

OPERATIVE SURGERY

THE HAND

YAMAGUCHI, GIVEIHEIRO

1915-1916

# OPERATIVE SURGERY

1915-1916

1915-1916

THE HAND

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916

1915-1916



# OPERATIVE SURGERY

## VOLUMES AND EDITORS

---

### ABDOMEN AND RECTUM AND ANUS [*in two volumes*]

Charles Rob, M.C., M.D., M.CHIR., F.R.C.S.

Rodney Smith, M.S., F.R.C.S.

Sir Clifford Naunton Morgan, M.S., F.R.C.S., F.R.C.O.G., F.A.C.S.(HON.)

### EYES, AND EAR, NOSE AND THROAT

Sir Stewart Duke-Elder, K.C.V.O., PH.D., LL.D., M.D., F.R.C.P., F.R.C.S.,  
F.R.S.

Maxwell Ellis, M.D., M.S., F.R.C.S.

### GENERAL PRINCIPLES AND BREAST

Charles Rob, M.C., M.D., M.CHIR., F.R.C.S.

Rodney Smith, M.S., F.R.C.S.

### GENITO-URINARY SYSTEM

J. D. Fergusson, M.A., M.D., F.R.C.S.

J. P. Williams, M.CHIR., F.R.C.S.

### THE HAND

R. Guy Pulvertaft, M.A., M.B., B.CH., M.D.(HON.), F.R.C.S.

### HEAD AND NECK

Maurice Ewing, M.SC., F.R.C.S., F.R.C.S.(ED.), F.R.A.C.S., F.A.C.S.

### NEUROSURGERY

Valentine Logue, F.R.C.S.

### OBSTETRICS AND GYNAECOLOGY

D. W. T. Roberts, M.A., M.CHIR., F.R.C.S., F.R.C.O.G.

### ORTHOPAEDICS [*in two volumes*]

Ronald Furlong, F.R.C.S.

### PLASTIC SURGERY

R. J. V. Battle, M.B.E.(MIL.), M.A., M.CHIR.(CANTAB.), F.R.C.S.

### THORAX

W. P. Cleland, F.R.C.P., F.R.C.S.

### VASCULAR SURGERY Charles Rob, M.C., M.D., M.CHIR., F.R.C.S..

The Paediatric Content throughout this work has been edited by P. P. RICKHAM, M.D., M.S., F.R.C.S., D.C.H.

# CONTRIBUTORS TO THIS VOLUME

---

H. ELLIOTT BLAKE, T.D., M.A., B.CH., F.R.C.S., F.R.C.S.(ED.)

*Honorary Plastic Surgeon, St. George's Hospital, London; Emeritus Consultant Plastic Surgeon, St. Helier Hospital, Carshalton, Surrey*

GEORGE BONNEY, M.S., F.R.C.S.

*Consultant Orthopaedic Surgeon, St. Mary's Hospital, London*

PAUL W. BRAND, C.B.E., F.R.C.S.

*Chief of Rehabilitation, U.S. Public Health Service, Carville, Louisiana; Clinical Professor of Surgery, Louisiana State University*

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

*Consultant Orthopaedic Surgeon, Salisbury General Infirmary and Odstock Hospital, Salisbury, Wiltshire*

DONAL BROOKS, M.A., M.B., F.R.C.S. (I.), F.R.C.S.(ENG.)

*Consultant Orthopaedic Surgeon, University College Hospital and Royal National Orthopaedic Hospital, London and at Heritage Schools and Hospital, Chailey*

NORMAN CAPENER, F.R.C.S.

*Consulting Orthopaedic Surgeon Emeritus, South-Western Regional Hospital Board*

DENIS M. DUNN, M.B., F.R.C.S.(ED.)

*Consultant Orthopaedic Surgeon to the St. Helena Group of Hospitals and The London Hospital*

ADRIAN E. FLATT, M.D., F.R.C.S.

