The Clubfoot
George W. Simons
Editor

The Clubfoot
The Present and a View of the Future

With a Foreword by M.O. Tachdjian

With 328 Figures in 523 Parts, 3 Figures in Color

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This book is dedicated to all the children of the world born with congenital clubfeet and to the orthopedic surgeons who care for them.
Foreword

During the past two decades, there has been great progress in the management of clubfoot. The First International Congress on Clubfeet was a landmark gathering of the leaders in the world in the treatment of clubfoot. The congress was organized by Dr. George W. Simons—a difficult and demanding task. The quality of the papers published in this monograph reflects his pursuit of excellence and attention to detail.

Still, there are many controversies in the management of clubfoot; it is evident that there is disagreement as to terminology and definition.

What is congenital talipes equinovarus? It is a deformity of multifactorial pathogenesis in which the heel is inverted, the forefoot and midfoot are inverted and adducted (varus), and the ankle and subtalar joints are in equinus position. The forefoot is in cavus with the toes at a lower level than the heel. It is vital, however, that one be more specific in the definition of talipes equinovarus.

It is in utero displacement and malalignment of the talocalcaneal, navicular, and calcaneocuboid joints; the talus is plantar flexed with its anterior end rotated laterally and its head and neck tilted medially and plantarward; the calcaneus is plantar flexed with its anterior end rotated medially and its posterior end rotated laterally and tethered to the fibular malleolus; the navicular is displaced medially and dorsally, and the cuboid is displaced medially in relation to the calcaneus. These articular malalignments are firmly fixed by capsular, ligamentous, and musculotendinous contractures.

The source of disagreement among researchers in clubfoot is due to the variability of severity of expression of a complex deformity produced by many etiologic factors. It is imperative that the pathology be delineated and the severity of the deformity of each individual case be assessed and classified.

The treatment of intrinsic, rigid, congenital talipes equinovarus is primarily surgical; nonoperative measures are preliminary steps for facilitation of definitive correction of the deformity, i.e., concentric reduction of the talocalcaneonavicular and calcaneocuboid joints. It is crucial that one not persevere with prolonged immobilization in casts, because disuse atrophy of muscles and rigidity of joints are not biologically acceptable. Motion is life! It is vital to restore mobility and function of a foot that is deformed in utero.

Another controversial issue is the value of radiography. Dr. Simons has demonstrated, without question, the importance of radiographic imaging.
in the delineation of pathology and the importance of an extensive, à la carte release in correction of this complex deformity. The value of intraoperative radiography cannot be overemphasized.

There is much ado about nothing as to the surgical approach—Cincinnati, posteromedial and lateral, or posterolateral and medial; it does not matter what surgical exposure is used, provided the ligamentous, capsular, and musculotendinous contractures are released and concentric reduction is achieved. Overcorrection should be avoided.

Meticulous postoperative care is crucial for success. Postsurgical immobilization in cast should not exceed 6 weeks. Part-time splinting and the use of dynamic means to restore mobility and function are important. It behooves the surgeon to be diligent in preventing complications. No matter how meticulous and thorough the surgeon is, problems will arise. Recurrence of deformity because of scar formation may occur. The medial tilting of the head and neck of the talus may not correct with bony growth after concentric reduction. Dynamic imbalance of muscles may cause supination deformity of the forefoot and midfoot. A percentage of patients will require revision surgery or tendon transfers to restore dynamic balance of muscles acting on the foot and ankle. The calf will be atrophic; the foot will be small.

I hope that, in the future, there will be periodic congresses on clubfeet, and that advances in technology of the biologic sciences and imaging will further advance our understanding of the pathomechanics, pathology, and treatment of talipes equinovarus.

