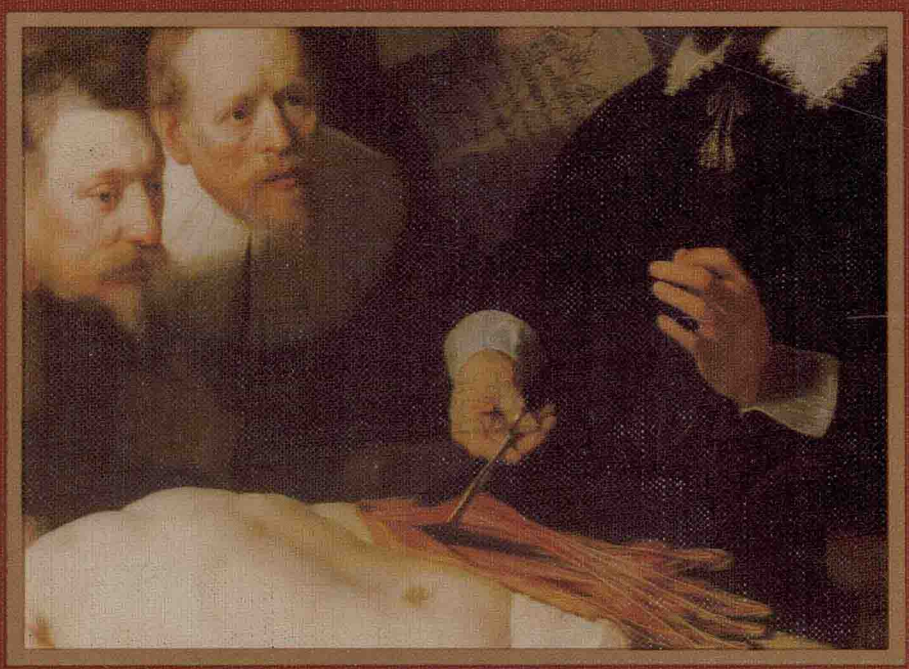
The HAND



TUBIANA

The HAND

Volume I

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PREFACE

A treatise can take one of several forms. It can reflect the personal experience of a single author, a formula which has the great advantage of uniformity. But surgery of the hand has already become too vast for a single "specialist" to discuss all its aspects in depth. On the other hand, a treatise can be a collection of articles by different authors who, however competent, have never worked together. This inevitably leads to some unevenness in presentation, to repetition, and occasionally to contradiction. The juxtaposition of different points of view need not be confusing and may even be stimulating, but the reading is made more arduous for those who use the book primarily as a guide. We have tried to avoid these pitfalls.

THE AUTHORS OF THIS BOOK

Our wish is that this work reflect the personal experience of the authors as well as serve as a reference book. We are aware that these goals may create some contradictions. It is difficult to make a book personal and, at the same time, encyclopedic.

I began work on this book with a small group of younger surgeons, R. Malek, J. M. Thomine, and P. Valentin. Besides this original team, which ensured the foundation of this treatise, we have called upon many other authors. Many of them, French or foreign, have worked with us at Cochin Hospital or at the Hand Institute in Paris. Others, from different disciplines, offer us that aspect of their work in which their competence is unequaled. A complete list is printed on the preceding pages. The close personal relations that I have maintained with many of them and the high esteem in which I hold them are inseparable from the editing of this book.

To all these authors, we express our deep gratitude, realizing the considerable work required to write each chapter. We are particularly honored by the trust and friendship that each of them has given us.

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Professor Robert Merle d'Aubigne (right) with Raoul Tubiana

into English, and Drs. M. Bombart, J. Calderwood, H. De Frenne, P. Esteve, M. Fahrer, P. Gallagher, A. Gilbert, J. Glicenstein, M. A. Gomez, S. Gordon, C. Hamonet, S. Hautier, J. Hobby, W. Holms, G. Khalil, N. Kuhlmann, C. Lane, R. Lisfranc, C. Martimbeau, G. Mayer, P. McMeniman, F. Megarbane, W. Morrison, J. Nosti, L. Poitevin, P. Rengeval, P. Saffar, M. M. Scott, B. Simmons, P. J. Thomas, B. Vaisler, F. Whalen, J. Wilkinson, and D. Wiltshire, who have helped us considerably in our translations. Our friend John Hueston of Melbourne, whose reputation in our specialty is worldwide, kindly read the English texts.

The revision and coordination of the anatomy chapters is done with the aid of Dr. M. Fahrer of Brisbane, who was our collaborator at the Hand Institute in Paris during his sabbatical year.

