

THE YEAR BOOK
of
SURGERY
1973

EDITOR

SEYMOUR I. SCHWARTZ. M.D.

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There are twenty YEAR BOOKS in various fields of medicine and one in dentistry. Publication of these annual volumes has been continuous since 1900. The YEAR BOOKS make available in detailed abstract form the working essence of the cream of recent international medicoscientific literature. Selection of the material is made by distinguished editors who critically review each year more than 500,000 articles published in the world's foremost journals.

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General Considerations.—Disseminated intravascular coagulation remains a concern in a variety of disorders of interest to surgeons. It is now appreciated that heparin is no longer to be regarded as primary therapy, and correction of the initiating disorder should be emphasized. Von Willebrand's disease is emerging as a common hemostatic defect. Surgery can be performed in patients with this disease using meticulous technic and administering steroids and fresh frozen plasma. Patient monitoring has become increasingly refined and the applicability is becoming more widespread. Arterial hypoxemia has emerged as the best evidence of early fat embolization to the lung. Hypoxemia is also frequently noted and is considered an important factor in the delirium that occurs in patients in intensive care units. More routine use of electrocardiograms to monitor patients who require an operation within 6 months of a myocardial infarction is indicated to detect arrhythmias which occur with a significant instance and are associated with a high mortality. The limitations of central venous pressure are now appreciated and the Swan-Ganz catheter provides information to avoid misinterpretation. Subclavian catheterization, which has become a standard procedure, requires an appreciation of the complications attendant in its use. There is an appropriate increase in consideration of management of addicts undergoing surgery. The concept of postoperative ileus has been refuted by barium studies.

Fluids, Electrolytes and Nutrition.—Several articles have detailed clinical and laboratory evidence for proper operative fluid replacement. These studies mainly point to the need, particularly with larger operative procedures, for replacing whole blood as it is lost, with the addition of modest amounts of saline solution.

Further definitions are seen for the selective use of hyperalimentation to provide nutritional support. Infection is still the most serious complication of hyperalimentation. One article confirms the opinion that, most often, during hyperalimentation the sepsis originates elsewhere in the body rather than primarily in the catheter. Regardless of the origin, once the catheter is contaminated, the bacterial contamination serves as a continuing source of sepsis.

Shock.—It is apparent from the quantity and quality of articles on shock being published by surgeons that shock remains one of the really serious surgical problems. Once again this year there is an increase in studies of the tissue responses, specifically the cellular and subcellular responses to shock. These studies are now beginning to emerge in a pattern. There seems to be little doubt that there is reversible, but serious and severe, cellular injury which occurs in response to both hypovolemic and septic shock, as well as to prolonged hypotension from any cause. This is characterized by reduction in active and passive transport mechanisms across the cell membrane. A number of articles also document changes during shock in the mitochondrial function of the cells of many organs, and a quantity of work shows the changes in many cells caused by lysosomal leak from injured cells. Under active investi-

gation now is the mechanism of change in cellular function. There is interference in the energy metabolism available for maintenance of normal cell functions, but the exact source of this energy depletion is yet to be elucidated. There are also several very sophisticated studies that attempt to differentiate the effects of sepsis on cellular function as opposed to hypotension, which is caused by sepsis.

Evidence continues to build that the fluid and electrolyte reactions to shock comprise a more complex response than simple loss of blood volume. The changes incident to the loss of vascular volume are being more actively investigated. The various ways in which fluid and crystalloid therapy provides additional benefit to the return of shed blood to the patient in shock is being actively pursued by many surgeons.

Studies on the rheology of shock continue to explore the coagulation mechanism. Interesting studies in primates are showing an absence of coagulation defects in hemorrhagic shock. These studies suggest that coagulation defects in the dog may be species or reservoir specific. On the other hand, septic shock does appear to cause coagulation defects in the primate.

There are several interesting studies on the metabolism of shock. Evidence of a remarkable impairment of the secretion of insulin during hemorrhagic shock is accumulating.

