

OPERATIVE SURGERY

Fundamental International Techniques

The Hand

Edited by
R. Guy Pulvertaft

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The Hand

Edited by

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OPERATIVE SURGERY

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Introduction

Since the last Edition of Operative Surgery appeared in 1970 there have been advances in concept and technique in the care of the hand. In this Second Edition of the Hand Volume each chapter has been revised where necessary and fourteen new subjects have been added. Anaesthesia and instrumentation, microsurgery and digital replantation, silicone tendon implants, high pressure injection injuries, reconstruction of the mutilated hand, cerebral palsy, entrapment neuropathies, and others appear for the first time. Recent advances have been included so far as they have become accepted as normal practice, even though the necessary facilities may not be available, e.g. microsurgery. In a multiple author volume there is inevitably some divergence of opinion and in a few instances differing techniques are described.

We welcome the new contributors and particularly the distinguished surgeons from other countries who have joined the British authors. This book is designed to offer the reader the experience of those who have been engaged in this work for many years. We are grateful to all who have given their knowledge and to the artists whose skills are a special feature of Operative Surgery.

R. GUY PULVERTAFT

OPERATIVE SURGERY

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Instruments

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1

A basic hand set is used for each case. These sets of instruments are packed and autoclaved in the Central Sterile Supply Department. This basic set (*see Illustration*) includes those instruments likely to be used in a routine hand operation, together with the dressings, bandages etc. Any special instruments are autoclaved separately and introduced whenever they may be required. The basic hand set consists of instruments which have been found particularly useful in hand surgery. These are illustrated in more detail later. In addition the set includes towel clips, sponge holding forceps, tissue forceps, Mayo's scissors, suction nozzle and dental cavity syringe used to irrigate beneath skin grafts.

The armboard cover is like a pillow case which fits over the armboard attachment to the standard operating table. It ensures that the undersurface of this table is protected by a sterile covering. The hand dressing pack contains a bundle of household steel wool wrapped in gauze with two rolls of 'Velband' orthopaedic wool. Crêpe bandages, gauze and a length of stockinette complete the dressing requirements. A Fisk lead hand is standard and invaluable to splint the digits during dissection.

Many of the instruments are those used in plastic surgery where an atraumatic technique is so important. Other instruments have been developed for particular use in hand surgery.



1

Power-driven instruments are especially valuable when one has to operate on the skeletal structure. This has made the introducing of Kirschner wires, widely used both in primary management of trauma and in secondary reconstruction, so much easier and more accurate that such instruments should be considered an essential part of the hand surgeon's armamentarium.

The instruments which have been found most useful in hand surgery are now illustrated. A 6-inch (15 cm) rule is used as a guide to scale.

2

Top row (from left)

Mapping pen

Scalpels—Bard Parker blades sizes 15 and 10

Gillies' toothed dissecting forceps (two pairs)

McIndoe's non-toothed dissecting forceps (two pairs)

Gillies' needle holder/suture scissors. (A smaller version of this instrument—Foster's needle holder/suture scissors is also useful for finer suturing as with nerve suture.)

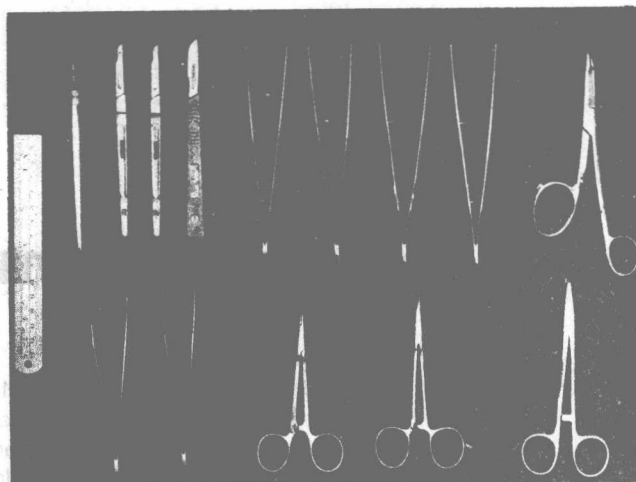
Lower row

Adson's toothed forceps

Adson's non-toothed forceps

Mosquito artery forceps—set of ten included in full hand set

Kilner's needle holder



2

3

On left

McIndoe's scissors

Top row

Kilner's skin hooks (1 pair)

