

OPERATIVE SURGERY

Fundamental International Techniques

Vascular Surgery

Third Edition

066407

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Fundamental International Techniques

Vascular Surgery

Edited by

Charles Rob

M.C., M.D., M.Chir., F.R.C.S.

Professor and Chairman of the Department of Surgery,
University of Rochester School of Medicine and Dentistry,
Rochester, New York



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Introduction

Vascular surgery may be defined as the surgery of the arteries, the veins and the lymphatics, together with certain related procedures such as amputations for ischaemia and fasciotomy for acute vascular occlusion. For convenience most cardiac operations have been placed in the **Cardiothoracic Surgery** volume. There is also a close association between vascular surgery and organ transplantation, because the success or failure of an organ transplant procedure depends in no small measure upon the vascular anastomoses between the host and the transplanted organ.

A brief history of the development of vascular surgery is now given because a note of this type is a useful introduction to any subject.

The first permanent union of two blood vessels either in the laboratory or clinical practice appears to have been accomplished in 1897 by Eck, a Russian surgeon. Before this there were occasional reports of lateral suture of blood vessels, but in 1900 Dörfler reviewed this subject and he concluded that the literature contained reports of only nine patients with a successful arterial repair by direct suture. In 1906 Carrel and Guthrie began experimenting with the anastomosis of blood vessels in the Hull Physiological Laboratory of the University of Chicago, and the techniques they developed have, except for minor variations, remained unchanged to the present time.

In the field of operative surgery some events stand out as milestones where a genuinely new clinical procedure was performed for the first time. Murphy in 1897 reported the first successful end-to-end arterial anastomosis using an invagination technique of the proximal into the distal artery. In 1906 Jose Goyanes used an autogenous vein graft for the first time to replace a peripheral aneurysm, this procedure was repeated in 1907 by Lexer, and in 1913 Pringle was the first English-speaking surgeon to report the insertion of a vein graft into the human arterial system. In 1947 Dos Santos was the first to perform the procedure of thrombo-endarterectomy in the way we use this technique today. In 1949 Kunlin introduced the procedure of femoropopliteal bypass grafting using an autogenous vein, and in 1951 Dubost, Allery and Oeconomos reported for the first time the successful resection of an aneurysm of the abdominal aorta and its replacement by an arterial homograft. In 1952 Voorhees, Jaretzki and Blakemore were the first to report the use of porous plastic cloth tubes to bridge arterial defects, a procedure which DeBakey and others have developed and improved. In 1963 Fogarty introduced the balloon embolectomy catheter which bears his name.

INTRODUCTION

We must not forget sympathectomy and the surgery of the venous system. In 1890 Trendelenburg reported ligation of the long saphenous vein for lower limb varices and admitted a recurrence rate of 22 per cent after a four-year follow-up. This led to the improved techniques used today. Sympathectomy was performed as a peri-arterial procedure by Jaboulay in 1899 and it appears that Jönnesco in 1923 was the first to resect the sympathetic ganglia.

Finally, we should remember the debt that vascular surgeons owe to those who developed arteriography and phlebography. In 1923 Berberich and Hirsch performed phlebograms in humans and in 1924 Brooks injected sodium iodide into a patient's femoral artery producing the first arteriogram. These techniques were improved and developed by Moniz and Dos Santos in Portugal together with many of our Swedish colleagues.

CHARLES ROB

OPERATIVE SURGERY

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OPERATIVE SURGERY

Contributors to this Volume

CARL H. ANDRUS
M.D.

*Assistant Professor of Surgery, University of Rochester Medical Centre
and Strong Memorial Hospital, Rochester, New York*

The Late
HAROLD W. BALES
M.D.

*Associate Professor of Plastic Surgery, University of Rochester School of
Medicine and Dentistry, Rochester, New York*

F. B. COCKETT
B.Sc.(Lond.), M.S.(Lond.),
F.R.C.S.(Eng.)

*Teacher and Examiner in Surgery, The University of London; and
Consultant Surgeon, St. Thomas's Hospital, London*

JAMES A. DEWEESE
M.D., F.A.C.S.

