

THE YEAR BOOK
of
SURGERY
1972

EDITED BY

SEYMOUR I. SCHWARTZ, M.D.

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ERLE E. PEACOCK, JR., M.D.

G. TOM SHIRES, M.D.

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Burns	99
Transplantation and Artificial Organs.	109
Oncology and Tumor Immunology.	157
Skin, Subcutaneous Tissue and Hand.	167
Breast	188
Head and Neck	198
Thorax, Mediastinum, Pleura and Lung	211
Heart	229
Noncardiac Thoracic Disease	229
Congenital Heart Disease	237
Valvular Heart Disease	254
Great Vessels and Peripheral Arteries	277
Veins and Lymphatics	287
Esophagus.	306
Stomach and Duodenum	321
Small Intestine	363
Colon and Rectum.	379

Liver and Spleen 405

Biliary Tract 439

Pancreas 454

Endocrine Glands 462

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Pancreas	454
Endocrine Glands	462

ANNUAL OVERVIEW

General Considerations.—Coagulation defects associated with massive blood transfusions in healthy adults have been evaluated, with resulting emphasis on thrombocytopenia as the most common abnormality resulting in generalized bleeding, while disseminated intravascular coagulation and primary fibrinolysis were rarely implicated. Continuous intravenous infusion is presented as a potential source of life-threatening infection and a particular problem with subclavian vein catheterization. The urologic complications of abdominoperineal resection have received deserved consideration. Extended experience with the ileal loop continues to demonstrate that this procedure provides the best permanent, cutaneous urinary tract diversion.

Anesthesia studies continue to detail the effects of anesthetic agents on organ function. The organs most often affected adversely include the liver and kidney. Several studies incriminate halothane as a potent anesthetic agent which produces hepatic injury as a hypersensitivity reaction in an unknown but small number of patients. The effects of nonexplosive anesthetic agents on renal function are attracting a great deal of attention. It is apparent that some inhalation anesthetics do cause renal function changes which may be detected only by sophisticated study, although these changes may not be detrimental unless there are other predisposing factors, such as major operative procedures, prolonged hypertension, severe volume depletion and infections.

Fluids, Electrolytes and Nutrition.—The bulk of surgical publications on fluid and electrolytes continues to delineate the fluid and electrolyte responses of the surgical patient to operation as well as to trauma by attempting to quantify more accurately the replacement of body fluids lost or sequestered in response to injury. The metabolic effects of injuries of all kinds, from external trauma to operative stress, have been investigated. The present knowledge that the energy profiles of post-operative patients undoubtedly are remarkably altered has led to study of the use of protein, carbohydrate and fat as fuel substrates in response to injury. Confirmation of the original studies of Dudrick, who showed the usefulness of total parenteral alimentation, continues. The type of patient best benefited by this procedure, the hazards and limitations of the technic and the results are now being thoroughly documented. Several articles emphasize the specific hazards of hyperalimentation and the need for extreme caution with parenteral feeding. The many complications serve to point out that, while the technic is useful and effective, it should be confined to selected patients and used under very careful supervision.

Shock.—It is apparent from the quantity and quality of surgical articles considering shock that this remains one of the major problems facing the surgeon. This year we see a marked increase in studies of the tissue and, more specifically, of the cellular and subcellular responses to shock. These studies are now beginning to show a pattern. There is little doubt that reversible but severe cellular injury occurs in response to both hypovolemic and septic shock, as well as after prolonged hypotension from any cause. The cellular response is characterized by reduction of

both the active and passive transport mechanisms across the cell membrane. A number of articles also document changes in the mitochondrial functions of the cells of many organs during shock. Others report changes in many injured cells, but particularly in those of the reticuloendothelial system, caused by lysosomal leak. The mechanism of change in cellular function which involves interference of undetermined source in the energy metabolism available for maintenance of normal cell functions is now under active investigation. There are also several very sophisticated studies attempting to differentiate the effects of sepsis on the cellular function from those of hypotension caused by sepsis.

Accumulating evidence continues to indicate that the fluid and electrolyte responses to shock are more complex than the simple loss of blood volume. The various ways in which fluid and crystalloid therapy are beneficial adjuncts to the return of shed blood in the care of the shocked patient are being intensively studied.

The pharmacologic responses of both animals and patients to various drugs, including the adrenal cortical drugs as well as the adrenergic stimulating and adrenergic blocking drugs, are still under investigation. Although this field continues to suffer from the many vagaries of experimental design, drug dosage, and combination drug therapy, it is a worthwhile focus of investigation. Ultimate patient survival, the final denominator, has not yet been adequately shown to be consistently influenced by pharmacologic manipulation.

Several good reports detail the specific effects of septic shock on tissue and organ function. Most investigators are beginning to believe that live organisms such as *Escherichia coli* probably produce an experimental septic shock far more comparable to human septic shock than that produced by chemically extracted endotoxin alone. The former should certainly produce a more standardized septic shock model and, consequently, more uniform data on organ, tissue and cellular responses.

The search for a human circulating toxin which produces myocardial depression in animals continues. From the available reports, it appears that more than one substance which has a secondary depressing action on other organs may be generated in response to shock. The nature and origin of the hypothesized substance are the subject of on-going study. Many surgeons are studying the role of disseminated intravascular coagulation (DIC) in responses to various forms of shock. This is a difficult field because it is still impossible to tell whether DIC causes or results from a deteriorating clinical picture in the shocked patient.

