Operative Techniques in Vascular Surgery

edited by

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and

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Foreword

This book is relatively unique, both in concept and in execution. This volume is based on a symposium in vascular surgery that has been carefully developed by Dr. John J. Bergan and Dr. James S. T. Yao. The symposium has served as a model for others by virtue of its precise planning and the excellence of its faculty.

This year, the symposium is devoted to the technical aspects of vascular surgery, and includes both aortic and venous surgery, as well as the operative approach to portal hypertension. The book has been divided into appropriate sections, such as surgery of the aorta, cerebral revascularization, surgery of the aortic branches, and other well chosen areas of surgical treatment of vascular disease. The authors of each chapter have contributed significantly to the advancement of vascular surgery in the particular areas to which they have been assigned. The participation by H. H. G. Eastcott, Roger Greenhalgh, and Henner Muller-Wiefel has added an international scope to the symposium. It is a tribute to the authors, as well as to Dr. Bergan and Dr. Yao that the volume is available at the time of the symposium. In addition, this book should be of great interest to vascular surgeons throughout the country.

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Preface

This book in intended to be practical. It is recognized that treatment, which is that part of surgery that changes as time passes, is evanescent. Nevertheless, success of operative procedures is dependent upon technical perfection, whatever the operation may be. Such technical perfection is literally in the hands of the surgeon. He brings with him to the operating room skill, knowledge, and a personality that allows him to control the operation in hours of calm and in moments of chaos.

A volume cannot contribute to a surgeon's skill, nor can it modify his personality. It cannot make him a more capable leader of his operating team. On the other hand, a volume can bring to him the best thoughts from the most reliable authorities relative to technical performance of the operation itself. This is done in the pages that follow.

In the modern era, surgery of aortic aneurysms was a most significant technical advance. Surgery of the aorta remains the keystone of vascular surgery as practiced in the 1980s. Therefore, it is appropriate to bring together the thoughts on treatment of aortic aneurysms as stated so clearly by Jesse Thompson of Dallas, Stanley Crawford of Houston, Richard Kempczinski of Cincinnati, and H. H. G. Eastcott of London. While the latter contributors speak of aortic occlusion, rather than aneurysm surgery, the problems in management of aortic disease are similar in both instances. Some thoughts on elective and urgent aneurysm resection are contributed by Bergan, speaking for the Northwestern University vascular group.

Surgery of the intra-abdominal aortic branches demands technical perfection. It is appropriate, therefore, to include the thoughts of Richard Dean of Nashville and James Stanley of Ann Arbor, who stand preeminent in the field of renal revascularization. William Ehrenfeld of San Francisco describes the techniques worked out in his very large experience with *ex-vivo* repair of the renal artery. Similarly, operations for acute and chronic mesenteric ischemia have been a long time interest of the Northwestern group, and their approaches to these problems are illustrated and described.

Revascularization of the lower extremity has been characterized in modern times by exploration of more and more distal anastomoses. The entire field is exceedingly

well discussed by Muller-Wiefel of Dusseldorf, Frank Veith of New York, and Roger Greenhalgh of London. The techniques described by them are nicely complemented by descriptions of sequential bypass grafting, as enumerated by William Flinn of the Northwestern group; composite arterial grafting, as described by Jonathan Towne of Milwaukee; and a well-crafted description of care of peripheral aneurysms by Robert Hobson of Newark.

Extra-anatomic reconstructions are useful in a variety of situations, none of which are simple and some of which are extremely complex. Therefore, the clear description of the axillofemoral bypass by Robert Rutherford of Denver and the knowledgeable exposition by Preston Flanigan of the University of Illinois on femorofemoral grafting are most helpful.

Jesse Thompson of Dallas stands preeminent in the field of cerebral revascularization. Therefore, it is appropriate to include his description of his method of carotid endarterectomy. Alternative methods of cerebral revascularization and technical advances in carotid surgery are the focus of William Baker's discussion. Preston Flanigan has very clearly described his methods of subclavian-carotid anastomosis for cerebral ischemia, and W. H. Edwards of Nashville has succinctly described his methods of vertebral artery reconstructive surgery. Indications have appeared for external carotid endarterectomy. The special technical problems associated with this procedure are described and their management detailed by Charles O'Mara of Johns Hopkins University.

