother's own feelings of guilt, inadequacy, etc. Prior to this study it was not realized that a very large number of mothers of burned children required psychiatric assistance as a sequela of the trauma.


2) OTHER CLINICAL STUDIES


   Immersion of partial-thickness burns in whirlpool second to third day after injury with aid of snorkle tube.

General article written according to techniques employed at the Surgical Research Unit, Brooke Army Medical Center.


General review of clinical papers presented at First International Symposium on Research in Burns, including brief summaries on current research and ideas concerning respiratory tract lesions, septicemia, myocardial failure, initial fluid replacement, metabolic changes following burns, infection, excision and grafting, and preventive measures.


Outline of 1953 regimen for early therapy at Winnipeg General Hospital.


Geriatrics burns. Study of problems associated with age. Data from the University of Texas Medical Branch.


Outline of burn therapy, including use of intravenous novocain solution, Alodan and Phenergan initially, fluids according to Wallace's regimen, early excision and grafting for small demarcated burns.


General article on therapy emphasizing physical therapy techniques.


Case reports of experiences from a large service by well-known burn authorities Washington University.


General review article of overall therapy at Birmingham Accident Hospital.


A history of burn therapy, beginning with the early Greeks and Romans and including notes on Wm. Clowes, who wrote the first book devoted to burns in 1591; Richard Wiseman; David Cleghom; Sir James Earle; Edward Kentish, Curling, James Syme, and Joseph Lister.

Prevention of burns: data pertinent to incidence of preventable burns, particularly in Great Britain, with emphasis on accidents in children.


General review article with data on 233 patients (8% mortality), 14 of 19 deaths attributed to septicemia.


   Short general review article.


   Local Therapy and Systemic Effects. Report from Temple University of employment of polarized air for drying of burn eschar and favorable effect on upper respiratory tract.


   General teaching article based upon regimen at Surgical Research Unit, Brooke Army Medical Center.


General article covering principles of treatment of the burned hand during all phases of therapy.


Review of burn pathophysiology and outline of treatment at Notre Dame Hospital, Montreal.

Discussion of management of severe burns from the internists' viewpoint with particular emphasis upon shock and fluid therapy.


Study of morbidity factors in 367 non-fatal burn patients treated at the University of Michigan Hospital 1946-1959, with particular reference to length of hospitalization.


Results of study of 77 burn patients with histopathological findings in 26 autopsy cases.


Employment of hypnotism in 5 patients with favorable results in terms of improved sleep habits, appetite, joint movements, and decreased pain and apprehension with respect to surgical procedures.

Presentation of two devices employed at Lyon in therapy of extensive burns: a plastic tent as an adjunct to exposure therapy (leaving the head outside) and a new type of small, mechanical dermatome.


General management of extensive burns with emphasis on shock therapy. Report of use of pancreatic enzymes for clinical debridement.


Management of the burn patient with respects to scheduling of surgery, preoperative preparation, non-operative considerations, immediate post-operative management and post-operative care of grafts and donor sites.

Outline of regimen at the Birmingham Accident Hospital and justification for establishment of Burns Units in Great Britain.


Experimental study in rabbits and in one burn patient employing an "Evans blue boundary" technique as an aid in distinguishing full-thickness involved areas in anticipation of early excision and grafting.


A review of literature and author's experience, detailed accounts of systemic and local treatment.

Summary of burn management according to acute, intermediate and definite phases of therapy with use of water-bath tank during dressing procedures.


Report from the Surgical Research Unit, Brooke Army Medical Center, of experiences with more than 400 burn patients and detailed studies in 12. Adaptive mechanisms displayed included suppression, constriction and denial. During recovery period constructive attitudes were assisted by interpersonal relations with staff, family, other burn patients, reassurance from photographs, realistic planning with regard to social and economic rehabilitation.


Comprehensive article, including historical review, gross and histological appearance of burns according to depth of involvement and discussion of physical signs of prognostic value.


Outline of diagnostic methods for emergency burn therapy: diagnosis of a "shock case;" diagnosis of the colloid requirement; diagnosis of destruction of red cells; diagnosis of renal insufficiency; diagnosis of electrolyte imbalance; diagnosis of bacterial colonization and infection, diagnosis of the depth of burning.

General review from the literature of systemic and local therapy (including summary of debriding agents under investigation at the time).


An interesting case of lactose in the urine following absorption of lactose powder in a topical agent (originally believed to be glycosuria).


Review of burn problems in general (No statistics available for Belgium) and outline of supportive and local therapy with discussion of controversial issues.

Review of current clinical and laboratory research with respect to burns shock, estimate of extent of injury, replacement of fluids, the toxin-antitoxin problem, germ free animal studies, surface therapy, infection, respiratory tract injury, other problems.


Classification of burns and supportive and local therapy according to shock phase, intermediate phase (through healing) and definitive treatment.

51. Lichtenauer, F. What must the general doctor know about the present day treatment of burns? Ther Gengew 98:403-10, 1959.

Not reviewed, Available in National Library of Medicine.

Description of local therapy with preference for use of an occlusive "pressure" dressing over a sulfonamide ointment; outline of supportive regimen; and principles of skin grafting.


Short general review of accepted methods of burn care.


General review article covering status of burns in 1952 according to shock phase, toxic phase (including use of ACTH and cortisone), local care, and convalescent phase.

Short review article covering all phases of therapy.

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Short article on early care covering burn pathophysiology, extent of burn, fluid therapy according to Evans Formula. (Bombay Hospital)

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Review of burn pathophysiology fluid requirements, experimental hypothermia research, and complications by staff at Emory University.

General review of acute therapy with particular reference to revival of exposure therapy.


Mortality study based on probit analysis of data from Parkland Hospital in Dallas, the Homer Phillips and St. Louis City Hospitals and Kankakee Clinic, Illinois during the years 1944-1951.


Section of 1953 article on assessment of therapy. Analysis of mortality data, summary of local and supportive care, prevention of burns with emphasis on inflammable clothing factors.

General article. Emphasis upon dangers of excess fluid administration in use of formulas. Conclusions with regard to cortisone therapy that it helps to disseminate infections and should be reserved for adrenal cortical insufficiency. Suggestion that sulfasuxidine be given orally to reduce bacterial contamination in perineal and gluteal burns. Warning against overloading with solutes in feeding programs. Thinks 90-150 gm sufficient.


General outline of burn care in each phase with section on burns of conventional and atomic warfare.

Summary of status in 1956 of burn shock theories, blood and plasma substitutes, exposure vs. closed methods of local treatment, the Reese Dermatome, fluid and electrolyte studies, enzymatic debriding agents, and ACTH and cortisone therapy.


Mortality data in Australia; early fluid and local care, and notes on surgical management and anticipated outcome of therapy.

Study of mortality rates from 1939 to 1957 in relation to survival time for fatal burns at the Massachusetts General Hospital. Note that in fatal minor burns other factors than cutaneous injury are at fault. In major burns of less than 90% survival times vary little with extent of lesions. Mortality rates in the first two weeks have fallen. Discussion of factors involved.


Study of 932 patients at Massachusetts General Hospital, of whom 181 developed respiratory difficulties. In 106 deaths in this series, 46 were attributed in part or wholly to respiratory tract damage.


Report from Massachusetts General Hospital on facial burns complicated by respiratory tract injury, especially in lesions sustained by persons in enclosed areas.

Principles of therapy according to the Duke University regimen (Evans formula with use of blood as part of colloids, occlusive layered dressings; Trilene analgesia; mechanical excision of eschar with emphasis upon special burns and techniques of cutting skin grafts.


Short article on resuscitation and early local care of burns.


Report of 31 patients over a 15-year period at Passavant Memorial Hospital in Chicago. Review of pathology, therapy, complications and reconstructive procedures required.


General article outlining burn regimen with use of hemoglobin and urine volume and specific gravity as guides to fluid therapy; closed treatment with dry dressings.
79. Romanos, G. J.  
The treatment of eye burns.  Trans Ophthal Soc UK 79:71-9, 1959. '3 refs'.

Data from East Grinstead between 1940 and 1950
with emphasis upon first-aid therapy of the eye-
lids and cornea in thermal and chemical (lime)
burns and indications for corneal grafts.

80. Ryan, R. F.; Lorgenecker, C. G.; Vincent, R. W.  Effects of preg-

Following clinical observation in 2 patients of
improved survival following burns and rapid
healing during pregnancy animal experimenta-
tion was undertaken in 75 pregnant rats with
standard burns. Differences observed between
these animals and controls were not statistically
significant.


Burn estimation chart from the Cooper Hospital
Camden, New Jersey, employing Lund and
Browder figures for estimation of surface area
percentages.


General review of present status of burn therapy with outline of management.


Report of experiences in management of acute burns with use of histaminase. Düsseldorf


Clinicopathologic conference presenting a 50 year old man with second and third degree involvement of more than 45% extent who succumbed to pseudomonas septicemia.


Presentation of formulae developed by Skerlj (Professor of Anthropology, University of Ljubljana, Yugoslavia) on the basis of anthropological measurements. Comparison with accepted methods (Wallace, Lund, et al.) of estimating percentages of surface area.

General management with emphasis upon early local and fluid therapy.

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Report from East Grinstead (in Spanish) of regimen of management of extensive burns, including use of formulas and both open and closed methods.


Methods of prevention of pain to spare the burn patient's nervous system additional trauma; the use of novocain block to decrease capillary permeability as well as for its analgesic effects, and other ideas on the local treatment of the burn wound are discussed.

Use of perirenal novocains blocks and various types of "sleep" therapy as an adjunct to burn therapy; regimen employed at the Vishnevsky Institute, Moscow.


Short article on practical points of care with emphasis on "high-dose" antibiotic therapy systemically and removal of eschar by "dabbing" solutions (combinations of antibiotics in saline). Report of a case who received gamma globulin (daily for 78 days) and one infusion of convalescent burn serum.


Review of regimen as employed for superficial and deep burns in Edinburgh (written in Italian).

Summary of histology, physiology of skin, classification of the burn wound; physiology therapy, and organization of a burns unit.

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Analysis of autopsies of 4 burned patients with suggestion that any complete account of burn injuries and deaths should include adequate and properly collected pathological information, particularly information on the pathology of the respiratory tract.

---


Detailed physical therapy program for all phases of burn care, including proper positioning, exercise, hydrotherapy, ambulation instruction, massage, etc.

A study of burn patient response to injury and hospitalization according to five personality categories. In a series of 47 adults approximately 45% fell into a passive-helpless group and approximately 30% were well-adjusted and cooperative.


Details of a case report with use of hypnosis for relief of pain, improvement of appetite and general morale purposes.


Burns in elderly patients. Recommendation of sodium chloride and one sixth molar sodium lactate in proportion of 4:1 to replace normal saline in fluid formulas; experiences in 26 patients. Recommends amputation to be considered with severe burns of lower extremities.
III

STATISTICAL REPORTS
FROM
HOSPITALS AND BURN CENTERS
III

STATISTICAL REPORTS

FROM

HOSPITALS AND BURN CENTERS


Statistical Data: Report of 76 cases by Swiss burn authority.


Study by probit analysis of 943 burn cases including 86 deaths. Outline of changes in morbidity between 1939 and 1954.

Report of experiences with 400 patients at the Medical College of Virginia and at Royal Hospital for sick children in Edinburgh. General burn regimen outlined.


Report from Surgical Clinic of University of Turin with data from 1949-1955 (276 cases) and outline of general regimen with 5% mortality.


Pediatric Burns. Statistical Study with particular reference to etiology.

Statistical study with particular reference to etiology and factors affecting mortality and morbidity.


Statistical study. Classical reference article on factors affecting burn mortality. Data obtained from Birmingham Accident Hospital.


Statistical study of anticipated mortality according to age and extent of burn based on 2807 cases. Revision of 1949 article.


Statistical Data: Review article with data covering 488 hospital admissions and analysis of burn deaths in relation to age, extent, alcoholism.


Report of seven cases treated without colloids since previous article.

Mortality tables on burns in England and Wales from 1949 to 1959, with the notation that new housing with safe heating would be the best long-term preventive measure.


Report of procedures employed as routine at the Birmingham Accident Hospital by the founder of the Burns Unit at this institution.


A review of the initial 2 years of operation of a special burn unit in a private general hospital (St. Mary's, Milwaukee). including notes on the unit area and equipment, number of patients, and treatment.

Statistical Study of fatal burns at Massachusetts General Hospital from 1939 to 1957 with implication of respiratory tract damages as principal cause of death.


Not reviewed. Article available in National Library of Medicine.


Review of 3 year results in use of exposure technique with outline of general regimen. See also 1957 review.

Report of experiences with 520 burn cases at Basingstoke with particular reference to mortality in patients over 60. Outline of supportive and local therapy (whole blood, dextran, exposure therapy by choice.)


A review of mortality figures on 1837 burned children admitted 1942-55 to The Hospital for Sick Children, Toronto, including information on sex, age, area burned, treatment and grafting, length of hospital stay, and a detailed analysis of the 52 deaths which occurred (a mortality rate of 2.8%).


Not reviewed. Article available in the National Library of Medicine.

Records of 402 burned patients admitted to the Accident Service of Radcliffe Infirmary, Oxford, during 1942-56, mortality rate 6.9%.


Statistical review of 148 patients with 5.4% mortality.


Statistical review of 170 patients in 11 years with resume of recent advances in supportive therapy.

Not reviewed. Article available in the National Library of Medicine.


Not reviewed. Article available in the National Library of Medicine.


General data with particular reference to etiology and implication of parental neglect or carelessness.

A review of the burn center at St. Mary's Hospital Milwaukee, with notes on improvements in the initial physical facilities and therapy made during 2 years of operation.


Notes and photographs of a newly opened (1959) burn therapy center at St. Mary's Hospital, Milwaukee, including information on physical facilities and the appointment of a staff burn team.


A review of 352 severe burn cases at Cook County Hospital, Chicago, all treated by the open method with notes on etiologic factors, associated injuries, therapy, complications, number of deaths and factors which the author believes contributed to this low mortality rate.

Not reviewed. Article available in the National Library of Medicine.


Not reviewed. Article available in National Library of Medicine.


Classification of burns with statistics on mortality at Sklifosovsky Institute, Moscow. See also Bull Soc Int Chir 18 491-6, 1959.

Not reviewed. Article available in the National Library of Medicine.


Not reviewed. Article available in the National Library of Medicine.


Report of 2 years experience in a burns center with 515 patients.

Review of the literature with report of experience at the Dusseldorf Dermatological Clinic.


Analysis of 116 home accidents with emphasis on measures for prevention, especially in children.


