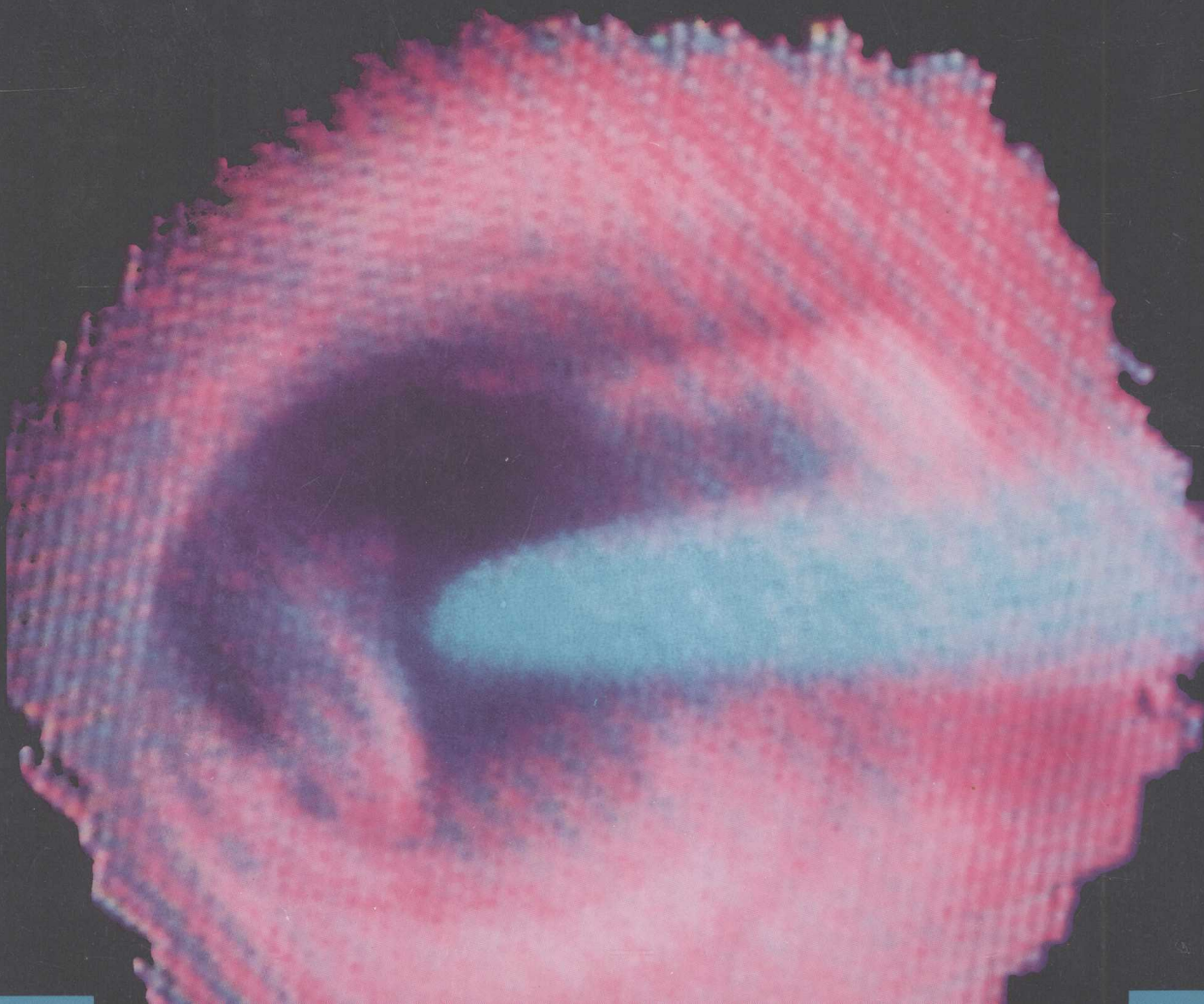
Angioscopy:
Vascular and Coronary Applications

Geoffrey H. White & Rodney A. White



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FOREWORD

The Chirurgeon must have a goode eye and a stedfast hande.
Andrew Boorde (1490–1549)
A Breviary of Health

The quotation above coming from the first medical textbook in English is as applicable 500 years after its appearance as when it was first set down by the physician to King Henry VIII. These words serve as an apt introduction to this marvelous, timely, and useful volume.