Several good reports this year discuss the specific effects of septic shock on tissue and organ functions. Some articles, for example, detail inability of the dog heart to respond to additional workloads during sepsis, and the correction of this defect by digitalis. Most investigators are beginning to believe that the use of live organisms, such as *Escherichia coli*, probably produces an experimental septic shock which is far more comparable to human septic shock than that produced by the chemically extracted endotoxin alone. Studies using live organisms to produce sepsis should certainly provide a more standardized septic shock model and, consequently, more uniform results on organ, tissue and cellular responses.

Trauma.—This year has continued to demonstrate a progressive increase in the number and in the quality of publications regarding the injured patient. This is gratifying in view of the fact that studies on the specific management of trauma and on the mechanism of injury following trauma have been so slow in coming.

Current work is providing additional documentation of the mechanism and development of opportunistic infections. Specific management of infections continues to need investigation.

The potentially lethal nature of blunt abdominal trauma is still emphasized, and several studies have recognized more subtle and occult injuries. In addition, the diagnostic accuracy for recognition of serious injury from blunt abdominal trauma continues to be improved by the use of such adjunctive technics as peritoneal lavage.

Justifiable emphasis is placed on more adequate recognition and treatment of posttraumatic pulmonary insufficiency. One interesting study relates the anatomic pulmonary lesions to the severity of infection. Another documents fulminant fat embolism in combat casualties. Additional studies point out that hemorrhagic shock alone, although produc-

ing some anatomic changes in the lung, does not produce significant physiologic change as manifest by hypoxemia.

It is becoming increasingly clear that posttraumatic pulmonary insufficiency has multiple but often identifiable etiologic bases; reports are pointing out that there were no patients with unexplainable posttraumatic pulmonary insufficiency. In fact, it was shown in a large number of combat casualties 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 the the "shock lung" is an oversimplification of pulmonary dysfunction which actually arises from multiple causes and rarely, if ever, from shock alone. Reports are showing that if posttraumatic pulmonary insufficiency is recognized early, with the adjunctive use of blood gas studies, and treated with vigorous pulmonary support, lethal insufficiency can be largely obviated.

Stress ulceration of the gastrointestinal tract continues to be a major cause of death after serious injury. Several sophisticated studies lend support to the ischemic etiology of stress ulceration. Most evidence indicates that the ischemic injury leads to back-diffusion of hydrogen with the leaks of vasoactive substances. There is a continuing need for more investigation of this major problem.

Wound Healing.—Basic research in wound healing during 1972 utilized thermography, oxygen electrodes, isotope labeling of connective tissue and measurements of water distribution to provide biologic understanding for clinical observations. An explanation for the apparent "better" healing in wounds in pediatric patients appears to be the result of vascularization. Additional interest in specialized cells termed myofibroblasts and in the process of wound contraction continues; the importance of tissue oxygen in controlling wound healing also was prominent. An explanation for the apparent shrinkage of skin grafts was shown in collagen turnover studies in transplanted skin; such studies should focus our attention more on the graft rather than on wound contraction as the fate of transplanted skin is studied. No specific or measurable effects of vitamin E on collagen synthesis could be demonstrated. Interest in sutures shifted more to the effect of the suture on the wound rather than the effect of the wound on the suture. As manufacturers develop new suture materials, claims undoubtedly will be made of the effect of the suture on wound healing; more studies of this type will be needed to help evaluate new synthetic materials. Clinically, the use of biologic materials such as fascia, omentum and dermis were advocated more enthusiastically than the use of synthetic materials such as Marlex to repair defects in the abdominal and chest wall. Studies are beginning to appear on the biologic defects involved in the production of inguinal hernias. Although the data are not conclusive at this time, the fundamental defect in inguinal hernias probably can be identified with presently available technics. The search continues for a method to specifically inhibit collagen synthesis; presently, most of the methods that work in tissue culture are too toxic in the intact animal or do not specifically affect collagen synthesis enough to be clinically significant. Control of the physical properties of newly synthesized collagen with

lathrogenic agents still appears promising and may provide the surgeon with the first agent to influence the physical properties of a newly synthesized scar.