Statistics covering 528 superficial and 252 deep burns (4.2% overall mortality). Review of changes in morbidity in relation to therapy.
IV

MASS BURN CASUALTIES,

DISASTER PLANNING, RADIATION BURN RESEARCH
IV

MASS BURN CASUALTIES

DISASTER PLANNING, RADIATION BURN RESEARCH


Mass Burn Casualties--delayed radiation effects in survivors of atomic bombings in Japan. Important article.


Mass Burn Casualties--General outline by former Surgeon General.


Mass Casualty Therapy--Teaching article for armed forces personnel. Revised in later publications of Artz and co-workers.

Mass Casualty Therapy. Article by U.S. authority directed toward armed service personnel in training course.


Specific recommendations for treatment of civilian population. Excellent article by well-known British authority.


Experimental Burns and Radiation Studies. Data from early research in this field.

A review of exposure treatment of 35 patients burned in an explosion of aviation gasoline on an aircraft carrier.


Experimental studies in 3000 small burns and 164 large area lesions in pigs (produced by carbon arc) to determine protective effects of clothing. Conclusions: reflectance of material (light colors) is important for protection, as is separation of fabric from skin by an air space. A heavier material affords more protection than a thin one but 2 layers of fabric are better. Fire-retardant qualities are important in keeping material from disintegrating but do not affect degree of severity of the injury.


Radiation research. Study in experimental carbon arc burns in pigs with modification of spectral distribution by filters (University of Rochester, Atomic Energy Project).


Outline of the Middlesex Count. Plan for emergency care of major and minor burns by lay personnel, if necessary. Includes "5 and 10 method" of sorting.

Statistics with relation to 9-year resurvey of approximately 800 Texas City Disaster victims.


Summary of data obtained from victims of the Texas City Disaster. Basic reference article.


Summary of principles of triage and therapy.


Emergency measures for treatment of mass casualties. Outline with major emphasis on prompt sorting and classification as to area and depth of burn. Priority for treatment and general and emergency treatments are discussed.

Radiation Burn Research: One of a series of studies in experimental irradiation.


Mass Burn Casualties and Radiation Research. Report of experimental studies in dogs subjected to 20% deep second degree burns combined with 100r external body radiation. Increase in mortality from 12% for burns alone to 75%. Bacteriological studies indicate early streptococcus invasion in combined group from radiation depression of immune responses (mortality reduced by penicillin therapy).


Basic Research in assessment, prevention and treatment of radiation effects.

A summary after 8 years on the surgical repair of the hands of the first known patients (4 men) with atomic radiation injuries sustained at Eniwetok Atoll showing that all patients were back at full-time jobs with no amputations. It is noted that these were not thermal injuries, but "pure atomic radiation" injuries.


General article on early mass casualty therapy.


Radiation Research: Review of studies since 1948 including apparatus techniques, thresholds for burning injury in terms of calories/sq. cm and clinical aspects of burns of first, second and third degrees. Results are believed to represent uninfected atomic weapon lesions.

Radiation Research: Report of ineffectiveness of therapy with above named agents to prevent blister formation in flash burns.


Brief report of experiences in treatment of 74 patients in Chicago School fire, including use of convalescent serum in 6 cases.


General article on early therapy with report of hypothetical case.

Fairly comprehensive article on casualty planning with discussion of logistics in relation to supplies.


Report on delayed radiation effects. Follow-up study.


Mitotic index of bone marrow is suggested as a rapid biologic index of radiation exposure. However, in the event of a major disaster when complete studies would be impossible, a leukocyte count would probably be the most useful test. Data also are presented on the 50% lethal dose of radiation for human beings.

A review of experiences with patients following the Iroquois Theater fire in Chicago in 1903, in which 602 patients were killed and 16 hospitalized. Early mass casualty report of historical interest.


Experimental Burns -- Radiation Studies.


Official Armed Forces Manual covering types of wounds and injuries, response of the body to injury, wound management, regional injuries.

Experiences with 74 casualties in the "Bennington" fire. Advantages of exposure listed with contra-indications: circumferential lesions, small demarcated burns for early excision, other patients who require transportation.


Important early study of experimental flashburns in human volunteers with analysis of physical factors involved.


Follow-up on treatment of patients with radionuclide burns (from atomic, cyclotron, cathode ray, x-ray sources) of the hand. Results indicate conservative treatment (avoidance of early amputation) was effective. Hand functions have been restored and fingers saved by anticipating progressive breakdown and by early resection and skin grafting.

Behavior patterns of people under stress during World War II bombing attacks, the atomic attacks in Japan, and in Civil disasters are discussed. Advance training and preparation are vital as preventive measures.


Experimental burns with specific reference to spontaneous and experimentally induced pain.


Outline of an evacuation system and temporary hospitalization facilities of mass casualties following an atomic disaster.


A summary of the findings of the atomic bomb casualty commission, 1947-1959.

Not reviewed. Article available in the National Library of Medicine.


Reduction of the number of patients and an increase in "medical manpower" are advocated as essential steps in any effective program of mass disaster care. These may be accomplished by (1) evacuating any likely target area of all but necessary personnel; (2) educating the public in self-help, and (3) careful sorting of injuries. Suggests a "self-help canteen" for minor burn patients, who could go through a "cafeteria" line for drugs, dressings, etc.


Short case report of accidental injury from P32.

Discussion of various developmental stages of fear and suggestions for prevention and treatment of panic states.


Discussion of role of blood in disaster and suggestions for storing of synthetic expanders and hemoligos serum for use to supplement blood.


Discussion of therapy with particular reference to a new anabolic steroid preparation.


Measurement of vertical flame speed of various materials. Caution against open fires and loosely fitting garments rather than type of textiles per se.

Experiments with rats, mice, guinea pigs, and dogs on the effects of whole body x-irradiation on the susceptibility of the animals to the shock of thermal burns.


Discussion of the problem of mass treatment of burns in atomic warfare in terms of types and number of expected injuries, with local wound care suggested as the primary "bottleneck" in any mass treatment program.


Discussion of general burn treatment under mass disaster conditions; emphasizes that both the correction of physiological disturbances which occur with large burns and the local treatment of the burn surface must proceed simultaneously not only to save lives but also to conserve manpower at a critical period.
43. Medical Field Service School, Brooke Army Medical Center---Instructor's Guide and Training Program for Army Medical Service Personnel in Emergency Medical Care, 1963.

Outline of program for training of military personnel in emergency principles and techniques and for mass casualty sorting and treatment procedures.


Discussion of necessity for setting up priority standards for triage and treatment of patients on the basis of radiation-plus-burn, or, for practical purposes, distance-plus-burn-plus-complicating injuries. These considerations have been influenced by the threat of fall-out damage, taking into account winds and weather, also by developments in the size, nature and potentialities of the nuclear weapons.

A research report on the emotional impact of two natural disasters occurring one year apart in San Angelo, Texas. Evidence indicates that effects were stronger and longer lasting than the economic problems involved, although loss was referred to by the victims mainly in terms of economics.


Early experimental studies on flash burns with establishment of physical criteria.


Major compromises in normal burn therapy mandatory in case of nuclear disaster—including the exclusion of patients with less than 15% or more than 40% body surface burns from high priority treatment.

Short article on experiences at the Surgical Research Unit at Brooke Army Medical Center in air evacuation of patients. Includes requirements for personnel and equipment.


General article with regard to sorting procedures for injuries.


Study of combined effects of burns and irradiation in dogs with particular reference to depression of host resistance to blood stream infection.


General article emphasizing 1) oral fluid therapy when possible, with blood and plasma or plasma substitutes for those who would receive the most benefit from it; 2) both closed and open local therapy, 3) "an early and vigorous" feeding program; 4) burn centers established for debridement and skin grafting.

A report on 11 severely burned patients (ages 10-12) from the Cleveland Hill School Fire and, based on this experience, some suggestions for the care of burn casualties in mass disasters.


Discussion of general burn disaster rules, including necessity for rapid screening and sorting of casualties; initial care of the burn wound ("protect it and forget it"); anti-shock measures and fluid therapy.


Emphasis on the necessity for self-care or "buddy-care" as much as possible in the treatment of burn patients following a nuclear disaster. Ideal treatment and necessary compromises in general care are pointed out and disaster kit for civilian self-care is outlined.


Discussion primarily of local care of major burn injuries after the patient has reached a hospital unit, including dressings, debridement and grafting procedures.


Study of a number of materials commonly employed for clothing, with emphasis on danger of loose fitting garments and untreated cotton in non-flash burns and protection in flash burns dependent upon weight, thickness, color and treatment of materials with flame retardant chemicals.

Animal experimentation emphasizing major qualities of fabrics commonly employed for clothing with analysis of ability to protect or failure to protect against thermal injury. Gross and microscopic grading of severity and analysis of healing time.
EMERGENCY CARE, EARLY THERAPY
AND REPLACEMENT FLUIDS
EMERGENCY CARE, EARLY THERAPY
AND REPLACEMENT FLUIDS


   Use of periston-N as a plasma expander.


   General teaching article by late well-known authority, advocate of closed methods.


   Review of literature and case report by Swiss burn authority. Material included in textbook.

Short article by well-known Swiss burn authority.


Experiences with use of mixture of blood (400 cc), plasma (250 cc) and saline (350 cc) with rates of flow and total amounts dependent upon severity of burn and response to therapy.


General teaching article according to 1956 Army Surgical Research Unit techniques,


Use of ataractic drugs as an adjunct to early therapy by Chilean woman surgeon.

Calculator developed at the Surgical Research Unit at Brooke Army Medical Center.


Plan of approach for immediate hospital care. General teaching article. Material included in textbook of Artz and Reiss.


Teaching article by burn authority notable chiefly for emphasis on individual evaluation and use of lactated Ringer's solution.


Clinical studies (Copenhagen) in 22 patients, employing fluids as advocated by Wallace.


Argument on basis of author's clinical observations on timing of fluid therapy. Strong proponent of tamic-acid silver nitrate local regimen.


Clinical experiment demonstrating safety of pasteurized pooled plasma from standpoint of hepatitis incidence.


Teaching article directed at nursing personnel.


Early experience with P. V. P. in eight patients.


Presentation of a burn therapeutic regimen which emphasizes methods of Weber, Vilain, Deleuze, Lorthoir (use of Plasmagel, neuroplegics, therapeutic agents to control hyperammonemia, etc.).


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Experiences in several hundred children with use of single parenteral solution consisting of 2/3 saline, 2% protein, 5% glucose given during the first 48 hours to replace all fluid needs.

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Discussion of Eagle's solution as replacement fluid. Formula of 0.67% NaCl, 2% protein and 5% glucose supplied by one unit of plasma, one unit 5% Dextrose in H2O and one unit 5% Dextrose in Saline or 2 gm serum albumin per 100 cc of combined solution of two units of 5% Dextrose Saline and one unit of Dextrose H2O. Rate of administration 20 cc per percent of involvement per hour.


Presentation of "Evans" formula as a guide to fluid therapy on basis of percentage of involvement up to 50%.


Outline of burn regimen at the Medical College of Virginia with report of standardized dry burn dressing and notes on closed versus open methods and ACTH therapy.

Report that dextran alone is sufficient except in anemic patients or those with extensive 2nd or 3rd degree burns.


Report of studies in nine normal subject and ten burn patients with extracellular S35 fluid volume studies.


Discussion of saline therapy in burns as "unphysiological saline" because of high chloride content and description of a more physiological "balanced" electrolyte replacement solutions.

Experimental studies in monkeys emphasizing necessity for fluids and electrolytes to replace quantitative and qualitative losses in the extracellular fluids as well in the vascular compartment.


Objectives of early therapy: adequate circulating blood volume; replace sodium and water losses in edema fluid, control the anemia which develops. Experimental and clinical experience demonstrates that with various combinations of fluids the period of survival of potentially fatally injured animals and patients (50% critical level) may be prolonged but ultimate recovery appears not to be related to early fluid therapy.


Report of use of Macrodex for maintaining osmotic pressure in the circulating blood and relieving aggregation of blood cells in 125 patients (only 8 over 30%), combined with use of closed tent employing 100% oxygen. Macrodex administered as follows:
5-10% 1-2 liters/12 hours;
10-20% 2-4 liters/24 hours;
20-30% 3-7 liters/36 hours;
30-40% 5-10 liters/48 hours;
40-50% 8-12 liters/60 hours; etc.


Outline of fluid therapy according to Evans formula, employing urinary output and clinical response as a guide. Other supportive treatment included.


Detailed treatment for the first 48 hours.

Comments on Evans formula (insufficient colloid for children, overestimation for adults), dextran with blood recommended rather than plasma.


Early treatment. Review of experiences with dextran at the Medical College of Virginia Burn Service. See 1962 reference.


Summary of 11-years experience with dextran at the Medical College of Virginia. Discussion of action as a plasma volume expander and an osmotic diuretic. No finding of prolonged bleeding or anaphylactic reactions, although these have been reported in non-burn patients. Experience with dextran as replacement therapy with blood in major burns, without blood in lesions up to 25%.


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Discussion of criteria for plasma dosage in burn shock. Use of Evans Blue intravenously for staining of necrotic tissue to determine depth.

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Discussion of value of dextran as an emergency plasma volume expander for civilian and mass casualty therapy. Comments on the small present demand for production.

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Analysis (from the Mayo Clinic) of properties and action of dextran as a plasma volume expander. Report of histologic studies in parenchymatous organs.


Continuation of previous study: Clinical experience with dextran in burned patients. Recommended primarily for use in early shock phase and as an adjunct to whole blood.


Project at Lima, Peru. Comparison between two similar groups of burns, one treated with large volumes of isotonic saline, largely oral (not hypotonic saline), and one with colloids, dextrose, water and little sodium, by vein. Conclusion that groups were comparable in mortality and that saline group did better clinically than those who received no salt. Conclusion--colloid therapy inferior to saline.


Report from the Lima Study group indicated the value of isotonic saline in treatment of adult burns but emphasizing the difficulty of employing large quantities of oral isotonic saline because of lack of palatability, vomiting and diarrhea.

Additional data from Lima Project on 153 adults and 185 children. In adults saline therapy alone (0% mortality) had a lower mortality and morbidity than colloid (plasma) and dextrose in water without saline or only very small amounts (12% mortality). In children burns of 30% and over were almost invariably fatal. A total of 20% mortality in shock period in 110 children. When plasma was added to saline mortality dropped to 9%.


A clinical study to evaluate the effects in small groups of burn patients of (1) saline solutions given during the first 48 hours postburn on shock and late mortality and (2) the addition of saline solution (instead of glucose and water) to plasma therapy (40%-50% of that recommended by Evans) on mortality during the shock period.


Study of rate and composition of fluid losses; composition, volume and rate of flow of replacement based on data from the Surgical Research Unit, Brooke Army Medical Center. Therapy outlined.