Upper extremity arterial reconstruction has become a particular interest of a small group of surgeons. Among these are William Flinn of the Northwestern group and David Roos of Denver. Their descriptions of upper extremity bypass procedures, transaxillary sympathectomy, the first rib resection comprise a concise segment on surgery of the vasculature of the upper extremity.

Complications of arterial surgery are with us always. Therefore, it is appropriate to include within this volume thoughts about technique in management of graft complications. Among these is a description of the methods of management of aortoenteric fistula by Victor Bernhard of Milwaukee; of the infected aortic graft by Roger Smith of the Henry Ford Hospital, Detroit; of the technique of obturator bypass by Ralph DePalma, now of Reno; and an interesting, innovative technique of distal profunda femoris bypass, also by Dr. DePalma. One problem of distal reconstructive surgery is that redo operations are frequently necessary. These can be approached in a simplified fashion, as described by James Yao, writing from the Northwestern vascular group.

Reconstructive surgery of the venous system is now possible. In this regard, Andrew Dale's technique of crossover grafting is included in this book, as are Robert Kistner's description of venous valve repair and Luis Queral's contribution on venous valve transposition. The Iowa City group's innovative approach to creation of spiral grafts is described by Creighton Wright and, in a section on surgery of portal hypertension, the mesocaval shunt is described by John Cameron of the Johns Hopkins Hospital, the LeVeen shunt by its inventor, now in Charleston, South Carolina, the Sugiura procedure of gastroesophageal devascularization by George Johnson of Chapel Hill, and the interesting mesoatrial shunt for Budd-Chiari syndrome by Cameron of Baltimore.

The strength of these presentations is the authority that each surgeon brings to his description of his technical modifications of standard procedures. Although no book can include all of the operations now being done, a book on vascular surgery in 1980 can include a description of a large proportion of them. This book does this, and it is hoped that it will go far toward supplying the needs of surgeons in training, and even contribute thoughts to experienced surgeons who always look for a new way to speed and simplify operative approaches to solution of vascular problems.

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Contents

SURGERY OF THE AORTA

Technique of Aortic Aneurysm Resection

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Ultimately, three factors influence a decision about surgery in patients with an abdominal aortic aneurysm. These are the patient's age, the size of the aneurysm, and the associated medical conditions. It is acknowledged that aortic aneurysms are potentially lethal and that their behavior is unpredictable.[1] Age is not normally a contraindication to abdominal aortic aneurysm surgery, but it becomes a relative consideration at the extremes encountered in persons with dilation of the aorta. Over age 70, associated medical conditions become increasingly important. Among these, pulmonary insufficiency is the most troublesome, renal insufficiency the most overemphasized, and senility the most philosophically important. When myocardial ischemia is present, judgment must be exercised to choose between operative risk and risk of death from rupture of the aneurysm.[2] It is thought that a 5- to 6-cm transverse diameter of an aneurysm divides those lesions that can be watched expectantly from those that must be operated upon.[3] However, most vascular surgeons feel that the presence of an abdominal aortic aneurysm is reason enough for its resection.[4] (It must be recognized that ultrasound evaluation of aneurysms underestimates their actual size.)

A patient with an aneurysm 6 cm or less in diameter has a 75 percent chance of surviving 1 year and a 50 percent chance of surviving 5 years without surgery. These figures are reversed in patients with aneurysms greater than 6 cm in diameter. Such patients have a 50 percent chance of surviving 1 year and a 6 percent chance of surviving 5 years. Death from aneurysm rupture will occur in 43 percent of all the patients.

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ELECTIVE ANEURYSM RESECTION

Surgical preparation begins when the patient with an abdominal aortic aneurysm enters the hospital several days in advance of operation. Pulmonary ventilatory function is assessed and therapy given as needed. Smoking is prohibited and carboxyhemoglobin determination is added to the routine list of laboratory examinations. Aortography is performed if the institution has a capable angiographer. Nothing is to be gained from preoperative digitalization or bowel preparation. Mannitol is not used in preoperative preparation of the patient, but an overnight infusion of 1000 ml of noncolloidal fluid is given. An antibiotic effective against staphylococcus and Escherichia coli is started 24 hours prior to surgery and continued through 3 days postoperatively. An arterial line, a central venous catheter and a catheter in the urinary bladder are placed after induction of general anesthesia. The Swann-Ganz catheter monitor is necessary only in patients with proven ventricular dysfunction.