Infections.—An excellent study was reported in 1972 that presents the first good scientific data that wound infections after appendectomy can be decreased by the use of topical ampicillin. Because such data are different than previously reported, additional studies need to be performed. Additional data showing that hyperbaric oxygen has a significant place in the treatment of gas gangrene was reported, but the practical aspects of administering hyperbaric oxygen remain so formidable that these data are not going to result in change of treatment of gas gangrene infections in most institutions. Basic research in wound infections continues to be directed more to the milieu than to the microbe. Factors of local immunity, medication and local wound care have been shown to influence significantly the development or control of wound infection. Similar concerns are responsible for reducing infections produced by tracheal intubation and mechanical ventilation.

Burns.—Continued emphasis upon the use of hypertonic saline in treating burns must be tempered with the realization that studies in laboratory animals are not necessarily applicable to human beings in whom renal failure is such an important problem. Direct measurement of total metabolism of a burned patient is possible now in more than one center; data continue to emphasize the high cost of energy loss while treating a burned patient. The utilization of xenografts without demonstrable data showing that they are any more effective than skin allografts continues to support a growing industry that may be increasing unnecessarily the cost of taking care of burned patients. Biologic dressings have made an important contribution to burn therapy but porcine skin is no better than other biologic dressings and may be considerably more expensive in many institutions. Excellent data showing that life island unit support does not give significantly better protection against infection are a relief to many surgeons and hospital administrators.

Transplantation and Artificial Organs.—Renal transplantation has finally come of age. We no longer need to read articles stating that transplantation is an experimental therapy. The United States Senate, the House of Representatives and the President of the United States agreed to approve HR-1 this past year. This law is a bench-mark legislative approach to catastrophic illness for several reasons. It is the first law which approaches a single disease system, namely, end-stage renal failure, and guarantees payment for specific modalities designed to correct the defect. Specifically, the patients who are "medically determined to have chronic renal disease and who require hemodialysis or renal transplantation for such disease, shall be deemed to be disabled for purposes of coverage under parts A and B of Medicare subject to the deductible, premium, and co-payment provisions of Title XVIII. . . . Medicare eligibility on the basis of chronic renal failure shall begin with the third month after the month in which a course of renal dialysis is initiated and would end with the 12th month after the month in which the person has a renal transplant or such course of dialysis is terminat-

ed." In short, transplantation and dialysis is paid for 3 months after treatment starts. The government would not do this without regulation and the Secretary of Health, Education and Welfare is "authorized to limit reimbursement under Medicare for kidney transplant and dialysis to kidney disease treatment centers which meet such requirements as he may, by regulation, prescribe." In short, Uncle Sam has decided to treat the treatable but regulate the costs and determine who the treaters will be—truly, the landmark of the year in transplantation.

In more mundane areas, renal transplantation has leveled off. There is no improvement in results from year to year although higher-risk patients such as those with diabetes, Fabry's disease and malignant hypertension are now being treated. Renal preservation has come of age, and both surface cooling and pulsatile perfusion with cryoprecipitated plasma are successful, but preservation of other organs appears more complicated. In immunogenetics, the histocompatibility locus has been further subdivided into subloci, which contribute to the serologically determined HL-A antigen, and other loci, which seem to predict mixed lymphocyte culture reactivity and even delayed hypersensitivity responses. There will be considerable progress along this line within the next few years. Most of the other research in renal transplantation has been concerned with extension of the indications to more complicated diseases, further research into the complications of immune suppression and finally research into the social consequences of our therapy.

Heart transplantation continues to be successful in California, liver transplantation in Colorado and lung transplantation nowhere.

There are two areas of increased interest in artificial organs. Kolff and his co-workers have succeeded in implanting artificial hearts in calves for prolonged periods. In another area, the membrane oxygenator is being increasingly adapted to respiratory assistance.

