

Mathes

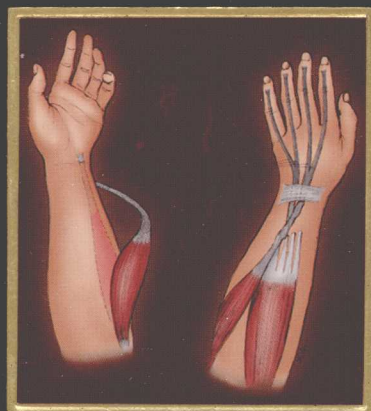
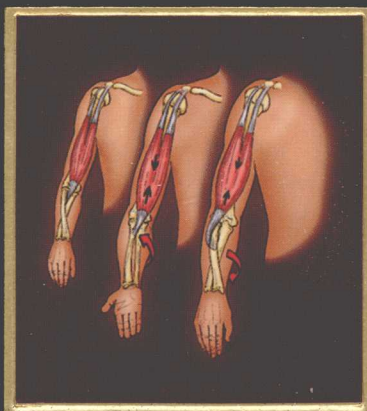
Plastic Surgery

VOLUME

8

THE HAND AND UPPER LIMB
PART 2

Hentz



Plastic Surgery

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Plastic Surgery

Second Edition

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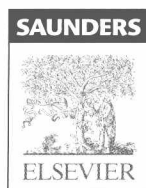
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Shireen L. Dunwoody, Editorial Coordinator

VOLUME *VIII*

THE HAND AND UPPER LIMB, PART 2



Volume I General Principles
Volume II The Head and Neck, Part 1
Volume III The Head and Neck, Part 2
Volume IV Pediatric Plastic Surgery
Volume V Tumors of the Head, Neck, and Skin
Volume VI Trunk and Lower Extremity
Volume VII The Hand and Upper Limb, Part 1
Volume VIII The Hand and Upper Limb, Part 2



Portrait by Richard Whitney

J. William Littler, MD

Born: Manlius, New York, October 7, 1915; died: Providence, Rhode Island, February 27, 2005.

Volumes VII and VIII, the two hand volumes, are dedicated to Dr. J. William Littler. Innovator, educator, artist, master surgical craftsman, and Renaissance man, he lived and loved life to the fullest.

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◆ PREFACE

It is a great thing to start life with a small number of really good books which are your very own. *Through the Magic Door* (1908), Sir Arthur Conan Doyle

My meeting for lunch with Joseph McCarthy in Boston in 1998 during the annual meeting of the Society of Plastic Surgery was arranged to discuss the possibility of my becoming the editor of the new edition of *Plastic Surgery*. I was well aware of the responsibility of assuming this giant project. My admiration of the past editors, including Joseph McCarthy for the 1990 edition of *Plastic Surgery* and John Marquis Converse for the 1964 and 1977 editions of *Reconstructive Plastic Surgery*, was great since these texts in my estimation really defined our specialty of plastic surgery and provided the platform for future advances in treating congenital and acquired deformities. My memory of Converse's first edition started with my residency in plastic surgery on my first rotation at the private practice of William Schatten, John Hartley, and John Griffith in Atlanta, Georgia. There, in moments when I was not involved in patient care activities, I would enjoy reading the pages of clinical advice on all subjects related to plastic surgery in the five volumes of *Reconstructive Plastic Surgery*. Subsequently, in 1977, as a faculty member at Washington University, I was privileged to be able to purchase my own copy of the then six-volume edition of *Reconstructive Plastic Surgery*, again edited by Converse. This time, my reading of the exciting pages was less relaxed, since I was using the text as the reference in preparation for my plastic surgery board examinations.

By 1990, I was able to contribute a chapter to *Plastic Surgery*, edited by Joseph McCarthy, and I personally knew most of the contributors, having witnessed the evolution of many of the new advances and unique contributions contained within the then eight volumes. With this background, I was excited and honored to have been recommended as the next editor of this text, which has so well reflected the greatness of the specialty of plastic surgery. My meeting was punctuated by advice regarding the importance of the text and the selection of experts who would provide both guidance and stimulation to future readers on the many subjects important to physicians involved in plastic surgery. The complexity of orchestrating so many contributors in a timely fashion was also emphasized. I left this luncheon inspired to undertake this project, with the anticipation of capturing the best and most innovative surgeons as contributors to achieve an edition in keeping with the unique traditions of excel-

lence of the past editions of *Plastic Surgery* and *Reconstructive Plastic Surgery*.

