

The Ponseti Method—Stay True to It!

Vincent S. Mosca, MD

Seattle Children's Hospital, Seattle, WA

Introduction

I was trained to believe that the definition of a clubfoot was a congenital equino-cavovarus foot deformity “that required surgery.” And that didn't mean a simple percutaneous tendo-Achilles tenotomy (TAT) that could be safely and effectively carried out in an outpatient clinic room with local anesthesia. A real clubfoot meant a la carte surgery that would require a tendo-Achilles lengthening (TAL) and posterior ankle capsulotomy at least and a circumferential postero-medial-lateral release at most.

Following my orthopaedic residency and pediatric orthopaedic fellowship, both at highly regarded institutions, I started my clinical and academic practice in 1985 at Children's Orthopedic Hospital (as it was known at the time) and the University of Washington School of Medicine in Seattle. For the next 10 years, I treated 60-70 clubfoot deformities per year, at least 90% of which underwent a la carte surgery. I never performed a simple, isolated TAT. It wasn't what I was taught. And the serial manipulation and casting techniques that I had learned and then carried out for the first 3-6 months of each child's life never seemed to result in residual deformity for which a simple TAT would be enough surgical treatment.

Children's Orthopedic Hospital, now called Seattle Children's Hospital, was then, and remains, the only children's academic full-service hospital that provides services to the five northwestern U.S. states of Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI). Those states comprise 27% of the land mass of the United States, most of which is rural and remote. As a

result, general orthopaedic surgeons in those states have historically treated clubfoot deformities as a service to their local populations. In those early years, there were no fellowship-trained pediatric orthopaedic surgeons in the WWAMI region except in Seattle, Spokane, and Boise. When



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things didn't go well, the local orthopaedic surgeons generally did not feel comfortable performing the next operation on their patients with clubfeet, so many referred their patients to me and other fellowship-trained pediatric orthopaedic surgeons in the major population centers.

There were undercorrections, recurrences, overcorrections at the talonavicular and subtalar joints, dorsal bunions, flat-top tali, and many iatrogenic deformities that could only be named by stringing together the terms for each of the segmental deformities (e.g., abducto-calcaneo-valgus). Yet the worst problems were not correcting the deformities but the pain, stiffness, and weakness created by “another” operation. Another operation (or two) could “correct” the iatrogenic deformities and at least temporarily relieve pain, but nothing could be done for the stiffness and weakness that increased with each subsequent operation. And stiffness equals pain and functional disability. There were many times I felt that an

amputation would provide the child far better long-term comfort and function than another salvage operation.

It was the large number and variability of these iatrogenic surgically created deformities in former clubfeet that initiated my quest to truly understand the biomechanics of the child's foot and develop the assessment principles for managing them.

It was with great interest and incredulity that I read the landmark 1995 article by Cooper and Dietz¹ in which they reported on the appearance, comfort, and function of a large number of Dr. Ponseti's patients who were treated with his method. These patients were between 25 and 42 years of age (average 34 years) and their feet were essentially indistinguishable from the normal controls. I couldn't imagine a comparable series of clubfeet that had been surgically treated by me or any high-volume clubfoot surgeon anywhere in the world. Although I, and others, had been reading Dr. Ponseti's articles going back to 1963,² we never "got it." Kite's method³ didn't work as well in our hands as it apparently did in his, so why should Ponseti's? Then came the second of the one-two punch—the 1996 publication of Dr. Ponseti's now classic landmark "green book" titled *Congenital Clubfoot: Fundamentals of Treatment*.⁴ Here, for the first time, we could read in detail and in one source exactly what he had been saying and doing, things that are generally not the purview of individual journal articles. And the details matter.

In 1996, I (and others who had never been to Iowa) almost immediately adopted the Ponseti method. Some of us committed that we would not modify the method at all unless the part that we considered modifying was subjected to careful scientific study. There are many parts to the method beyond the basic concept of manipulate and cast. Changing any part could, inadvertently, eliminate or seriously modify the key element(s) to the proven success of the overall method, and it wouldn't be apparent until too late. I've developed, modified, and written about many pediatric foot procedures during my career but have taken great efforts not to modify this method. Twenty-five years later, I still have not

modified the method as I learned it from Dr. Ponseti and his book, except for the type of casting material I use, which has been shown to have no effect whatsoever on the outcome of treatment. In his final years, Dr. Ponseti would tell my patients who contacted him, concerned about my use of semi-rigid casting tape, that it was, "OK, because Dr. Mosca knows how to use it."

It is important to emphasize that the Ponseti method is not a panacea for this most common congenital musculoskeletal deformity. Dr. Ponseti never promised that his method would yield complete anatomic correction, just that the resulting preservation of range of motion and strength would enable long-term comfort and strength for most normal activities. Clubfeet do not and cannot become normal because they are genetically programmed congenital deformities. However, the reliably achievable stated goals are laudable. Importantly, if true to the method, the need for open joint surgery with its associated pain, stiffness, and limited function in adulthood is largely eliminated. There has never been another clubfoot treatment method with comparable reported short- and long-term outcomes.

