

# ARTERIAL SURGERY

## New Diagnostic and Operative Techniques

Edited by

**John J. Bergan**

**James S. T. Yao**

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## Foreword

Some believe that vascular surgery has matured as a discipline, and that the pace of advances in the future will slow considerably. This book refutes that thesis, for its theme is newness; new technology, new applications of knowledge, new techniques, new understanding of past dilemmas. Even if maturation of the specialty has taken place, vascular surgery is no less exciting now than when aneurysms were first resected or when veins were first used to bypass occluded arteries. Now we are presented with the excitement of laser anastomosis of blood vessels, duplex scanning, and angioscopy, to name a few recent developments of which every general-vascular surgeon must be aware.

The contributors to this volume have set forth the newest findings in their fields. Eventually, some will prove to be useless, but others may move vascular surgery ahead in a quantum leap. In the past, technology has driven the truly major advances: monofilament suture attached to delicate needles, noncrushing instruments, synthetic grafts, high-speed x-ray equipment for angiography, and Doppler devices. All evidence suggests that technology will drive the major advances in the future. And herein lurks danger for the specialty, because technology will bring new devices with which patients will be diagnosed and treated, devices that will require skill and practice to use. As the devices become more refined, an operating room may no longer be necessary for the treatment of serious vascular disease. The danger to the specialty will be realized if general-vascular surgeons retain the mindset that surgery always encompasses an anesthetic, an operating room, a scrub nurse, blood, clamps, and sutures. If the surgeon remains wedded to the operating room, nonsurgeons will be in the radiology department and the outpatient area using the new scopes, manipulating the new devices, and solving the vascular problems of patients without anesthesia, an operating room, or even a surgeon.

The new findings in this book reveal the framework of vascular surgery in the future, a framework into which are woven new devices and techniques that may be used by colleagues not trained in vascular surgery. Surgeons must be at the forefront of the development, refinement, and use of these technical innovations. If they are not, only the carcass of the specialty of vascular surgery will be passed on to the next generation of surgeons.

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## Introduction

"Be not the first by whom the new are tried, nor the last to  
lay the old aside."

*Alexander Pope 'An Essay on Criticism'.*

Although in the Old Testament, in the book of Ecclesiastes, we are cautioned that "there is no new thing under the sun," in fact, a great many developments in arterial surgery in the past few years are truly new ideas and many of them may profoundly affect the way in which we take care of our patients. Recognizing this, we felt the need to collect together in one volume information relevant to these new developments that would put them into perspective for the practicing vascular surgeon. In choosing the topics and selecting the authors, some judgment was necessary. The subjects had to be relevant to practice. The authors needed to be authoritative, knowledgeable, and broad minded about the impact of their area of special interest on vascular surgery as a whole.

If we are to have an effect upon atherosclerosis we must know how diet and biochemistry interweave. We must be able to advise our patients in order to favorably affect inevitable progression of atherosclerosis. In this volume, Craig Miller does this admirably and makes cogent suggestions. Host interaction in vascular prostheses has been the professional interest of James Anderson. Many of his findings on this subject are summarized in his chapter.

With regard to lasers, it is obvious that the book of Ecclesiastes was wrong. Laser energy is truly new and its application to vascular surgery appears inevitable. Various aspects of laser technology are the focus of a full section in this volume. The basic physics are explained by Rodney White, the effects of laser energy on the arterial wall by Peter Lawrence, the use of laser energy in arterial and venous anastomosis by Walter McCarthy, and the use of the laser for disobliteration of occluded arteries by Timothy Sanborn. The future of laser utility in vascular surgery seems to lie with the Excimer laser and Warren Grundfest explains this tool, its clinical applications, and a critique of lasers in general in vascular surgery.

Clearly, a growing trend in vascular surgery is development of better imaging. In the section on Radiologic Techniques in Vascular Imaging, Madeleine Fisher outlines the implications of MRI, while Bert Eikelboom explains the use of new contrast media, especially in application to digital subtraction angiography. Interventional radiology has had a profound effect on the way in which vascular patients are cared for. Barry Katzen

explains his rationale and use of thrombolytic therapy, and Wayne Johnson describes analysis of the work at the Toronto General Hospital with PTLA.

Many aspects of the diagnosis and treatment of cerebrovascular insufficiency are controversial and a number of these controversies are aired in this volume. Some of these have to do with the fact that surgery on the extracranial arteries may actually cause stroke. In an attempt to prevent this, Preston Flanigan explains intraoperative use of the B-mode scan in carotid surgery and Eugene Bernstein explains the use of the transcranial Doppler. James Yao examines sonic characterization of the carotid artery plaque and the significance of this to vascular surgeons, while Edouard Kieffer details surgery of the vertebral artery and presents this from the view of an enormous personal experience. Treatment of asymptomatic carotid stenosis is controversial and the subject is thoroughly aired in this volume by Bob Hobson. Finally, the position of carotid endarterectomy in management of symptomatic patients is explicated by Allan Callow.