Chicago, Illinois

Mihran O. Tachdjian, M.S., M.D.
Jusepe de Ribera’s
The Boy with the Clubfoot

Courtesy of the Louvre Museum, Paris
About the Painting,
*The Boy with the Clubfoot*

Aware that there was considerable controversy about the cause of the affliction of the subject in this painting, I nevertheless chose Jusepe de Ribera's *Le Pied Bot* as a keynote theme for the First International Congress on Clubfeet. A reproduction of the painting appeared on announcements of the congress and on the course handbook. It now also appears in this monograph.

Understanding, this choice resulted in several telephone calls and considerable correspondence, with a number of well-intentioned opinions and comments from colleagues stating that the subject, in fact, had some malady other than clubfoot—most probably cerebral palsy. Numerous aspects of the painting were cited as reasons for these comments. The most erudite of these comments came from Leo Arthur Green, M.D., of Jackson Heights, New York, who unfortunately was unable to attend the congress.

In Dr. Green's evaluation of the boy's malady, he points out several other possibilities for the differential diagnoses. These include trauma, stroke, and spastic hemiplegia.

Dr. Judy Hall, a medical geneticist in Vancouver, British Columbia, has suggested amyoplasia congenita (arthrogryposis) on the basis of the bilateral wrist flexion, elbow extension, and shoulder pronation contractions. In addition, she comments on the boy's apparent trunk-leg disproportion, but does not think he had a form of dwarfism.1,2

Because of the considerable interest expressed about the painting, I visited the archives of the Louvre Museum in Paris in an effort to answer a number of questions that had been asked about both the painting and the artist. After several afternoons of perusing the vast correspondence on this painting, I selected the single most informative document about *Le Pied Bot*. I have chosen to reproduce here excerpts from both Dr. Green's letter and the Louvre document. I hope that you will find these as informative and interesting as I have.

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The Boy with the Clubfoot: Who Advised the Artist?

Leo Arthur Green

[Dr. Leo Green has been treating clubfeet for over 50 years. In 1954, during his visit to the ALYN Orthopaedic Hospital in Jerusalem, his interest in children's foot disorders led to his establishing the American Society for Crippled Children in Israel, an organization devoted to fund-raising in the United States. I am grateful to him for allowing me to reproduce excerpts from his letter.—Ed.]

A painting of the early 17th century by [Jusepe de] Ribera, which today hangs in the Louvre Museum in Paris, was used as the keynote theme for the cover of the announcement of the First International Congress on Clubfeet at the Medical College of Wisconsin in Milwaukee, on September 5th and 6th, 1990.

The viewer's attention is drawn to several areas in the painting:

The fact that the upper and lower limbs are involved suggests that he may have a right hemiplegia and that the right foot is not a true clubfoot. . . . McCauley\(^3\) refers to Ribera's painting as depicting "a youth with a talipes equinovarus as part of a right-sided hemiplegia." In general, however, clubfoot is not frequently associated with hemiplegia.

The right shoulder appears to be lower than the left, which supports the long, and presumably heavy, staff. There is a pouch hanging on the right hip from the shoulder. The elbow is extended and the wrist is flexed. The hand seems to be grasping the pouch, but the visible 5th and 4th metacarpophalangeal joints appear to be extended and the proximal interphalangeal joints flexed, suggesting an ulnar clawed hand. [Possibly a flaccid paralysis, i.e., polio.—Ed.]

The right foot exhibits severe equinus deformity but no varus. [Cavus as well?—Ed.] In addition, there is considerable shortening of the right leg, with the metatarsophalangeal joints appearing to be extended with the proximal and distal interphalangeal joints being held in flexion, forcing the full weight to be borne on the metatarsal heads. The adult with typical uncorrected equinovarus deformity walks on the outer border of the foot and not on the metatarsal heads. [This data further reinforces the possibility of a paralytic deformity.—Ed.]

In summary then, it appears that a strong case may be made for questioning the name of the painting. Who, if anyone, was the artist's medical adviser? It is obvious that Ribera was a keen observer and depicted the medical condition of his subject accurately in a most detailed and artistic manner, even if the painting may have been named incorrectly.