*Chairman of the Division of Cardiothoracic Surgery, University of Rochester
Medical Centre, and Professor and Surgeon, Strong Memorial Hospital,
Rochester, New York*

H. H. G. EASTCOTT
M.S., F.R.C.S.

Senior Surgeon, St. Mary's Hospital, London

W. G. FEGAN
M.Ch., F.R.C.S.(I.)

*Research Professor of Surgery, University College of Dublin,
Trinity College at Sir Patrick Dun's Hospital, Dublin*

ALASTAIR J. GILLIES
M.D.

*Professor and Chairman, Department of Anesthesiology, Professor of
Pharmacology and Toxicology, University of Rochester School of
Medicine and Dentistry, Rochester, New York*

R. P. JEPSON
F.R.C.S.

*Honorary Consultant Surgeon,
The Royal Adelaide Hospital, South Australia*

ELLIOT O. LIPCHIK
M.D.

*Professor of Radiology, Head Cardiovascular Section, Department of
Radiology, University of Rochester Medical Centre, Rochester, New York*

JERE W. LORD, JR.
M.D., F.A.C.S.

*Clinical Professor of Surgery,
New York University School of Medicine*

J. S. P. LUMLEY
F.R.C.S.

*Assistant Director, Surgical Professorial Unit,
St. Bartholomew's Hospital, London*

ALLYN G. MAY
M.D.

*Associate Professor of Surgery, University of Rochester and
Strong Memorial Hospital, Rochester, New York*

KENNETH OWEN
M.S., F.R.C.S.

*Consultant Urologist, St. Mary's Hospital,
St. Peter's Hospital and King Edward VII
Hospital for Officers, London*

JEFFERSON RAY, III
M.D., F.A.C.S.

*Attending, Thoracic Surgery, St. Joseph's Hospital,
Marshfield, Wisconsin*

CHARLES ROB
M.C., M.D., M.Chir., F.R.C.S.

*Professor and Chairman of the Department of Surgery, University of
Rochester School of Medicine and Dentistry, Rochester, New York*

CONTRIBUTORS TO THIS VOLUME

EDWIN D. SAVLOV
M.D.

Associate Professor of Surgery, University of Rochester School of Medicine and Dentistry, and Director of Surgical Oncology, Highland Hospital, Rochester, New York

ROBERT D. SCHROCK, JR.
M.D.

Clinical Assistant Professor of Orthopaedic Surgery, University of Rochester School of Medicine and Dentistry, Rochester, New York

SEYMOUR I. SCHWARTZ
M.D.

Professor of Surgery, University of Rochester School of Medicine and Dentistry, Rochester, New York

CHARLES D. SHERMAN,
M.D. JR.

Clinical Professor of Surgery, University of Rochester School of Medicine and Dentistry, Rochester, New York

G. W. TAYLOR
M.S., F.R.C.S.

Professor of Surgery and Director, Surgical Professorial Unit, St. Bartholomew's Hospital, London

A. E. THOMPSON
M.S., F.R.C.S.

Consultant Surgeon, St. Thomas's Hospital, London

Professor and Chairman, Department of Anesthesiology, Professor of Pharmacology and Toxicology, University of Rochester School of Medicine and Dentistry, Rochester, New York

Honorary Consultant Surgeon, The Royal Adelaide Hospital, South Australia

Professor of Radiology, Head Cardiovascular Section, Department of Radiology, University of Rochester Medical Center, Rochester, New York

Clinical Professor of Surgery, New York University School of Medicine

Assistant Director, Surgical Professorial Unit, St. Bartholomew's Hospital, London

Associate Professor of Surgery, University of Rochester and Strong Memorial Hospital, Rochester, New York

Consultant Urologist, St. Mary's Hospital, St. Peter's Hospital and King Edward VII Hospital for Officers, London

Attending Thoracic Surgery, St. Joseph's Hospital, Marshfield, Wisconsin

Professor and Chairman of the Department of Surgery, University of Rochester School of Medicine and Dentistry, Rochester, New York

ALASTAIR J. GILLIES
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R. P. JEPSON
F.R.C.S.