There are many reasons why this volume comes to us at an appropriate time. In many ways vascular surgery was reached a plateau of diagnostic and therapeutic experience. Just as this has happened, a burst of new technology has arrived to carry vascular surgery onward, just as a multistage rocket carries a payload to further heights in stages. Clearly, the angioscope and laser are most important in this new technology and predictably will carry vascular surgery forward to new levels of treatment.

The trend in vascular diagnosis is toward direct imaging. The trend in vascular reconstruction is toward less invasive procedures, some of which will be applied outside the operating room. As this happens, we, vascular surgeons, must remain in charge and learn to utilize the new instrumentation. Angioscopy typifies this. There is a learning curve in its use. Support personnel in the operating room and radiology suite must adjust to its peculiarities in setup and sterilization. The surgeon must become competent in interpretations of the three-dimensional view provided by the fiber optics and magnification systems. In doing so, the value of angioscopy becomes obvious and the technical manipulations become easier for the surgeon. A view of the endarterectomized carotid artery, the profundoplasty, the visceral reconstruction, the graft thrombectomy, and the downstream investigation following far distal reconstruction are its most obvious applications. Investigation of the in situ vein to ensure complete valve destruction is another, and further undreamed-of applications will follow. Thus, this book confirms introduction of angioscopy into practical vascular surgery for practicing vascular surgeons. And as we peruse this book, we can put into practice the words of Shakespeare's Julius Caesar, who said of a physician:

He reads much
He is a great observer, and he looks
Quite through the deeds of men.
Julius Caesar I, ii, 201

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This book is dedicated to our wives,
Kathleen and Deanna, and to our families.

PREFACE

Until recent years, the emphasis in treatment of advanced cardiovascular disease has been toward anatomical bypass of obstructed or stenotic vessels in both the peripheral vascular and coronary circulations. Radiologic imaging techniques give an outline of the disease process, but in most cases the procedures are preformed semi-blindly since, except at the operative site, it is not possible to visualize the disease process within the vessels without excising or destroying them. Improvements in fiberoptic imaging and a strong interest in less invasive methods of treatment are bringing about changes in this field. With new intravascular techniques such as balloon angioplasty, atherectomy, and laser ablation, there is now a strong desire to visually monitor the disease process and effects of these various interventions. At the same time, advances in fiberoptic technology have made it practical to see the internal surfaces of blood vessels for the first time using endoscopic techniques.

Angioscopy has been developed to a stage where widespread acceptance is occurring, and great interest has been generated in the applications for research and clinical practice. This increased interest is reflected in the vascular surgical, cardiac surgery, cardiology, and radiology literature and the programs of national symposia and courses. In addition, techniques for percutaneous introduction of angioscopes have recently been refined to the point where angioscopy promises to involve a far wider field or medicine.

There is a need to collate and present the large body of knowledge and experience in angioscopy, and it was our goal to do so with the publication of *Angioscopy: Vascular and Coronary Applications.* The specific aims of the book are to describe the techniques, applications, and technology of flexible, fiberoptic endoscopy within the blood vessels of the peripheral vascular system and the heart. Areas of particular emphasis are in (1) the descriptions and analysis of various applications of these techniques for the vascular surgeon, cardiologist, cardiothoracic surgeon, and radiologist; (2) detailed descriptions of intraoperative and percutaneous techniques, including specific techniques in various regions of the body, with a "how to do it" approach; and (3) detailed analysis of angioscopy equipment and accessories to aid in selection and purchase, including information on sterilization and maintenance. Adjunctive techniques including laser angioplasty, atherectomy, and thromboembolectomy are also covered and the role of angioscopic monitoring for each of these is presented.

Authors for each chapter have been selected on the basis of their special experience and expertise. It is natural that there should be some degree of

duplication of material, since experience in particular fields has developed along similar lines and it was felt preferable to obtain several viewpoints on specific topics. This has also helped in allowing many of the chapters to stand on their own as complete and authoritative references. We are pleased that the authors have provided complete and up-to-date information, with new developments added to the text just prior to publication. In fact, it has made for fascinating reading as each contribution has arrived.

We sincerely appreciate the efforts and valuable contributions of these authors, all of whom agreed to a very short deadline so that timely publication was assured. The coordination and cooperation of experts from the fields of cardiology, vascular surgery, radiology, pulmonary medicine, cardiac surgery, and basic sciences and the assistance of members of the production and marketing division of the major angioscope companies have allowed us to present a very wide and complete picture of the field of vascular endoscopy. We are also grateful for the editorial directions and constant encouragement from Nancy Chorpenning and Kevin Kelly of Year Book Medical Publishers. Gloria Stevens in our Los Angeles office provided expert assistance in manuscript preparation and unceasing efficiency in word processing for a large proportion of the initial drafts and the final manuscript.