[Dr. Green's analysis provides considerable food for thought. I would agree that the artist depicted the subject's condition accurately, whereas medical knowledge at that time, no doubt, failed to appreciate the various

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pathoanatomic subtleties of the boy's deformity. Other possibilities include a form of dwarfism and, possibly, one of the many associated syndromes that occur with clubfeet.—ED.

Ribera's The Boy with the Clubfoot: Image and Symbol*

Edward J. Sullivan

Jusepe de Ribera's The Clubfooted Boy, painted in 1642 and now in the Louvre, is one of this artist's most intriguing works. It is also a picture of considerable iconographic complexity which, for the most part, has gone unrecognized.

Given its humble subject matter, it is a surprisingly imposing painting. We see a young boy in tattered clothes standing erect, grinning as he jauntily supports a crutch over his shoulder. In his right hand he holds a large hat and in his left there is a cartellino, or small piece of paper, on which are written the words DA MIHI ELIMOSINAM PROPTER AMOREM DEI or "Give me alms for the love of God."

Many writers in the past have sought to place The Clubfooted Boy in the pictorial tradition of dwarfs and jesters, which was especially strong in Spain.2 This tradition matured in the mid-17th century with Velázquez's portraits of dwarfs . . . While Ribera does not illustrate the specific social conditions that contributed to the poverty of The Clubfooted Boy, he makes no attempt to dissimulate the harshness of his life by dwelling on the details of his deformity.

A relationship to northern European depictions of beggars and cripples may be noted by comparison with such works as Bruegel the Elder's Cripples of 1568 (Louvre). . . . In Bruegel's painting, as in some other Dutch and Flemish versions of the subject, physical defects are equated with defects of the soul, as an inscription on the reverse of the picture attests.3 . . . Essentially, however, Ribera's image belongs to a different, particularly Spanish conception of the lame and deformed. . . .

. . . Ribera's subject, as the popular title implies, is actually deformed. The clubbed foot and the wide open mouth, in which the decaying gums are carefully drawn, make this fact perfectly clear.

Perhaps the best way to approach the painting is to take account of the features that contribute to its unusual individuality and enduring appeal. First of all, there is the broad smile. Why should a poor, lame child be

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*Painting signed and dated "Jusepe de Ribera Español/F, 1642." It was acquired by the Louvre in 1869 as part of the LaCaze Bequest (Accession n. MI.893).
smiling? The almost triumphant expression maintained despite the painful mouth condition is reinforced by the way he holds his crutch over his shoulder in the manner of a young soldier, carrying his gun, instead of using it to walk, as a cripple normally would.

Ribera's *The Clubfooted Boy* . . . becomes understandable within a visual tradition that used the figure with a crutch as a symbol of charity received, a tradition that developed more strongly in Spain than in any other country. Ribera, however, worked mostly in Naples and he is often thought to be more representative of the developments of baroque painting in Italy than in Spain. Yet Naples was a city under Spanish domination and Ribera was the favorite artist of the Spanish viceroys. In fact, a label on the back of the picture that was discovered in the early 1960s, points to this work as having been commissioned by Ramiro Felipe de Guzman, Duke of Medina de las Torres and Viceroy of Naples from 1637 to 1644.* Bellori¹ states that Ribera actually resided for long periods of time in the ducal palace. The fact that *The Clubfooted Boy* was executed under the aegis of Medina de las Torres is particularly significant, for it was during these years that Ribera returned to a more “Hispanic” mode in style and subject matter after years of adapting his imagery to the more classical Italianate taste of his former patron, the Count of Monterrey, who had been responsible for bringing Domenichino to Naples in 1633.

During the vice-regency of Medina de las Torres, Ribera experienced an intensification of what may be called his brilliant “naturalistic abstractions,” . . . highly simplified naturalism was, of course, not new to Ribera with the advent of the patronage of Medina de las Torres. . . .