Gillies' skin hooks—small (1 pair)

Gillies' skin hooks—large (1 pair)

Joseph's double hooks (1 pair)

Small blunt hooks, Harlow Wood pattern for use as digital nerve retractors (1 pair)

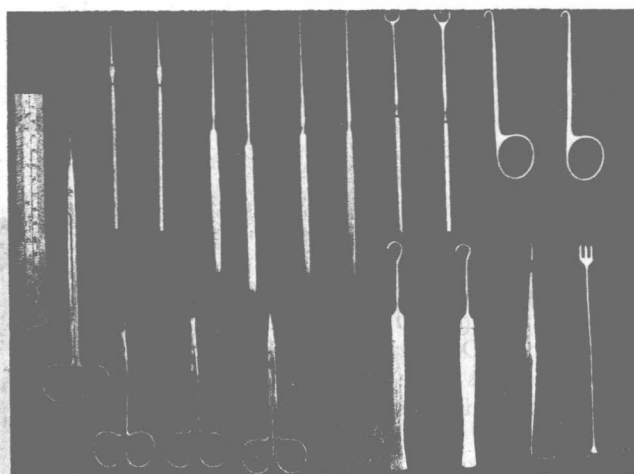
Lower row

Small scissors, curved-on-flat (2 pairs)

Small straight scissors with sharp points

Large blunt hooks or tendon retractors (1 pair)

Kilner's skin retractor, double-ended (1 pair)



3

4

Top row

Small Watson-Cheyne's dissector

Campbell Reid's periosteal elevator/bone spikes (1 pair)

Ash dental scaler 152 (used as fine dissector)

McDonald's dissector

Howarth's nasal raspatory

Volkman's spoon, double-ended

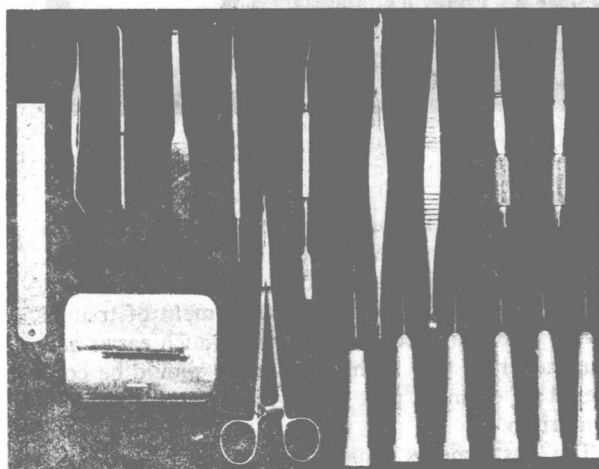
Swanson's reamers

Lower row

Watchmaker's anvil

Artery forceps, large; used for tunnelling (alternatively Brand's tunnelling forceps may be used)