Oncology and Tumor Immunology.—Cancer immunology has become fashionable once more, particularly among surgeons interested in transplantation, and it appears that a major thirst toward adjunctive immunotherapy of cancer is developing among surgical investigators. Several facts are clear: tumors probably possess tumor-specific transplantation antigens on their cell surfaces that are capable of inducing immunity in their hosts. If a tumor is transplanted into a syngeneic host, the tumor will normally grow and kill the recipient. If the tumor is totally excised or otherwise destroyed, the host will not only survive but subsequent transplants of this tumor to the same host will be rejected. Lymphoid cells from the immune host can prevent the growth of tumor cells when mixed together either in vivo or in vitro, and it is possible to demonstrate antibodies to the tumor in the serum of immunized hosts. An antigenically unrelated tumor can, however, kill a host resistant to the first tumor—demonstrating the immunospecificity of the animal's resistance.

It is not necessary to excise or destroy the tumor to induce an immune response to the tumor in syngeneic hosts. If a second inoculum of one tumor is given to a host already bearing this tumor, the second challenge will grow less well, i.e., a state of immunity has been established concomitant with the growth of the primary inoculum. Hosts bearing small transplantable tumors can be shown to have both antibodies to

their tumor cells and lymphoid cells capable of killing tumor cells in vitro. If the primary tumor is allowed to grow, however, concomitant immunity appears to wane, and lymphoid cells from hosts bearing larger tumors may no longer kill tumor cells in vitro. Not only is the intrinsic cytotoxic ability of these cells lost, but the serum of a tumor-bearing host appears capable of specifically blocking the cytotoxic capacities of pre-immunized cells. There are additional severe limitations to the degree of strength of tumor immunity. Not only is concomitant immunity lost as tumor size increases, but also even strong pre-existing immunity can be overcome by large challenge doses of tumor. The specific immune response of host against tumor is depressed by large tumors, and there is an apparent nonspecific depression of many of the components of the immune system as well. In brief, once established, the tumor and host act synergistically in favoring growth of the tumor. Cancer immunotherapy seeks to reverse this trend by augmenting those elements of the immune response that are inhibitory to tumor growth, or by suppressing those components (i.e., blocking or enhancing antibody), which appears to counteract effective tumor cell destruction. Much work is currently being done to augment the effect of immune response to tumor antigens in several ways: (1) nonspecific stimulation of the immune apparatus with various adjuvant substances (these include BCG and other bacterial as well as nonbacterial substances); (2) specific active immunization using tumor antigens whose immunogenicity is increased (i.e., with neuraminidase); (3) adoptive transfer of immunologically competent or sensitized cells; (4) passive administration of antibodies to tumor antigens; (5) inhibition of blocking substances (i.e., with antiplasma cell serum); (6) immunization against factors required for tumor growth (i.e., tumor angiogenesis factor); and (7) passive administration of specific inhibitors to tumors (i.e., transfer factor or immune RNA.) Obviously, a combination of these modalities with each other and with other therapeutic modalities is possible.

In evaluating both experimental studies of this type and clinical therapy, it is important to distinguish between immunoprophylaxis and immunotherapy. Immunoprophylaxis seeks to prevent the establishment of an infectious group of cells or oncogenic organisms. Immunotherapy seeks to augment the host capacity to destroy an established, growing tumor. From a discussion of the preceding principles of tumor immunity, it must be apparent that the established tumor has already developed a system of "immunologic accommodation" which must be broken—a far more difficult task than is immunoprophylaxis. The articles in this book discuss many attempts to achieve a true immunotherapeutic response. One of the problems facing most of the investigators is to establish an in vitro correlate by which we can judge alterations in the immune response induced by this treatment. One must remember that these in vitro correlates may not truly be correlates of curative treatments, just as one must be sure that the tumor antigens found on tumors are those responsible for tumor immunity and not incidental findings on an altered cell.