*Professor of Orthopaedics, University of Iowa Hospitals, Iowa City; formerly First Assistant, Orthopaedic and Accident Department, The London Hospital*

D. W. LAMB, F.R.C.S.

*Consultant Orthopaedic Surgeon, Princess Margaret Rose Orthopaedic Hospital, Edinburgh*

T. G. LOWDEN, F.R.C.S.

*Consultant Surgeon, Sunderland Group of Hospitals*

W. M. McQUILLAN, F.R.C.S.

*Consultant Orthopaedic Surgeon, Royal Infirmary and Princess Margaret Rose Orthopaedic Hospital, Edinburgh; Senior Lecturer in Orthopaedic Surgery, University of Edinburgh*

T. J. S. PATTERSON, M.D., M.CH., F.R.C.S.

*Clinical Lecturer in Plastic Surgery, University of Oxford*

R. GUY PULVERTAFT, M.B., B.CH., M.D.(HON.), F.R.C.S.

*Orthopaedic Surgeon, Derbyshire Royal Infirmary; Surgeon, Harlow Wood Orthopaedic Hospital*

D. A. CAMPBELL REID, M.B., B.S., F.R.C.S.

*Consultant Plastic Surgeon, United Sheffield Hospitals and Sheffield Regional Hospital Board; Clinical Teacher in Surgery, University of Sheffield*

H. GRAHAM STACK, F.R.C.S.

*Consultant Orthopaedic Surgeon, Albert Dock Fracture and Orthopaedic Hospital, London, Harold Wood Hospital and The London Hospital*

O. J. VAUGHAN-JACKSON, V.R.D., B.M., B.CH., F.R.C.S.

*Orthopaedic Surgeon, The London Hospital; Consultant in Orthopaedics to The Royal Navy*

P. J. WHITFIELD, F.R.C.S.

*Senior Registrar, Plastic Surgery and Burns Unit, Queen Mary's Hospital, Roehampton*

# INTRODUCTION

---

Successful surgery depends upon an accurate assessment of the problem, a knowledge of what can be achieved by treatment, the quality of the surgery and the after care. In this volume, the first in *Operative Surgery* to be concerned entirely with the hand, is collected the practical advice of surgeons with wide experience in this work. The section which appeared in Volume 6 of the First Edition has been revised and expanded.

During recent years hand surgery has grown into a special subject. In an increasing number of countries it is now possible for some men to devote the whole or a large part of their time to the hand. There are also

many surgeons, both in Britain and overseas, who have other duties to perform in addition to hand surgery. There are others who only occasionally are required to deal with these problems.

Although surgery cannot be learned solely from a book, it is hoped that the technical features here described will be of practical help, particularly when the work is read in conjunction with *Clinical Surgery*. We trust that the specialist in hand surgery may also find something of value, even though he may practise techniques differing from those to be found in these pages.

R. GUY PULVERTAFT

# CONTENTS

---

	PAGE
Introduction . . . . .	<b>xi</b>
R. GUY PULVERTAFT	

## CONGENITAL ABNORMALITIES

Syndactyly . . . . .	<b>1</b>
T. J. S. PATTERSON, M.D., M.CH., F.R.C.S.	
Polydactyly . . . . .	<b>6</b>
T. J. S. PATTERSON, M.D., M.CH., F.R.C.S.	
Ring Constrictions . . . . .	<b>9</b>
T. J. S. PATTERSON, M.D., M.CH., F.R.C.S.	
Club Hand: Absent Radius . . . . .	<b>12</b>
D. W. LAMB, F.R.C.S.	

## TRAUMA

The Acute Injured Hand . . . . .	<b>17</b>
ADRIAN E. FLATT, M.D., F.R.C.S.	
Operative Treatment of Fractures of the Hand . . . . .	<b>33</b>
D. A. CAMPBELL REID, M.B., B.S., F.R.C.S.	
Repair of Severed Tendons in the Hand . . . . .	<b>45</b>
R. GUY PULVERTAFT, M.B., B.CH., M.D.(HON.), F.R.C.S.	
Peripheral Nerve Injuries . . . . .	<b>60</b>
W. M. MCQUILLAN, F.R.C.S.	
Burns of the Hand . . . . .	<b>70</b>
P. J. WHITFIELD, F.R.C.S.	