ELLIOT O. LIPCHIK
M.D.

JERE W. LORD, JR.
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J. S. P. LUMLEY
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ALLYN G. MAY
M.D.

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M.S., F.R.C.S.

JEFFERSON RAY, III
M.D., F.A.C.S.

CHARLES ROB
M.C., M.D., M.Ch., F.R.C.S.

OPERATIVE SURGERY

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Exposure of Major Blood Vessels

H. H. G. Eastcott, M.S., F.R.C.S.

Senior Surgeon, St. Mary's Hospital, London

and

A. E. Thompson, M.S., F.R.C.S.

Consultant Surgeon, St. Thomas's Hospital, London

PRE-OPERATIVE

Indications

The exposure of blood vessels is indicated under emergency circumstances for local injury and control of bleeding, or for the relief of occlusion. It is also required for very rapid blood transfusion, for the intra-arterial injection of radio-opaque contrast media, extracorporeal circulation and regional perfusion.

The major vessels are most often exposed for the elective surgical treatment of aneurysms, arteriovenous fistulae and arteriosclerotic obstruction.

Contra-indications

No major blood vessel should be exposed if the surgeon's purpose can be adequately achieved in any other way, such as by pressure in local injury for control of bleeding, or percutaneous injection for radiology. An overlying layer of infected or densely adherent tissue should not be disturbed; an alternative normal adjacent site should be chosen for the approach.

Special pre-operative treatment

Some patients will have been receiving anticoagulant drugs. It is wise to counteract these by giving the appropriate antidote: for heparin, the appropriate amount of 10 per cent protamine sulphate (2 mg

protamine for 1 mg heparin); and for the prothrombin depressor group, such as warfarin, 20 mg of vitamin K₁.

Compatible blood transfusion should be available in adequate quantity to replace blood losses.

Anaesthesia

General anaesthesia is preferable for most patients, although local infiltration with 1 per cent Xylocaine is very suitable for limb embolectomy in patients with severe heart disease. Hypotension should be avoided in the presence of coronary or cerebrovascular disease.

Heparin

Total heparinization may be used if protracted clamping is anticipated (1.5 mg/kg body weight). Alternatively, heparin-saline solution (1:200,000) may be instilled into the arterial tree distal to the site of operation. A vasodilator (e.g. thymoxamine 30 mg) may be added to this solution to reduce vasospasm.

Exposure

'The use of wide approach for dealing thoroughly with nerves and vessels needs no defence' (Henry, 1946). When reconstructive surgery is necessary flexures may be crossed, muscles and tendons divided and the abdomen opened to its fullest extent.

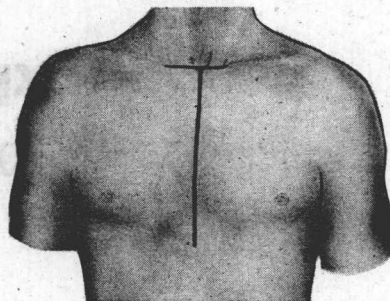
THE OPERATIONS

EXPOSURE OF ASCENDING AORTA

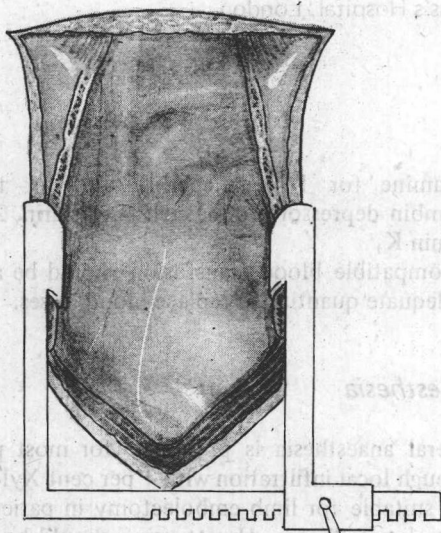
1

The incision

This is in the mid-line extending from the suprasternal notch to just beyond the xiphisternum. The extent is dictated by the need for extracorporeal circulation. A transverse component at the upper end improves the cosmetic result.