*The Clubfooted Boy* conforms to the known characteristics of Medina de las Torres's taste. An unidealized figure is depicted and there is an abstraction of detail, with a subtle presentation of what remains. It is the single purified image, the distilled residue of the scene that is the most significant. We see in this painting a smiling cripple, rejoicing in his poverty, embodying the words of the first beatitude: “Blessed are the poor, for theirs is the kingdom of God.” As the agent through which the charity of the more fortunate is accomplished (gaining for them heavenly merit), the child encourages the generous person to enact the words of the seventh beatitude: “Blessed are the merciful, for they shall obtain mercy.”

. . . This same spirit of specific detail and pious naturalism is behind Ribera's portrayal of *The Clubfooted Boy*. In the picture the viewer has nothing else on which to focus his attention but the child. The boy's smile is not the roguish grin of a trickster but an attitude radiating inner joy. He is not only gifted with true poverty but, in receiving the alms for which he asks with the *cartellino*, he becomes the means through which more fortunate souls will receive grace and, consequently, salvation. Indeed, he holds an outsized hat suggesting that a generous soul has already shared his worldly possessions with the child. *The Clubfooted Boy* represents the triumph of poverty—a militant image that is further strengthened by the crutch held over his shoulder like a musket, and by the proud, upright stance maintained despite a painful affliction.

. . . If we look more deeply into the subtle meanings of [Ribera's paint-

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¹This label was first published by Jeanine Baticle in the catalogue of the exhibition *Trésors de la Peinture Espagnole, Églises et Musées de France*, Paris (Louvre and Musée de Artes Décoratifs), 1963, no. 72, 193–195.
ing] a richer and more profound artistic personality emerges. Ribera should be recognized not merely as a practitioner of an astringent Caravaggism, but as a highly original, highly innovative creator who employed earthbound naturalism for spiritual motives.

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Introduction

The first International Congress on Clubfeet, held on September 6 and 7, 1990, at Children's Hospital of Wisconsin, Milwaukee, Wisconsin, represented the culmination of 20 years of progress in the surgical correction of congenital talipes equinovarus (CTEV).

In 1970, one of the key issues on the forefront of the study of clubfeet was George Lloyd-Roberts' concept of the "horizontal breech." This concept held that the talus was externally rotated in the ankle mortise around the vertical axis. He believed this occurred as the result of inadequate surgery or walking on an incompletely corrected clubfoot. Posterior position of the fibula with respect to the tibia on the lateral radiograph was thus explained by Lloyd-Roberts' concept. Working at the Hospital for Sick Children in London, Lloyd-Roberts influenced many surgeons, including myself, who were trying to improve methods of treatment.

In 1971, I joined M.O. Tachdjian at Chicago Children's Memorial Hospital. He was very encouraging and enthusiastic about exploring new ideas and techniques. Concluding that Lloyd-Roberts' concept of talar position was not supported by our own studies, and that the talus is normally aligned in the ankle mortise of the typical clubfoot, Tachdjian invited several of Europe's leading pediatric orthopedic surgeons to Chicago as visiting professors to discuss clubfeet and other pediatric orthopedic problems in great detail. These meetings were highly informative, especially in regard to our further understanding of clubfeet in general and Lloyd-Roberts' concepts in particular.

In 1973, Tachdjian organized the first of his now famous Pediatric Orthopedic International Seminars (POIS). Although that first meeting was well attended, it gave only a small indication of how successful these seminars were to become. Lloyd-Roberts joined the second POIS meeting as a member of the faculty, a task he added to his busy annual schedule until his untimely death in 1988.

Meanwhile, Goldner was developing the view that the talus was internally rotated in the mortise, both around an AP as well as a vertical axis. Goldner and Fitch subsequently described a "four-quadrant release" in which the soft tissue correction was directed at the ankle rather than the subtalar joint. Gould, also concurring with Goldner's approach, advocated the use of multiple incisions including the high-loop incision to avoid skin contractures.