Pulvertaft's graduated set of reamers



4

5

Top row

Set of small osteotomes

McIndoe's bone-cutting forceps

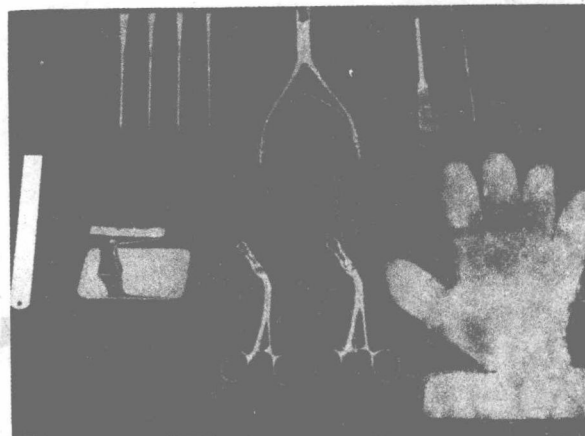
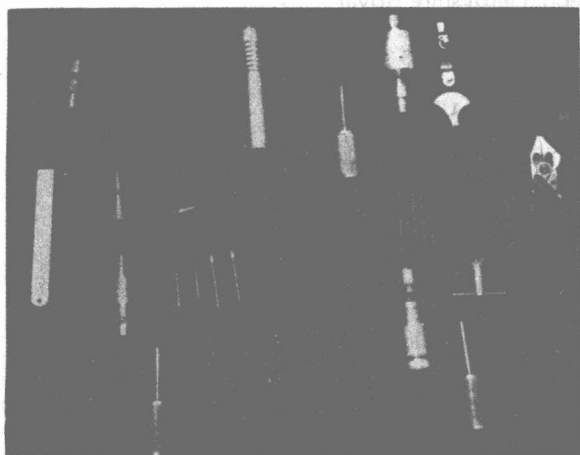
Small periosteal elevator/bone spikes (see Illustration 4)

Lower row

Watchmaker's anvil

Small bone-holding forceps (1 pair)

Fisk's lead hand splint



5

6

**Power-driven equipment for hand surgery
(Stryker air-driven unit)***Top row*

Cable and drive unit

Oscillating saw unit with different size blades

Lower row

Roto-osteotome handpiece with side cutting and egg burrs

Dermabrader hand piece with Jacob's chuck adapted for Kirschner wires

On right

Wire cutters

6

[The illustrations for this Chapter on Instruments were supplied by the Author.]

The Tourniquet

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INTRODUCTION

The advantages of operating in a bloodless field are so obvious that they require no elaboration. A great deal of modern hand surgery would not be feasible without the aid of a tourniquet. Bunnell remarked that no-one would attempt to mend a watch in a pool of ink.

As with any other instrument, a tourniquet needs to be used with caution. Harmful effects, or disaster, can result from prolonged application and from local pressure under the band. Wilgis (1971) and others have drawn attention to the changes that occur in tissues deprived of their blood. Wilgis recommends that a tourniquet should not be maintained for over 2 hr and if it is necessary to use it for a longer period, an interval of 15–20 min should elapse to allow the tissues to return to normal before it is re-applied. It has always been the author's practice to regard 2 hr as the maximum safe time and no ill results have been observed.

The safest tourniquet is the inflatable type with a pressure gauge. The gauge should be tested at least once a week and preferably before each operative session against a mercury manometer and the cuff examined for leaks.

The blood supply should not be cut off until immediately before the incision is made and the tourniquet should be removed as soon as the operative technique permits or when the time limit has been reached. The time elapsed and the pressure used are recorded on a wall board and the surgeon is kept informed of the time. When the operation cannot be

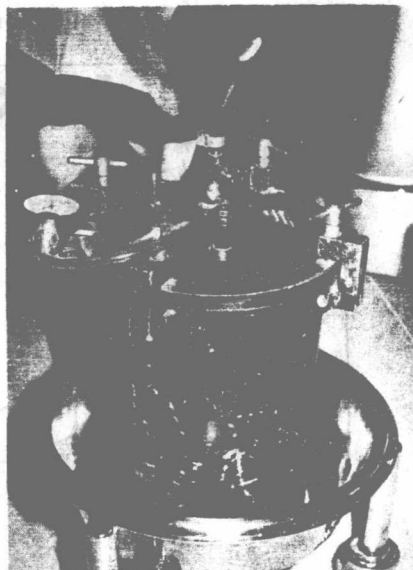
completed within the allotted time, the remainder of the operation may be performed without a tourniquet, or it may be released for an interval depending upon the circumstances. The period of 2 hr refers to healthy subjects; for those who suffer from such disorders as diabetes, arteriosclerosis, rheumatoid disease and Dupuytren's disease it may be advisable to reduce the tourniquet time. In some instances and in the aged it is wiser to operate without a tourniquet and take advantage of the relative ischaemia induced by supporting the limb in elevation. The effect of heat upon ischaemic tissues must not be overlooked and hot accessory lighting should be used with caution. The cuff pressure does not need to be above 230 mmHg for the average adult and 180 mmHg for the child. These pressures have to be increased for those with raised blood pressure or with fat arms.