## RECONSTRUCTIVE PROCEDURES

Skin Replacement and Scar Correction . . . . .	<b>79</b>
P. J. WHITFIELD, F.R.C.S.	



Operations for Fracture of the Scaphoid Bone . . . . .	PAGE 104
GEORGE BONNEY, M.S., F.R.C.S.	
Capsulectomy and Arthroplasty of the Metacarpophalangeal and Inter- phalangeal Joints . . . . .	114
D. A. CAMPBELL REID, M.B., B.S., F.R.C.S.	
Peripheral Nerve Injuries: Reconstructive Techniques . . . . .	123
DONAL BROOKS, M.A., M.B., F.R.C.S.(I.), F.R.C.S.(ENG.)	
Paralysis of the Intrinsic Muscles of the Hand . . . . .	129
PAUL W. BRAND, C.B.E., F.R.C.S.	
Pollicization . . . . .	151
D. A. CAMPBELL REID, M.B., B.S., F.R.C.S.	
Neurovascular Pedicle Flap . . . . .	162
D. A. CAMPBELL REID, M.B., B.S., F.R.C.S.	
GENERAL	
Infections . . . . .	167
T. G. LOWDEN, F.R.C.S.	
Dupuytren's Contracture . . . . .	177
H. ELLIOTT BLAKE, T.D., M.A., B.CH., F.R.C.S., F.R.C.S.(ED.)	
The Rheumatoid Hand . . . . .	192
O. J. VAUGHAN-JACKSON, V.R.D., B.M., B.CH., F.R.C.S.	
Carpal Tunnel Syndrome . . . . .	220
R. GUY PULVERTAFT, M.B., B.CH., M.D.(HON.), F.R.C.S.	
Teno-vaginitis Stenosans and De Quervain's Syndrome . . . . .	223
R. GUY PULVERTAFT, M.B., B.CH., M.D.(HON.), F.R.C.S.	
Excision of the Trapezium . . . . .	228
DENIS M. DUNN, M.B., F.R.C.S.(ED.)	
Fusion of the First Carpometacarpal Joint . . . . .	232
DENIS M. DUNN, M.B., F.R.C.S.(ED.)	
Operations for Ganglion . . . . .	235
M. S. BRETT, F.R.C.S.	
Amputations . . . . .	239
H. GRAHAM STACK, F.R.C.S.	
Splints and Other Appliances for the Hand . . . . .	247
NORMAN CAPENER, F.R.C.S.	



# SYNDACTYLY

T. J. S. PATTERSON, M.D., M.Ch., F.R.C.S.

*Clinical Lecturer in Plastic Surgery, University of Oxford*

## PRE-OPERATIVE

Webbing of the fingers is one of the most common malformations of the hand. It is important to distinguish two groups, since the prognosis and timing of treatment are different. In the first group, two or more normal fingers are joined by a web of skin which may extend to the tips; this is often bilateral and familial, and the toes are commonly affected. The characteristic of the second group is that the skeleton is abnormal; this is usually unilateral, there is no family history and the toes are not affected. The prognosis depends more upon the condition of the underlying skeleton than the webbing. Indiscriminate division of the webs may leave individual fingers which are weak and stiff. It may be better to delay treatment until careful observation and x-ray evidence have shown that separation of one or more fingers will improve the function of the hand.

### Timing of operation

The best age at which to separate webbed fingers is four years. By this time the child is old enough to tolerate his stay in hospital and to co-operate in treatment. The hand is big enough to make the operation and post-operative dressings easier. Treatment can be completed before the child goes to school at five years.

If a longer finger is joined to a shorter (usually ring and little fingers) the longer finger may be distorted as the hand grows. These fingers should be separated as soon as any distortion is noticed. Occasionally the fingers are fused by bone at the tips; here the longer finger is already distorted at birth. Separation of these fingers involves dividing bone, and inevitably opens the terminal interphalangeal joints. Despite early

operation some distortion of the terminal phalanges may persist.