As for illustrations, Mr. L. Dorn is responsible for the drawings and Mr. C. Leclerc for the photographs. The style of presentation owes much to these excellent artists. Moreover, the well-known talent for drawing of our colleagues Dr. I. A. Kapandji, W. Littler, and E. Zancolli has often been called upon in this work.

Finally, before the historical survey of hand surgery by J. Boyes and J. Hueston in which they will portray the outstanding pioneers in this field, we have the pleasure of retracing an outline of the careers and work of Professors Robert Merle d'Aubigne and Emmanuel B. Kaplan, who did us the honor of prefacing the book.

Professor Robert Merle d'Aubigne was born in Paris in 1900. He submitted his thesis in 1928 and was appointed Chirurgien des Hôpitaux de Paris in 1936. He took an active part in the resistance during World War II, and in 1945 became head of the Reconstructive Surgery Unit of the French First Army. From then on, surgery of the motor apparatus, which was his primary interest, became his specialty.

His concept of orthopedics was much wider than the one hitherto accepted. He found it difficult to concede that orthopedics should be limited to the skeleton and post-traumatic conditions and felt that reconstructive surgery of the motor system should include trauma and classic orthopedics as well as plastic surgery. Thus, while supervising the construction of the new center of orthopedics and reconstructive surgery at Hôpital Cochin, he included a casualty service, a burn unit, and research laboratories. In addition, he organized, in the Greater Paris area, a center for rehabilitation and orthopedic appliances and a center for paraplegics. On his initiative, a modern and well-equipped hospital group was thus born, geared exclusively to treatment, research, and teaching in the fields of orthopedics, traumatology, and reconstructive surgery. The teaching provided in these centers had a strong influence not only on young French specialists but also on the hundreds of surgeons who came from abroad to complete their training.

Professor Merle d'Aubigne remains one of the last "general orthopedists" capable of handling all the problems that may arise in this wide field. While most of his collaborators have branched off into more or less restricted subspecialties, Professor Merle d'Aubigne, thanks to a vast experience and brilliantly lucid mind, has an expert knowledge of all aspects of treatment of the motor system.

It is impossible here to give a review of his contributions to all aspects of surgery of the motor system, such as traumatology, bone tumors, arthritis, and arthrosis of the hip. He was attracted toward corrective problems requiring precision and meticulousness, such as the correction of loss of tissue, imbalance and distortions of the skeleton, joint prostheses, and the treatment of peripheral nerve lesions. This is why he showed a natural predilection for surgery of the hand, to which he has contributed a number of publications on reconstruction of the thumb, tendon transfers, Volkmann's contracture, lesions of the brachial plexus, fractures, and paralysis of the hand.

Professor Emmanuel Kaplan

Professor Emmanuel Kaplan was born in Krementabourg, Russia, in 1894. He studied medicine at the Imperial University of Kharkov, and then in France, in Montpellier and Paris, from 1912 to 1914. After acting as medical officer in the Russian Army from 1916 to 1921, he returned to Paris in 1922. In 1924, he settled in the United States, where he continued his medical studies and became a resident in orthopedics at the Hospital for Joint Diseases in New York, becoming Attending Orthopedic Surgeon of the same hospital in 1950, before being appointed Consultant Surgeon to the Unit. In addition to his surgical activities, Dr. Kaplan continued his work on anatomy at Columbia University, where he was Demonstrator in Anatomy and later Associate Professor.

Being an anatomist and a surgeon, Dr. Kaplan has an essentially functional approach to hand surgery. This is evident from the titles of his well known books: *Functional and Surgical Anatomy of the Hand* and *Surgical Approaches of the Extremities and the Spine*. While continuing with his own personal work, Dr. Kaplan, heir to several cultures, endeavored to revive the works, regretfully forgotten, of the great anatomists and physiologists of the past: Duchenne, Weitbrecht, and Bourgery. In fact, comparison, contrast, and understanding have always been his main themes: he linked anatomy with orthopedics, brought the works of the past nearer present-day research, and compared animal with human anatomy.

An indefatigable worker, he is preparing two more studies: *Anatomical Variations of the Hand,* and a translation of Bourgery's *Anatomie de l'Homme*.

RAOUL TUBIANA

FOREWORD

Sterling Bunnell's creative genius and devotion were responsible for the deep interest in and initiation of surgery of the hand as a special division of surgery. His art and his tireless efforts helped to expand his ideas and details of his organization and technique throughout the world. Since then important developments of technique, basic research, and treatment in this specialty have been observed in many countries. It extended widely in certain special branches and required the participation of many surgeons and scientists for further development. It is no longer possible for a single individual to cover all fields. Only the combined efforts of experts in separate fields of morphology, physiology, kinesiology, and surgical art can present the entire subject in a form useful and valuable for hand surgeons.