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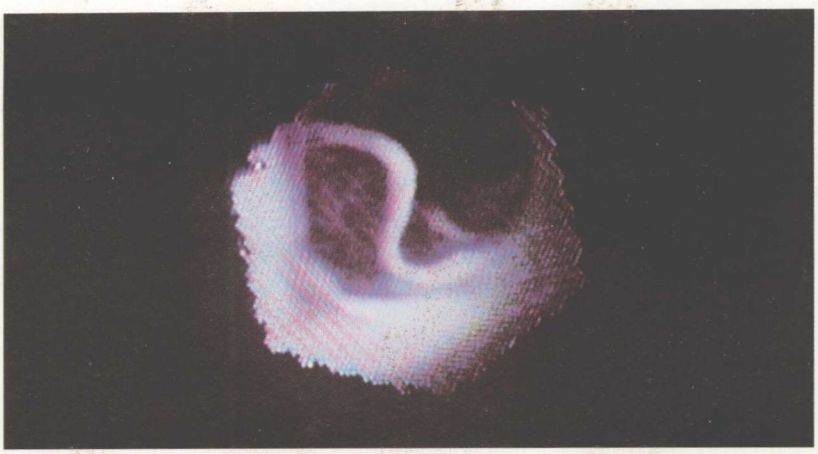

Plate 1
Angioscopic view of an intimal flap in the superficial femoral artery.

Plate 2
Angioscopic view of complex intimal dissection of superficial femoral artery, with recent thrombosis of the lumen.

Plate 3
Intraoperative angioscopy of the superficial femoral artery. The common femoral and profunda femoris arteries are controlled and the 2.8 mm angioscope fits comfortably into this vessel in an elderly women with small arteries.

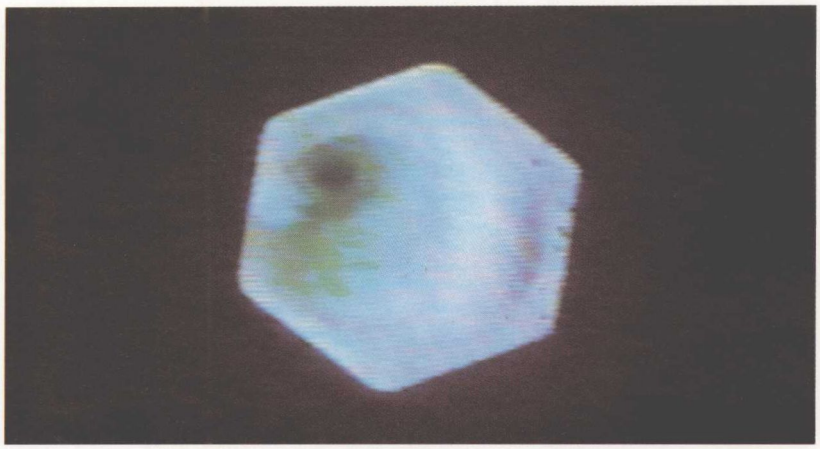

Plate 4
Normal appearance of the profunda femoris artery. The superficial femoral artery in this patient was severely diseased. A small intimal frond is seen at the 9 o'clock position.

Plate 5
Angioscope within the femoral artery. Atraumatic distal tip is demonstrated.

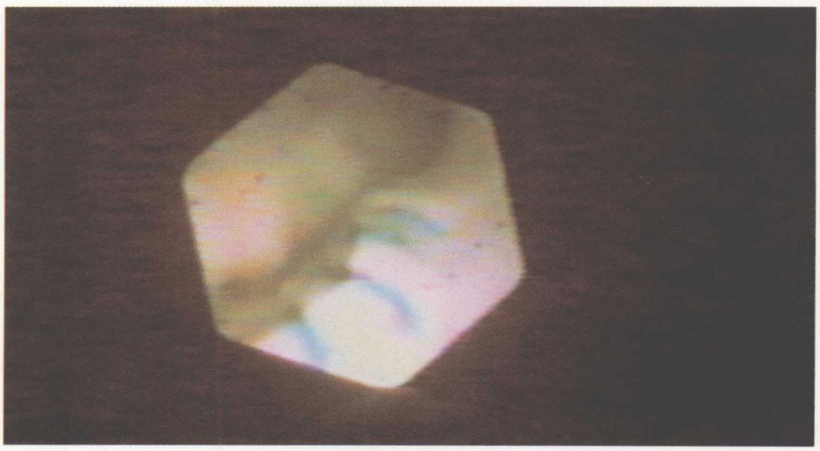

Plate 6
Suture line of a PTFE graft to the popliteal artery. The angioscope is within the bypass graft.