My first step was to find an academic hand surgeon to edit the two hand volumes. J. William Littler had served as the editor of the hand and upper extremity volume in Converse's two editions of *Reconstructive Plastic Surgery*. Littler was a master hand surgeon and one of the foremost innovators in hand surgery. McCarthy selected a unique combination of academic hand surgeons, James W. May and J. William Littler, to edit the two volumes dedicated to upper extremity and hand surgery in the 1990 edition of *Plastic Surgery*. With the many new techniques related to microvascular surgery, the space devoted to this important aspect of plastic surgery had been expanded into two volumes. Jim May, like Bill Littler, is a master hand surgeon, a gifted teacher, and an innovator in all aspects of plastic surgery and was able to include both his contributions and those of many other hand surgeons, who all took part in advancing this important discipline.

Fortunately, the decision regarding who should be the hand editor for this edition of *Plastic Surgery* was obvious. Vincent R. Hentz is a master hand surgeon and past president of the American Society of Surgery of the Hand. As an accomplished educator and chief of the division of plastic and hand surgery at Stanford, he is the ideal person to follow in the footsteps of Littler and May. In keeping with the many innovations and new techniques in upper extremity and hand surgery, this edition contains two volumes devoted to hand surgery. Of interest, we have shifted the editorial geography from the East Coast (New York City and Boston) to the West Coast (San Francisco and Palo Alto). Unfortunately, despite the improvement in weather characteristics of the western coastline of the United States, the commitment to continue the excellence of this text has kept the editors mostly indoors during the complex editing process necessary to complete these volumes.

The goal of this edition is to cover the scope of plastic surgery. The key was to select the best contributors to define the problems encountered in plastic surgery, to provide both the most current and the most successful solutions, and to deliver the challenge for future innovation in each area of plastic surgery. In this new edition, there are 219 chapters with 293 contributors. Each of the senior authors of the 219 chapters was carefully selected for his or her recognized expertise in the assigned subject of the chapter. Each author has personally contributed to the advancement in knowledge related to his or her area of expertise in our specialty.

The authors selected are inspirational leaders due to their many innovations toward improvement in the management of the plastic surgery patient. After the manuscripts were submitted, each chapter was carefully reviewed by the editors to ensure that all aspects of the authors' assigned topics were adequately covered and well illustrated so that the reader could readily incorporate the chapter content into the practice of plastic surgery.

In the eight volumes included in this edition, all subjects pertinent to the scope of plastic surgery are covered. Many new topics, 67 in all, have been developed or were enlarged from broader subjects and warranted a new individual chapter. Thirteen of these new chapter topics are included in Volume I: General Principles. The enlargement of the volume containing general principles reflects the continuing expansion of our specialty, the emphasis on experimental and clinical research, and the impact of research on the practice of plastic surgery. In the remaining volumes, devoted to specific clinical topics, two new types of chapter formats were added: 25 technique chapters and 7 secondary chapters. The technique chapters are added to complement the overview chapters and are designed to focus on particular techniques currently in use for a clinical problem. Likewise, the secondary chapters are again an extension of the overview chapters on particular subjects but focus on problems that persist despite the application of primary plastic surgery solutions. These secondary chapters are designed to demonstrate areas where operations may fail related to improper patient or technique selection or technique failures. They also discuss procedures to correct unsatisfactory outcomes following primary plastic surgery.

Volumes II through VII are divided into specific topographical areas of plastic surgery. Volume II: The Head and Neck (Part 1) is devoted to cosmetic procedures and contains six new topic chapters, seven new technique chapters, and three new secondary chapters. This volume now contains color illustrations, which will help the reader evaluate problems and results following cosmetic procedures. Many important subjects are expanded and introduced. For instance, there are now five chapters on the face lift, which provide the reader with the ability to compare techniques and focus on specific aspects of the procedure. Volume III: The Head and Neck (Part 2) is dedicated to reconstructive procedures and contains 10 new topics as well as the traditional subjects used in the previous edition. Volume IV: Pediatric Plastic Surgery contains five new topics and provides multispecialty approaches to children presenting with congenital facial anomalies. Volume V: Tumors of the Head, Neck, and Skin has seven new topics. Along with management principles of head and neck cancer, identification and treatment of melanoma and non-melanoma skin cancer have been added in new topic chapters. Volume VI: Trunk