Transverse abdominal incisions render this operation needlessly complex. A vertical midline incision to be closed in a single layer is made from xiphoid to pubis. A total abdominal exploration is done, with careful attention being turned to each organ system before examination of the retroperitoneum. Unanticipated lesions should be found prior to resection of the aneurysm and appropriate surgical judgment exercised.[7]

The transverse colon and mesocolon are reflected upward. The small bowel is reflected to the right and upward. The ligament of Treitz and the superior duodenal attachments are incised, and the inferior mesenteric vein is divided. The retroperitoneum is opened distally to expose the bifurcation of the iliac arteries. Systemic heparin is given in a dose of 0.6 to 1.0 mg/kg of body weight.

After a decision is made as to whether or not a bifurcation graft will be utilized, the iliac arteries are clamped to prevent distal embolization. It is felt to be important to occlude the distal circulation prior to manipulation of the aneurysm or the aorta superior to it.

Following distal clamping, attention is turned to the superior portion of the aneurysm. Retroperitoneal fibroareolar and lymphatic tissues are incised to expose the aortic wall, which then is encircled with an index finger and clamped with any of the many aortic clamps. Several options are now available to the operating surgeon. If the aneurysm is large and associated large iliac aneurysms are also present, the surgeon may elect to do an aortobifemoral graft. If this technique is chosen, it is only necessary to oversew the neck of the aneurysm after transecting the aorta. There is no need to open the sac, evacuate the clot, or otherwise extend the operation further. The aortobifemoral graft is led parallel and usually medial to the aneurysm. The femoral graft limbs are led through the retroperitoneum in a conventional fashion, much as in reconstructions for occlusive disease. The only difference is that the femoral arteries are transected prior to anastomosis.

If the aneurysm is of moderate size and affects one or both common iliac arteries, it may be elected to extend the bifurcation graft to the external iliac arteries. These can be dissected free and skeletonized at any time prior to opening the aortic aneurysm itself. If, on the other hand, a tube graft is to be done, then simple crossclamping of the common iliac arteries without further dissection may be the technique of choice. Figures 1 through 6 show the simplest form of the aneurysm replacement.

Fig. 1. In emergency situations, proximal aortic control can be obtained with the aortic compressor. Otherwise, the upper aorta is exposed by incising the ligament of Treitz, mobilizing the duodenum to the patient's right, and incising the fibroareolar tissue to the aorta and encircling the aorta with a finger. The compressor can be applied in the region of the renal arteries, as shown, or in the lesser omental sac. (Reprinted with persmission.[8])

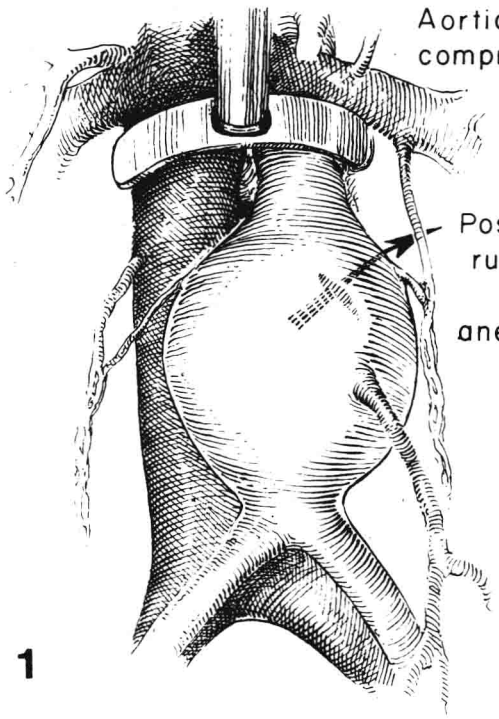
Fig. 2. Distal iliac artery clamping is performed without mobilization of the iliac arteries if the patient's aneurysm is confined to the aorta itself. Following this, the aneurysm is incised and laminated clot evacuated. (Reprinted with permission.[8])

Fig. 3. After opening the aortic sac widely, inferior mesenteric artery back-bleeding is noted. This and lumbar arterial orifices are suture closed. (Reprinted with permission.[8])

Fig. 4. After completion of the proximal suture line and near total completion of the distal suture line, the aorta and graft are flushed from above and below. (Reprinted with permission.[8])

Fig. 5. Following completion of the anastomoses, the aortic wall is imbricated over the graft to obliterate all dead space and assure hemostasis in the retroperitoneum. (Reprinted with permission.[8])