The arm band should be approximately 10 cm wide for the adult and 5 cm wide for the child. The simplest form of pneumatic tourniquet is that in which the air pressure is supplied by a hand pump, but the gauge needs to be checked constantly during the operation in case there is an undetected leak. It is well to remember that some bleeding may occur in children even though the pressure has not fallen, due to circulation through the osseous vessels. The disturbing factor of pressure dropping in a tourniquet may be overcome by connecting the tube to a compressed air cylinder fitted with a reducing valve. This is effective and is widely used, but it should be appreciated that there is a potential risk and it has been known for the system to fail causing a higher pressure in the cuff than was intended.

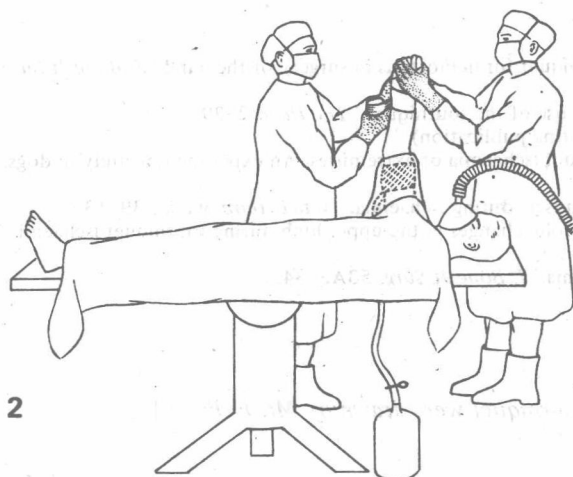
TECHNIQUE

1

A method learned from Paul Brand which the author has used successfully for many years is to connect the tourniquet to a pressure drum, such as is used for paint spraying, filled to the required pressure. The drum is of sufficient capacity to compensate for small leaks and provided the gauge is accurate there can be no possibility of excessive pressure.



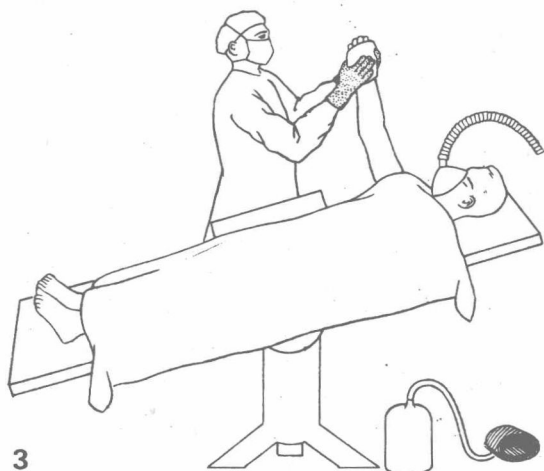
1



2

2

The band is applied over a layer of soft material to the middle of the upper arm and secured by firm bandaging. This is conveniently done in the anaesthetic room. After the patient has been placed upon the operating table and the drapes fitted, the limb is elevated and exsanguinated by a sterile crêpe or latex bandage. The tourniquet is connected to the pressure drum and the release tap opened. The exsanguination bandage is not used for patients undergoing treatment for septic and neoplastic conditions.



3

3

On completion of the operation, the wound is covered by a moist dressing and the limb is elevated. If the table is equipped to do so, it is advantageous to tilt the patient feet down and sideways to bring the limb above heart level. The drum tap is closed and the band is completely removed from the arm. The elevated position is maintained for 8–10 min, by which time the greater part of the haemorrhage will have ceased. Any remaining bleeding is controlled by bipolar coagulation or ligation. The wound is closed and a supportive, but not compressive, dressing is applied. Drainage is a matter of personal choice. It has not been the author's custom to use drainage except after operation for sepsis and severe trauma or when pedicle flaps have been used.

4

The limb is held in elevation for 24–48 hr with the support taken from the elbow.



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[Illustrations 2 and 3 for this Chapter on The Tourniquet were drawn by Mr. F. Price.]