Use of solutions consisting of 2/3 normal saline in 5% glucose containing 2% protein (as serum albumin); this is the single solution used.


Preliminary report of four clinical cases in which 4% in 5% urea in dextrose was substituted for salt solution with colloids. Urine volume was maintained at 2-3 ml. per minute. Improved urinary output observed.


Report of three pediatric cases in which hypertonic NaCl was given with evaluation of fluctuation in urinary pH. Conclusion that increased adrenal activity does not produce obligatory Na retention in excess of serum concentration and that pH determinations may serve as a guide to therapy. Recommendation that potassium treatment be started on 3rd to 4th day postburn.

Comprehensive review of indications for dextran therapy.


Advantages of resuscitative therapy with human albumin compared with other colloids. 100 ml. corresponds to 350 ml. of plasma or synthetic plasma expanders.


Brief summary of essentials of early care (Brooke regimen).


General article advocating 6% dextran in saline instead of plasma, six cases reported in detail.


Comparison of mortality in a small group of severe burns treated at Parkland Hospital (Dallas) 1944-52, who received whole blood, plasma and saline with a large group of cases 1952-56 treated chiefly with saline. Patients with tracheobronchial lesions excluded, as well as elderly patients, burns of over 65% and less than 15%. Burn index employed rather than true depth. Inferences drawn with regard to influence of therapy on mortality, particularly during shock phase.

Appraisal of burns, reevaluation of pathological changes, initial supportive therapy (Evan's formula).
VI

LOCAL THERAPY; TOPICAL

AGENTS: LOCAL INFECTION
VI

LOCAL THERAPY; TOPICAL
AGENTS: LOCAL INFECTION

1. Adamczak, T.; Maciejczyk, S. Local Burn Treatment with Silicones

   Paper given by Polish surgeons at Czech International
   meeting on Burns, 1960, advocating use on minor burns.

2. Arden, G. P. The prevention and treatment of infection in burns by

   Topical application of 15% M and B cream in combination
   with dressing. (115 pts) For control of infection it was
   found to have no advantages over penicillin. Recommended,
   however, as a possible first-aid dressing because of drying
   qualities.

3. Artz, C. P. Practical techniques in the care of the burn wound. Amer
   Surg 24:593-9, 1958. 6 refs.

   General review article by well-known burn authority.

A general review of present status of exposure therapy, including 10 years experience since its revival as a modern technique. Important article by noted authority.


Basic types of defects and discussion of techniques involved in burn scar reconstruction.


Experiences with these agents applied in preparation for grafting and on graft site.

General discussion for nursing personnel of early local wound management in burns.


Initial treatment and local care. Short article.


General background article in controversy between closed and open method in early 1950s.

General teaching article on local care from initial stages to skin grafting.


General teaching article with regard to face burns.


Local therapy of the burned hand in initial treatment.


Preliminary experimental study with topical agent.

Experiences in use of topical agent.


Comparison of cases employing closed and open methods with particular reference to morbid factors. Data from the University of Texas Medical Branch.


Discussion of role of local therapy in the burn regimen history and rationale of the exposure method, indications and contraindications.

Local and systemic therapy with reference to pre-grafting and grafting phases.


Comprehensive article describing techniques of burn care as employed during recent years on the Burns Service at the University of Texas Medical Branch, with emphasis upon mechanical cleanliness and water micro-debridement and handling of grafting phase.


Case report involving use of topical bacitracin spray.

Indications for hydrotherapy.


Study relating dressings with wound healing.


Preliminary studies with polyvinyl plastic spray in acute burn wounds following experimental use in pigs.


Limited clinical study.

Review of the literature with reference to therapy of the burned hand and general methods of management.


Review of 134 cases treated with an antihistamine jelly (Andantol-Gellee).


Experimental studies with conventional "pressure" dressings, alone and aided by incorporation of inflatable bladders.  Initial pressure of 20 to 40 cm. of water falls rapidly and sustained pressure results in no clinical advantage.  Reports of experiences with aluminum foil in dressing.

Simplified techniques with emphasis on mechanical cleanliness and use of single layer dressings.


Employment of skeletal traction devices to aid in exposure of circumferential burns.

Local wound therapy from the standpoint of debridement, grafting, and prevention and treatment of contractures.


Use of topical ointment in 12 clinical patients.


Advantages of uses of Zinax gel (partially hydrolyzed casein and zinc acetate) gauze in a large series (581) of localized industrial burns in comparison with 1945 treated with vaseline gauze.

Six case reports of very extensive deep burns of the face and scalp with osseous involvement. Operative management and results.


Report of a case with identical burns of both legs in which epidermis was removed from one side. Water loss was measured and clinical data recorded. Results indicated that conservation of epidermis favored rapid local healing and better end result.


Evaluation with respect to (1) regional lymph adenopathy, (2) temperature, (3) wound pain, (4) edema, (5) bacterial contamination and (6) rate of healing of 10 methods of local burn therapy in 100 volunteer patients, each serving as his own control.

Review of management of hand burns (Budapest) with particular reference to electrical burns and emphasis upon necessity of employing both orthopedic and plastic techniques in respective procedures.


Use of an antibiotic spray in 21 patients with second and third degree burns.


Report of favorable results with tetracycline-oleandomycin as routine prophylactic and therapeutic antibiotic in 502 patients in Rosario, Argentina.


Clinical experience with Triburon ointment in 10 patients.


42. Glenk, G. Local treatment of 1st and 2nd degree burns with badional gel
Zbl Chir 78:385-9, 1953.


43. Gonzalez-Ulloa, M. Treatment of burns: evaluation of the advantages


44. Grant, J. C.; Findlay, J. C. Treatment of burns and scalds

Report of beneficial results in use of gauze-soaked chlorhexidine as topical agent in 108 cases.
Comparison with 92 previous cases.

Description of converted tub for use in association with water spray in mechanical cleansing of burn patients.

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History, indications and technique of exposure therapy.

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Outline of management of hand burns at the Surgical Research Unit, Brooke Army Medical Center, with particular reference to positioning devices.

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Review of open and closed methods.


Serial histological studies in experimental animals (pigs) with burns treated by dressings and by exposure. Marked absence of infection in open burns with more rapid healing (average difference 2 weeks).


Comparison of results with tulle gras and silver dinaphthylmethane disulphonate tulle in second degree burns.


Experiences in use of exposure in Korea and discussion of mass casualty applications.

Report from Surgical Research Unit, Brooke Army Medical Center. Local antibiotics were found to have no beneficial effects in control of bacteria colonizing burn granulations.


Recommendation of closed methods as initial therapy.


Note on use of saline-detergent bath to facilitate removal of burn dressings.

Experiences with sterile gelatine. (Vulnogelat).


Analysis of criteria for a local emergency spray for pain and report of experience with a preparation containing benzocaine in a special oil base (as an adjunct to exposure therapy).


Indications and techniques for incision through constricting eschars encountered in conjunction with exposure therapy of extremities.

Preliminary observations in 30 cases with exposure therapy.


Short article advocating use of an aerosol spray containing 20% dissolved benzocaine for relief of pain and first aid use in combination with injection of analgesic drug. Experience in 700 industrial burns.


Important reference article. Use of exposure therapy advocated to promote cool, dry surface and expedite management of acute extensive burns (Edinburgh).

Experiences at the Surgical Research Unit at Brooke Army Medical Center over a 2-year period, employing exposure therapy for the early postburn phase and thereafter covering with fine-mesh petrolatum gauze prior to grafting and coarse-mesh gauze impregnated with paraffin (Parresied Lace Mesh Gauze, Abbott Laboratories) as a dressing for grafts. Results in 155 skin grafts on 55 patients.


Summary of results in 22 patients.


Studies at Birmingham Accident Hospital with prophylactic topical chemotherapeutic agents employed in both closed and open methods of local care. Neomycin-chlorhexidine tulle gras was considered superior to penicillin cream in dressings cases and "polybactrin" spray to penicillin-lactose powder in exposure patients.


Discussion of compression dressings in relation to wound healing and use of other methods; technique of application.


Experiences in 24 patients with a mixture of bacitracin, neomycin, polymyxin B Sulphate, pyruvic acid, etc. in a soluble vehicle.


Local therapy outlined including use of enzymatic debridement for small localized wound.

Use of surgical decompression to prevent the added trauma of vascular damage to primary destruction of tissue in burns. Case presentations.


Report of 3 cases treated with enzymatic debridement.


General principles of hand care (adequate circulation and elevation, early skin coverage, vigorous and early physiotherapy) with note that hands are involved in over 80% of burns seen at the Surgical Research Unit, Brooke Army Medical Center.

Use of tub baths at 102°F for 20-30 minutes in post-shock phase, in preparation for grafting, (Hubbard tank) and for underwater exercise.

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Recommendation that deep burns be excised early with application of a full-thickness flap unless vascular thrombosis is present in which case grafting should be delayed, as in high tension wire electrical burns.

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Report of experimental data in rats (See previous article) and suggested outline of first-aid therapy, employing removal of heated clothing and immersion in cool water or application of cold compresses "until the doctor comes."


Prevention of complications in deep leg burns by use of an orthopedic device for positioning and exercising while at bed rest.


Use of amniotic membranes from a tissue bank to protect partial-thickness burns, contraindicated in full-thickness lesions.


Short case report in which uninvolved prepuce tissue was utilized for cover of lateral surfaces of the penis.

Report of experimental reduction of local edema by immersion of burn within 1 minute of injury into cold water. Treatment for 15-30 minutes.


Short general article on role of physical therapist in the rehabilitation program for the burn patient.


Use of Brno (Karfik director) of large burn pads stitched with tapes and designed to resemble clothing. Easily and quickly applied and held in place with stockinette. May be employed as dressings irrigated by use of Carrel drains threaded into the inner layer of gauze.


Experiences with a large series of burns of less than 20% employing application of cold compresses or immersion of injured part in ice water.


Use of gel for burns and other pathology.

In an evaluation of minor burn therapy regimens that can be administered by lay personnel, it was found that 2 drugs (vaseline gauze and phisohex) were superior when evaluated from the viewpoint of healing time of the burn wound. Human volunteers used in this study.


Report of 22 cases treated with a gel of hydrolized casein, sodium lactate, and sodium lauryl sulfate covered by 4-ply coarse-mesh gauze impregnated with zinc acetate.


Use of foil as dressing over granulations and to prevent adherence of raw wounds to bed clothing or operating table sheets.


Use of a spray of terramycin and hydrocortisone followed by open treatment.

Examination of the feasibility of the first-aid treatment with cold water proposed in treatment of mass burns.


General principles of management of hand burns with use of local ointments, early active and passive motion, early grafting, use of Bunnell and other splints.


Experiences with exposure therapy with and without topical agents. Hydrocortisone ointment felt to be contraindicated.

English abstract of report of 320 burns (265 hospitalized) in 3-year period. Mortality of 4%. Staph aureus most predominant organism. Use of exposure in combination with burn pads in circumferential burns. Early excision for burns of less than 20%. Surface disinfectants employed as an adjunct to exposure. No discussion of supportive therapy.
VII

ANESTHESIA

PRE-GRAFTING AND GRAFTING TECHNIQUES
VII

ANESTHESIA

PRE-GRAFTING AND GRAFTING TECHNIQUES

1) ANESTHESIA


Comprehensive article for reference from the Surgical Research Unit, Brooke Army Medical Center. Detailed techniques for each phase of anesthetic management on basis of physiologic and pathologic changes. Discussion of special problems of myocarditis, endotracheal intubation indications and problems, hypoanalgesia, inadvertent hypothermia in the Operating Room, impaired pulmonary diffusion and arterial oxygen desaturation.

Report of cardiac arrest in burn patients during induction of anesthesia due to vagal overactivity from administration of suxamethonium or to intubation. Preventive i-v atropine injection advocated.


Report of increased incidence of cardiac arrest immediately following intubation in operative procedures for burns as compared with other conditions. Subsequent use of hypnotic analgesia in susceptible individuals.


A general article on the use of anesthesia (for premedication, for surgery of severe burns, and in the recovery period) in burn cases involving children. Based on clinical work with 500 cases.


Outline of the anesthetist's role in resuscitation, blood loss estimation, transfusion and anesthesia during surgical procedures.

Review of agents employed for analgesic purposes and report of use of sernyl in 50 cases. Complete analgesia in 78%, transient side-effects in 50% of children over five.


A study on the choice of the type of anesthesia to be used in surgery of burns along with an evaluation of the "take" of grafts with reference to the type of anesthesia used.


General discussion of pain responses followed by summary of experience at Duke University Hospitals with tri-chlorethylene administered through a special face mask and controlled and regulated by the patient himself. Advantages listed together with specific indications.

Outline of anesthetic techniques employed at Birmingham Accident Hospital, 1948-1953, with analysis of poor risk factors and complications encountered.


Presentation of the pathophysiology of burn wounds as it concerns the anesthetist, along with recommendations of types of anesthesia to be used for adults and children when changing dressings.
2) CHEMICAL DEBRIDING AGENTS


   Experimental studies with relation to debriding agents in the laboratory animal.


   Topical Agent for Debridement. Early stud.


Report of favorable experience with papain in 20 patients with a variety of conditions, including 6 partial-thickness and 6 full-thickness burns.


A report of extensive studies in experimental third degree burns.


Clinical trial of ethizyme in seven cases with deep burns and three cases with post-surgical skin necrosis. Favorable results reported with only minor complications.


Use of guinea pigs in an experiment designed to measure quantitatively the effects of nine proteolytic enzymes in the lysis of burn eschars.


Case reports of local treatment with chemical debriding agents.


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Clinical experience in 16 patients with small localized burns with 40% salicylic acid followed 24 hours later by application of ficin in pyruvic acid for 48 hours.

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Nine Case Reports of use of Viokase.

A report on a method of bioassay of four proteolytic enzymes to test their effectiveness in debriding 3rd degree burn eschars; guinea pigs were used as experimental animals.


Short review of other debriding agents and report of use of Tryptar in an acute burn.
VII

ANESTHESIA

PRE-GRAFTING AND GRAFTING TECHNIQUES

3) PREGRAFTING AND GRAFTING PROCEDURES


Technical report of simplified handling of donor areas, method employed by a number of centers.


Experiences with early excision of the burn eschar.


General article.


Massive Early Excision. Case reports in seven patients with immediate grafting.


Reference article on cadaver grafts.

Mass casualty implications of use of postmortem homografts in severe extensive burns.


Evidence of employment of sheet grafts in preference to postage stamp grafts. Institute of Burns and Plastic Repair, Buenos Aires.


Report of two cases of early massive surgical excision (approximately 50%) with good results.

"Salvage" of four of patients estimated to be in 95% (+) mortality group (University of Rochester).