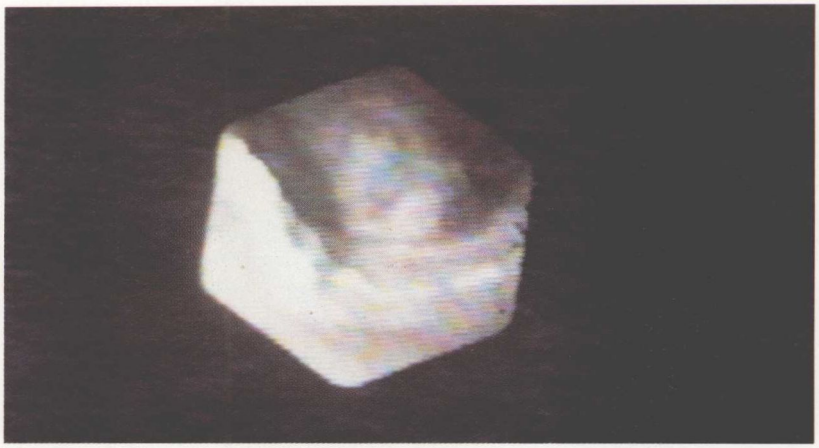

Plate 7
Large thrombus totally occluding the lumen of the popliteal artery. Embolectomy catheter had been passed beyond this point on several occasions before residual thrombus was detected on this angioscopic inspection.

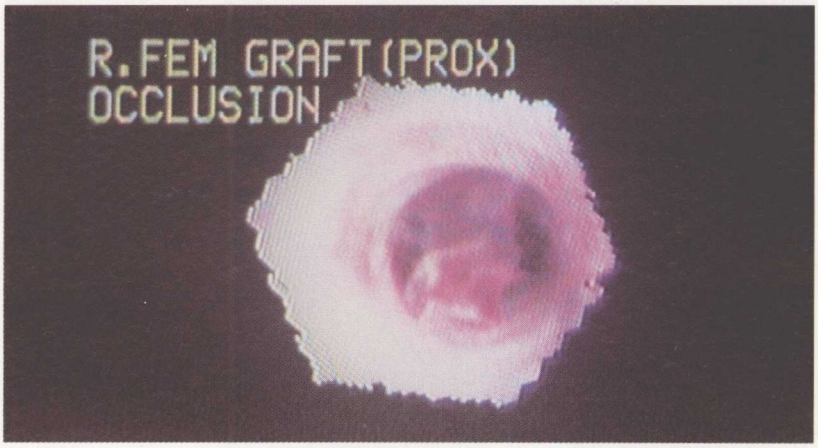

Plate 8
Thrombus adherent to one wall of a prosthetic bypass graft.

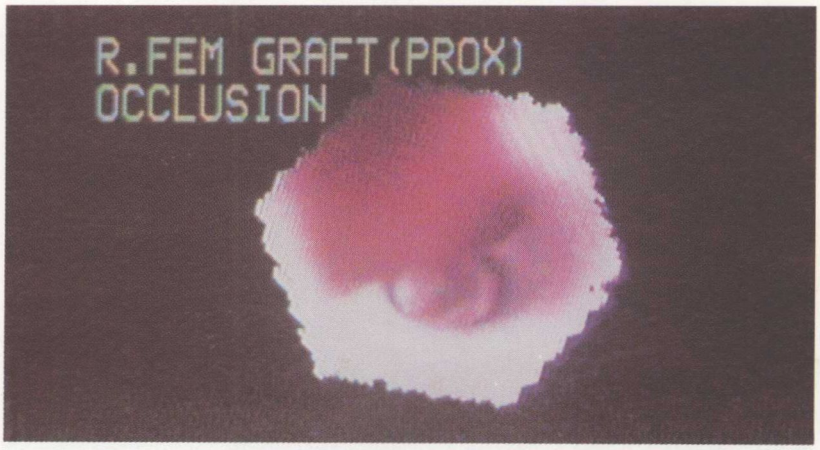

Plate 9
Recent thrombus, with reddish color and semiliquid outline.