Turco's technique, a one-stage posteromedial release with internal
fixation, had been published in 1971 and was developing a strong following throughout the world. Turco, like most orthopedists at that time, was of the opinion that the hindfoot deformity was a two-dimensional deformity, with the heel being in varus, but not rotated in the third plane (around a vertical axis). He therefore released three sides of the subtalar joint, leaving the lateral side intact. Thus, with his procedure the calcaneus rotated on the lateral capsule as though it were on a hinge. Although Turco's procedure provided significant improvement over earlier multistage approaches, in many cases it failed to produce complete correction.

Early in 1972, I attempted to address these failures by operating on the lateral side of the foot, releasing the lateral calcaneocuboid joint, the anterior portion of the subtalar joint, and the lateral talonavicular joint. This led to a “progressive approach” or stepwise series of procedures with the use of intraoperative radiographs to determine when satisfactory correction was achieved. The following year (1973), Lichtblau published his technique for excision of the anterolateral aspect of the calcaneus. This was part of a simultaneous medial and lateral soft tissue release performed through two incisions.

In 1975, Seringe (Paris) described, as the main residual deformity following the conventional posteromedial release, adduction of the calcaneal pedal block [or calcaneal forefoot (CFF) block]. As a remedy for this, Seringe described a technique of soft tissue release that consisted of posterolateral, anteromedial, and talocalcaneal releases; however, they subsequently concluded that he could accomplish correction without subtalar release.

Like Lloyd-Roberts, Carroll et al. also believed that the talus was externally rotated in the ankle mortise (around a vertical axis); however, he believed that this position of the talus was present at birth. They described internal rotation of the talus as a part of their extensive soft tissue release. In 1974, Lloyd-Roberts later described medial rotation osteotomy of the distal tibia with external rotation of the foot (by a second-stage posteromedial release (PMR) or Evans’ procedure) in older cases.

Meanwhile, I also believed that calcaneal rotation was fundamental to the clubfoot, but visualized this rotation as occurring around an axis located at the posterior aspect of the talus, rather than centrally in the area of the interosseous talocalcaneal ligament.

In 1979, McKay introduced his concept of calcaneal rotation beneath the talus. He recognized the importance of releasing the lateral subtalar joint completely in order to achieve calcaneal rotation around the vertical axis as well as achieving eversion of the calcaneus to correct varus. He envisioned that the lateral rotation of the anterior calcaneus required simultaneous medial rotation of the posterior calcaneus. This could be achieved by moving the posterior calcaneus away from the fibula (in a medial direction) and fixing the calcaneus to the talus in this position by inserting Kirschner wires through the talonavicular and talocalcaneal joints.

In North America, McKay is credited with being the first to describe calcaneal rotation beneath the talus, although it appears that Bosch of Vienna published this finding in several papers between 1953 and 1964. Bosch, however, did not describe a surgical approach to correct this pathologic anatomy. Grill, who succeeded Bosch in Vienna, must be given credit for making Bosch’s work generally known. However, the first published article on calcaneal rotation appears to have been one by Par-
ker and Shattock in 1884. These earlier publications, however, do not detract from McKay's contribution both to the conceptual understanding and surgical treatment of calcaneal rotation.

At the 1979 POIS, John Roberts of the Children's Hospital in New Orleans asked McKay and me to join with him in a three-center evaluation of our respective techniques and their underlying theoretical models. At the end of this study, Roberts, McKay, and I agreed that McKay's concept of calcaneal rotation was correct. Moreover, we agreed that McKay's idea of releasing the entire lateral side of the subtalar joint was valid and produced better results than releasing only the anterior part of the lateral subtalar joint, as I had been doing. These findings were reported at the annual meeting of the Pediatric Orthopedic Society (POS) in 1980. Subsequently, McKay's three-part paper on his procedure and theory appeared in 1982 and 1983. It was McKay's lateral release that ultimately led the way to the development of improved, yet more extensive, soft tissue releases in North America in the 1980s, e.g., Barnett's modification of the complete subtalar release (CSTR) (see Chapter 9, page 268) and calcaneocuboid joint release.