While cancer immunotherapy struggles to emerge, cancer chemotherapy has come of age with little help from the surgeons. The Lasker

awards were given in 1972 to a large number of physicians and investigators who fostered the development of chemotherapy over the past 20-30 years. Newer drugs, newer combinations of drugs and combinations of drugs with radiotherapy and/or surgery are achieving real results, and one would guess that surgeons will be utilizing these advances increasingly in the future.

Immunodiagnostic procedures for carcinoembryonic antigens, α -feto protein and similar substances present in the blood of patients with cancer may well be of future prognostic use by diagnostic laboratories. Angiographic studies of tumors may well help delineate the extent of the tumor so that more adequate excisions can be carried out.

Skin, Subcutaneous Tissue and Hand.—Basic research on fundamental problems involving the upper extremity was limited primarily to control of tendon adhesions. Although the theoretical possibility that collagen synthesis could be inhibited during healing after tendon surgery was exciting following the introduction of proline analogues, no data accrued during 1972 to give any real hope that this is possible in the immediate future. Proline analogues have been found to be too toxic in living animals and, as yet, there are no data to support the hypothesis that proline analogues specifically inhibit collagen synthesis in an intact animal. The results of treating wringer injuries aggressively and trying to prevent the serious complications of impending Volkmann's contracture by early therapy were emphasized. A new approach to restoration of opposition of the thumb appears to be possible by transfer of a motor nerve. Improved results in vascular reconstruction in the hand and in transplantation of nerves around the elbow joint also were reported. Continued emphasis upon obliteration of dead space and primary closure of wounds were advocated for treatment of pilonidal sinus. Important emphasis upon the serious nature of sweat gland carcinoma, particularly in young patients, appeared in 1972. Several articles studying the effect of regional lymph node dissection on cutaneous melanoma point out the difficulty of studying this capricious lesion and emphasized that there still are no data to support the concept of regional node dissection except to get rid of visible tumor and to make the prognosis more accurate.

Breast.—Prognosis and treatment of breast cancer continues to await properly performed prospective studies in which as many factors as possible are controlled. In the meantime, 1972 produced more clinical opinion and speculation with very little data to help clarify treatment of breast disease. Most of these studies are heavily biased by a form of treatment or selection of patients. The case for local excision and modified mastectomy seems stronger than in the past but it should be emphasized again that data needed to draw conclusions are not available at this time. Bone scanning by new technics appears more accurate and less expensive than conventional bone surveys for metastatic disease. The true nature of fibrocystic disease also is still speculative. Prospective studies of this condition are needed before conclusions suggested in 1972 can be accepted. Further studies on lobular carcinoma seem to support the hypothesis that this is a distinctly different type of tumor in that small duct cells which may be under hormonal influence

primarily are involved. Therapeutic possibilities raised by such studies are being explored in several centers. An increase in gynecomastia probably is due more to the use of antihypertensive drugs than to any other measurable factor. An encouraging trend in many of the better publications on breast oncology was consideration of factors such as the biologic milieu and factors that influence natural resistance or immunity. Postoperative radiation seems to have less of a theoretical or practical basis than previously suspected; the possibility that preoperative radiation may be helpful still exists in view of the 1971 survey. No prospective studies on this subject were reported in 1972.