This treatise in hand surgery represents more than a combined contribution of experience by various surgeons and scientists. It reflects also the various methods and experience of many lands and represents an international effort to preserve and to recreate the most precious and precise tool of man.

Professor Raoul Tubiana has created a special work as a surgeon with many personal contributions in surgery and basic research. His knowledge of several languages has helped him to obtain international cooperation after years of personal contact and observation of the work of others. His wide vision, extending into the past and also into the future, will place this treatise historically to serve as an academic and practical guide to surgeons and an inspiration for further research in all fields related to the understanding and preservation of the human hand.

EMMANUEL KAPLAN

THE HAND: Whole and Part

When reflecting on the advantages and disadvantages of specialization, one can find few better examples than that afforded by surgery of the hand. What other organ can be the site of so many, such specific, and such minute local problems? And yet no other is so dependent on the rest of the body. This remarkable precision tool is, with the eyes, our chief instrument of information. Its participation in the expression of our thoughts, written and spoken, and in our sexual life is such that injury to, or loss of, that organ is bound to have severe psychological repercussions.

I would like, in this preface, to express my admiration for the spirit in which Raoul Tubiana has conceived this book. His close attention to detail has never blinded him to the fact that the upper limb is a whole of which the hand is a part, and the individual who carries two upper limbs is never far from his thoughts.

The cultural background of Raoul Tubiana is responsible for this attitude. After starting his career as a general surgeon, it was as an orthopedic surgeon that he became interested and later specialized in the hand, without at any time losing sight of the problem of the upper limb and of the motor apparatus as a whole.

While recognizing that specialization in hand surgery is essential because of its spirit, its indications, and its special techniques and also because of the increasing number of cases requiring treatment, I personally would hate to see it become isolated. The closure of the frontiers between hand surgery and orthopedic surgery would be detrimental to orthopedic surgeons, who learn the value of dedication, precision, and detail in their dealings with the hand, but also to hand surgeons, who in their passion for technique may tend to let function come in a poor second. The latter must remember that the hand cannot be isolated from the rest of the upper limb and that their knowledge of this limb must be complete. The former must realize that methods used for the lower limb cannot easily be applied to the upper limb.

The physiology of the two sets of limbs is fundamentally different in two respects. While the lower limb relies for its efficiency on its stability, the upper limb relies on its mobility; the hand remains functional at the end of a flail arm. While a healthy lower limb cannot make up for the lost function in its crippled or destroyed mate, the upper limb can take over for its counterpart to a greater extent than is usually realized. This may be by a real sharing of work, one arm taking over the gestures that the other cannot perform, or a total takeover is also possible. It is well known that young amputees learn to perform all common gestures with the one hand. These facts should always be kept in mind when the choice is made between arthrodesis and arthroplasty, and also when the palliative treatment of paralyses is planned. Let us consider a few examples.

Because the only function of the shoulder is to provide the hand with the widest possible field of reach, the surgeon should make every possible effort to preserve its mobility. Immobilization of the shoulder should be banned in the treatment of lesions of the distal extremity of the limb; it should be reduced to a minimum in lesions of the proximal segment. Only a few days of immobilization usually suffice in fractures of the scapula and in some fractures of the upper end of the humerus. In certain tumors, a wide excision of the scapula and of half the humerus is preferable to disarticulations, as it preserves a functional hand even though the limb may be totally flail. By contrast, arthrodesis should be regarded only as a last resort after the supplementary capacity of the other limb in everyday functions has been carefully evaluated. A limp shoulder, as long as it is painless, is always preferable to an ankylosed one. The same is true of the elbow, where mobility is essential: stiffness should be treated by resection, paralysis by transfers. The introduction of prostheses has removed the last indications for arthrodesis of the elbow even though their life span is still unknown. The shoulder and the elbow should enable the hand to be carried (if necessary, by the other hand) to its target.

The function of the forearm consists in *orienting* the hand into a favorable position; hence the importance of preserving pronation-supination in fractures of one or both bones. If some mobility must be lost, the hand should be placed halfway between pronation and supination, leaving the shoulder to complete the movement. This emphasis on function should end the pernicious belief that, theoretically and anatomically, the hand should be immobilized in supination to correct rotation. Indeed, numerous disabilities have resulted from this mechanistic approach in the treatment of forearm fractures.

At the wrist the requirements are somewhat different: mobility in rotation is essential, but in the direction of flexion and extension, stability is needed. Surgery for a painful stiff wrist will usually fix the hand in the axis of the forearm if pronation and supination are preserved. It must not be forgotten, however, that an adult right-handed carpenter, for example, will only very rarely succeed in training his left hand.