These concepts of Goldner, Turco, Lloyd-Roberts and Carroll, and McKay provided the basis for considerable controversy during the ensuing decade, as each of these surgeons described a different operative procedure to correct the deformities as he envisioned them. Unfortunately, no accurate method existed that could irrefutably substantiate the validity of one method over the other.

Turco's procedure was based on pathoanatomic concepts that were generally accepted at that time. It provided such great improvement over previous techniques that it became widely accepted. Although it is probably still the most widely used technique throughout the world, its use in this country has gradually decreased as the other techniques have assumed greater popularity, especially that of McKay.

Tachdjian's POIS seminars and other meetings provided a forum for discussion of new surgical procedures and an important venue where pediatric orthopedists from around the world could exchange ideas and make lasting friendships. Many important ideas were conceived as a result of the annual POIS meetings. During this time, I attempted to develop a standardized method for the radiographic evaluation of clubfeet, a method that could be used to diagnose deformities, to affirm correction intraoperatively, and to evaluate surgical results retrospectively (1978). My results, as determined radiographically by the standardized method, revealed that the "progressive approach" did not eliminate incomplete corrections and that a more extensive procedure was needed.

At this time, most clubfoot surgeons were using a single medial incision. In 1980, Alvin Crawford, who had just been appointed Chief of Pediatric Orthopedic Surgery at the Cincinnati Children's Hospital, began to experiment with an alternative incision he had learned from Giannestras. Crawford extended Giannestras' incision further forward in order to visualize all the structures affected in the clubfoot. Having been told about this incision by Crawford, in 1981, I started using it and never returned to the old two-incision technique.

Although some surgeons expressed concern that the Cincinnati incision would not allow adequate Achilles lengthening, the incision proved very satisfactory if its distal arms were extended forward both medially and laterally so that the skin flap could be dissected as far proximally as required to achieve adequate lengthening of the Achilles tendon. The main
advantage of the Cincinnati incision, in the opinion of those who use it, is that it provides exceptional exposure for all areas requiring release, in the hindfoot and midfoot as well as in the forefoot (the incision can be extended as far forward as necessary). In addition, this incision affords a better view of the ankle and subtalar pathology than other incisions and it gives superior cosmetic results. My limited, but favorable, experience with the Cincinnati incision was reported at the annual meeting of the Pediatric Orthopedic Society of North America (POSNA) in 1982 and shortly thereafter, Crawford et al. published their classic paper on the Cincinnati approach to the clubfoot.

By this time, it was clear that the old techniques of “analytical radiography” and the “progressive approach” were superceded by the concept of “calcaneal rotation,” the development of the Cincinnati incision, the CSTR, and similar extensive soft tissue procedures. The clinical evidence began to mount, however, that the CSTR, like its predecessors, had limitations. Many of the earlier feet treated by CSTR were overcorrected into valgus. The calcaneus in these feet was either rotated or translated into valgus position, and I, like a number of other surgeons, was unable to correctly interpret the intraoperative radiographs. After performing a retrospective study of the films of many appropriately corrected and overcorrected clubfeet, it was discovered that the chief reason for overcorrection was the placement of the navicular too far laterally on the talar head. With this placement, the medial side of the talar head and the medial surface of the navicular were flush or at the same level. After placing the navicular in different positions, it was determined that the navicular had to be placed in a slightly protruding position, medially. At the same time, it became clear that there should be no lateral protrusion or step-off at the talonavicular joint. These findings were confirmed in a series of intraoperative posteroanterior (PA) and postoperative anteroposterior (AP) radiographs, despite limited or absent ossification in the navicular, using special radiographic measurements that were subsequently substantiated once ossification of the navicular occurred.