Head and Neck.—The year 1972 probably marks the beginning of the end of good articles advocating massive excisional therapy for tumors of the floor of the mouth and the neck region. Superb articles this year showing the results of radiotherapy in the floor of the mouth and the neck are fulfilling the prediction made several years ago that mutilating surgery in this area soon would not be necessary. In addition, for unexplained reasons, chemotherapy seems to be improving. Although cures are not reported, reduction in size of lesions and rate of growth apparently are possible. In the past, relief from pain was the major objective of chemotherapy. There still is a problem created by reporting clinical results that are not properly controlled and that do not carry modern statistical evaluation. The results of head and neck cancer treatment apparently are improving, however, and the major factor appears to be superb radiation therapy. Only a decade ago, even the most enthusiastic radiologists did not recommend radiation therapy for cervical metastasis. Now the first good studies are being reported which show that destruction of cancer in the neck by radiation is as good as and possibly better than surgical excision of lymph nodes. A timely warning about the malignant potential of plexiform neurofibroma should restrain the enthusiasm of surgeons to use neurofibroma to reconstruct facial defects. Plastic surgeons still appear too enthusiastic about exploring orbital floor fractures. Proper selection of patients for conservative surgery in the larynx and pharynx can reduce the disability of surgical treatment in this area. Search for an appropriate material to restore contour in the face seems to be directed more to biologic materials this year rather than utilization of synthetic substances.

Noncardiac Thoracic Disease.—A potentially significant statistical observation was reported by Langston; he noted a change in ages of patients with lung cancer over the past few decades, suggesting an epidemiologic factor in etiology. Advances with diagnostic technics have been significant, including the flexible bronchoscope, bronchial brush biopsy, mediastinoscopy and trephine lung biopsy.

Combining radiation therapy with operation for bronchogenic carcinoma continues to be disappointing. A good summary of sleeve lobectomy for poor-risk patients with bronchogenic carcinoma was reported, indicating its value as a compromise procedure in selected patients. A significant report of replacement of the tracheal bifurcation with a molded Silastic prosthesis in one patient, with short-term survival, was published by Neville, and another case was reported by Childress in

which successful reconstruction of the trachea with an intercostal-periosteal graft was performed.

The controversial question of thoracotomy for most penetrating injuries of the chest was explored by Robicsek *et al.* Although the value of thoracotomy for treating all penetrating wounds of the chest would be debated by most, their data indicate that the hazards of operation are small. The dreaded problem of tracheoesophageal fistula complicating tracheostomy with a balloon cuff was reviewed by Harley. Hopefully the significant advances in design of tracheostomy cuffs will greatly diminish or eliminate this near-lethal complication. The Lanz cuff developed by Magovern is most promising.

Congenital Heart Disease.—Corrective operation in infants remains the frontier of greatest activity for congenital heart disease. Several groups are investigating the stimulating results with deep hypothermia and circulatory arrest reported by Barratt-Boyes and associates. At the same time, technics with standard cardiopulmonary bypass modified for infants are being examined to a greater degree. A more effective method of ventilatory support in these infants after operation, permitting spontaneous breathing with continued positive airway pressure, was reported by Stewart and Kirklin. Significant technical reports appeared concerning different complex malformations, complete atrioventricular canal, the Rastelli operation, the Mustard operation for transposition, and aortic valvuloplasty for aortic insufficiency complicating ventricular septal defect. A statistical study by Brewer of neurologic injury following operations for coarctation of the aorta found that such complications occurred in about 1 case in 200. His suggestion that the adequacy of collateral circulation should be assessed in each instance, using a temporary shunt if the circulation is inadequate, is sound. The blood pressure in the distal aorta after the aorta has been occluded is probably the best index of collateral circulation.

Valvular Heart Disease.—Enthusiasm for fascia lata valves has waned substantially because of disappointing late results. Investigation of homologous fascia lata has been undertaken by Ionescu; Zerbino, in São Paulo, has reported initially favorable results with homologous dura mater. The value of covering prosthetic valves with cloth continues to be reaffirmed in several reports. Favorable reports also support the tilting disk valve of which the Björk-Shiley model is best known. Aortic homograft valves continue to give admirable results with freedom from thromboembolism but are associated with a disquieting frequency of late incompetence, fortunately not to an excessive degree.

Support for open mitral commissurotomy is indirectly provided by the report by Mullin that re-stenosis of a mitral valve is an uncommon late complication. This suggests that many stenotic mitral valves were inadequately opened at the initial operation.

