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‘Fast Casts’: Evidence Based and Clinical Considerations for Rapid Ponseti Method

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The Ponseti method of correction of congenital clubfoot is recognized as the preferred management technique for this pediatric deformity. The original method has been subtly modified over time in response to clinical experience and research findings. Most recently, two randomized controlled trials have shown that less time is needed for each serial cast immobilization. Clinical cases from the Kingdom of Tonga are presented to illustrate the clinical use of more rapid plaster cast changes - the ‘fast casts’ modification incorporating increased manual manipulation time, within the Ponseti method. The Pirani score was used to monitor the clubfoot correction between each plaster cast change for each baby. In all feet the Pirani scores reduced sequentially with shorter periods of casting. Shorter duration of cast immobilization – ‘fast casts’ – can be used with many advantages for the clinical setting. Less time in plaster can at least halve the corrective phase of Ponseti management without compromising results. In addition, there are possible benefits for families from distant locations, for babies being less prone to skin irritations, and less difficult day-to-day baby care related to long leg plaster casts. These factors may benefit compliance and overall treatment outcomes.

Key words: clubfoot, Ponseti, pediatric , foot

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The Ponseti method has taken the developed world by storm in the last decade, becoming acknowledged as the optimal treatment for congenital clubfoot deformity.^{1,2}

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Cited as the most significant and potentially debilitating congenital pediatric orthopaedic deformity, *talipes equino varus*, has littered the pages of historic tomes, medical journals and textbooks alike.³ The Egyptian boy king, Tutankhamen; the tragic poet, Lord Byron; and celebrated stage and screen actor, Dudley Moore; eponymously all male, were born and/or lived with clubfoot deformity.⁴

Whilst management with splints, binding, and plaster casts has been evident across the hundreds and thousands of years in which clubfoot deformity is referenced, the 20th century saw such conservative measures subsumed by surgical correction, and

notably the posterior medial release (PMR).⁵⁻⁷ The PMR is a joint invasive procedure, which also severs to lengthen, all the soft tissue structures found contracted on the medial and posterior aspects of the infant clubfoot.⁸

In the 21st century, surgical correction of clubfeet has been firmly denounced.⁹ Both retrospective concerns and reviews, and prospectively designed studies have shown the poor outcomes, in terms of pain and function, resulting from the PMR and akin surgical procedures.⁷

Simultaneously, the *Ponseti method*, developed and named after the orthopedic specialist Ignacio Ponseti¹⁰, has been investigated both retrospectively and in many prospective randomized controlled trials (RCTs), and found not only to give the best clinical outcomes, but to also be a more economical management, when compared to surgery - the rare health care setting finding of a '*win:win*'.¹¹

Much investigation of Ponseti's original method has occurred in the last decade.^{7,12,13} Whilst it's superior outcomes for management of congenital clubfoot has met with universal consensus, this has also resulted in considerable refinement of the technique.^{11,14,15}

The original Ponseti method

The duration of each serial plaster cast, a fundamental aspect of the basic weekly casts which made up the original Ponseti method¹⁶ now has good evidence for amendment.

The original method described by Ponseti involves a series of plaster casts changed weekly for a period of five to six weeks, followed by percutaneous elongation of the Achilles tendon and application of a final cast for three weeks. The foot abduction bracing phase, is commenced immediately after the post tenotomy cast is removed.

There is now strong evidence to suggest that accelerated frequency of cast changes has comparable outcomes to those of the original Ponseti method.¹⁷ with the benefit of limiting time spent in casts during the corrective phase of treatment.

The evidence for, and implication of, 'fast casts'

It was first revealed that casts changed every five days, instead of the originally prescribed seven days, gave the same results – potentially saving ten to 12 days in the initial casting phase.¹⁸ Two more recent RCTs have shown that casts changed twice (even three times) each week attain the same correction as weekly casts.^{17,19}

The halving of the casting phase from an average six weeks to three weeks, without compromising results, has clear advantages. Less time immobilized in plaster casts is intuitively preferable for the baby, and their parents or caregivers. Shorter durations of each corrective cast reduces the likelihood and extent of undetected skin pressure lesions, and at least halves the overall corrective phase, such that babies commence the (virtually) full-time boots and bar phase over three months, at a younger and possibly more amenable age. With the consistently demonstrated and positive correlation between successful use of the maintenance boots and bar, and lessened relapse of clubfoot correction – starting the boots and bar habit earlier within the rapid development that hallmarks infancy – may be more helpful than at first glance considered.²⁰⁻²²

How can the notion of 'fast casts' be applied clinically, and what are the possible pitfalls as well as benefits?

Illustrative use of the 'fast casts' technique

Two cases from Tonga, the country with the world's highest incidence of congenital clubfoot deformity²³, are included in this review. In Tonga, a pacific island country geographically comprised of numerous islands, clinical use of the 'fast casts' method facilitates coordination with the availability of surgical expertise to perform Achilles tenotomies, as well as accelerated progress of babies through the casting stage. Both of the case-study babies were cast and re-cast four times in one week. This is more rapid and intense than might normally occur due to the visit from the off-shore surgeon occurring the following week (the local surgeon has now undertaken training for tenotomy procedures).



Figure 1 Baby J, whose data is presented in table 2.