When both hands are affected it is kinder to operate on one hand at a time to allow the child some freedom of movement. Since the first dressing needs a general anaesthetic, the second hand is operated on at this time—usually 10–14 days later.

If three fingers are webbed together, only one pair should be separated at a time; exposure of both sides of a finger at one operation carries the risk of damaging the blood supply to the tip.

### Instruments required

General soft tissue set; skin grafting set; small bone-cutters.

### Anaesthesia

The operation is carried out under a general anaesthetic. A pneumatic tourniquet is applied to the upper arm after the limb has been exsanguinated.

### Separation of webbed fingers

The principle of treatment is to make a skin-lined cleft which will not contract as the child grows. Occasionally, if the web is lax, it may be possible to design the incisions so that the cleft can be re-surfaced by local skin. In the great majority of cases there is not enough skin, and a graft must be added. If a graft is used as a continuous sheet round both sides of the cleft, there is a tendency for the marginal scar to contract and pull skin down from the hand so that the web partially recurs. To avoid this a local flap or flaps should be used at the base of the cleft to break up the continuous scar lines. Since the base of a normal

cleft extends further up the dorsum of the hand a single, dorsally-based flap gives the most natural-looking result.

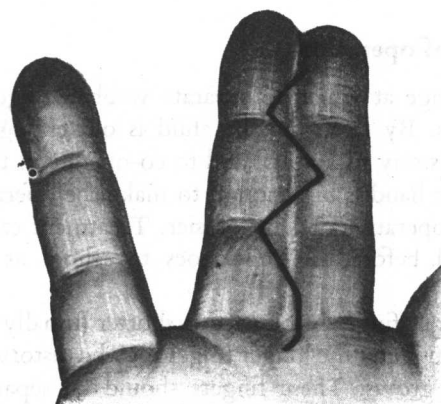
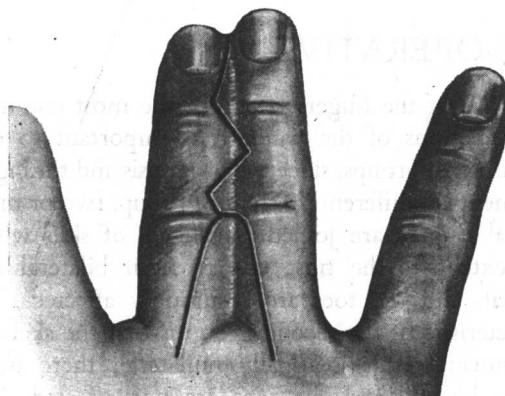
The skin graft may be either thick split-thickness or a Wolfe graft. The former is easier

and quicker to handle, and satisfactory for all cases. A Wolfe graft must be taken from a hairless area—the outer third of the groin crease is convenient; unless it is dissected with care it may be too thick on the sides of the fingers.

## THE PROCEDURE

### Dorsal flap

The dorsal flap for the base of the cleft extends from the level of the heads of the metacarpals to the proximal crease over the proximal interphalangeal joints.



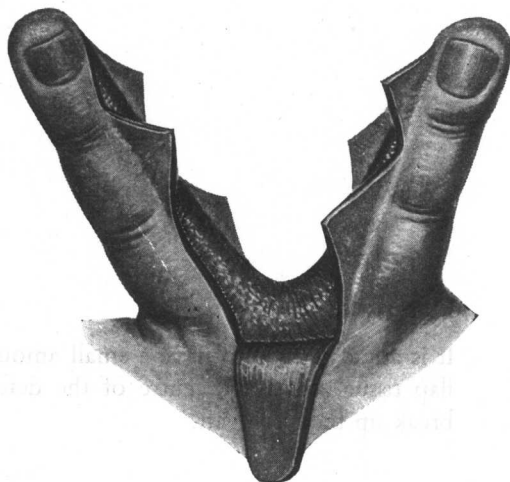
### Staggered incisions

- 1
- 2 Staggered incisions on the fingers avoid the risk of contracture of a straight scar. When the web is lax these edges may be raised as small flaps which are inter-digitated to cover the sides of the fingers.