The report by Crosby of early operation for bacterial endocarditis is stimulating because of absence of infection of the prosthetic valve. Hopefully others can duplicate this significant work. Of great interest is the demonstration by Arbulo that a patient will tolerate total excision of the tricuspid valve, *without replacement*, for at least several months or

longer. This was used in several patients in desperation who had acquired endocarditis of the tricuspid valve from heroin addiction. This seems the safest form of therapy for this disease, although probably most patients will require insertion of a prosthetic valve at a subsequent operation.

Coronary Artery Disease.—The area of greatest activity in cardiovascular surgery continues to be operations for coronary artery disease. Several publications of broad general significance appeared in the past year. A national committee, chaired by Lepley, defined optimal resources for coronary artery surgery. The implications of widespread bypass grafting were reviewed by Glenn in his presidential address to the American Heart Association, and the natural life history of coronary artery disease, defining a baseline to compare results with operation, was reviewed by Ross.

Several articles have appeared indicating the gravity of stenosis of the left main or proximal anterior descending coronary artery; this has such a poor prognosis that prophylactic bypass operations are indicated, even in asymptomatic patients. Technics of bypass surgery have changed somewhat. Wilson sounded a note of caution about the safety of ischemic arrest by publishing a series with a very low mortality when ischemic arrest was avoided. Experiences combining coronary endarterectomy with bypass grafting were again reported by Urschel. Several groups have enthusiastically adopted the internal mammary artery, rather than the saphenous vein, for bypass. Experiences with excision of myocardial scars remain somewhat disappointing, with limited improvement at best.

Operations for preinfarction angina or early myocardial infarction are being investigated cautiously by several groups. Almost uniform agreement has been reached that continuing anginal pain, refractory to nonoperative therapy, should be treated by bypass grafting. Disagreement exists about the best approach if the pain subsides but angiography shows extensive coronary occlusive disease. Once infarction has occurred, some groups have found good results with bypass grafting performed within a few hours after infarction, but this remains an important goal for investigation. Operative procedures for extensive infarction, often with shock, have been greatly aided with intra-aortic balloon pumping, which has become established as the best available method for assisted circulation.

Miscellaneous Cardiac Problems.—Progressive improvement in prolonged assisted circulation was demonstrated by Osborn and associates, who maintained venoarterial bypass for longer than 10 days in a few patients with acute respiratory insufficiency. The studies of MacGregor suggest that tolerance for intermittent ischemic arrest of the heart varies widely with the myocardial biochemical substrate existing before arrest. The significant problem of subendocardial ischemia during bypass was further investigated by Buckberg and Maloney, with data suggesting that prolonged fibrillation in hypertrophied hearts may cause extensive ischemia. A report by Boyd warned of the devastating consequences of disseminated intravascular coagulation complicating a low

output syndrome; this can precipitate gangrene in extremities that formerly were free from arterial disease.

Great Vessels and Peripheral Arteries.—Optimal resources for vascular surgery were defined by a national committee headed by DeWeese. Several publications have encouraged use of a temporary vascular shunt during excision of thoracic aneurysms, rather than regional bypass with heparinization. The TDMAC heparin shunt developed by Gott has been the most satisfactory.

The grim prognosis of untreated aortic aneurysms was again reaffirmed by long-term statistical studies by Szilagyi and associates, who followed patients in whom operation was not done because of serious cardiovascular disease. Death subsequently occurred in many from rupture of the aneurysm. Reconstructive procedures for femoropopliteal occlusive disease continue to give satisfactory, though not outstanding, results. Long-term statistical analyses were published by Darling and Linton. A progress report on long-term results with vascular grafts extended down to the lower leg was given by Tyson.

Hypertension.—Radioimmunoassay of renal venous renin has the best predictive value for the response to surgery in patients with renal hypertension. A 10-year experience with autogenous saphenous vein aortorenal grafting demonstrates cure or marked improvement in 98% of cases. Ex vivo reconstruction of the blood vessels and autotransplantation is preferable when there is involvement of the small peripheral arteries.