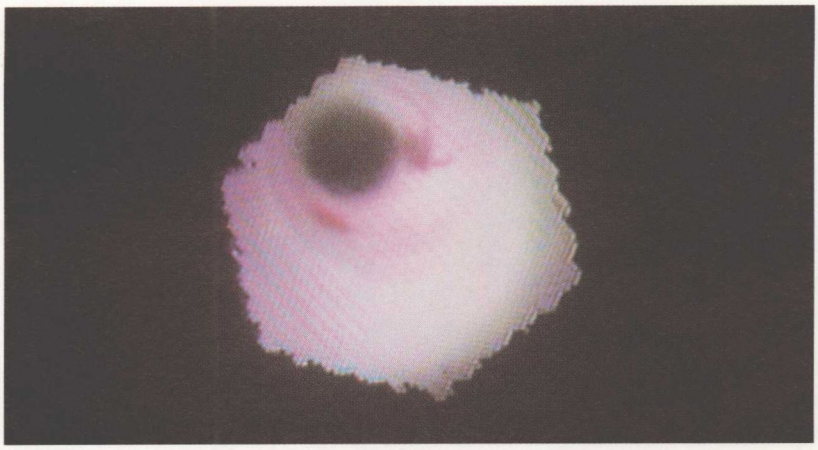

Plate 10
Post-thrombectomy view of distal superficial femoral artery, with 2 branches still occluded by propogated clot.

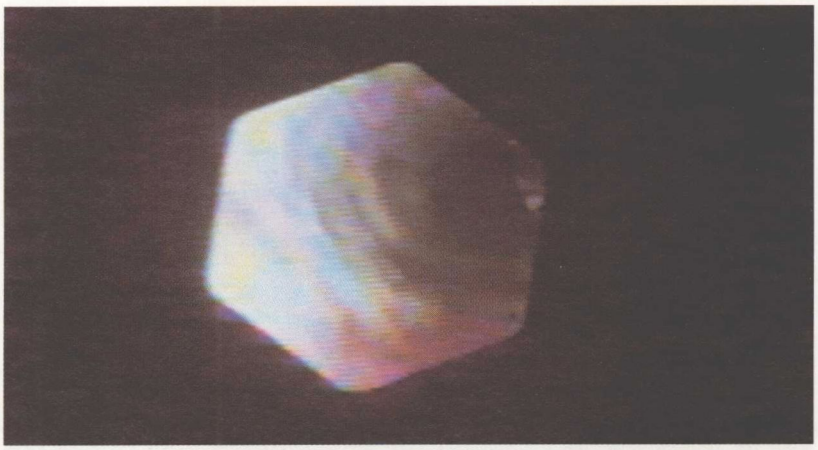

Plate 11
Post-thrombectomy view of femoral artery with diseased intimal surface and minor amount of adherent mural thrombus.

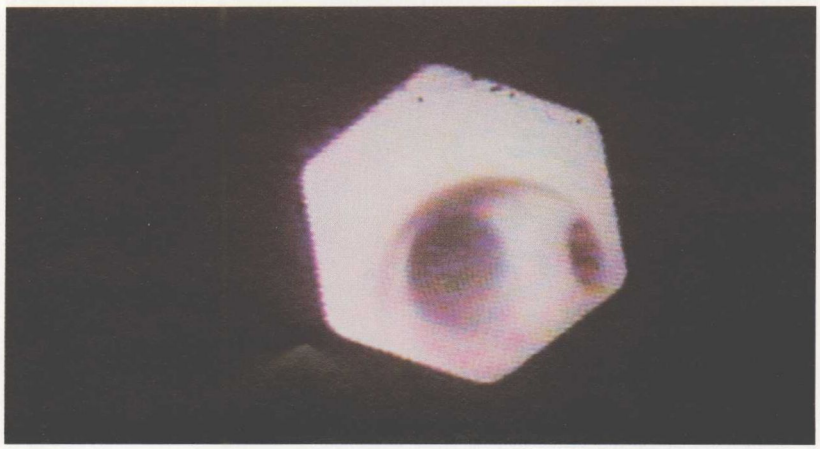

Plate 12
Tibial artery orifices at the popliteal bifurcation. Arterior tibial artery orifice to right, branching off the major tibioperoneal trunk.