Trauma.—The continuing increase in the number and quality of publications considering the injured patient is gratifying in view of the fact that studies of the specific management of trauma and of the mechanism of injury following trauma have been so slow in coming. As pointed out by Altemeier in his Scudder Oration, published in 1971, the importance of infections in the injured is still quite manifest. Several articles have displayed increased recognition of the infections which occur following injury and have discussed their specific definition and management. In addition, several new infections which often mimic other diseases such as gas gangrene or even appendicitis have been described. At least two good review articles clearly point out that surgical control is still the pri-

mary mode of treatment for patients with severe surgical infections. However, earlier, more specific, and more effective antibiotic therapy is certainly a useful adjunct.

Several articles reflect the intense study of changes in the blood in response to injury and infection now under way. There is no question that changes in the clotting factors, the microvascular flow, and the intravascular clotting following injury and infection occur, but the exact nature and physiologic significance are still unknown.

The potentially lethal nature of blunt abdominal trauma continues to be emphasized, and several studies have recognized more subtle and occult injuries. In addition, the diagnostic accuracy for recognition of serious injury following blunt abdominal trauma is being improved by such adjunctive technics as peritoneal lavage. One of the fascinating aspects of severe trauma, recently recognized, is the complex role of oxygen transport. The effects of changes in the oxygen hemoglobin dissociation curve and the various factors influencing these changes are now being studied, and the results certainly should improve the care of the injured patient. Many sophisticated articles are now considering the detailed organ response to injury, such as changes in renal, pulmonary and gastrointestinal function, including stress ulcer.

It is becoming increasingly clear that posttraumatic pulmonary insufficiency has multiple but often identifiable and explainable etiologic bases. For example, one study of a large number of combat casualties showed that if the patients with burns or intracranial or pulmonary contusion lesions were excluded, posttraumatic pulmonary insufficiency was not seen except in the presence of sepsis. Consequently, it appears that the "shock lung" is an oversimplification of pulmonary dysfunction which actually arises from multiple causes and rarely, if ever, from shock alone. We are now finding that the lethality of posttraumatic pulmonary insufficiency recognized early with the aid of blood gas studies and treated with vigorous pulmonary support can be counteracted in many cases.

Wound Healing.—The most interesting discovery in the field of wound healing biology last year was identification by Majno of smooth muscle-like cells with contractile powers in granulation tissue. No unifying hypothesis to explain all available data on wound contraction has been possible in the past. Discovery of another powerful contractile element opens the door to a new range of experiments, especially welcome as wound contraction study, for all practical purposes, has been dead for 10 years. A most interesting clinical study of wound healing produced data which should convince surgeons that selection of a tranverse or vertical incision for right upper quadrant abdominal surgery can be made almost entirely on the basis of exposure; no difference was found in the number of complications of wound healing. Although search continues for accelerators of the healing process, no clinically significant progress was reported. The importance of procollagen-hydroxylase and lysyl oxidase as target enzymes and discovery of procollagen as a definite precursor of the mature collagen molecule encourage control of collagen synthesis by biologic methods. Although urea in concentrations found in azotemic patients does not seem to inhibit tensile strength gain in

incised and sutured wounds, additional data showed that serum from uremic patients inhibits growth of fibroblasts in tissue culture. Stimulation of stem cells from the fibroblast series was shown to be initiated by lysosomal enzymes, which suggests that healing control at the cell membrane level may be possible.

Infections.—The control of infections seems directed more to study of cellular and immunologic processes than to development of antibiotics. Cross infections between urinary tract, transient bacteremia and healing wounds are being viewed as possible mechanisms for development of postoperative infections. A number of new topical antibiotics have been introduced for prevention of infection in burn eschar. Some of the antibacterial factors in normal skin have been studied in more detail this year, and the data suggest that mature skin grafts, for instance, are able to resist infection more effectively than freshly transplanted ones.

Burns.—Burn therapy remains approximately the same in 1972 as in previous years. Interesting studies on the relation of urinary tract infection to burn wound infections and the possibility that pre-existing urinary tract infections may be responsible for some burn infections introduce new adjuvants to the control of infection. Vaccines still are being investigated, and interesting data from rats are reported. Additional information attesting to the enormous energy loss attributable to evaporation of water through burn eschar are even more impressive than previous reports. Correction of this hazard can still be improved in most institutions; selection of fluid therapy for burns should be even more individualized and less dependent upon a formula and stock solutions. Intravenous hyperalimentation has added a new tool for solving nutritional problems. Additional topical antibiotics are available; no one agent appears significantly better than another, particularly if basic surgical principles of wound management are neglected. In general, progress in burn management during the last year has been largely concerned with providing additional data to support previous forms of therapy in the fields of infection control, fluid computation and electrolyte needs, and reduction of energy dissipation through evaporative water loss. Enthusiasm for skin allografts to dress temporarily deep second degree burns continues.

Transplantation and Artificial Organs.—The number of kidney transplants performed throughout the country has increased steadily during the past 2 years. During the calendar year of 1971, there were 2,147 transplants performed in 1900 recipients. As of April 1, 1972, a total of 9,131 kidney transplants were recorded by the Transplant Registry, an increase of approximately 400 reported kidney transplants per year for the past 2 years. Considering that there are between 10,000 and 30,000 potential kidney transplant recipients, it would appear that this therapy is slowly gaining on the need. Kidney transplantation is now well-accepted therapy for children, and a variety of groups continue to explore its use in treating various systemic diseases affecting the kidneys, such as juvenile diabetes mellitus, lupus erythematosus and malignant hypertension. The results of kidney transplantation in these groups are encouraging.

Cadavers furnished approximately 61% of all kidneys, with parent and