### Separation of fingers

3

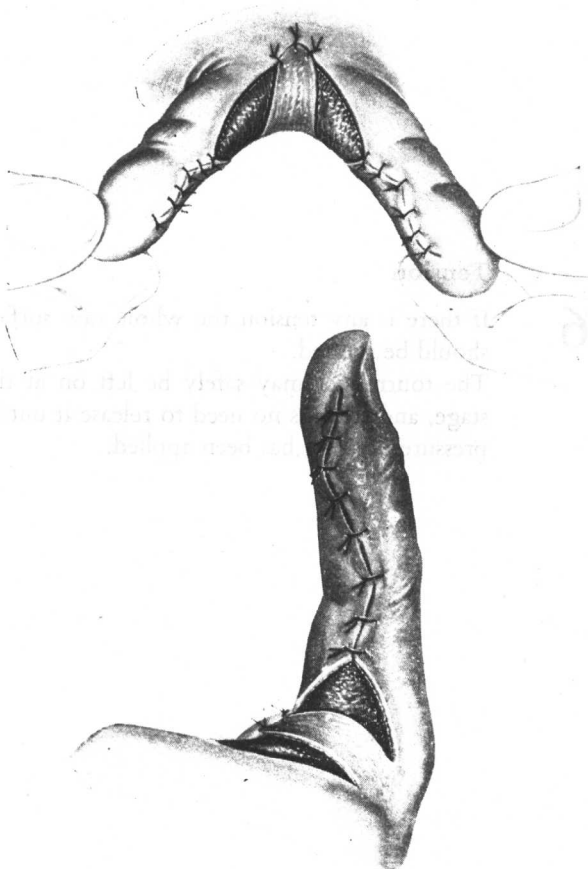
The flaps are raised and the fingers separated. The dissection is carried up between the heads of the metacarpals with care to preserve digital vessels and nerves which may be abnormally placed.



### Suture of dorsal flap

4

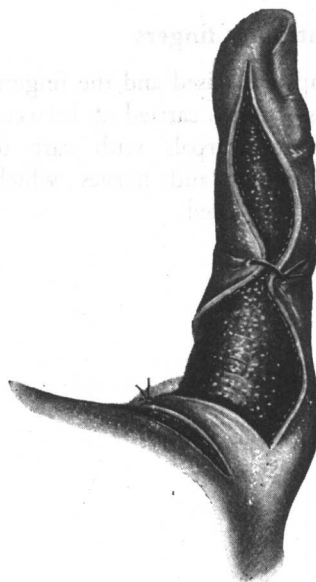
The tip of the dorsal flap is sutured into place, and the defects on the sides of the fingers are covered by suturing the small flaps together *if this can be done without tension*. A small raw area is usually left at the base of the fingers which must be grafted.



### Flap tissue

5

It is an advantage to have a small amount of flap tissue across the centre of the defect to break up the free graft.

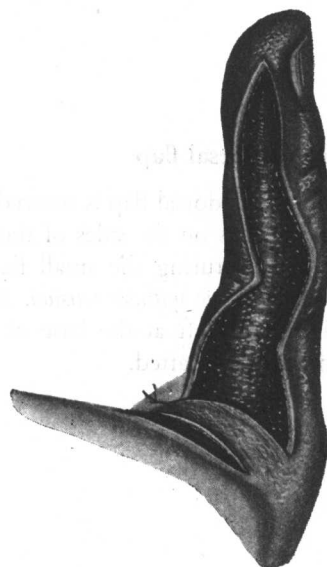


### Tension

6

If there is any tension the whole raw surface should be grafted.

The tourniquet may safely be left on at this stage, and there is no need to release it until a pressure dressing has been applied.