According to a survey of members of the Pediatric Orthopaedic Society of North America (POSNA) published in 2012 by Zionts et al., nearly all (96.7%) of those surveyed stated that they use the Ponseti treatment method.⁵ Although this was not a treatment outcomes study, the survey results indicated near universal adoption of Ponseti's techniques for initial clubfoot deformity correction and maintenance.

However, clubfoot treatment using the Ponseti method is not always easy, even for the highly skilled, highly experienced pediatric orthopaedic surgeon. Six casts, percutaneous TAT, and tolerance of the foot-abduction-brace (FAB) for 4 years is typical but not guaranteed. And relapses, defined as recurrent structural deformities, are common. Relapses may be due to noncompliance with bracing and/or muscle imbalance. Whereas muscle imbalance can contribute to structural deformity relapse, muscle imbalance itself is not a relapse. Instead, it is an inherent neuromuscular feature of some genetically

different clubfeet that, so far, can only be identified clinically. Rates of relapse within the first 4 years of life reported by experienced and skilled pediatric orthopaedic surgeons, including Dr. Ponseti, range from 31-56% of clubfeet,^{2,6-10} not an insignificant percentage.

Recognizing the high rate of relapses, Dr. Ponseti included in his method not only the techniques to achieve and maintain initial deformity correction but also the approach to managing the relapses that inevitably occur. A follow-up survey of POSNA members by Hosseinsedeh et al. published in 2019, reported that Ponseti's recommended management of relapses was not closely adhered to.¹¹ Specifically, Dr. Ponseti recommended repeat serial long leg casts followed by nighttime bracing for early relapses. Seventy-eight percent of survey respondents followed his recommendations, but over 11% went straight to surgery for a repeat TAT and/or an anterior tibial tendon transfer (ATTT). Ponseti recommended preoperative serial cast treatment to correct recurrent structural deformities in feet with muscle imbalance prior to ATTT, with the possible addition of a concurrent repeat TAT in selected patients. Thirty-eight percent of respondents reported not performing preliminary casting.

It is important to reiterate that ATTT is a recognized part of Ponseti management and not a failure of treatment. Three studies from Iowa and one from Los Angeles with follow-up durations of 5-42 years reported rates for ATTT from 38-54% of clubfeet.^{1,2,6,12,13} However, a concerning finding in the second POSNA survey was that, in addition to ATTT, 43% of respondents reported performing concomitant posterior ankle capsular releases. Not only is posterior ankle capsulotomy not a part of Ponseti management, he discouraged all capsular releases. It is certainly possible that at least some of the 38% of respondents who did not cast preoperatively could have avoided the need for posterior capsulotomy by having done so.

Finally, the second POSNA study revealed great variability in the bracing protocol in comparison with Ponseti's final recommendations. This finding also, no

doubt, contributed to the relapses and frequent need for capsulotomies. There may, however, be some justification for this variability because Dr. Ponseti's recommended bracing protocol evolved from 2 years to 4 years over a period of decades and even within his book from cover to cover.⁴ But his final recommendation of 3 months full time and 4 years nighttime bracing is associated with the best treatment outcomes, so it must be learned and followed.

The reasons for apparent partial and perhaps decreasing dedication to all aspects of the Ponseti method are, no doubt, many. And it's a slippery slope from a little surgery to more extensive surgery. The following are several reasons why I believe clubfoot surgery is increasing.

First, it took several years after the 1995 article and 1996 book for most orthopaedic surgeons to convert from surgical management of clubfeet to the Ponseti method. It took at least as many years to eliminate most of the iatrogenic clubfoot deformities that were so pervasive in prior years. So, pediatric orthopaedic surgeons who were trained in the last 15-20 years have not seen the many well-intended but disastrous outcomes of clubfoot surgery. They don't have the incentive that their teachers had/have to stay true to the Ponseti method and avoid clubfoot surgery. It perhaps seems easier and less morbid to "just operate" on a particularly resistant clubfoot than to persist with the Ponseti method. According to the writer and philosopher George Santayana (1905), "Those who cannot remember the past are condemned to repeat it." I believe the corollary is that "those who have not studied or lived the history are more likely to repeat it."

Second, and as noted earlier, clubfoot treatment using the Ponseti method is not always easy, even for those of us who have applied over 20,000 clubfoot casts. There are the "fat" feet that slip out of the casts or develop pressure sores and take many more than six casts before the TAT can be performed. And then these feet are challenging to maintain in the FAB which results in more slippage and pressure sores as well as recurrent deformi-

ties. It would seem to be easier to “just operate” than to cast for prolonged periods of time, brace, recast, reinitiate bracing and so on.