Amputations.—An improved outlook is noted for amputations of the leg with an increase in primary healing and a reduction in hospital stay. Below-knee amputations are now performed more liberally, and the use of an immediate postoperative prosthesis has been associated with improved results.

Veins and Lymphatics.—The inadequacy of clinical diagnosis of deep venous thrombosis has led to the introduction of noninvasive diagnostic techniques including fibrinogen-¹²⁵I scanning and Doppler and plethysmographic studies. Subanticoagulant doses of heparin or prophylaxis with warfarin or dextran have been shown to markedly reduce the incidence of thrombosis after major surgery. In those patients requiring interruption of the inferior vena cava to prevent pulmonary emboli, partial occlusion with a clip or suture technic is preferable to ligation since the incidence of fatal emboli are comparable and there are fewer postoperative sequelae associated with partial interruption. Enzymatic clot lysis has been shown to be effective in occlusive arterial and venous disease. Anticoagulants should be used concurrently to prevent subsequent rethrombosis. An interesting series has shown that patients can tolerate right nephrectomy and ligation or resection of the inferior vena cava above the left renal vein. The literature concerning lymphangiosarcoma has been reviewed. The prognosis, particularly for postmastectomy disease, is poor and is considered somewhat better for amputation than radiation therapy.

Esophagus.—The first solid demonstration of a consistent increase in lower esophageal sphincter pressure after hiatal hernia repair has now

been made after posterior gastropexy (Hill repair). We look forward to carefully executed studies of this type for the other "newer" types of repair. Why posterior gastropexy increases the sphincteric pressure is unknown from a physiologic standpoint.

A more and more aggressive operative approach to all penetrating wounds of the esophagus as well as to severe caustic injuries is clearly apparent since improved results provide adequate justification for such an approach. It is indeed unfortunate that at the same time that we make advances in one area, retrogressive steps are taken by such innovations as the introduction of nonphosphate detergents, which have proved to be far more injurious to the esophagus and stomach than their predecessors.

Stomach and Duodenum.—It is clear that highly selective (or proximal gastric) vagotomy without drainage obviates both dumping and diarrhea. The recurrence rate to date is low after this operation but the follow-up period is short. Postoperative secretory studies have begun to hint that acid secretion might rise progressively with time. We must await further evaluation before accepting this procedure as a reliable one for cure of the ulcer diathesis.

The antrum has assumed new importance now that it has been confirmed that complete antrectomy abolishes the secretory response to insulin in man. Since total removal of the antrum would appear to be a goal we will be striving to achieve more regularly, it is comforting to know on the basis of recent comparisons of gastrin content with surface pH that pH mapping of the antrum is a reliable means of detecting gastrin-secreting mucosa.

The importance of the enteroinsular axis (release of insulin by various gastrointestinal hormones such as gastrin, cholecystokinin and secretin) becomes increasingly evident as new studies of the dumping syndrome appear. Inappropriately low insulin levels in blood for the level of blood glucose and increased levels of enteroglucagon have now been demonstrated in patients with the dumping syndrome. It is likely that decreased gastrin, cholecystokinin or secretin might be responsible for the relative insulinopenia in these patients.

Small Intestine, Colon and Rectum.—Selective angiography in the diagnosis and treatment of obscure gastrointestinal hemorrhage has reached a high degree of technical expertise. The true value of this modality for the treatment of bleeding will not be known until properly controlled trials are conducted. On the other hand, colonoscopy with fiberoptic instruments will probably replace operation for benign polypoid lesions of the colon and in addition offers many and valuable diagnostic advantages. The initial hope that the CEA would be an iron-clad test for cancer of the colon has not been realized because positive tests occur in so many other conditions, but perhaps it will have some usefulness in prognostications of the postoperative course of the patient with operable and resectable carcinoma.

Burkitt has proposed that a low-fiber, low-residue diet may be important in the pathogenesis of cancer of the colon, an hypothesis consistent with the recent observation that the fecal flora in patients on low-residue diets is markedly different from that of individuals who