Similar problems arose in the dorsal-plantar relationship at the talonavicular joint, whereas the navicular frequently subluxated superiorly. Here again, it was determined that when the dorsal surface of the navicular and the dorsal surface of the talar head are at the same level (i.e., no dorsal step-off), and the long axis of the talus passes through the base of the first metatarsal on the lateral radiograph, the normal talonavicular position exists (i.e., dorsal talonavicular subluxation is not present).

Although critics were quick to blame overcorrection on excessive release of soft tissues, particularly the interosseus talocalcaneal ligament, the studies cited here demonstrated that the majority of overcorrected feet were overcorrected at the time of surgery, being internally fixed in the overcorrected position.

A set of clinical criteria for positioning the navicular and the use of intraoperative radiographs were recommended as solutions to this problem. Unfortunately, many people have found the technique of taking intraoperative radiographs too demanding and the radiographs difficult to interpret. Papers on preliminary experience with the CSTR specifically discussing the causes and prevention of overcorrection appeared in 1985 and 1987.

A second cause of overcorrection was failure to recognize and correct significant calcaneocuboid subluxation. As the 1980s drew to a close, de-
Formity at the calcaneocuboid level began to attract considerable attention. Several of the papers in this volume discuss this newly understood deformation.

This was the apparent state of the art at the beginning of 1990, and yet, in my travels, I have learned of additional work being done on various aspects of the clubfoot problem. Some of this work could be described as basic research; some consists of clinical studies; some is highly theoretical. It was apparent that this work should be synthesized and reported.

John S. Gould, Chairman of the Department of Orthopaedics at the Medical College of Wisconsin, and I worked with the leaders of SICOT (Société Internationale de Chirurgie Orthopédique et de Traumatologie) to organize a congress on clubfeet that would be scheduled to precede the Montreal meeting of SICOT in September, 1990. Sir Dennis Patterson, SICOT president, and Maurice Duhaime, vice president of the SICOT congress, were very helpful in the planning that led to this first International Congress on Clubfeet (ICC).

The initial call for papers for the congress included a list of topics on which the organizers believed further research was needed. Two limitations were placed on papers: they had to be presented and written in English, and they could not be devoted to presentation of surgical results. Although surgical results are ultimately of the greatest importance to all surgeons, the organizers felt that in the absence of a well-documented, generally accepted set of criteria for the evaluation of CTEV, either preoperatively or postoperatively, it would be futile to attempt comparisons of results. In fact, recent symposia have shown that attempts to compare one study with another can be grossly misleading. A few papers on surgical results were eventually accepted, however, because of the light they shed on other issues.

It is now recognized that one of our major endeavors for the next few years must be to establish a common set of criteria for the evaluation of the unoperated CTEV and for the results of the various conservative and surgical procedures still in use.

The organizers hoped for a submission of 25 to 30 strong papers. Over 100 abstracts were received, and the meeting had to be extended from one day to a day and a half. Despite the extension, many fine papers had to be turned away; a further extension would have caused conflict with the SICOT and POSNA meetings in Montreal.

A total of 84 papers presented at the International Congress on Clubfeet appear in this monograph. These were presented by 65* surgeons from 30 nations. Although many of the papers were presented by surgeons from the United States, the number of papers and participants from other countries made this a truly international congress. Most of the papers presented here have been rewritten and embellished to provide more scientific documentation than the versions that were presented at the meeting, with its limits on time. Most of the papers fall into two general categories: scientific presentations on clinical and basic research, and anecdotal or theoretical papers. The latter type was judged to be highly important, given the rapid advances being made in the study and treatment of clubfeet. Although some of the procedures suggested in this volume are little more than concepts at this time, some of them may eventually represent major advances in the field of clubfoot surgery.

*This number does not include the authors whose papers are included in Chapter 17 but who were not presenters at the congress.
It is with great pleasure that the editor presents this compilation of papers in the form of a monograph on the first International Congress on Clubfeet.