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Presentation of experiences with early excision in stages on McCormack's service at University of Rochester.

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Case reports with discussion of improved cosmetic results following removal of granulation tissue and use of thick partial-thickness grafts.

Report of beneficial results following early excision.


Use of early excision at Hospital for Sick Children, Toronto.


Report of 43 cases with excision and grafting in 48 hours and 16 within 3-14 days postburn.


Study of a hospital treatment program designed to decrease the number of bed days per burn patient. A total of 77 cases were analyzed prior to instituting this program and 77 analyzed after the new program was started. Hospital bed days decreased from 28.7 days to 22.4 with removal of slough usually between the 3rd and 7th day postburn.


A short general article advocating early coverage in extensive burns with early debridement, autografts and homografts.


Reports of massive debridement in extensive burns (at Birmingham Accident Hospital) carried out successfully but without spectacular results in terms of ultimate mortality. Immediate or very early excision of acute burns recommended only for deep burns of minor extent, the major drawbacks being the severity of stress of major surgery in extensive burns and inability to distinguish between areas of deep second-degree and third-degree involvement in some instances (etiology is perhaps the safest guide).

Summary of previous studies in 45 patients at the Birmingham Accident Hospital with burns up to 20-30% of the body surface. In extensive lesions complete wound closure could not be achieved. No conclusion as to ultimate effect on infection and mortality but present opinion that massive early excision "entails more trouble and anxiety than delayed grafting at two to three weeks."


General article on skin grafting in burn injuries, including notes on early surgical management, types of skin grafts, methods of obtaining grafts, and surgical dressings following grafting.


To meet the need for a surgical dressing that "exerts uniform pressure" and is simple to apply, the authors devised a transparent, pneumatic polyvinyl plastic sheath for dressings of the arm and leg. This was a preliminary report on its use, in three cases. Some problems encountered were sensitivity reaction to the polyvinyl plastic and moisture collection if dressing was applied directly to the skin.

A detailed article on the treatment of the burned foot, emphasizing the value of primary excision and grafting of completely destroyed skin, and indicating the suitability of split-skin grafts for replacement of burned skin on the foot, including its weight-bearing surfaces. Summary of 301 cases.


Report of treatment of burns by general methods, including 5% Sorbitol inactivators, of Proteolytic Enzymes, Mercaptoethylamine and a "cellular protector" combined with abrasion.


Report of comparative studies between 14 patients treated by early excision and 8 by conventional methods. No operative deaths. Morality rate in excisional group of patients was 42% as compared with 75% in the control series.

Summary of experiences with massive excision over a 5-year period at the University of Cincinnati. 19 cases have been treated in comparison with 35 by conventional methods. Conclusion that early excision should be reserved for small to moderate areas of full-thickness burns.


Study of the question of whether or not to remove granulations partially by slicing through exuberant tissue. In spite of the extra blood loss involved, better cosmetic results were obtained when granulations were removed in toto, although the procedure was applicable only for localized wounds.


A report on the care of small or medium-sized burns by accelerated excision and skin grafting (usually by the end of the 1st week postburn).

Report of a technique devised by Meeker and Snyder for local handling of acute burns in preparation for grafting consisting of serial dermatome debriding procedures which remove only the upper layers of necrotic tissue and are carried in depth only to the point where minute bleeding points are reached.


To help solve the problem of skin covering for large burn wound surfaces as quickly as possible, a technique for "sowing" miniature skin grafts is advocated. A cutting apparatus which will cut a split skin graft into small graft particles of approximately a 1-mm. area is described.


Case history with photographs of severe full-thickness lesions involving the lower extremity and the sole of the foot.

General discussion of etiology and therapy of deep scalp burns with case histories and diagrams of zones involved for grafting.


Experience with hydrotherapeutic debridement of burn wound eschar by immersing the patient in the Hubbard whirlpool tank; 35 cases reported.


General principles used by the author and his colleagues in the surgical treatment of burns, based on follow-up studies (between 1 1/2 and 9 years after final treatment) of 235 burn patients who required skin grafting.


Preliminary report of experiences at the Surgical Research Unit, Brooke Army Medical Center, with staged excision in 19 patients with 40% - 82% burns. Outline of regim in employed.


Demonstration of techniques devised by Limberg (Institute of Traumatology and Orthopedics, Leningrad) for treatment of scar contractures. Outline of patterns and discussion of indications for their use.


A brief historical account of changes in burn treatment is given, followed by a discussion of techniques for immediate surgical excision and grafting, which the author considers particularly valuable for hands and feet.


VII
ANESTHESIA
PRE-GRRAFTING AND GRAFTING TECHNIQUES
4) HOMOGRAFTS


Case study of a 9-year-old boy with 80% body surface burns who was treated with homografts from his mother; graft survival was 4 weeks. Two other cases of 60% and 72% surface burns are also noted.


Short article on effectiveness of cadaver homografts as biological dressing in severe burns. Surgical Research Unit experience.


Study on the effect of the burn status on homograft survival in rats with standardized steam burns.
with hypothesis that large homografts of the size employed survive for longer periods than small ones up to a point at which maximum antigenic response would be observed. Homografts applied 4 days following burning survived for a shorter period than those applied 24 hours after injury.


Discussion of preservative techniques for human skin including information on freezing temperatures, storage, the effect of various temperatures on tissue proteins, etc.


Report on synthetic homografts with review of principle materials evaluated to date.

Report from Lyon Group on advantages of employing simultaneous homografts and autografts.


Histological studies of alternating homografts and autografts.


Experiences with lyophilized homografts supplied by the Tissue Bank at Bethesda in the burns center at Padua.

Review of use of lyophilized skin (34,485 sq. inches in 16 patients) as biological dressing in extensive burns. Histologic aspects and general conclusions.


Report of 5-year storage project at Duke University School of Medicine with evaluation of viability of 1) human skin by oxygen consumption, enzyme activity as measured by reduction of tetrazolium dye and tissue culture; 2) of animal skin by simultaneous autografts and tissue cultures; and 3) of corneas by tissue culture techniques for epithelium, stroma and endothelium. Technique of storage: 45°C in 20% glycerol preservative fluid.


Summary of therapy at Central Institute of Traumatology and Orthopedics, Moscow including use of zovocaine block, transfusions, coloids, penicillin, streptomycin, vitamins, cardio-tonics. Also experiences with homografting, employing cadaver skin.

Persistence of 3 x 8 cm. homograft for four weeks in a 7-year-old burn patient with agammaglobulinemia (University of Minnesota).


Summary paper presented at the First International Congress of Research in Burns in 1960. Discussion of factors concerned with attenuation or abolition of transplantation immunity and outline of current research efforts to alter the specificity of transplantation antibody by introducing a variety of aminoacid analogues, aminoacid antagonists and antimetabolites.

Report of prolonged take employing Ashley's techniques, of ribonucleic-acid treated cadaver skin in one human burned patient and of specific enzymatic activity to explain the homograft rejection mechanism.


Study of length of time after death in which human cadaver skin is viable under standard hospital conditions, with finding that skin taken from cadavers stored at 4°C and removed as long as 32 hours following death was viable in tissue culture.


Clinical study of the use of homografts for temporary wound coverage in 50 patients, including indications, sources, storage methods, techniques, and survival period.


A case study of a 5-year-old identical twin with full-thickness burns over 68% of her body, who was resurfaced with homografts (from her twin sister) totaling 570 sq. inches and with autografts of an additional 90 sq. inches. Total hospital stay was 52 days.


Extensive report of lyophilized skin project at the Tissue Bank, U.S. Naval Medical School at Bethesda, Md., from 1951-1960. Project has involved 300,000 sq. inches of stored skin utilized by 72 physicians in 103 severe burns. Discussion of methodology, probit analysis of 89 cases, estimated percentage of primary take (80%), persistence (19 days average), lack of antigenic response, indications, comparison with data regarding fresh homografts.
VIII

ANTIBIOTIC THERAPY AND INFECTION
ANTIBIOTIC THERAPY AND INFECTION


Case Report and discussion.


Unpublished research data from University of Cincinnati Medical School Burn Service.

A study of 1683 patients between 1942 and 1950 in an attempt to determine the effectiveness of chemotherapeutic and antibiotic agents in preventing and controlling postburn infections.


Summary of papers concerning current research on infection following burns, presented at First International Symposium on Research in Burns. Includes brief discussions of the varying opinions on the effectiveness of antibiotic therapy, the influence of gram-negative bacteria, the role of skin grafting in combatting infection, and emphasis on the need for further research.


Case report of severe burn contaminated with the fungus Fusarium roseum, a plant parasite or soil saprophyte. Proteolytic activity actually aiding in separation of the eschar.

Measurement of gamma globulin levels in normal and burned patients at Surgical Research Unit, Brooke Army Medical Center.


Statistical study of 335 patients with reference to mortality based on data obtained at Mt. Vernon Plastic Surgery Center. Emphasis on infection in spite of therapy.


Article based on experiences at Institute of Burns and Plastic Repair, Buenos Aires.

   General article on wound colonization, infection, and methods of management.


    General article. See previous reference.


    Study from Birmingham Accident Hospital with data on topical antibiotic preparations as well as systemic agents.


    Review of cases from Pediatric Burns Unit at Guy's Hospital, London.

Outline of measures employed at St. Vincent's Hospital, New York: prophylactic antibiotics, mechanical cleansing, aseptic techniques, cultures of environmental and wound flora, early excision in burns under 15%, judicious use of enzyme debridement.


A general survey of the problems involved in the treatment of infection in burns caused by Staph. aureus, including the development of strains resistant to antibiotics; bacterial factors; and local and systemic factors involved in bacterial growth.


Report of 8 cases with rash in patients with staphylococcus aureus as the sole pathogen in the nose and throat.


Detailed case report of septicemia by causative chromogenic organism ordinarily considered non-pathogenic. Hypothesis that Schwartzman-like reaction occurred following endotoxemia supported by experimental data.


Attempts to determine if antibody in the sera of burned and unburned individuals measured as native hemagglutinin was protective for mice with induced pseudomonas infection.


Study of 106 burned children and 10 adults who received gamma globulin and were compared with 102 children and 19 adults who did not receive it. In children between 4 mos. and 4 yrs. and in patients having burns of less than 20% surface area, the gamma globulin appeared to lessen the occurrence of septicemias and to reduce total late mortality.


Treatment of experimental burns in guinea pigs with pyocyanus infections. Local agents were ineffective as were intramuscular injections of Polymyxin B. Exposure therapy, which promoted a dry wound, was more effective than other types of treatment.


Study of 106 burned children and 10 adults who received gamma globulin and were compared with 102 children and 19 adults who did not receive it. In children between 4 mos. and 4 yrs. and in patients having burns of less than 20% surface area, the gamma globulin appeared to lessen the occurrence of septicemias and to reduce total late mortality.


Treatment of experimental burns in guinea pigs with pyocyaneus infections. Local agents were ineffective as were intramuscular injections of Polymyxin B. Exposure therapy, which promoted a dry wound, was more effective than other types of treatment.
25. Kurlat, F. B. Bacteriological considerations in burns. Sere Med

Report of bacterial cultures in 29 burn patients
with review of methods and flora.

26. Liedberg, N. C. F.; Kuhn, L. R.; Barnes, B. A.; Reiss, E.;
Amspacher, W. H. Infection in burns. I. The problem and

Studies in burn infection from the Surgical Research
Unit, Brooke Army Medical Center. Description of
facilities, general burn therapy techniques and
protocol for bacteriologic studies and quantitation
of data are presented against a background of
chronological evolution of infection following thermal
trauma.

III. Septicemia, a common cause of death. Surg Gynec Obstet
99:151-8, 1954. 20 refs.

Infection studies at the Surgical Research Unit
Brooke Army Medical Center. Report of wound
culture studies with respect to graft failure;
preparation of granulations and systemic infection.
Effects of topical agents and penicillin.

Experiences with local ointments and topical agents at the Surgical Research Unit at Brooke Army Medical Center.


An experimental study in control and burned guinea pigs injected with pyocyaneus organisms with evidence to show impairment of the antibacterial defense mechanisms.


Guinea pig experiments designed to study differences in bacterial growth in inoculated, incubated blood plasma from burned and unburned animals. Differences noted in cellular response to i-p injection of pseudomonas. Discussion of implications.


Studies from the Birmingham Accident Hospital with regard to development of resistance of strains of Staph aureus and therapeutic trial with novobiocin and erythromycin, in combination, by systemic administration. Discussion of effectiveness of antibiotic therapy on wound cultures in closed and open methods of management with conclusion that better response was obtained with dressings; however, routine chemotherapy against Staph aureus infection in the local wound was not recommended.


Comparative studies of antibiotics indicating that intramuscular methicillin is the drug of choice in treatment of staphylococcal infections and as effective against streptococcus pyogenes as oral tetracycline and erythromycin. Therapeutic effect of methicillin was greater in covered burns.


A series of investigations on the clinical value of prophylaxis and chemotherapy in the treatment of severely burned patients at Birmingham Accident Hospital.

Trial in staphylococcal and streptococcus pyogenes infections in burns indicating that BRL 1621 by mouth is as effective as methicillin given intramuscularly.


Report of a decreasing number of positive pseudomonas cultures since 1958. Whether this phenomenon is related to thorough drying of burn surfaces by blotting techniques following mechanical cleansing and rinsing during dressing changes, or whether spontaneous variations have occurred in the environmental flora is a matter of conjecture.


Data on 172 children and 103 adults in USPHS "Peru Project" with burns of over 10%. Pseudomonas septicemias reported as major cause of death after 48 hours.

A series of experiments on mice which (1) demonstrates the presence of systemic infection during the first 10 days postburn, (2) indicates that chemotherapy lessens mortality during this period, and (3) reports the results of tests with rabbit pseudomonas antiserum for its ability to protect mice from fatal infections following burning.


Study of 100 burn patients with lesions of more than 20% treated without the use of antibiotics. Results were comparable so far as mortality was concerned, with a control series of the same number. Many of these patients had septicemia or repeated positive blood cultures for pathogenic organisms.

Discussion of experiences at the Surgical Research Unit, Brooke Army Hospital with bacterial cultures and therapy of infection. M. pyogenes was the most common cause of septicemia; proteus and pseudo-monas were next. Chloramphenicol, bacitracin, and novobiocin were the drugs of choice against pyogenes, although resistance developed rapidly. Proteus was sensitive to chloramphenicol but resistant to other agents. Polymyxin was employed against pseudomonas. Bacitracin was most useful against resistant staphylococcus. Novobiocin was of limited use. Report of attempts to develop a serum against pseudomonas organisms and discussion of symptomology and methods of therapy.