## POST-OPERATIVE CARE

The fingers are covered with a single layer of tulle gras, and the cleft is packed with wool wrung out in saline so that the fingers are held straight and slightly separated. The hand and wrist are enclosed in a "boxing-glove" type of dressing. The tourniquet is then released. The hand and forearm are elevated for 48 hours.

The first dressing is done at 10-14 days. This usually needs an anaesthetic. All sutures are removed. The grafted fingers are held straight on a simple tongue-depressor splint, and the rest of the hand may be left unbandaged. After a further 10 days the splint is discarded by day but should be worn at night for 3 weeks.

Careful follow-up is required. There is a tendency for grafts to contract in the early stages. If this occurs night-splinting should be prolonged.

As the child grows, the scars at the margins of the grafts may not keep pace with the child, and secondary contracture may occur. This is particularly common if the operation has had to be carried out when the child is under four years of age—when a longer finger is joined to a shorter. A series of Z-plasties on the marginal scars may be adequate. If the contracture is more severe it will be necessary to incise across the graft to create an oval defect which can best be filled by a small Wolfe graft. Night-splinting after these secondary procedures should be prolonged.

*[The illustrations for this Chapter on Syndactyly were drawn by Mr. R. N. Lane.]*

# POLYDACTYLY

T. J. S. PATTERSON, M.D., M.Ch., F.R.C.S.

*Clinical Lecturer in Plastic Surgery, University of Oxford*

---

## PRE-OPERATIVE

Polydactyly—duplication of one or more digits or part of a digit—is the most common congenital anomaly in the hand. There may be associated abnormalities in the hand or the rest of the limb, the most usual being syndactyly—the abnormal digit is webbed to its neighbour. The deformity may range from a small skin tag to duplication of the whole limb. There is a definite familial tendency. The condition is often bilateral and the feet are similarly affected in many cases. The abnormal digit is usually marginally placed on the hand; polydactyly in the centre of the hand is less common.

On the *ulnar side* of the hand a small tag of soft tissue is common. This may be sessile, although without bony connexion, or there may be two diminutive phalanges attached to the hand by a thin pedicle—the “pedunculated post-minimus”. This is liable to undergo torsion which, if not relieved, may cause gangrene of the digit.

A reasonably well-formed digit may be flail or attached to the hand by bone. In the latter case the digit often sticks out at an angle to the hand.

On the *radial side* duplication of part of the thumb is the most common of all types of polydactyly. There may be a small skin-tag on the radial border of the thumb, or the thumb may be split into two more or less equal parts including a double metacarpal. One or both parts of the completely duplicated thumb may be triphalangeal. In the most severe form, the “mirror-hand”, the thumb is replaced by an accessory hand set at right-angles to the palm.

## Timing of treatment

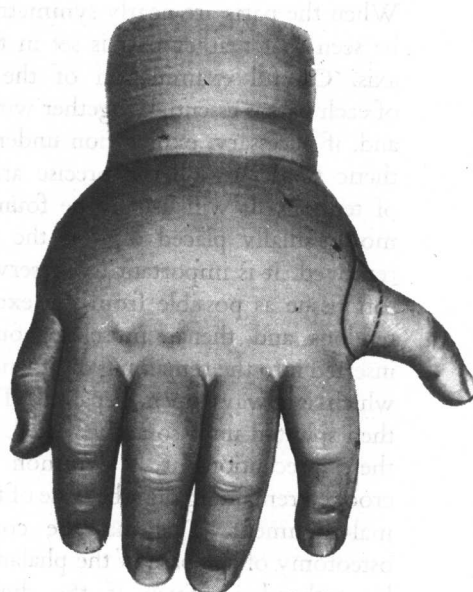
Many of the small tags can be simply removed when the child is first seen. In the more complicated deformities surgical correction is easier at the age of two, by which time the parts are large enough to allow precise repair. However, these are unsightly deformities, and the surgeon may be under heavy pressure from the parents to complete the treatment as soon as possible.

In the *foot* the extra digit should be removed at the time when the child needs to wear a normal shoe.