and Lower Extremity contains 34 added topics. For example, in the area of postmastectomy reconstruction, 12 new chapters have been added to provide specific diagnostic, management, and technical information on breast reconstruction issues. Similarly, four new chapter topics have been added on body contouring procedures. With emphasis on bariatric surgery and body contouring procedures, these chapters provide a complete array of information on techniques and outcomes. Volume VII: The Hand and Upper Limb (Part 1) contains introductory and general principles related to diagnosis and management of acquired disorders, both traumatic and nontraumatic. Volume VIII: The Hand and Upper Limb (Part 2) contains three parts: congenital anomalies, paralytic disorders, and rehabilitation. The two volumes on hand and upper extremity surgery contain an additional 22 chapters introducing new subjects to this edition of *Plastic Surgery*.

Education involves the process of observation as well as contact with teachers, mentors, colleagues, and students and the literature. Each component is essential to learning a specialty in medicine and maintaining competence in the specialty over the course of one's career. In plastic surgery, the abundance of master surgeons gives everyone the opportunity to observe excellence in technique, during residency and later through educational programs. Contact with teachers and colleagues must be maintained in order to keep abreast of the new innovations in medicine and to measure one's outcomes in the context of standard of care. Our professional society meetings and symposia, both locally and nationally, provide us with this opportunity. Contact with mentors and students is critical for innovation. The physician must seek out these sources of inspiration and stimulation to improve patient care. Collaboration with professionals is a unique opportunity to allow further growth in our specialty and is available in every medical environment. The literature allows the physician to see where we have been, where we are currently, and what the future holds. The physician can hold a piece of literature in the hand and review its message both in critical times, when patient management decisions must be made on a timely basis, and during leisure times, when a subject is studied and carefully measured against personal experience and knowledge acquired through professional contacts. It is hoped that this edition of *Plastic Surgery*, like its predecessors, can serve the purpose of literature in teaching. Its eight volumes contain more than 6800 pages of information carefully formulated by recognized experts in our specialty in plastic surgery. It is designed, as initially stated, to define the current knowledge of plastic surgery and to serve as a platform for future creativity to benefit the patient we see with congenital and acquired deformities.

Stephen J. Mathes, MD, 2005

◆ ACKNOWLEDGMENTS

So many talented and dedicated professionals are necessary to complete a text of this magnitude. It is impossible to really thank everyone adequately, since there are so many people behind the scenes who were silently working toward the completion of this project. However, I shall endeavor to acknowledge the people who provided scientific, technical, and emotional support to make this edition of *Plastic Surgery* possible.

My first contact with the publisher (Saunders, now Elsevier) started with my meeting with Allan Ross and Ann Ruzycka Anderson. Allan Ross, executive editor, was assigned to guide this text to publication. He is a dedicated publishing executive who was most supportive at the inception of this project. Ann Ruzycka Anderson, senior developmental editor, has been working in medical publishing for 20 years. This text was most fortunate to have Allan and Ann assigned as the guiding forces at the onset. Ann states that working on this text is "something exciting, worthwhile, and important" because she is helping to "produce the largest book in medical publishing history."

Because this book took 5 years to complete, there were changes in the personnel involved in the project. Joe Rusko, medical editor, assumed the responsibilities of guiding the development of the text, with Allan Ross taking on the role of consultant. Joe has great enthusiasm and provided great ideas for the format of this book and for associated advertising. During the past year, the project was turned over to the leadership of Sue Hodgson, currently the publishing director and general manager for Elsevier Ltd. With Sue living in London, the project took on a more international outlook, with Sue flying between London, Philadelphia, New York, and San Francisco to keep the project moving ahead to completion. Both Sue Hodgson and Allan Ross have a great deal of success in guiding complex publications to press. Sue has published highly successful books in dermatology, and now, it is hoped, she will be able to make the same claim for the field of plastic surgery. For sure, she can now lay claim to publishing the largest medical book in existence. Recently, Sue Hodgson summed up her role in the publishing industry as follows: "The opportunity to create new products to answer the market's educational needs and handling high-profile and demanding projects are what get me out of bed in the morning." All plastic surgeons who use this text are indebted to the perseverance and commitment of these

publishing leaders: Allan Ross, Joe Rusko, and Sue Hodgson.

"The quality of a person's life is in direct proportion to their commitment to excellence, regardless of their chosen field of endeavor."