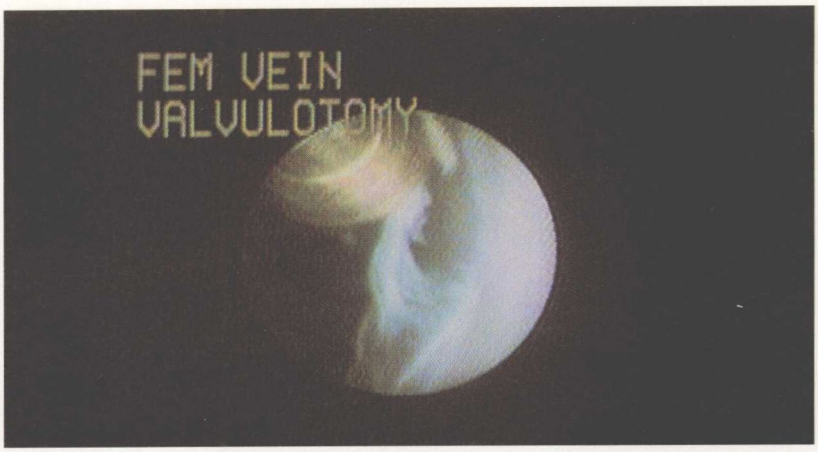

Plate 13
Non-obstructing valve fragment remaining after division with a laser thermal valvulotomy probe.

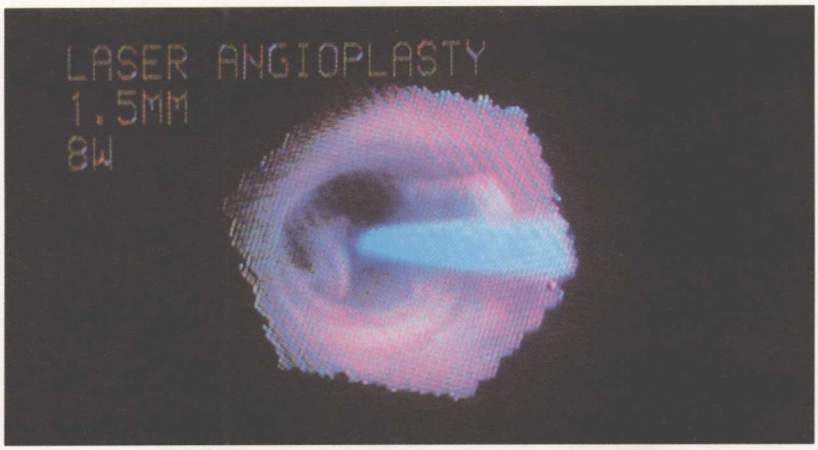

Plate 14
Angioscopic view of a 300 micron laser thermal probe activated by 8 Watts argon energy. Note that the thermal tip is not visible once it has entered the occluded arterial segment.

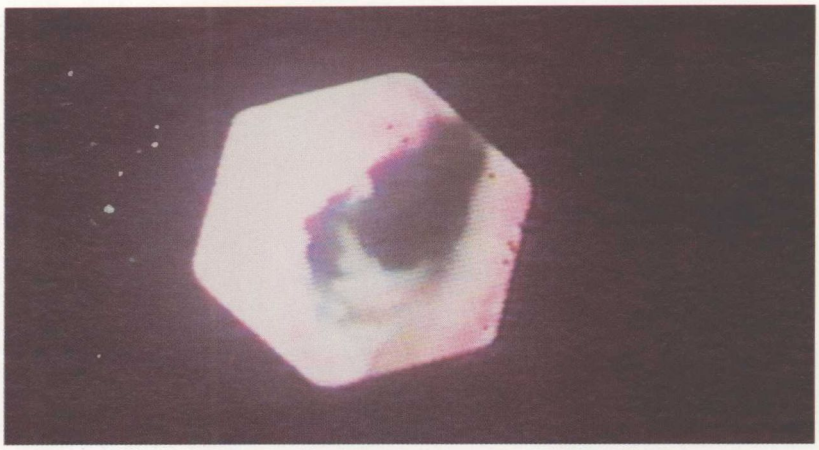

Plate 15
Angioscopic view of a laser thermal recanalized artery demonstrating small intimal flaps and thermal damage.

Plate 16
Angioscopic view of the atherectomy bur inside the artery. The bur has been threaded over the guidewire and positioned just proximal to the stenotic lesion. This view allows direct visualization of the actual atherectomy process.