Detailed studies conducted over a 6 months period with respect to air sampling (open plate and slit sampler) of the burn ward and comparison with wound flora and with samples from the adjacent corridor. Staph pyogenes was the commonest pathogen, followed by pyocyanea. Both air and patients carried the same "resident" pathogens. Therapy and ventilation problems are discussed.

Report of four year study of bacteria flora in small burn wounds in dogs with discovery that severe burns do not sterilize the skin but that remaining bacteria proliferate and may be invasive. Septicemia results only with overwhelming numbers of bacteria carried into the general circulation.


Detailed description of characteristic lesions, symptoms and laboratory findings in pseudomonas infections which occurred terminally in 14 of 38 burn deaths at the Surgical Research Unit, Brooke Army Medical Center.


Review of bacterial flora from exogenous sources and from wound colonization, discussion of local and general infection.

Sterile edema fluid from 24 hour burns is non-toxic when injected into rabbits. Both pathogenic organisms in physiological solutions and "infected" edema fluid produce the same results as are found in burned animals.

49. Tumbusch, W. T.; Butkiewicz, J. V. The increase in the gram-negative gram-positive organism ratio in burn deaths associated with septicemia. (U.S. Army Surgical Research Unit, Brooke Army Medical Center, Fort Sam Houston, Texas, Research Report MEDEW-RS-3-59 October 1959) 7 p.

Not reviewed. Article available in National Library of Medicine.


Not reviewed. Article available in National Library of Medicine.

Summary from the Surgical Research Unit, Brooke Army Medical Center of published and unpublished data on Pseudomonas septicemia: factors in increasing incidence, signs and symptoms and similarity of clinical course to endotoxemia, status of therapy, as yet ineffective against this complication of extensive burns.

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Report of unusual complication of burns in a child following development of septicemia.
IX
HEMATOLOGY
STUDIES
HEMATOLOGY
STUDIES


Experimental Burns: One of a series of renal studies in the burned dog.


Preliminary study from Birmingham Accident Hospital for material reported in 1960 by Davies.


Important reference article with detailed techniques of red cell volume determinations in 110 patients at Birmingham Accident Hospital.

Measurement of disappearance of Fe 59 tagged red blood cells in normal and burned rats (25%). Mean survival time of 42 days in former, 9 days in latter.


Direct measurement of changes in red cell mass (maximum in 4 hours) and studies of osmotic fragility and plasma hemoglobin in dogs with standardized burns. Report of splenic extrusion of sequestered erythrocytes following initial 13% decrease in red cells. Discussion of related work of others. Advocates colloids other than blood to relieve initial 50% plasma loss.

Early important reference article on mechanism of acute erythrocyte loss as a result of changes in osmotic fragility following thermal trauma.


Determinations of disappearances rates of Evans blue dye, Cr\(^{51}\) labeled red cell equilibration studies, plasma and red cell volume determinations in 20 dogs before and after thermal injury and analysis of results in terms of early or late death of animals.


Experimental studies in burned dogs (20% contact burns) and a burned man (16% 3rd degree burns) in which evidence of a depression in hemoglobin formation was found, life span of 2 normal dogs' erythrocytes was about 100-104 days while, in the man, life span of the cells formed during injury was approximately 126 days. Other physiological and biochemical data also were gathered.

A study with rabbits to determine the effect of pretreatment with heparin on the concentration of 5-hydroxytryptamine and platelets in whole blood following experimental burns. Without pretreatment, it was noted that there was a decrease in the number of circulating platelets and a subsequent decrease of 5-HT following the burn; this did not occur when the rabbits were pretreated with heparin.


Burns equivalent to those which would follow a nuclear explosion were administered to rats and the effects of these flash burns upon the destruction of red cells measured with regard to intensity of irradiation, length of exposure, amount of body area burned, and destruction of normal cells following burning.


Reports of animal and human research on the occurrence of sludge in blood circulation following burns, including studies using horizontal microscopes.

Red cell survival time studies in acute burns and during convalescence indicating correlation to some extent with the severity of lesions.


Hematologic study in pigs with correlation between plasma hemoglobin levels and known volumes of burned tissue. Table devised for estimation of depth of burn in relation to extent and concentration of plasma hemoglobin in 8%.


Three groups of rats - with 20%, 30% and 50% body surface burns - (along with 3 unburned control groups) were checked for hematocrit and erythrocyte and reticulocyte counts at specific intervals following burning to determine the relationship of postburn anemia to survival and extent of injury.

Control rats, bled rats and thermally injured rats (20% and 50% body surface burns) were compared to investigate the quantitative changes in femoral marrow between the groups. Results showed that, in the burned group, a suppressed medullary hematopoiesis occurred and was a contributing factor to circulatory anemia after thermal injury.


Role of spleen in depression of hematocrit and suppression of reticulocytes, more marked following burns than under normal conditions. Hypotheses discussed.

Analysis of pattern of red-cell destruction with emphasis upon individual idiosyncrasies and necessity for whole blood transfusions as indicated by 1) continuing shock with falling hematocrit on plasma therapy, hemoglobinemia or hematuria present a few hours postburn; 2) high fragility rate of red-cells.


Fundamental studies in supportive shock therapy of burns (Massachusetts General Hospital).


Hematological Study. Report of red cell destruction in experimental burns (dogs), employing cells tagged with radioactive chromate 8-10% acute loss in relation to total blood volume considered indications for withholding whole blood transfusions for 48 hours.

A study to determine the erythrocyte volume on both the venous and arterial sides of the circulation following experimental burns in dogs, which showed an average red cell loss at the 3rd hour postburn of 7% (venous samples) and 29% (arterial samples) with the average loss (based on mean value of both arterial and venous samples) of 18%, approximately twice that of the venous sample by itself.


Study from the Medical College of Virginia of circulating plasma and red cell volumes (as measured by radio-active phosphorus tagged red cells and T-1824 dye) in control and burned animals with and without splenectomy.


Rat experiments on the effect of changes in erythrocyte volume on increase of hematocrit following burns. Results indicated that hematocrit was not an adequate criterion of early intravascular fluid loss and that a possible "increase" of M.C.V. should be considered.


Extensive studies from Birmingham group in 150 clinical subjects. Measurement of red cell volume during each phase of the burn with findings of accumulated losses averaging 185% of the total number under a regimen of occlusive dressing techniques and removal of eschar prior to grafting by sharp dissection.


Method for gauging necessity for blood transfusions by the percentage of microcytes in the film.

Study of carbon monoxide-hemoglobin values in expired air in 8 burn patients with findings of daily loss of 15.2 gm. of hemoglobin. Hb breakdown in body accompanied by endogenous CO formation.


Comparison of variations in eosinophil counts in children in relation to surgery and to extensive burns with findings in adult patients.


Dohle bodies of unknown significance were found in the neutrophil leucocytes of a number of burned patients, most often in patients with large amounts of full-thickness skin loss. The Dohle bodies seemed to appear 1 or 2 days postburn and generally disappeared once skin cover was nearly or completely obtained.

Study of 31 burned patients in relation to the rise and fall of eosinophil counts; the significance of persistent or recurring eosinopenia and the effects of ACTH and cortisone on the circulating eosinophils also are discussed.
RENAL STUDIES AND THERAPY

OF RENAL COMPLICATIONS
RENSAL STUDIES AND THERAPY
OF RENAL COMPLICATIONS


One of a series of renal studies in the burned dog.


Therapy of renal insufficiency in the laboratory animal.


Therapy of renal insufficiency in burned dogs.

General article with reports on 12 patients, including renal function studies and discussion of problems associated with fluid therapy.


Treatment of hemoglobinuria and attendant renal dysfunction with mannitol (1 gm/kgm in 5-10 minutes) to induce "solute diuresis."


Report of 2 cases of renal insufficiency treated with the artificial kidney.


Study in renal pathology in 17 cases, indicating glomerular defects in acute failure in addition to tubular necrosis and casts.


Renal function studies in relation to the use of osmotic diuretics such as urea and the carbohydrate crystalloids.


Experimental work to evaluate diuretic effect of 20% urea given intravenously in dogs with serious severe burns.

Report of experiences with dextran (60% in isotonic saline) as a substitute for plasma in fluid replacement therapy and discussion of methods of promoting solute diuresis. Mannitol considered the most effective agent for this purpose.


Report of studies with 4% urea solution following thermal trauma.


Report of renal plasma flow (PAH clearance) studies in overhydrated dogs, employing 0.9% sodium chloride, 5% dextrose in water and 4% urea in 5% dextrose in water.

Histologic analysis of the kidneys of 86 burned patients with finding of proximal tubular necrosis in 17, chiefly in elderly patients with oliguria and nephrosclerosis, and distal necrosis in 34, mainly children with or without associated oliguria. Focal changes in 18 children were not considered important.
XI
OTHER
COMPLICATIONS


Complications of Burns. Case Report.


Endocrine: Use of insulin in two patients with pseudodiabetes. Article by Army Surgical Research Unit Staff at Brooke Army Medical Center.

Complications—Hematology. Case reports of 16 patients.


Studies indicate that following injury the physical state of the blood changes so that fat droplets are formed from blood in vitro. The clinical symptoms ascribed to fat emboli are believed to be caused by impaired flow due to red cell aggregation.


Complications—Hemorrhagic. Case reports.


Complications of Burns. Six Case Reports.

Case Report.


Complications - Hemorrhagic. Case Reports.


Complications - Bone and Joint changes noted in clinical subjects.

Fifty patients with respiratory lesions treated by therapy described in this paper, which included immediate tracheotomy followed by the use of enzyme aerosols and by suctioning at regular intervals to keep the bronchial passages open. Some success was noted with patients with pulmonary burns of the upper respiratory tree, but if the burns were in the lower tree, they were generally fatal.

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Classification and description of bone and joint changes associated with extensive burns (six-year study). This work has led to the incorporation of a well-outlined physiotherapy program at the University of Texas Burns Service, which takes into account preventive as well as therapeutic measures. 

Summary of alterations noted in more comprehensive article in 1959 with classification according to roentgen studies in 725 burn patients (University of Texas Medical Branch).

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A case study of a patient with 35% external burns who had a Curling's ulcer (duodenal). The patient died 13 days after the burn.

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Indicated treatment of burn cancers as in other malignancies, i.e. wide surgical excision with regional node dissection if needed. Prognosis of burn scar cancer is not as good as the prognosis of skin cancer in general. Since burn cancers generally do not occur in areas that have been grafted, a preventive measure is early grafting and, following initial healing, secondary correction for scarring. Seven case reports are cited as representative of malignancy changes found in burn scars.

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Report of 2% incidence of Curling's ulcer in series of 1,000 patients at Brooke Army Medical Center with recommendation of antacids for prophylaxis.


Results of clinical findings on hepatic insufficiency related to severe burns discussed in the light of physio-pathological mechanisms. Indications are that hepatic insufficiency may be improved by salts of potassium, magnesium and aspartic acid.


A case report is presented of a perforated gastric ulcer associated with severe burns (2nd degree, 45% body surface).


Three experiments on normal and burned rats to study the rate of liver regeneration were reported. Following 70% hepatectomies, liver regeneration was rapid and equal in both control and burned rats; using 35% hepatectomies, regeneration was greater in the burned rats. Discussion of experimental results relative to present theories of "metabolic reaction to injuries" and to factors that control liver growth and regeneration.


Case report on a 6-year-old girl who died 4 months after severe burns. In a biochemical analysis, the free amino acid content of the fatty liver was found to be about 10 times as high as normal.


Complications of acute burns outlined in a review of 1,000 patients at the Surgical Research Unit of Brooke Army Hospital. These include circulatory, renal, cardiac, hemorrhagic, and infectious complications in addition to the special problems posed by location of burn lesions, i.e., ears, hands, bone, tendon, and joint involvement, and the eye. Electrical burns, also discussed along with chemical thermal trauma.


Comprehensive discussion of complications with use of intravenous femoral polyethylene catheters based on experience at the Surgical Research Unit. Warning against routine use because of the dangers of septic thrombophlebitis.

Emphasis on indications for tracheotomy in patients with respiratory involvement and face burns. Discussion of use of tracheal oxygen mist as an adjunct to therapy.


Report from Brooke Army Medical Center on 64 tracheotomies in 1000 patients. Indications and complications.


Extensive post-mortem studies in patients dying from burns or other trauma. Relation of incidence to age, survival period (bed rest) and prolongation of life by therapy.


Discussion of complications in general with warning against cortisone Rx because of interference with evaluation of sodium balance.


Review of the literature and report on roentgenograms in 40 severe burns of whom 8 demonstrated osteoporosis as a non-specific sequela of thermal trauma. Discussion of etiology.


Discussion of 22 cases of gastrointestinal ulceration associated with burns, including a review of 17 cases reported in the literature from 1942 to 1952 and 5 additional case studies from the authors' experience.
XII

BURN PATHOPHYSIOLOGY

AND

EXPERIMENTAL RESEARCH
XII

BURN PATHOPHYSIOLOGY
AND
EXPERIMENTAL RESEARCH

1) GENERAL CIRCULATORY AND CARDIOVASCULAR CHANGES

1. Birke, G.; Liljedahl, S.O.; Linderholm, H. Studies on burns.

   Detailed case reports in 8 burn patients (considered 20%-100% mortality risks) in whom cardiac catheterization techniques were employed for therapeutic and investigative purposes.

2. Birke, G.; Liljedahl, S.O.; Linderholm, H. Studies on burns.

   Report of studies with cardiac catheterization techniques in 8 burn patients. Therapeutic agents (e.g. blood, oxygen, potassium, digitalis) discussed in relation to circulatory and pulmonary pathophysiology.


Measurement of cardiac output, plasma volume, liver blood flow and other circulatory parameters in experimental burns in dogs. Immediate, marked, sustained depression in cardiac output (little change in mean arterial pressure) with plasma volume reduction following circulatory depression. Indications of increased turnover of plasma proteins.


Report of dog experiments in which cardiac output decreased to approximately one-half following a severe standardized burn and blood volume expansion alone was found insufficient to restore normal levels. The beneficial effects of rapid digitalization in combination with fluid therapy were demonstrated, and the possibility efficacy of digitalis therapy in clinical burn shock was suggested.


Studies on myocardial involvement in burn shock as a concomitant of decreased cardiac output. Improvement on therapeutic trial with digitalis.


Various methods of measuring cardiac output and plasma volume made to study the effects of intravenous infusion during burn shock, e.g. dextrose-saline, dextran, plasma and gelatin, or cardiovascular responses of burned dogs.


Report of initially normal or decreased cardiac output followed by higher levels after several days of treatment.


Studies of myocardial function in dogs following standardized (30%) burns. A reduction of myocardial contractibility was demonstrated; this alteration was significantly less evident in a group of control dogs, who received similar "manipulation" but were not actually burned.
2) HEPATIC FUNCTION


Organic changes in the liver obtained through biopsy studies in severely injured patients. Data from the Institute of Burns, Plastic and Reconstructive Surgery in Buenos Aires.