—Vince Lombardi

After the authors were selected for the 219 chapters, it was obvious that we needed someone special to serve as the editorial coordinator between the editors and the authors. Thanks to the advice of Allan Ross and Ann Ruzycka Anderson, Shireen Dunwoody was recommended for this position. Shireen is an accomplished computer programmer and musician and has served as a senior medical writer, media programmer/editor, and developmental editor since 1991. Among the high-profile medical texts on which she has worked are *Clinical Oncology* (Martin Abeloff et al., editors), *Surgery of the Liver and Biliary Tract* (Leslie Blumgart, editor), and *Fundamentals of Surgery* (John E. Niederhuber, editor). Shireen has worked closely with the editors and our assigned authors during every step of the process—obtaining the manuscripts (including a multitude of meetings and phone calls with authors), helping find artists when needed, confirming references, discovering historical information as related to the many subjects covered in *Plastic Surgery*, and coordinating all these data with the publishing staff in Philadelphia and New York. When asked to describe what this job was like, she described the process as follows: "At times, this project has been a struggle, but most of the time it has been a joy (kind of like raising eight children). On any given day, working on this project has given me a reason to (1) get up in the morning; (2) stay up all night; (3) despise the morning; (4) stay sober; (5) get drunk; (6) laugh; (7) cry; (8) live; (9) lie; (10) rejoice. Who could ask for anything more? It has certainly kept things interesting!" Shireen credits special members of the publishing staff for helping this immense project move ahead at a fairly steady pace. In Philadelphia, Linda Van Pelt, senior project manager, book production, and RoseMarie Klimowicz, freelance copyeditor, have been with this project since its inception. They have both dedicated vast amounts of blood, sweat, tears, and personal time. Ann Ruzycka Anderson has been dedicated to this project since the onset and has also worked closely with Shireen. Judy Fletcher, publishing director, provided

the support needed for timely layouts and served as an advocate for this project even when layout or illustrations were changed to maintain the continuity and artistry of the chapters. Finally, Shireen acknowledges her two amazing assistants in Palm Springs, California, Donna Larson and Carla Parnell, who have helped her scan, copy, crop, sort, mail, and stay sane. Without the dedication and brilliance of Shireen Dunwoody in bringing out the best in the editors, publishers, authors, and artists, this text would not have the quality and completeness it now possesses.

My immediate family was always supportive of this project despite the time-consuming work associated with text preparation. I wish to acknowledge and thank my family for their exciting accomplishments, which are a source of pride and enjoyment: Mary, Norma, Paul, Leslie, Isabelle, Peter, David, Brian, Vasso, Zoe, Ned, Erin, Maggie, and Rick.

In any profession, the support and encouragement of one's colleagues are essential for productivity. I wish to thank the faculty in our division of plastic surgery for their specific contributions to the text and their active roles as outstanding teachers for our residents and students at the University of California in San Francisco. The faculty, both full time and clinical, include the following: Bernard Alpert, Jim Anthony, Ramin Behmand, Kyle Bickel, Greg Buncke, K. Ning Chang, Tancredi D'Amore, Keith Denkler, Issa Eschima, Robert Foster, Roger Friedenthal, Gilbert Grading, Ronald Gruber, William Hoffman, Clyde Ikeda, Gabriel Kind, Chen Lee, Pablo Leon, Mahesh Mankani, Robert Markeson, Mary McGrath, Sean Moloney, Douglas Ousterhout, John Owsley, Lorne Rosenfield, Vivian Ting, Bryant Toth, Philip Trabulsky, D. Miller Wise, and David Young.

During the time span in which this book was edited, a group of outstanding residents completed their plastic surgery residencies at UCSF. All these residents contributed to both the care of many of the patients included in the chapters written by our faculty and the development of concepts used in the chapters of this edition. Each resident listed has contributed to the advancement of our knowledge in plastic surgery: Delora Mount, Richard Grossman, Jeff Roth, Laura McMillan, Kenneth Bermudez, Marga Massey, Yngvar Hvistendahl, Duc Bui, Te Ning Chang, Hatem Abou-Sayed, Farzad Nahai, Hop Nguyen Le, Clara Lee, Scott Hansen, Jennifer Newman-Keagle, and Wesley Schooler. General surgery residents, research fellows, and students who participated in the project include Lee Alkureishi, Julie Lang, Edward Miranda, and Cristiane Ueno.