1

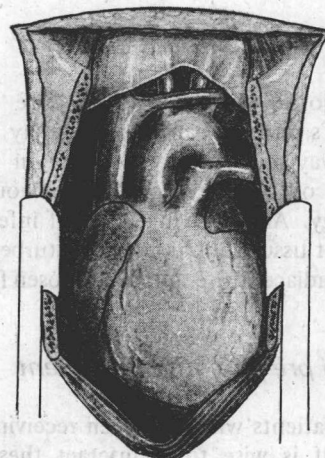


2

2

Entering the mediastinum

The sternum is divided with a counter-rotating power-driven saw or a Gigli saw. The line of division deviates slightly to the left in its lower half to avoid entering the right pleural cavity.



3

3

Deep dissection

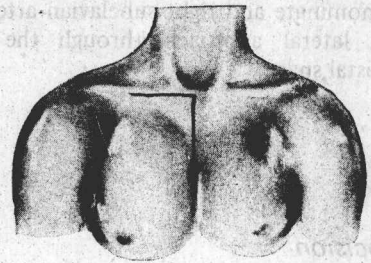
The thymic remnant is divided and the innominate vein identified. Final access to the ascending aorta is obtained by opening the pericardium longitudinally.

EXPOSURE OF INNOMINATE ARTERY AND THORACIC PART OF RIGHT SUBCLAVIAN ARTERY

4

The incision

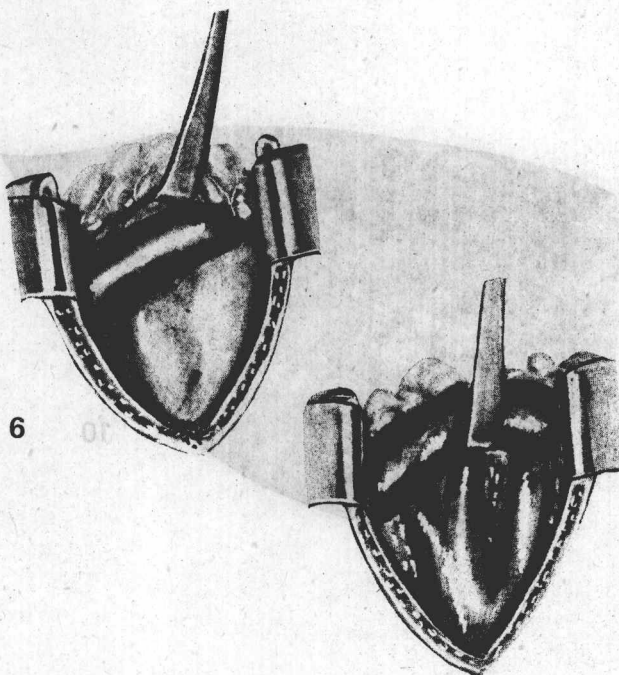
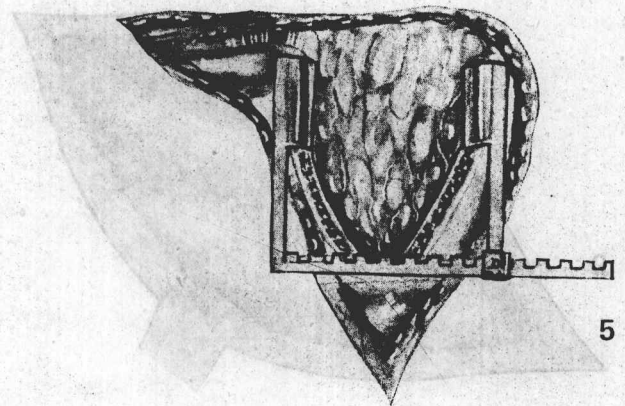
The shoulder girdle is displaced backwards by placing a sandbag between the patient's shoulders. The incision is centred over the right sternoclavicular joint, exposing the medial third of the clavicle, the manubrium and the first two intercostal spaces.