Fig. 6. A two-layer aortic wall imbrication is useful when the aneurysmal sac is large and redundant. (Reprinted with permission.[8])



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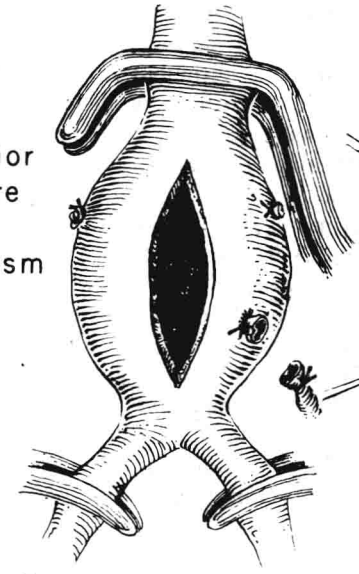

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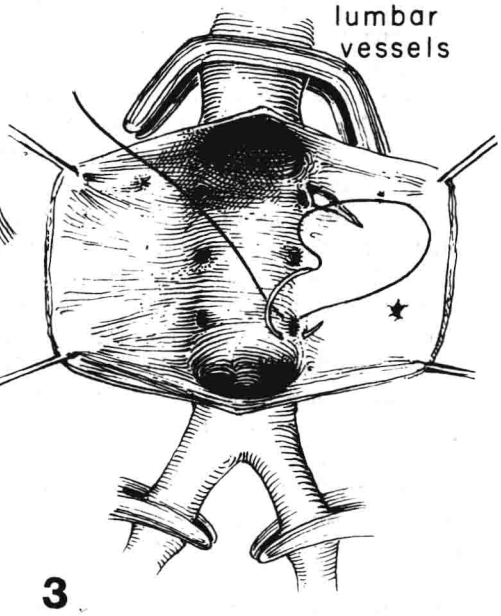

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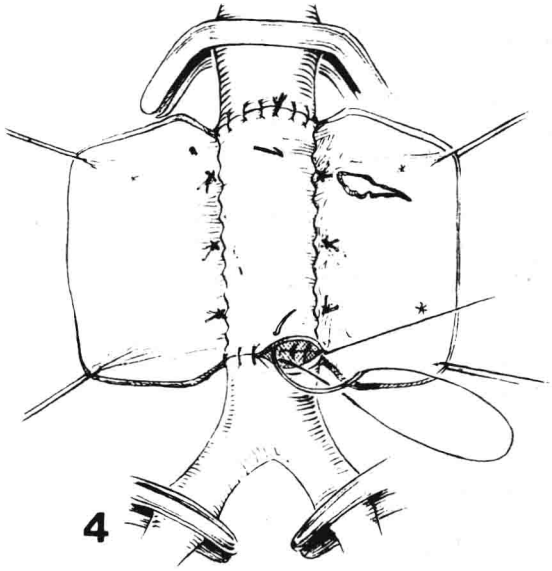

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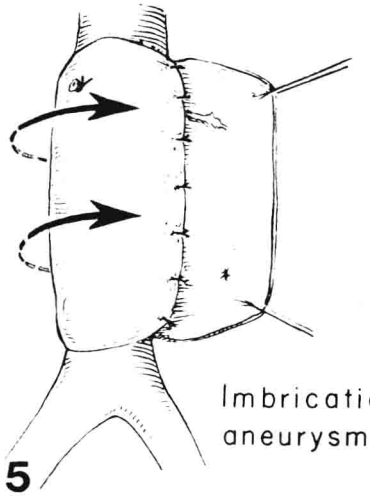

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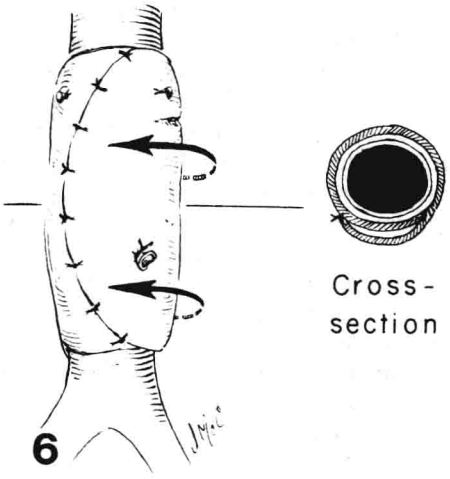

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