Without the dedication of our staff, the preparation of this text would not have been possible. Crystal Munoz served as our office manager during most of the preparation time. My patient coordinators, Marian Liebow and, later, Skye Ingham, are patient advocates and made the arrangements necessary to treat the patients discussed in our chapters. Our nurses, Janet Tanaka and, later, Ann Hutchinson, were essential to the overall care of patients presenting to our clinical practice. Our staff provides the support needed to allow the faculty to have the time necessary to participate in the creative activities expected in academic plastic surgery.

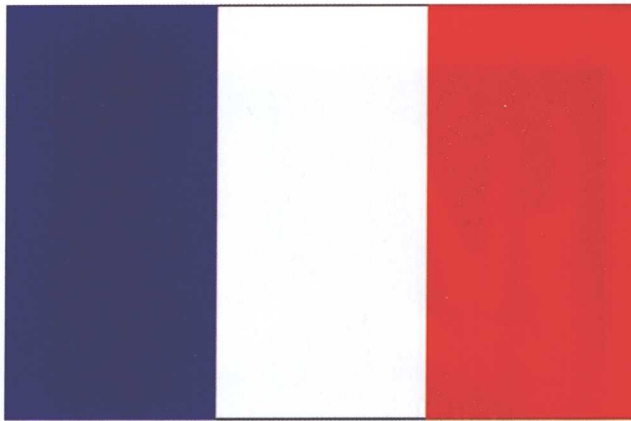
Plastic surgeons depend on visual assessment of problems; thus, illustrations are an essential part of our scientific literature. Numerous artists were involved in the chapters selected by the individual authors. However, two artists were available to all the contributors and provided outstanding art to accompany many of the chapters. Kathy Hirsh, located in Shanghai, China, and Scott Barrows, in Chicago, have worked diligently to provide accurate artistic interpretations of the surgical procedures recommended throughout this text.

"Mental toughness is many things. It is humility because it behooves all of us to remember that simplicity is the sign of greatness and meekness is the sign of true strength. Mental toughness is spartanism with qualities of sacrifice, self-denial, dedication. It is fearlessness, and it is love."

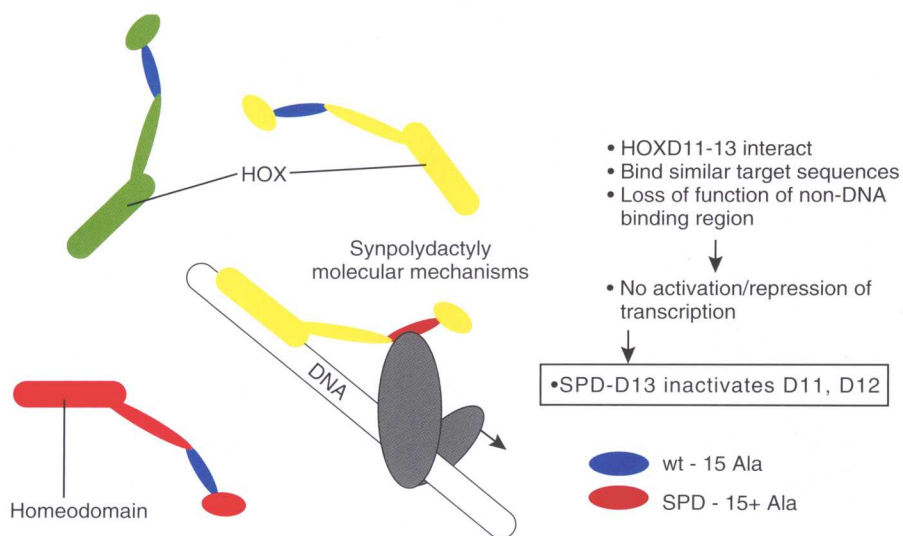
—Vince Lombardi

All the authors who contributed to these volumes exemplify mental toughness. To complete a chapter for a text is often considered an unappreciated task. However, thanks to the great reputation established by the prior editors of this comprehensive work, John M. Converse and Joseph G. McCarthy, and the previous editors of the hand volumes, William Littler and James May, the top plastic surgeons in their respective fields have given their time and efforts to maintain the excellence associated with past editions of this text. Thanks to these contributors, this book provides information at the forefront of innovation and current practice in the specialty of plastic surgery. The contributors and their families are thanked for their perseverance and sacrifice in the completion of these chapters and for their dedication to our specialty, plastic surgery.