If the orthopedic surgeon must never forget the hand, the hand surgeon should never forget the arm. We have seen that a normal hand can be used at the end of a powerless limb. By contrast, a crippled hand in the same situation is not used. Our disappointments have at times been great at the end of interminable and complex palliative procedures in subtotal paralyses of the upper limb! But it is possible to restore useful function to a mutilated or paralyzed hand if the proximal segments remain capable of carrying it to the object.

We shall not dwell on the mutilated hand: its function can often be improved. But natural adaptation can be remarkable and should guard against haste and surgical overenthusiasm: the functional result of surgery in terms of practical use of the hand may not equal the technical ability of the surgeon or fulfill the promise of the postoperative photograph.

The severely paralyzed hand poses a similar problem; the concern is not so much with paralyses of the intrinsics, whose palliative treatment is fairly well codified, as with those associated with lesions of the long flexor and extensor muscles in the forearm. Together with Raoul Tubiana and Y. de la Caffinière, we have attempted to define the surgical indications in these cases.

Three principles must be followed to avoid disappointments both to the patient and to the surgeon in the reconstruction of the paralyzed hand.

1. The restoring of manual function, or rather of one manual function, is

subordinated to certain general conditions, such as the intelligence and cooperation of the patient, but also to his understanding and acceptance of the limitations and unpredictability of the result. Local conditions that must be satisfied include free, painless, and useful mobility of the relevant joints. Ideally, at least a protective level of sensation should be present, but this is not an absolute condition, especially in leprosy and in patients with bilateral lesions.

2. The objectives of surgery should be limited to the possible. If only one, two, or three transferable muscles are available, one cannot expect to restore both the precision grip and the full-handed grasp. One should be content with a simple and elementary movement which will be precious if it is strong and active, i.e., opening and closing of the lateral pinch formed by the pulp of the thumb on one side and the lateral aspect of the flexed index on the other.

3. Paralyses underline the need for assessing not only the hand but the limb as a whole: the possibility of wrist movements supplementing paralyzed fingers by a tenodesis action must be regarded as a priority. The wrist should not be arthrodesed simply to make its flexors and extensors available for transfer: these muscles are much more useful in their natural position than after transfer.

These examples have been given only to illustrate a truth that will unfold all through this book. Like the good pathologist, the hand surgeon should be capable of focusing down on minute detail such as may require the use of microsurgery; but in his clinical examination and the choice of his indications he must expand his field in order to include the upper limb as a whole as well as the patient with his lesions and with his physical, intellectual, and moral potential.

ROBERT MERLE D'AUBIGNE

INTRODUCTION AND PLAN OF THE BOOK

BIRTH, OCCURRENCE, AND EVOLUTION OF HAND SURGERY

We can trace the beginnings of hand surgery to antiquity, but until the last few decades it has seldom generated special interest. Paradoxically, only now, when manual work is on the decline, are people starting to realize the importance of looking after hands.

The present-day acceptance of the importance of hand surgery is due to several factors: to the essential role of the hand as a means of relating to objects and persons, to frequent and multifaceted pathology of the hands, to the complexity of treatment, and to the important social sequelae initiated by incapacitated hands.

Recall the discomfort of a superficial finger wound and you will understand the dominance of the hand in all our activities. Consider that every year 15 out of 1000 people experience hand injuries. This means that in our life span, each of us will probably have at least one such wound. The constant use of hands and the difficulty of protecting them without compromising their efficiency make them extremely vulnerable.

In industrialized countries, about one third of all accidents requiring time off work are hand injuries. In one third of these cases, they cause permanent disabilities and they account for more than one fourth of lost working days.

These accidents and their repercussions cause huge material losses, as well as drastic consequences at both personal and social levels. Logically, large financial, social, and medical resources should be directed to the prevention and treatment of hand accidents. However, this is not the case. The lack of interest by all governments is appalling.

For many years, surgeons have concentrated primarily on the treatment of life-threatening conditions. Lesions of the hand, with few exceptions (and it is these very exceptions, such as spreading infections, which first attracted the attention of general surgeons), are usually a threat only to function. For this reason, they were left to inexperienced juniors.

Later, following the advances in surgery and anesthesiology, even when surgeons began to take an interest in the functional outcome of patients, the hand continued to be neglected, in spite of the fact that it is, without any doubt, the most useful tool of man. Another reason for the neglect was that hand surgery was wrongly considered to be easy surgery, limited to the treatment of minor injuries. Because of their high incidence, hand injuries were left to the care of practitioners who had neither the ability nor the facilities for their proper management. It is rarely possible for the qualified surgeon with a busy schedule to find the additional time to deal with the incessant flow of casualties involving the hand.