Data presented from dog experiments to support the theory that body fluid homeostasis is maintained by blood levels of hormones controlling salt and water excretion which are altered by changes in liver plasma flow.


Experimental and clinical investigation of liver function, which was found to occur within a few hours after injury, with slow recovery over a period of several weeks.

Studies with Rose Bengal, I$^{131}$ and uric acid to determine relative splanchnic oxygen consumption in dogs with a 30% burn. Data indicate that hepatic hypoxia does not contribute to the production of early hepatic injury following severe thermal trauma.


Impaired liver function has been found to occur within a few hours after injury, with slow recovery in patients over a period of several weeks.
3) ACTH AND CORTISONE THERAPY AND STUDIES ON ADRENAL FUNCTION


Two case reports employing use of ACTH in extensive burns.


Report of beneficial results in 40 experimental burns treated with injections of ACTH.

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Discussion of burn pathophysiology in relation to stress and adrenal function.

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Case report of adrenal failure in a severe burn.

Evaluation of adrenal function in relation to burn severity and to therapy, with note of marked differences between fatal and surviving burn cases and an occasional instance of adrenal insufficiency following acute thermal trauma.


Study of levels in urine of adrenaline and noradrenaline which were found to be generally elevated in relation to severity of lesions and to persist after initial period. Exception: instances of acute adrenal medullary insufficiency in some fatal cases.


A report on 12 fatal burn patients with possible adrenal medullary insufficiency. At time of death, eight of these showed subnormal adrenaline output and subnormal adrenaline content of the adrenal gland.


Endocrine studies in burns on adrenaline and noradrenaline excretion, including details of techniques and results in 20 normal adult males, 30 burn patients who survived and 14 fatal burns. In non-fatal cases there was an immediate rise in urinary output and elevation excretion levels persisted for 2 to 12 weeks with gradual return to normal. Most of the fatal burns showed a high output initially with terminal sub-normal levels, probably due to inherent failure of the adrenal medulla.


Endocrine studies in 26 patients (including 2 fatal ones) in the Bennington aircraft carrier fire. Measurement of urinary and blood 17-hydroxycorticosteroid levels over a prolonged period without evidence of adrenal failure. Increased activity as long as 16-17th day, then return to normal. Normal response to ACTH administration and to trauma. The 2 fatal cases had received cortisone and ACTH and had high levels at death.

A study with rats with 50% back burns to determine the effects of a range of dosages and administration intervals of adrenocorticotropic and adrenocortical hormones on survival 10 days postburn, no significant increase in survival was noted.


Clinical experiments to determine the increase of adrenocortical activity following trauma and to determine if this activity is at its height directly following trauma. Two types of trauma were studied: major surgical operations (29 patients) and burns (44 patients with 10 to 50% body surface burns). Results indicated adrenal activity was greater following thermal trauma than following surgical trauma.

Experiences in 22 severely burned patients with conclusion that ACTH and cortisone should not be used routinely but that there was no serious objections to use of these agents.


Description of a case in which at 3 months post-burn there occurred massive edema following sodium depletion. Hyperaldosterone effect was believed responsible. Urinary ketosteroid patterns are included.


A series of 13 experiments on rats to study the effects of corticotropin, cortisone and desoxy-corticosteroneoate on treatment of experimental burns.


Studies of corticosterone plasma levels in the rat following scalding in comparison with normal controls.


Experiments in 600 white mice (including controls) to determine the effects of ACTH, cortisone and a mixture of the 2 hormones on postburn mortality rates. Results showed no beneficial effects from the hormones, and, in fact, mortality was enhanced by cortisone treatment.

Study of 54 burned patients with regard to adrenocortical activity (based on spontaneous changes in eosinophil count following burning) and in 21 patients on changes brought about by test doses of ACTH or adrenaline. Results confirmed previous findings that, following severe burns, there is always adrenocortical hyperactivity; no subsequent adrenocortical failure was noted in 49 of the 54 patients.


Report of deleterious effects of cortisone therapy on localized burns. Avascularity, delayed healing and infection noted whereas control lesions were well in 6 days.


Report of animal experiments to determine the effect of treatment with cortisone or corticotropin on the abnormal capillary permeability which follows burns. No evidence was found that either hormone influenced capillary permeability. The authors concluded that the results did not confirm the current (1952) theory that "these hormones are plasma and fluid spacers in the burned patient."


Case studies in 12 severely burned patients. Results indicated that following extensive burns, excretion of corticoids was elevated markedly, but that excretion of 17-ketosteroids (though sometimes increased initially) declined in severe chronic burns; a poor prognosis was felt to be indicated when there was a "prolonged severe depression of the total eosinophil count" after burn injury.

Biochemistry and Metabolism of Burns. Article by Swedish authority in Burn Research.


Review of effects of therapy on metabolic status, based upon experience at Institute of Burns, Plastic and Reconstructive Surgery in Buenos Aires.


Fifty patients were studied in an investigation of the elimination and catabolism of albumin from the blood following severe burns (24 patients) and surgical operations (16 patients) (10 controls). $^{131}$I labeled albumin was used in the study.

Report of fundamental studies in protein metabolism with radioactive compounds and summary of clinical results with high-protein forced feeding.


Summary of basic metabolic studies with tagged compounds and other methods.


A series of animal (mice and albino rats) experiments to investigate the effect that diets deficient in certain vitamins and essentially fatty acids have on burn healing.


Review of literature and observation of wound healing following experimental burns in rats fed on varying percentages of normal requirements of pyridoxine. The completely deficient group failed to show normal healing. Rats fed on 100% pyridoxine level showed slower healing than those at 5% and 25% levels.


Report of differences in weight and mortality between burned rats maintained at 30°C and 20°C. The latter lose weight, have sustained negative nitrogen balance and show higher mortality on fixed diets (at pre-burn level), but improve if allowed free access to food. Eschar separation and wound healing are more rapid at 20°C.

Basic studies of albumin metabolism employing tagging with $^{131}$I in burns and other trauma to study relation of albumin to general changes in protein metabolism.


Report of clinical improvement in 23 burn patients following administration of Dianabol and Durabolin and effects of exogenous aldosterone in one patient.


Experimental studies in guinea pigs with standardized burns to observe pattern of injury as it involves Vitamin C. Confirmation of previous observations of altered metabolism and increased need for ascorbic acid after injury.


Summary of nutrition program in care of extensive burns, employing tube feedings, supplementary vitamins, etc. Recommendation of 50-80 calories and 2-3 gm of protein per kg.


Use of Lopomul in supplementary feedings for clinical patients.

An unsuccessful attempt to verify previous reports of decrease in nitrogen excretion in traumatized rats following administration of supplemental ascorbic acid to animals with severe thermal injury.


Comprehensive review of the literature with regard to metabolic and nutritional changes associated with injury and certain acute and chronic diseases, and a discussion of mechanisms involved.


Review of the nutritional and metabolic aspects of shock. See 1959 reference.

Balance data in a composite patient and averages of 6 patients in metabolic studies at the Surgical Research Unit, Brooke Army Medical Center.


Study of effect of pituitary growth hormone administration to 4 clinical subjects at the Army Surgical Research Unit. Retention of potassium, calcium, sodium, and chloride was observed above critical levels which approximated "ad lib" levels of administration. No effect was noted upon magnesium and phosphorus balance. Highest positive nitrogen balance was observed in patient studied late in convalescence.


Study of 11 patients during four 10-day periods at the Army Surgical Research Unit. Ratios presented for K:N during various phases of response.

Report of continuous forced feeding regimen in a burn patient with indwelling catheter and use of milk-base formula with added vitamins and minerals.


Study of four severely burned patients to determine the effect of growth hormone upon metabolic balance, with definite effect on the nitrogen balance being noted in the data analysis.


Nitrogen and mineral balance studies (60-180 days) in 5 burn patients at the Army Surgical Research Unit. Details of technique included.

Observations following administration of pituitary growth hormone to burn patients at the Army Surgical Research Unit.


Metabolic studies in 11 burn patients at the Army Surgical Research Unit. See Summary in Soroff et al., 1962.


Study of 11 male burn patients and 11 controls with statistical analysis of the nitrogen and potassium requirements for equilibrium in burned patients.


Outline of forced feeding regimen with formulas for use of protein hydrolysates as supplements to the diet and for tube feeding.


Nitrogen and caloric balance study of 13 burn patients at Karolinska Institute (Stockholm). At least 1.2 gm of protein/kg were required with caloric intake at 40-60 calories/kg and increases mandatory for external protein loss. Tube feeding formula included.

Study in skin slices subjected to thermal trauma \textit{in vitro}. Results suggest that an inactive enzyme precursor present in normal tissue is converted by heat damage to an active protease.


Review of work of Rabelo, Clark and Kinney on total energy expenditure in 2 burn cases; of Malin and Slawikowski on convalescent serum studies in rats; of De Jesus et al on immediate excision of standardized flame burns in rats; and of Foreman on influence of occlusive therapy on wound healing.
9. METABOLIC RATE AND EFFECTS OF TEMPERATURE


Report of clinical study in 40 patients with 5%-20% burns (38 of 2nd degree) treated with repeated applications of cold packs combined with long-term heparinization.


Metabolic studies in burned normal and thyroidectomized rats at 24°, 28°, and 32°C. The hypermetabolic state appears not to be related to the thyroid gland but to be secondary to increased vaporizational heat loss through the wound. The catabolic phase in burns may be ameliorated by regulation of the environmental temperature.

Study of thyroid $^{131}$ uptake levels in burned rats with conclusion that the burned rat is capable of increased oxygen consumption (thus, heat production) with normal or subnormal levels of thyroid activity. The thyroid modulates response but does not control it.


Demonstration of dynamic relationship between a surface wound and the external environment which alters the energy balance. Whichever factors produce the least total obligatory vaporizational heat loss place the least total nutritional demand upon the injured animal.


Inquiry into etiology of elevated basal metabolic rates with conclusion that correlation exists between extent and severity of burn rather than with fever or hyperactivity of thyroid.


Production of hypothermia following tail burns by immersion and following generalized burns of general hypothermia in air. Enhanced wound healing effect from cold in local burns and some protective value of low temperatures noted in generalized burns to correlate with seasonal variations of mortality rate of control animals.

Conclusion from experiments in 16 animals following 50% scalds that cooled animals suffered less severe systemic injury than control group.


Study of vaporization heat loss through burned skin eschar, and open wounds and effect of coverage with a water-impermeable dressing (Saran wrap).


Hypothermia with drugs and/or cold packs and for treatment of burns in the acute phase in experimental animals (dogs).

Experimental studies in dogs with analysis of local wound during sleep therapy.


Clinical studies indicating evaporative water loss 20 x normal in early phase post burn, decreasing as healing occurs. Respiratory loss is minimized with 100% humidification in tracheotomy cases.


Beneficial effects of cooling in dog limb burns related to reduction of capillary circulation and filtration and a reduction of enzymatic action. Exudates had a lower protein concentration and extracts from muscle and skin were reduced in quantity and concentration.

Effects of vaporizational heat loss through burn eschars and open wounds in production of hypermetabolism. Use of warm saline baths in the early period and eventual skin coverage to combat this catabolic stimulus.


Metabolic study of a fatal 45% burn patient (surviving 16 days) and an 85% burn patient (surviving 4 days). 160% increase in daily caloric expenditure in 45% burn for first 10 days, followed by decrease. The overwhelming burn had hypothermia and showed early, progressive metabolic deterioration.


Effect of cold in reduction of local wound edema in experimental burns.

Experiments with hypothermia in the burned dog through exposure to cold air and ice bath immersion. Transient deceleration of edema fluid noted along with other favorable effects, but prolonged hypothermia was deleterious from standpoint of inhibition of respiratory center, alteration in renal tubular function and depression of reticulo-endothelial system.


Studies indicating progressive tissue damage in mild burns for several days, accompanied by persistent pain, which may be influenced by immediate cooling for a short period of time. Delay of cooling had an inverse effect. Results in more severe burns were not spectacular, although others have reported prolonged survival. Technical difficulties due to variability in skin and hair growth are discussed.
6) LOCAL BURN WOUND STUDIES


   Important experimental study demonstrating that wound healing agents act by irritation which produces serum exudation which in turn exerts a beneficial effect.


   Microscopic study of response to thermal injury in rabbit ear chamber (demonstrating that inflammatory exudation of leucocytes and phenomenon of "leucocyte sticking" to vessel walls are less intense in animals receiving cortisone). Belief that increased susceptibility to bacterial infections after cortisone is due in part to this anti-inflammatory action.


Preliminary studies of susceptibility of burned skin of rats to peptic and tryptic digestion. (Also changes in collagen of rat skin and tail tendon - more extractable by normal saline. Action of trypsin increases with heating.


Description of original apparatus (the "Bailey Burner"); and discussion of technique for inflicting standardized scalds in the laboratory rat. University of Texas Medical Branch.

Experimental burns in mice and rats, analyzing histamine and 5-hydroxytryptamine at 10 min., 2 hrs., and 24 hro. in skin, subcutaneous tissue, spleen, and lung with no increase found over normal values, contrary to work of Dekanski (1951).


Clinical studies of dye methods for early diagnosis of depth of involvement.


Animal experiment (dogs and pigs) to determine a method for early differentiation between partial and full thickness burns. Direct sky blue dye which has an affinity for the lymphatic system, was injected into the burned skin: in a partial thickness burn, there was a centrifugal lymphatic spread of the dye, with no uptake noted in the full-thickness burn area.


In vitro and in vivo studies of burned skin for determination of effect of heat on oxygen consumption and enzyme activity. Important fundamental investigation.

Study of the influence of fluid therapy (moderately effective) and surgical excision (ineffective) in experimental burns in mice.


Discussion of differences between superficial (IIa) and deep (IIb) second degree burns with emphasis on local pathology and dynamic biological changes.

Study in 57 albino rats to determine the rate of closure of wounds of equivalent sizes made by skin excision and full thickness burns, and to determine if the rate of burn healing is significantly affected by eschar excision and wound base protection.


Studies of bacterial cultures of granulations prior to and following application of skin grafts and observation that rapid destruction of pathogens takes place once coverage is obtained over a mechanically clean surface. Histological and tissue culture preparations carried out in collaboration with Pomerat have demonstrated the remarkable mitotic activity of granulation tissue. The question of whether or not to remove granulations partially by slicing through exuberant tissue was also studied with conclusion that flattening occurred automatically with elevation of involved parts and with skin coverage.