5

Splitting the manubrium

The manubrium is divided in the mid-line with Sauerbruch's shears or a Gigli saw. The two halves are separated with a Tuffier's retractor. Further exposure can then be obtained by transecting the sternum below the manubrium or dividing the clavicle and anterior ends of the first and second ribs.



6

Deep dissection

The thymic remnant and anterior mediastinal fat are cleared to expose the innominate vein. The anterior borders of the pleural cavities are swept away laterally.

7

Exposure of great vessels

Mobilization of the innominate vein permits it to be retracted upwards, revealing the origins of the great vessels.

4 EXPOSURE OF MAJOR BLOOD VESSELS

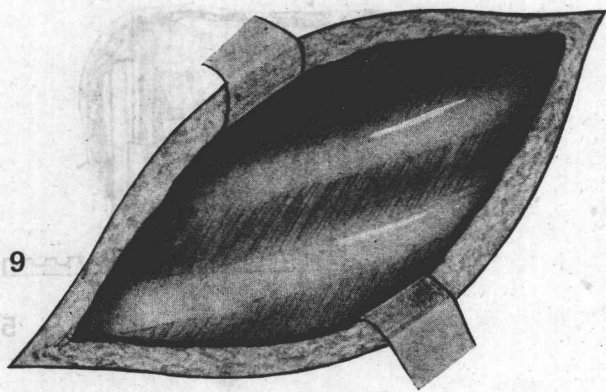
EXPOSURE OF THORACIC PART OF LEFT SUBCLAVIAN ARTERY

This can be exposed by modifying the approach for the innominate and right subclavian arteries (above), or by lateral approach through the fourth left intercostal space.

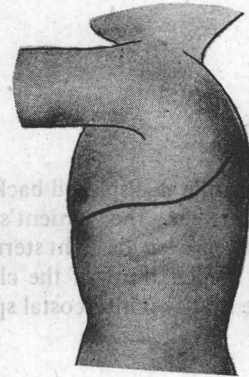
8

The incision

With the patient in the right lateral position a curved incision skirts the angle of the left scapula.



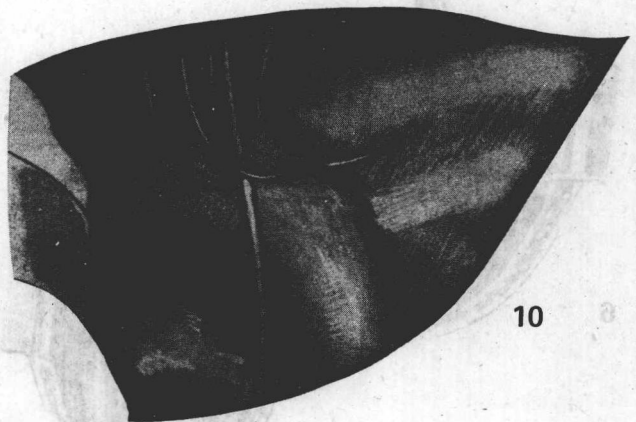
EXPOSURE OF INNOMINATE ARTERY AND THORACIC PART OF RIGHT SUBCLAVIAN ARTERY



9

Deep dissection

The trapezius and serratus anterior muscles are divided and the chest is entered through an incision along the upper border of the fifth rib. Adequate exposure requires division of the fifth rib (and fourth if necessary) at the posterior end.



10

Intrathoracic exposure

The intrathoracic segment of the left subclavian artery can be exposed by incision of the overlying mediastinal pleura. The vagus nerve, the left superior intercostal vein and the thoracic duct lie close to the vessel.