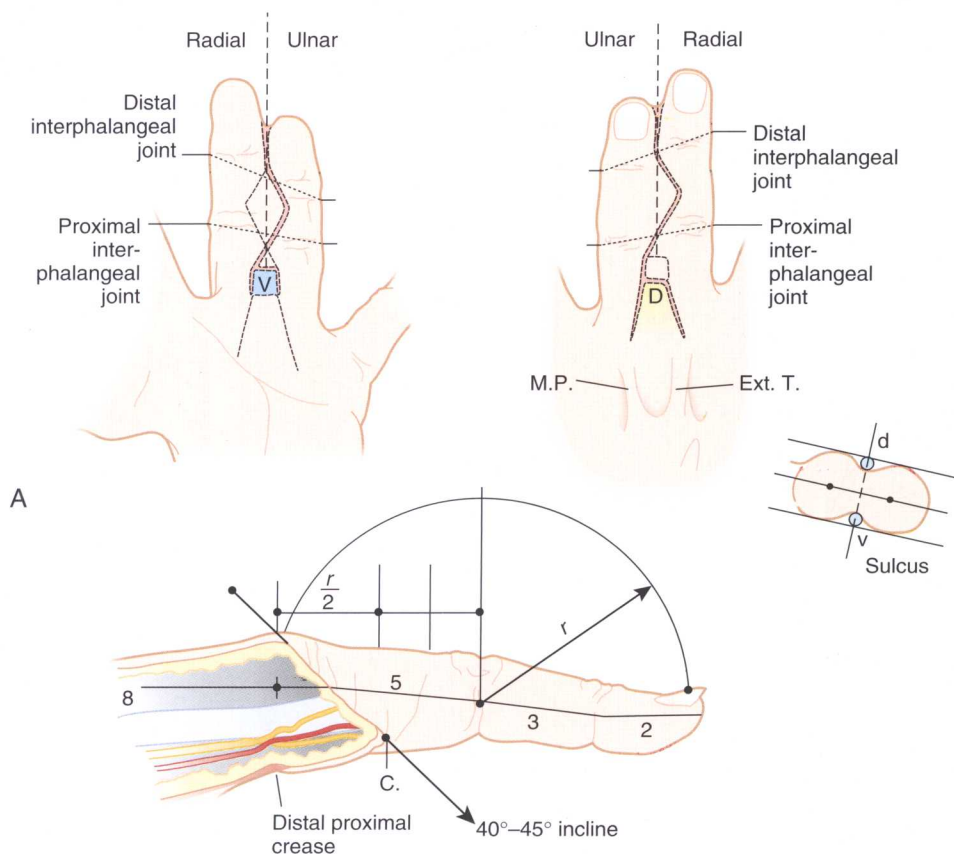
SJM



COLOR PLATE 201-1. The French flag problem. The modern era of embryology began in 1969, when Wolpert proposed the French flag problem. How do developing biologic systems create a pattern?