Experiments: studies in mice. Excision of a standardized scald prior to 2 hours resulted in reduction in mortality, thereafter, it was harmful. Measurements were made of fluid in burned area and of excretion of intraperitoneal saline.


Outline of technique for studying epithelization of burn in clinical subjects and results indicating that superficial blistered burns epithelize about 40% more rapidly when blisters are left intact.

Summary of previous study and report of influence of a number of topical agents, all without effect except royal jelly from the bee, which appears to enhance epithelization. Discussion of findings on mitosis counts.


Report of the effect on the enzymes of the skin as measured in homogenates of human epidermis and the ear skin of guinea pigs. Inactivation of certain enzymes in the metabolic cycles of injured tissue was noted in terms of decreased oxygen consumption, glucose utilization, lactic acid production and succinic dehydrogenase activity.


Detailed outlines of staining techniques for determining the depth of experimental burns. Modification of Verhoeff's elastic tissue stain most useful for general work.

Study in rabbits indicating that neural injury may be delayed following injury for as long as 2-3 days and that although regeneration of isolated new branches begins about the 4th day, complete regeneration requires 4-7 weeks.


Investigation of nerve degeneration and regeneration following radiant heat injury in rabbits. Emphasis on possibility of delayed degeneration and on slow but delayed regeneration (4-7 weeks).


Study of changes in capillary permeability following various types of thermal injury in dogs with dye techniques. Influence of pressure and cold.

Animal experiment to test the feasibility of using dyes to predict the areas of complete tissue death in burn wounds. One hundred experimental burns were observed in dogs using Evan's blue dye injections to determine areas where capillary leakage of stained proteins did not appear, indicating devitalized tissue which could be subjected to early excision.


Clinical and histological studies in grafts of process of vascularization, of regeneration of nerve endings and of restoration of tactile, pain, and temperature perception.


Study in 3 burn patients on a gelatin-free diet. Following thermal injury high levels of urinary OH P (hydroxyproline) reflect the proteolytic breakdown of denatured dermal collagen.

Studies indicating that the pattern of wound healing following thermal injury in the guinea pig possesses the same characteristics as observed in unburned scorbutic animals unless large prophylactic doses of ascorbic acid are administered.


Topical agents employed in treatment of partial-thickness burns in the rabbit; preliminary study.


Description of technique for measuring quantitative changes in tripeptidasic activity of the plasma in relation to cutaneous burns in patients and in experimental animals. Attempts to define by histochemical techniques the onset, site and conditions of enzyme activation in the local wound.

Experimental studies indicating that abnormal carbohydrate pathways are utilized in the metabolic activity of granulation tissue.


Quantitative and qualitative analysis of protein content of wound exudate; average loss in 30% burn wound 85-90 gm. of protein with range between 20 and 200 gm. A/g ratio lower than serum.


Analysis of lymph from the dog limb following experimental burns indicating a significant increase in lipid content in addition to an increase in lymph volume.

Study in experimental animal (the pig) of lipids and phospho-lipids in burned and normal skin. Decrease in burned areas with finding of lipid in blebs between epidermis and dermis in mild burns. Following immersion burn of dog paw rapid outflow of lipid, largely phospho-lipid, in the lymph.


A summary of current research in cytology related to burns, including references to the role of electrolytes, the effect of cold and heat on cells, cell populations, the effects of gases on cells, the use of cell cultures in radiobiology, etc.


Histopathologic evidence from experimental burns that progressive cellular destruction and reparative processes are competitive and proceed concurrently, with the latter beginning at 24 hours. Injuries from steam and flame are more severe than from gasoline explosion flash burns. Burned epidermis was found to be an effective barrier against bacterial invasion.

Results of experimental studies and recommendation that first aid consist of continuous wiping off of chemical until copious flushing with water can be accomplished. Rapidity of treatment more important than "fancy neutralizers."


An in vivo method with dorsal air pockets for obtaining large quantities of diffusible material from burned or irradiated skin, for assay purposes, circumventing the circulation.


Use of stainless steel basket apparatus for producing standardized back burns in mice.

Experimental studies with Evans blue and vital red dyes in controlled guinea pig burns to observe types of capillary permeability stasis and edema and their interrelation. Late permeability and edema changes may be produced by chemical products which form in burned skin or exudate.


Results consistent with the hypothesis that delayed increased capillary permeability seen after injury is due to consecutive operation of 2 or more intermediary mechanisms or chemical mediators released from the tissues. Release of histamine may be responsible for initial phase.


Attempts in the laboratory animal (the rat) to produce suppression with a variety of agents of endogenous mechanisms responsible for increased capillary permeability in burns, as measured by leakage of circulating protein-bound dye and edema formation. In mild burns endogenous mechanisms appear responsible for increased capillary permeability. In more severe burn injury direct injury plays an added role.

Effect of topical application of a monoamine oxidase inhibitor in a small group of burned rats: inflammatory edema was markedly decreased, whereas previous experiments with systemic administration had shown little influence. Conclusion that release and destruction of an adrenaline-like substance is a local phenomenon.


Histochemistry studies in 33 burn patients in comparison with normal controls. An increase in glycogen was noted first in the tip of migrating epithelium and later in large quantities as piling up of epithelium occurred at the margins of the wound. There was a rapid rise in RNA concentration in the mitotically active layers of the skin, and a greater concentration of the DNA content of nuclei in rapidly dividing cells at the wound edge, particularly in cells of the basal layer.


Investigation of the pattern of inflammatory reaction in mild experimental burns in guinea pigs, rats and rabbits and division of response into two aspects 1) immediate, mediated by histamine and abolished by low concentrations of local or systemic anti-histamine; 2) and delayed, which is unaffected by substances which are strong in vitro antagonists of the fibulin permeability factor.


Effect of 10 inches of hydrostatic pressure from a saline solution on edema accumulation in experimental burns in rabbits which were sacrificed at 4 hours. Weight of tissue without pressure increased 119%, with pressure increase was 43%. Discussion of tub apparatus design for immersion of burn patients in 10 inches of Ringer's solution as soon as possible after injury.
7) TOXIN - ANTITOXIN STUDIES


Guinea pig tests to explore the possibility that an "immunological phenomenon" is one of the contributing events to injury and death following burns.


Correlation of positive Coombs tests with mortality in Wistar rats receiving 32% scalds at 98ºC for 35 seconds.

Preliminary investigative work conducted on a project at the University of Texas Medical Branch. See Matter et al.


A series of experiments in which marine invertebrates were scalded and their coelomic fluids tested in various ways to investigate the theory of a toxic burn factor.


Report from the Burns Unit at Prague on antibody titer levels in the serum of burned patients, employing skin antigens, as measured by colloidia particle agglutination technique.


In vivo evidence of specific antigens produced from skin injured by thermal trauma and for the development of burn toxin antibodies as an autoimmunization phenomenon. Antigen characterized as being a thrombin-like material, heat-labile, incapable of passing through a Seitz Filter and not species-specific.


Summary of laboratory data with regard to auto-antigens in burned skin of animals and techniques employed in clinical use of convalescent burn serum.

Summary article in English of animal and clinical studies at the Central Institute of Hematology and Blood Transfusion in Moscow with regard to autoantigens in the blood and skin of burned subjects. The development of circulating antibodies and the effects of "immune" blood and serum on early burn toxicity.


Summary of work with Sunonart, advancing the hypothesis that the pathological changes in acute burns are related to increased protease activity.


Studies on toxin-antitoxin with failure to confirm the HeLa cell cytotoxicity test of Rosenthal except in the presence of hemolysis or exposure of specimens to sunlight.

Animal study of diffusates from burned skin of rats: diffusates containing 10-12 mg. protein/gm. body wt. when injected into 30-50 gm. rats caused death in 2-5 hours, similar amounts of 0.9% NaCl or hemoglobin caused no deaths in 24 hours.


Report of working committee with summaries of existing clinical and laboratory published and unpublished data. Conclusion that at present there is no evidence as to whether or not convalescent serum, blood or plasma surpass other methods of treatment of acute burns to a statistically reliable degree and suggestion that the benefits of such therapy might be related to antibodies against antigens of bacterial origin rather than to specific substances produced in heat-damaged tissues, including elements of the blood.


Study on mice to determine the part played by exogenous or endogenous polysaccharide in burn shock.


Report that iodinated bovine gamma globulin injected into normal and burned rabbits showed no difference in effect.

Unpublished studies of Malm indicating that careful documentation on convalescent burn serum is lacking, and that animal research, chiefly with rats, has been disappointing in view of the fact that when laboratory conditions are optimum and barbiturates are avoided as anesthetic agents it is impossible to achieve a high enough standard mortality level against which to evaluate the efficacy of convalescent serum during the early critical period. This study includes an extensive bibliography.


Two animal (rat) experiments on the use of burn convalescent serum and/or chloromycetin in reduction of mortality following burns.


A general review of current research on burn toxins and convalescent serum and a brief history of theory and research in this area dating from 1893.
23. Matter, P.; Chamber, K., Bailey, B., Lewis, S.R., Blocker, T.G., Jr.,
Blocker, V. Experimental studies with reference to antigen-antibody
phenomena following severe extensive burns. Ann Surg 157:725-737,
1963.

Summary of present status of the burn toxin problem
with report on in vivo and in vitro studies at the
University of Texas, Medical Branch.

24. Miller, L. F. Comments regarding immunotransfusion in the treatment
of burns, Appendix G., Immunotransfusion in the treatment of burns,
Subcommittee on Plasma, Natl. Acad. of Sciences, Natl. Res. Coun.,
Div. of Medical Sciences, 1961.

Report on a controlled double blind study of a large
number of specimens in 1961 with inability to duplicate
Rosenthal's results with HeLa cell cultures except
when there was hemolysis of specimens or when there
had been exposure to sunlight. Miller states that no
positive conclusions can be drawn from the work
conducted in his laboratory at the time of the Chicago
School fire studies of Rosenthal and that data obtained
were "consistent with" but "in no way confirmatory of
a toxin-antitoxin concept."

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25. Newton, W. F.; Fujii, K.; Moyer, C. A. Attempts to reproduce the Feodorov phenomenon. Proceedings of Subcommittee on Plasma, National Academy of Sciences, National Research Council, 1961. Report on attempts to duplicate the anaphylaxis experiments of Feodorov. Attempts to isolate a burn toxin have not been successful, and true anaphylaxis has not been observed.


Summary of opinion of workers as to the efficacy of convalescent burn serum with the conclusion that "While proof is lacking for the existence of a specific burn toxin of antigenic nature and of corresponding specific burn antibodies, there are indications ... that specific antimicrobial antibodies may be present in the blood of organisms which have recovered from infected burn wounds. It is within the realm of possibility that beneficial effects might result from transfusion of blood, plasma, or serum from a donor possessing antibodies which react specifically against microorganisms infecting a recently burned organism."


Report of use of convalescent burn serum in 123 clinical burns, with report of decrease of mortality (from 35% to 25%) during the early period but not in the overall period.


In vivo experiments with rats with indications that following burn injuries of the skin, diffusates such as histamine, bradykinin, adenosine derivatives and possibly serotonin are released.


Report of experimental studies concluding that use of convalescent serum in burned mice has produced results "only slightly more effective" than normal gamma globulin.


Several rat experiments to ascertain the role of the skin in burn deaths, also a note on the possibility of a burn toxin derived from the skin.

Study of diffusates of burned skin of animals in blood, including a discussion of reaction of red cells of burned animals when "put in contact with" serum of rabbits injected with "crude toxin"-adjuvant, plus a note on these results as related to postburn anemia.


Study to see if there are antigenic differences in skin injuries caused by "burns, irradiation and hypotonic solutions."


Demonstration by special techniques of an antitoxic-like substance in the blood of healed patients.

Report of evidence of the presence of toxins in acute burn sera as demonstrated in inhibition of HeLa cell tissue culture growth, hemolysis or red cells of acutely burned individuals and precipitins against healed burn sera.


Report on failure to confirm the HeLa cell cytotoxicity test of Rosenthal except in the presence of hemolysis or exposure of specimens to sunlight. Also report on unsuccessful attempts to reproduce the original experiments of Feodorov in guinea pigs. Although delayed anaphylactoid reactions have been noted, no true anaphylaxis has been observed.

Unpublished data from a double blind study of a large number of specimens in 1961 with confirmation of Rosenthal's techniques with the HeLa cell cultures only when there was hemolysis of specimens or when there had been exposure to sunlight.


Development of the concept of Brancati that antigenic toxin is elaborated in burned tissue on the basis of anaphylactic shock.


Report of studies following injection of in vitro heat-deaerated serum proteins and commercial preparations of polypeptides into laboratory animals. No toxic reactions were noted on intravenous injections, but morbid or lethal effects occurred on subcutaneous administration into rabbits or into the ventral lymph sac of the frog. The hypothesis is advanced that toxicity results from hydrolysis by a proteolytic enzyme present in lymph fluid, and that the agglutinin factor extracted from peptone-produced edema provokes the same result when injected into other animals.
43. Simonart, A. Toxicity of the edema of burns. Actualites Pharmaco1


44. Simonart, A. J. L. Survival after lethal burn of previously treated
rabbits, in Research in Burn, edited by C. P. Arts, AIBS Pub No.

Rabbits were used to test the effects of pre-
treatment with (1) phosphates or with (2)
brun edema as protection against lethal burns.

45. Skurkovich, S. V. Treatment of thermal burns with immune serum.
Vestn Kn.r Grekov 77 90-5, 1956.


A general article reviewing current (1960) theories and research on burn toxaemia, encompassing work in this area by Simmaart and Gedraad (Belgium), S. R. Rosenthal (U.S.) and Feodorov (Russia).


8. BIOCHEMISTRY: ALTERED PHYSIOLOGY AND PATHOLOGY, AND OTHER EXPERIMENTAL STUDIES


Study of urinary peptides for 48 hour period following burns. Each technique of separation resulted in somewhat different fractions but it appeared that peptides represented an increase in substances normally present. Light G10 content, believed related to glycoproteins. (There is some evidence that glycoproteins migrate to alpha 2 globulins electrophoretically.)


Short article with case reports illustrating etiology of hyperglycemia in burns. Based on work at Stoke-Mandeville Plastic Surgery Center.


One of a series of studies from this group of Swedish burn investigations. Excretion studies in 9 patients.


Report of normal or increased anabolism following severe burns obscured by relatively greater catabolic response.


Analysis of data in radioisotope studies in burned patients.

Discussion of early and late manifestations of disturbed pathophysiology in extensive burns.


Discussion of the "troisieme secteur" in severe burns, composed of water, electrolytes, and protein.


Experiences at a Czech Burns Center with ataractic drugs employed for control of pain and anxiety or in hypothermia regimen.