Third, clubfoot casting is an art and not a science. It is a technical skill but different than many surgical skills due to the wide variations in the severity and rigidity of clubfoot deformities and their responsiveness to treatment. Not all clubfeet are alike. And like any technical procedure, skill mastery is based on high volume repetition. So in smaller communities where the number of children with clubfeet is low, the well-intended and well-trained pediatric orthopaedic surgeon cannot be expected to have the same success rate in regard to number of casts required, need for more than a simple TAT, and the avoidance of cast slippage and pressure sores. Surgery is faster and may seem to be easier for the novice or low-volume practitioner.

Fourth, there are wide variations in the tolerance of the child for the treatment and in the compliance of the family with all components of the method. Some of these variations are regional or cultural and not under the control of the pediatric orthopaedic surgeon. Surgery may seem to be the only way to achieve and maintain deformity correction in these children through no fault of the surgeon.

Fifth, I know that not everyone treating clubfeet in the late 1990s truly embraced the Ponseti method. When the treatment didn't go well, some resorted to surgical release as they liked the “initial success” and the satisfaction from surgical correction in clubfeet. I understand that because the primary reason I became a pediatric orthopaedic surgeon was that I liked operating on clubfeet. That's a fact! Yet, I was one of the first to abandon that passion when I realized it was not in the child's best interest. So, if some of the teachers in my generation did not and have not fully embraced the Ponseti method, how can we expect their students to fully embrace it?

Sixth, I am aware that some pediatric orthopaedic surgeons who treat a large volume of clubfeet do not train the next generation of residents and fellows in the

Ponseti method for fear of cast slippage, pressure sores, and internet scrutiny by the many parental clubfoot support groups. In fact, some of the support groups have taken on a life of their own, being excessively critical of both low- and high-volume providers, thereby damaging their reputations and even leading some to abandon the treatment of clubfoot all together. For some surgeons, the feeling might be that a well-executed operation will not draw a family to the support groups in the same way that a cast pressure sore will. After all, Dr. Ponseti said that approximately 5% of clubfeet do not respond to his method. Neither the family nor anyone else could ever know if the index child undergoing surgery is the 1 in 20 or one of the 19 in 20 who are treated surgically by a particular practitioner.

Litigation has been brought against some pediatric orthopaedic surgeons for creating generally benign and treatable complications of Ponseti casting. This has been promulgated by unethical online support for this inappropriate parental group scrutiny by one or more pediatric orthopaedic surgeons who even profit handsomely for their support. That support adds to the decreased interest by some pediatric orthopaedic surgeons in continuing to treat clubfeet. Then what? Who will treat clubfeet? Will families have to travel great distances every week to the few chosen Ponseti practitioners with the volume of patients to become and stay good at it?

We all eventually retire and/or move on to the great clubfoot clinic in the sky. The incidence of clubfoot is not changing. We need to support and offer ongoing education to those providers who may be struggling to master the Ponseti method but who are trying very hard to get it right. Chastisement and criticism of our colleagues are absolutely in the worst interest of the children with clubfeet and their families. We must train the next generation. A slipped cast can be reapplied. A swollen foot, shallow pressure sore, and mild rocker bottom deformity will resolve following a 1-2 week cast holiday in most cases. Those are undesirable but not “never” events, regardless of the practitioner's level of skill,

training, experience, and proclamation. And they are not litigious occurrences. The families must be so-informed rather than incited. We must train the next generation in the most successful implementation of the Ponseti method. More repetitions of any technical skill are directly related to better outcomes, so patients should stay with their practitioner who can salvage the minor complication in the best interest of the child and learn from the experience. No technique is without potential risks and complications regardless of who is performing it.

We need to stay true to all components and aspects of the Ponseti method because, if this nonsurgical method is unsuccessful, how successful can the infrequently performed surgery be? When surgeons were operating on clubfeet frequently, the results were often disastrous. If surgeons are now operating infrequently and only on the most severe and rigid clubfeet, the results should be even worse. My clinical fellows may see one or two clubfoot operations during their year in Seattle, not enough to become expert at this technically challenging procedure.

How then does one gain and maintain this intricate surgical skill that is rarely indicated? Should pediatric orthopaedic surgeons participate in mission trips to underserved areas in the world to gain and maintain surgical experience? Should the rare child with a clubfoot that does not respond to Ponseti management be referred to the regional pediatric orthopaedic surgeon with the most surgical experience with the technique? All hypothetical questions without answers.

Yes, there are consequences to mastering the Ponseti method, but they pale in comparison with the consequences of not mastering it.

Four hundred years BC, Hippocrates described a method for clubfoot management that, in all regards, was the early version of the Ponseti method. What followed were 2,400 years of increasingly complex clubfoot surgery because of disregard or ignorance of his teachings. Hopefully, the Ponseti method will not befall the same fate. Stay true to it. The kids deserve that commitment from all of us.

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