## THE OPERATION

1

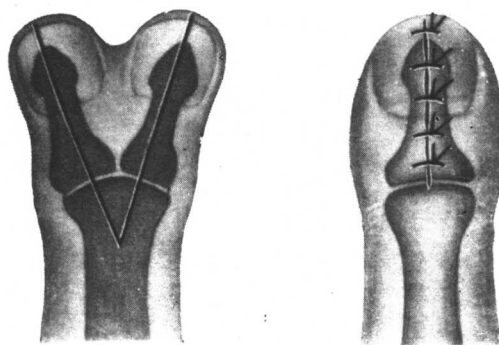
The midwife usually ties a ligature round small skin tags at birth. This removes the main mass and does away with the risk of torsion, but leaves a projecting nubbin of tissue which will have to be excised later. With larger accessory digits the decision as to which one to remove is often easy. If there is any doubt it will usually be found that the digit nearest to the border of the hand is the abnormal one. It is important to be sure that no epiphysis is left behind to cause further growth. The amputation is carried out by the standard techniques described on pp. 239-246.



### Removal of wedge

2

The decision as to which part of a duplicated digit to remove may be particularly difficult in the thumb where the parts may be nearly symmetrical. When the terminal phalanx is bifid a wedge may be removed from the centre and the halves approximated in layers. This leaves a rather broad tip to the thumb with a ridged nail but with good function.





### Removal of digit

3

When the parts are nearly symmetrical it will be seen that neither part is set in the correct axis. Careful examination of the functions of each part is essential, together with an x-ray and, if necessary, exploration under an anaesthetic to determine the precise arrangement of tendons. It will usually be found that the more radially placed digit is the one to be removed. It is important to preserve as much soft tissue as possible from the excised digit; tendons and thenar muscles should be reinserted into the remaining digit, and the joint, which is always open, repaired. The digit is then splinted until soundly healed. In spite of these precautions it is common to find a crooked remaining digit because of the original mal-alignment. This may be corrected by osteotomy of the base of the phalanx or, later, by arthrodesis. Even if the digit remains crooked these children grow up with excellent function.



[The illustrations for this Chapter on Polydactyly were drawn by Mr. R. N. Lane.]

# RING CONSTRICTIONS

T. J. S. PATTERSON, M.D., M.Ch., F.R.C.S.

*Clinical Lecturer in Plastic Surgery, University of Oxford*

---

## PRE-OPERATIVE

This is a very rare and curious group of malformations. If the general incidence of malformations of the hand is about 1 : 600 live births, the incidence of ring constrictions is about 1:15,000. A number of varied types occur, all characterized by the presence of ring markings in the skin. There is no familial tendency.

The aetiology is unknown. Since this group is the only one of all malformations which is commonly associated with amniotic bands it has frequently been suggested that pressure from a band is the cause of the malformation. It is now believed that the abnormalities of the amnion and of the limbs are due to the same failure of development at an early stage *in utero*, and that one does not cause the other (Patterson, 1961).

The various anatomical types are:

- (1) A simple ring in the skin, often multiple.
- (2) A deeper ring, often associated with distal abnormalities, particularly *lymphoedema*.

(3) The true "intra-uterine" amputation. This resembles a "guillotine" amputation where the bone sticks out of the retracted soft tissues. The end of the bone may be tapered but there are no proximal bony abnormalities. This is in distinction to the agenesis of a part, such as the hand, often wrongly referred to as "congenital amputation", where the bone is more affected than the soft tissue, with proximal abnormalities, and there is always some remnant of the agenetic part, such as a rudimentary digit, at the distal end.

(4) Terminal or fenestrated syndactyly. One or more digits are joined together by bands of varying thickness—ranging from a thin band between the tips to extensive webbing. This type of webbing can be distinguished from the more common syndactyly by the fact that there is always a small skin sinus at the base of the cleft; also, there is never fusion of bone at the tips of the digits such as may occur in acrocephalo-syndactyly.