Review of the following problems: reaction of the suprarenal cortex and behavior of ADH after burns; use of neuroplegics to ameliorate reaction to stress; indications for hormone therapy, particularly synthetic anabolic compounds, and "metabolic paresis" produced by a partial block in glycolysis.


A review of disorders in basic cellular metabolic processes which may explain impairment of energy balance in the patient with severe burns.


Report of excretion patterns of 16 amino acids in the urine of patients immediately before and during convalescence.


Extracellular fluid - $^{35}$S volume studies in patients and experimental animals, with data to quantitate the volume of salt water loss in various types of trauma, including burns.


Study of compartment relationships under normal conditions and following trauma. Use of Cr-51 tagged red cells for determination of circulating red cell mass with simultaneous assay of plasma volume with I[31] tagged albumin. Clinical subjects and laboratory animals (mice) employed. In the latter viscera were analyzed for radioactivity and sodium, potassium, and chloride content.


Preliminary report of difference between 25% full-thickness immersion burns in water at 60-85°C for varying periods of time and charring from 2 exposures to a magnesium flash burn at 1000°C for 0.7 sec.


Study of response to therapy in 25% full-thickness immersion burns of approximately 55% at 75°C for 10-15 sec. in comparison with similar area burns sustained by charring in a flame-proof chamber with electrically ignited magnesium powder.

See previous reference.


Study in mice of role of histamine with observation that a protective effect is achieved by dosage prior to thermal trauma but not 1 hour after scalding or after a dose of endotoxin.


Study of clearance rate of staphylococci injected i.v in dogs in burns and other stress.

Review of pathologic changes affecting fluid requirements. Use of body weight records as an adjunct to urinary excretion for guidance in therapy.


Study in 14 burned patients of response to fluid therapy (Evans formula) during period of edema and thereafter.


Study in 7 patients with lesions of over 20% the plasma volume, blood volume, thiocyanate space and total body water increases in thiocyanate space and body weight were proportional to the extent of burn.

Study in 5 patients with major burns; attempt to measure insensible fluid loss from lungs, skin and burned areas.


Review of papers on burn pathophysiology presented at the International Symposium on Research in Burns in 1960 with summary of newer trends in the field of biophysics.


Study of plasma lipids after experimental burns in rabbits. Cholesterol double normal value after 12 hours. Phospholipids early increase followed by fall. Amount of edema not important. Following peptone injections, an increase is noted, but not in relation to the extent of burns.

Studies at the Army Surgical Research Unit in acute burns in the dog with findings to indicate that potassium lost from traumatized tissue is deposited in normal tissue.


A state of insulin hypersensitivity as reflected by plasma potassium depression was demonstrated in burned dogs.


Summary of balance data with presentation of two clinical cases. (Burns Institute, Buenos Aires).

Analysis of balance data according to the edema, diuresis and subsequent phases of acute extensive burns with discrepancies noted in time of occurrence of maximum excretion levels with those reported by Barnes, Cope and Moore.


An inhibitor of proteases isolated from potatoes was noted to have a marked inhibitory influence on the inflammatory reaction following burns in rats and mice but no effect systemically.


With starch block electrophoresis and DEAE cellulose chromatography techniques combined a total of 22 different serum proteins are distinguished. Techniques are presented in detail for study of urinary proteins in burn patients, and chromatograms from a number of cases are analyzed. Increases in the various zones are discussed from the standpoint of possible source.

Using techniques outlined previously studies were made in 19 urine specimens from 5 burned children and the percentage of total protein in each of the nine chromatographic zones charted, each area was also expressed as mg of equivalent albumin. It was postulated that the general increase in protein excretion, which was mild rather than spectacular, was related to increased renal permeability to proteins.


Study of prolonged decreased glycogen synthesis in muscle and liver of burned rats without a corresponding decrease in blood glucose or glycogen levels.


41. Lanchantin, G. F., and others. Serum protein changes in thermal trauma. 4. Some quantitative and qualitative aspects of total serum glycoprotein and seromucoid following burns. (U. S. Army Surgical Research Unit, Brooke Army Medical Center, Fort Sam Houston, Texas Research Report MEDEW-RS-12-57 June 1957) 29 p. 50 refs.


Study of protective effects of histamine and related compounds against thermal trauma and endotoxin shock.


Treatment of experimental burns in rats with ganglionic blocking agents (hexamethonium or azamethonium). Report of prolonged mean survival time and suggestion that hypotension resulted in decrease in fluid loss.


Establishment of 100% mortality in 6 hours from a 50% scald at 90°C for 35 seconds (ether anesthesia) followed by continuous i.v infusion of 18% of body wt in fluids for 10 hours. Survival in groups of 12 at 10 days as follows: whole blood plasma 72%, saline 17%, red cell suspension 27%; plasma 17%, P, V, P, 33%, oxypolygelatin 33%; fluid gelatin 17%; saline lactate 42%.


Standard thermal injury in the rat did not change the rate of oxidation of the labeled oil emulsion although normal blood clearance times were slightly above those in the control group.


Therapeutic test (i.e., influence on survival) in mice of a number of agents reported to ameliorate effects of shock from burns and other trauma, Chlorpromazine and, at times, Dibenamine were effective. No beneficial effect was noted from other substances.


A summary of current metabolism research related to burn therapy, including the problems of volume regulation and maintenance; blood, colloids, and salt solutions; special organs and metabolism, etc.


Study of elevated insensible weight loss (i.e., loss of CO₂ and water vapor through the skin and lungs less the mass of oxygen absorbed) in rats, which was found to range from 60% to 200% above normal.

Increased glycoprotein levels found after the acute stage of burns were interpreted as a reflection of reparative processes rather than destruction.


Study of amino-aciduria following burns and trauma with quantitative increase of normal "nonessential" amino acids and presence of "essential" amino acids normally not found in the urine.


Employment of dressings with a topical agent free of sodium, nitrogen and potassium in order not to have adherence to the wound. Following agitation in distilled water for 24 hours samples were removed for Na and K, after which sodium bicarbonate was added in order to facilitate solution of protein. After another 24 hours determinations were made.
57. Prendergast, J.J.; Fenichel, R.L.; Daly, B.M. Albumin and globulin changes in burns as demonstrated by electrophoresis. AMA Arch Surg 64:733-40, 1952.

Results of electrophoretic studies in 8 patients with emphasis upon gamma globulin concentration as an index of severity of burn: little increase in lesions of 15% and below, great increase in burns of 25%-35%.


Review of methods of producing standardized trauma and shock and evaluation of blood, plasma, and electrolyte solutions on curtailment of edema, restoration of blood volume and correction of depletions of fluids, electrolytes and protein in undamaged tissues.


Increase in peptide-like substances in the urine following thermal trauma with description of techniques employed. Also note of correlation between urine peptide concentration and antibody titers in the blood which have been reported by Pavkova.

Use of isoindoline, a blocking agent, to observe survival of burned rats following thermal trauma at varying temperatures.


Studies of the lymph fluid in burned dogs following cannulation of the thoracic duct with finding of free hemoglobin within a short period following injury. Characteristic alterations in the normal electrophoretic pattern occurred with a drop in albumin and a rise in beta globulin.


Histological studies in the dog and in 6 patients who died as a result of severe burns.

Outline of burn pathophysiology by medical director of Mead, Johnson, and Co. according to local effects, effects on the body fluids, metabolic effects and psychologic effects. An excellent article for the general practitioner with 45 cartoon-type illustrations.


Review of records of 24 severely burned patients undertaken to help clarify the relationships between the patients' state of hydration and plasma sodium concentration.


Conclusion that use of sucrose is preferable to sodium thiosulfate for extracellular fluid volume. Sodium thiosulfate "space" may be better as an estimate of volume of distribution of sodium.


Studies in rabbits with experimental burns, plasma calcium decreases rapidly, after which a gradual rise occurs, phosphorus rises immediately but fails to subnormal levels within 48 hours.


Preliminary studies indicating changes in local tissues and those outside the burned area.


Studies indicating a disturbance in glucose utilization appears to be other than in the conversion of glucose to CO₂; a dialyzable principle is present in the plasma. Epinephrine may be a causative agent.


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JOURNAL REFERENCES

A. For articles abstracted.

B. Available in the National Library of Medicine.
A. FOR ARTICLES ABSTRACTED

Acta Chirurgiae Plasticae
Acta Chirurgica Belgica
Acta Chirurgica Scandinavica
Acta Dermatologica
Acta Endocrinologica
Acta Haematologica
Acta Pediatrica Espanola
Acta Pharmacologica et Toxicologica
Acta Physiologica Scandinavica
Actualites Pharmacologiques
Afrique Francaise Chirurgicale
Aggressologie
Algerie Medicale
Allergie Asthma
American Journal of Clinical Pathology
American Journal of the Medical Sciences, The
American Journal of Medicine
American Journal of Nursing, The
American Journal of Pathology, The
American Journal of Physical Medicine
American Journal of Physiology
American Journal of Surgery, The
American Practitioner and Digest of Treatment
American Surgeon, The
Anaesthesist, Der
Anales de la Facultad de Medicina, Lima
Annales de Chirurgie Plastique
Annales de Medicine Legale et de Criminologie (Paris)
Annals of Internal Medicine
Annals of the New York Academy of Sciences
Annals of the Royal College of Surgeons of England
Annals of Surgery
Antibiotic Medicine and Clinical Therapy
Antibiotics Annual
Antibiotics and Chemotherapy
Archiv fur Kinderheilkunde
Archiv fur Klinische Chirurgie, Langenbeck s
Archiv für Klinische und Experimentelle Dermatologie
Archives Francaises de Pediatrie
Archives of Industrial Health, AMA
Archives Internationales de Pharmacodynamie et de Therapie
Archives of Pediatrics
Archives of Physical Medicine and Rehabilitation
Archives of Surgery, AMA
Archivio Italiano di Chirurgia
Archivio per le Scienze Mediche
Arizona Medicine
Arzneimittel-Forschung
Arztliche Forschung
Arztliche Wochenschrift
Arzthlientherapie
Australian and New Zealand Journal of Surgery
Bibliotheca Haematologica
Blood
Bollettino della Societa Italiana di Biologia Sperimentale
Bordeaux Chirurgical
Boston Medical Quarterly, The
British Journal of Anaesthesia
British Journal of Clinical Practice
British Journal of Experimental Pathology
British Journal of Plastic Surgery
British Journal of Surgery, The
British Medical Bulletin
British Medical Journal
Bulletin de L'Academie Nationale de Medicine
Bulletin de L'Academie Royale de Medicine de Belgique
Bulletin of Hospital for Joint Diseases
Bulletin of the Hospital for Sick Children (Toronto)
Bulletin de la Societe Internationale de Chirurgie
California Medicine
Canadian Anaesthetists' Society Journal, The
Canadian Journal of Biochemistry and Physiology
Canadian Medical Association Journal, The
Chinese Medical Journal
Chirurg, Der
CIBA Clinical Symposia
Journal of Hygiene, The
Journal of the Indiana State Medical Association, The
Journal of the International College of Surgeons, The
Journal of the Kentucky State Medical Association
Journal Lancet, The (U. S.)
Journal of the Maine Medical Association, The
Journal of the Medical Association Georgia
Journal of the Medical Society of New Jersey, The
Journal of the National Medical Association
Journal of Occupational Medicine
Journal of the Oklahoma State Medical Association, The
Journal of the O s o City Hospitals
Journal of Parasitology, The
Journal of Pathology and Bacteriology, The
Journal of Pharmacology and Experimental Therapeutics, The
Journal of Pharmacy and Pharmacology, The
Journal of the Royal Army Medical Corps
Journal of the South Carolina Medical Association, The
Journal of Surgical Research, The
Journal of Trauma, The
Kururgija (Moskva)
Klinische Monatsblatter fur Augenheilkunde
Klinische Wochenchrift
Lancet, The (England)
Lille Chirurgical
Lille Medical
Lyon Chirurgical
Lyon Medical
Marseille Chirurgical
Medical Clinics of North America
Medical Journal of Australia, The
Medical Services Journal Canada
Medicina Clinica (Barcelona)
Medicina Española
Medizinische Klinik
Medizinische Monatschrift
Medizinische Welt, Die
Metabolism -Clinical and Experimental
Military Medicine
Minerva Chirurgica
Minerva Dermatologica
Minerva Medica
Minnesota Medicine
Mississippi Doctor
Monatsschrift für Kinderheilkunde
Munchener Medizinische Wochenschrift
Nature
Nebraska State Medical Journal, The
Nedersands Tijdschrift Voor Geneeskunde
New England Journal of Medicine, The
New York State Journal of Medicine
New Zealand Medical Journal, The
Nordisk Medicin
Northwest Medicine
Pathologie et Biologie
Pediatric Clinics of North America
Pediatrics
Pennsylvania Medical Journal, The
Pharmacological Reviews
Physical Therapy Review, The
Plastic and Reconstructive Surgery and the Transplantation Bulletin
Policlinico--Pratica, Il
Postgraduate Medicine
Practitioner, The
Praxis
Presse Médica Argentina, La
Presse Médicale, La
Proceedings of the Institute of Medicine of Chicago, The
Proceedings of the Royal Society of Medicine
Proceedings of the Society for Experimental Biology and Medicine
Radiologia Clinica
Rassegna Internazionale di Clinica e Terapia
Revista da Associação Médica Brasileira
Revista Brasileira de Cirurgia
Revista Clínica Española
Revista Médica de Costa Rica
Revue Belge de Pathologie et de Médecine Expérimentale
Revue Médicale de Liège
Revue Médicale du Moyen Orient
Revue Médicale de Nancy
Rhode Island Medical Journal
Riforma Médica, La
Rivista di Patologia e Clinica della Tuberculosis
Schweizerische Medizinische Wochenschrift
Science
Semaine Médicale Professionnelle et Médico-Sociale, La
Semana Médica, La
South Dakota Journal of Medicine and Pharmacy, The
Southern Medical Journal
Strahlentherapie
Surgery
Surgery, Gynecology and Obstetrics
Surgical Clinics of North America, The
Surgical Forum
Texas Reports on Biology and Medicine
Texas State Journal of Medicine
Thérapie
Tidskrift der Gegenwart, Die
Tidsskrift for Den Norske Laegeforening
Toulouse Medical
Transactions of the Association of American Physicians
Transactions of the Association of Industrial Officers
Transactions. Ophthalmological Society of the United Kingdom
Triangle
Ugeskrift for Laeger
L'Union Médicale du Canada
United States Armed Forces Medical Journal
West Indian Medical Journal, The
Western Journal of Surgery, Obstetrics and Gynecology
Wiener Klinische Wochenschrift
Wiener Medizinische Wochenschrift
Wisconsin Medical Journal, The
Zeitschrift für die Gesamte Experimentelle Medizin
Zeitsschrift für chirurgie
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