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Definition of Terms and Abbreviations

For purposes of clarity, it is necessary to use some standard terminology to describe various elements of the foot. Many of these terms enjoy popular usage in the United States, whereas in Great Britain and other English-speaking countries other terms are used. The terms most commonly used in the United States are the ones that will be used in this monograph.

Throughout the text the term congenital talipes equinovarus (CTEV) will be used to signify the idiopathic clubfoot as opposed to other forms, such as neurologic, teratologic, functional, etc. In addition, abbreviations frequently used in this monograph will be indicated here.

Supination is defined as rotation around the longitudinal (anteroposterior) axis of the foot, with elevation of its medial border, and pronation is the opposite.

Adduction is defined as internal rotation of the foot around the vertical axis, bringing the forefoot closer to the midline of the body, and abduction is the opposite.

Dorsiflexion and plantar flexion of the ankle refer to the upward and downward rotation of the foot around a mediolateral axis passing through the talar body.

The term varus often has been applied to the forefoot to imply the presence of the combined deformities of adduction and supination. However, in this discussion, varus will be used to define pathologic degrees of inversion of the calcaneus beneath the talus.

Rotary movements of the hindfoot will be described as occurring around either the longitudinal (anteroposterior) axis, the vertical axis, or the mediolateral axis. The AP axis passes horizontally through the foot in the sagittal plane at the level of the midtalus. The vertical axis passes upward through the calcaneus, through the interosseous talocalcaneal ligament, through the talus, and up the tibia. The mediolateral axis passes through the foot in the coronal plane at the level at the malleoli.

The following terms are used in preference to those enclosed within the parentheses: ankle (crural), talus (astragalus), calcaneus (os calcis), and navicular (scaphoid).

The following abbreviations will also be used:

AP anteroposterior (dorsiplantar)
APTC angle anteroposterior talocalcaneal angle
Cal. Ost. calcaneal osteotomy
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>CC joint</td>
<td>calcaneocuboid joint</td>
</tr>
<tr>
<td>CC joint and TN joint</td>
<td>Chopart’s joint</td>
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<tr>
<td>CCR</td>
<td>calcaneocuboid release</td>
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<tr>
<td>CCS</td>
<td>calcaneocuboid subluxation</td>
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<tr>
<td>CSTR</td>
<td>complete subtalar release</td>
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<tr>
<td>Cub. Ost.</td>
<td>cuboid osteotomy</td>
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<tr>
<td>Cun. Ost.</td>
<td>cuneiform osteotomy</td>
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<tr>
<td>FFA</td>
<td>forefoot adduction</td>
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<tr>
<td>FFS</td>
<td>forefoot supination</td>
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<tr>
<td>HFV</td>
<td>hindfoot varus</td>
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<tr>
<td>IP joint</td>
<td>interphalangeal joint</td>
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<tr>
<td>Lat.</td>
<td>lateral</td>
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<tr>
<td>Lat. TC angle</td>
<td>lateral talocalcaneal angle</td>
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<tr>
<td>Med.</td>
<td>medial</td>
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<tr>
<td>M. Ost. (1–5)</td>
<td>metatarsal osteotomies—first through fifth</td>
</tr>
<tr>
<td>MTP (or MP) joint</td>
<td>metatarsophalangeal joints (Lisfranc’s joint)</td>
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<tr>
<td>Pl. Rel.</td>
<td>plantar release</td>
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<tr>
<td>PMLR</td>
<td>Posteromedial and lateral release (peritalar release)</td>
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<tr>
<td>PMR</td>
<td>posteromedial release</td>
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<tr>
<td>PR</td>
<td>posterior release</td>
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<tr>
<td>TAL</td>
<td>Achilles tendon lengthening</td>
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<tr>
<td>TMT joints</td>
<td>tarsometatarsal joints (Lisfranc’s joint)</td>
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<tr>
<td>TN joint</td>
<td>talonavicular joint</td>
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