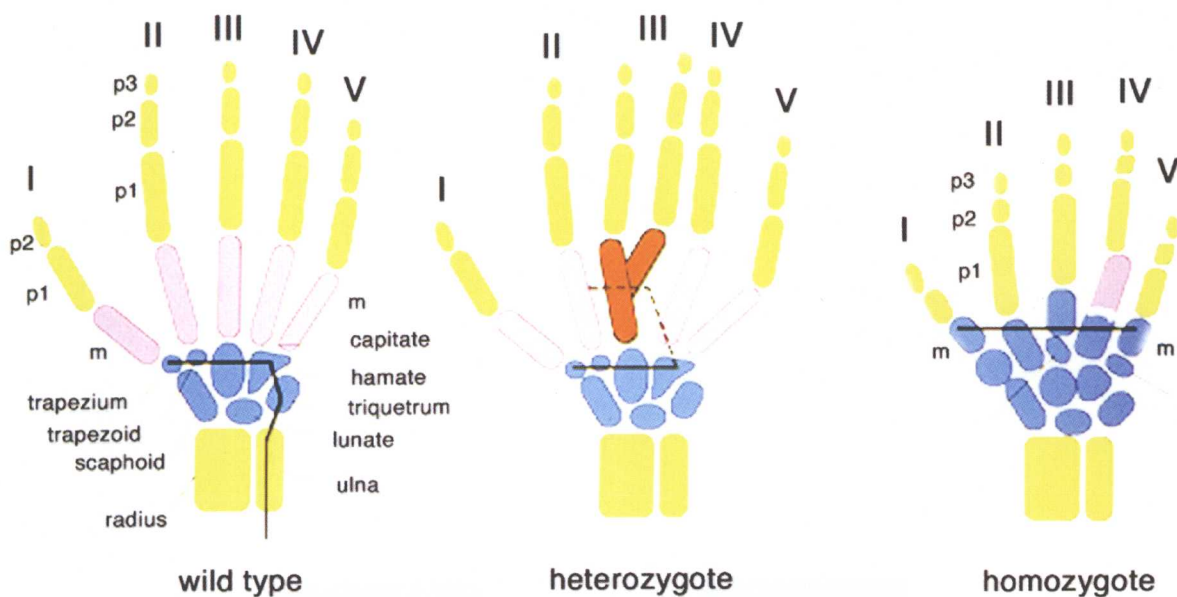


COLOR PLATE 201-3. Mechanism of mutation in synpolydactyly (SPD). The molecular mechanisms responsible for the development of synpolydactyly are unknown. One hypothesis is that the alanine stretch on the nonbinding portion of DNA creates a repression of transcription. (Courtesy of Stefan Mundlos, MD, and Bjorn Olsen, MD.)

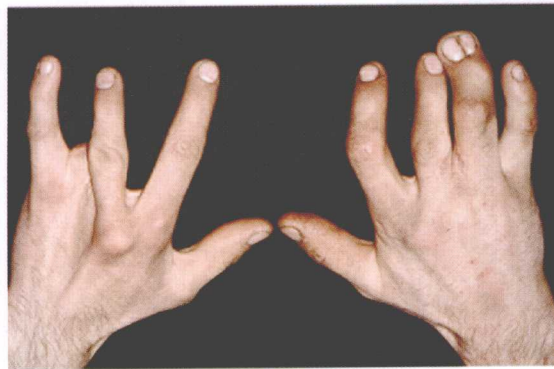


B

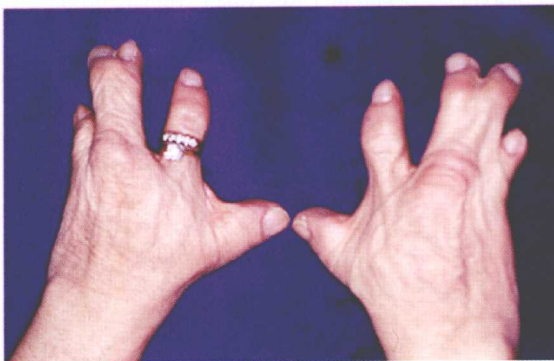
COLOR PLATE 204-1. Normal anatomic relationships. *A*, These original sketches by J. William Littler demonstrate the hourglass configuration of the interdigital web space. Dorsal nonglabrous skin without hair extends into the commissure region and gradually blends with the glabrous skin from the palmar surface. The dorsal (D) and palmar (V) flaps outlined, when joined at the base of the new commissure, will simulate the normal hourglass configuration. M.P., metacarpophalangeal joint; Ext. T., extensor tendon. *B*, This side view of a digit pinpoints the level of the commissure base at the midportion of the proximal phalanx. The normal slope of the commissure subtends a 40- to 45-degree incline from proximal to distal. The relative lengths of the skeletal segments relate to the Fibonacci sequence (1, 1, 2, 3, 5, 8, 13, 21 . . .), in which the length of a given segment is the sum of the two preceding segments. C., digitopalmar flexion crease.



A



B



C

COLOR PLATE 201-2. Synpolydactyly clinical forms. A, The diagram of the hand skeleton of a normal (wild type) individual is compared with heterozygous and homozygous distal upper limbs in individuals with synpolydactyly. Carpal bones are in blue. The pisiform is not shown. Digits are represented by Roman numerals, phalanges by the letter *p*, and metacarpals by the letter *m*. In the heterozygote, metacarpal III is branched and gives rise to an extra distal digit. In the homozygote, the metacarpals are fully or partially replaced by carpal-like bones. Note the short *p2* in all the digits. B, The clinical appearance and radiographs of a heterozygous individual. After a syndactyly release of the left hand, the ring digit was lost because of vascular compromise. This complication occurred in 1959. C, The mother of the individual shown in B was a homozygous individual. No surgical correction was ever performed, and she wore her ring on the left index digit. Her feet were equally deformed and constituted her major disability.

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