Surgery of the aorta is not new in vascular surgery, but methods of approach to such surgery have changed. Cardiac evaluation becomes an important part of preoperative care and this is explained here by Bruce Cutler. Intraoperative monitoring is improving and this as well as perioperative monitoring is detailed by Jerry Goldstone of San Francisco. The biggest threat to surgery of the thoracoabdominal aorta is production of paraplegia. New developments, some of which have come from the investigations of Lars Svensson may prevent such paraplegia. His chapter summarizes these findings in some detail. Hopefully, new findings in aortic surgery as described by John Bergan may ultimately prevent the development of aneurysm disease. For the present, surgery remains necessary and recent advances in management of complex aortic aneurysms is the subject of Stanley Crawford's chapter. New graft materials may have promise and therefore the comparison of PTFE with Dacron bifurcated grafts is welcome. This important subject is covered in some detail by Robert Coubier. The prevention of production of sexual dysfunction in aortic surgery has been of particular interest to Ralph DePalma who has already taught us a great deal. His chapter here goes further and cites several very important lessons that can markedly improve the performance of aortic surgery today.

Correction of visceral ischemia is important to vascular surgeons and it is unfortunate that such operations appear so seldom that real proficiency in diagnosis of visceral ischemia and treatment of it has taken a great deal of time to develop. The greatest recent advance in this field has been the ability to image visceral arteries. The utility of duplex scanning in the renal artery is explained by Robert Barnes, and William Flinn explains the use of the duplex scan in the mesenteric circulation. As he does this, he summarizes all available means of evaluation of the visceral circulation and provides a very valuable overview in this regard. Alternatives in performing visceral and renal revascularization exist. Ronald Stoney explains the antegrade bypass which is gaining increasing favor in treatment of visceral ischemia, and David Brewster summarizes experience with use of the hepatic and splenic arteries in renal revascularization.

Modern vascular surgery as we know it today, began with revascularization in the lower extremities. In the section on femorodistal occlusive disease, a number of new findings and techniques are exposed. In this section, Linda Graham comments on the future role of endothelial seeding in bypass grafting, while Malcolm Herring summarizes the results of endothelial seeding in bypass grafting in man. Eugene Strandness always at the forefront of noninvasive evaluation, explains the use of Duplex scans in the peripheral arteries, giving practical applications as he does so.

Surgery of femoral popliteal occlusive disease is terribly important. A critique of

alternatives in use of the autogenous vein is provided for us by Frank Veith, and John Porter comments on the status of the reverse saphenous vein graft presenting a point of view somewhat at variance with the opinions of John Corson who details his experience with the in-situ technique. Alternatives in revascularization are explained by George Andros who describes the place of the arm vein as a conduit, while DeLaurentis explains the complexities of the composite-sequential graft as well as its advantages. Angioscopy may be very useful in vascular reconstruction and Neil Olcott of Palo Alto explains this technique here.

Finally, perioperative use of the duplex scan is described by Dennis Bandyk who has made an invaluable contribution to predicting failure of bypass grafts before this tragic event occurs.

Daniel Webster, something of a sceptic, quoted Lord Brougham when he said "what is valuable is not new and what is new is not valuable." What we see in this book is that many new things are extremely valuable. It is our hope that putting these together in one reference resource will markedly advance our science and better the practice of the art of vascular surgery and the care of patients with vascular conditions.

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## Basic Considerations

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### Diet and Biochemistry in Atherogenesis

Lipids, lipoproteins, and their structural subunits (fatty acids) have long been associated with the development of atherosclerotic cardiovascular disease and thrombosis.<sup>1</sup> It is known that atherosclerosis may be induced experimentally by manipulation of dietary fat intake and a reduction in intake of saturated fats can ameliorate disease development in certain cases. Most attention, however, has been directed to the total amount of dietary fat consumed, the relative amounts of saturated compared to unsaturated fats, and the amount of plasma cholesterol moieties (low density lipoprotein [LDL], very low density lipoprotein [VLDL], high density lipoprotein [HDL], total cholesterol, and triglyceride levels). Recent interest has focused on certain long chain polyunsaturated fatty acids of the C<sub>20</sub>H<sub>38</sub>O<sub>2</sub> family found in high quantities in marine lipids. This was initially based on the fact that Greenland Eskimos were observed to have a low incidence of myocardial infarction despite the fact that almost one-half of their total caloric intake came from animal fat. An expanding amount of data has subsequently been generated that suggests that certain fatty acids contained in marine lipids (specifically, eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA]) have diverse metabolic effects on a variety of