Figure 2 Baby S, whose data is presented in table 3.

Gender: male		Age: 12 days			
Cast no.	1	2	3	4	
Date/month	5th	6 th	8th	10th	
<i>Pirani score</i>					
- lateral border	1	0.5	0.5	0	
- medial crease	0.5	0.5	0.5	0	
- talar head	1	0.5	0	0	
Mid foot score	2.5	1.5	1	0	
- posterior crease	0.5	0.5	0.5	0.5	
- empty heel	1	0.5	0.5	0.5	
- equinus	1	1	1	0.5	
Hindfoot score	2.5	2	2	1.5	
Total score	5	3.5	3	1.5	

Table 1 Baby J – left congenital clubfoot. The use of ‘fast casts’ saw this baby’s corrected and ready for the tenotomy procedure after six days (4 casts).

Gender: male		Age: 6 weeks							
Cast no.	1	2	3	4					
Date/month	5th	6th	8th	10th					
<i>Pirani score</i>									
	L	R	L	R	L	R	L	R	
- lateral border	1	1	1	1	0.5	0.5	0.5	0	
- medial crease	0.5	0.5	0.5	0.5	0.5	0.5	0	0.5	
- talar head	1	1	0.5	0.5	0.5	0.5	0	0	
Mid foot score	2.5	2.5	2	2	1.5	1.5	0.5	0.5	
- post crease	1	1	1	1	1	1	1	1	
- empty heel	1	1	1	1	1	1	1	1	
- equinus	1	1	1	1	1	1	1	1	
Hindfoot score	3	3	3	3	3	3	3	3	
Total score	5.5	5.5	5	5	4.5	4.5	3.5	3.5	

Table 2 Baby S - bilateral congenital clubfeet. The use of ‘fast casts’ corrected the cavus and adduction of the clubfoot deformity, but made no change to the equinus component, which required the tenotomy for correction (as indicated by the initial Pirani score).

As the Tables 1 and 2 show, both babies showed consistent correction of their foot deformity with manipulation and casting. (Fig. 1 and 2) The Pirani scores reduced consistently within the initial corrective phase, showing the value of using this demonstrably reliable and objective measure. Further, the initial Pirani scores of 5 and 5.5 respectively, heralded the very likely need for tenotomies.²⁴ Indeed, the hindfoot scores equaled or approximated the total Pirani scores after the casting phase, signaling the residual equinus aspect of the deformity. It must be stated that similarly to the findings of the clinical trial by Xu et al¹⁷, that these Tongan cases also underwent *'more rather than less'* manipulation prior to casting. Whilst the effect of manipulation time has not been formally studied, histological investigation directs maintained loading of ligaments to promote the lengthening or 'uncrimping' of these structures.²⁵ Might it be that more attention to, and time spent, carefully manipulating clubfoot correction is able to render cast time less relevant?

Considerations, variations, and further questions

There are many factors to consider when contemplating the use of 'fast casts' as part of the Ponseti clubfoot correction method.

Firstly, there is now very good evidence to support shortening cast time¹⁷ for the typical, congenital clubfoot deformity.

Secondly, the convenience for parents travelling with infants to distant clinics for treatment which necessitates time away from home, work, and family, a common occurrence in developing countries, may be greatly improved.²⁶⁻²⁸ If, as on average, a baby requires six casts, the time away from home/work may be reduced from six weeks to two weeks. This could provide great savings for costs incurred whilst living away from home, and time lost from work. In turn, compliance may also benefit.

Thirdly, less time immobilized in plaster is probably advantageous for the baby in terms of reduced skin sore issues, easier bathing, more normal motor development and possibly lessens the risk of osteopenia.²⁹

Notable in the current findings on faster casting is the longer manipulation time, (two minutes) specified by Xu, et al.,¹⁷ an additional departure from the original Ponseti protocol, and also the long follow up time of this study, as opposed the otherwise similar Malawi trial.¹⁹

It is important to appreciate that all accelerated casting studies and trials have addressed the typical congenital clubfoot, and that the effects and use in syndromic¹¹ or complex clubfoot types³⁰ are unknown.

The application of best available evidence to any health care setting is important, particularly if there are clear benefits to the recipients of this care. The rescheduling of the weekly clubfoot clinic for casting, to at least twice weekly, is now a possible shift in contemporary evidence based practice.

Conclusions

The Ponseti method continues to be the best approach to correction of the typical congenital clubfoot. There is now high-level evidence to support changing casts after three days or less, which greatly reduces the time infants spend immobilized in plaster.

The pre-casting manipulation is important and indications are that more time spent may be beneficial in correcting the clubfoot deformity.

In developing countries where travelling to clinics necessitates time away from home, work, and family, the adoption of 'fast casts' can reduce costs to families, and perhaps help to improve compliance and overall outcomes.

References

1. Steinman S, Richards BS, Faulks S, Kaipus K. A comparison of two nonoperative methods of idiopathic clubfoot correction: the Ponseti method and the French functional (physiotherapy) method. Surgical technique. *JBJS* 2009 91A (Suppl 2): 299-312. [\[PubMed\]](#)
2. Carroll NC. Clubfoot in the twentieth century: where we were and where we may be going in the twenty-first century. *J Pediatr Orthop* 2012 21: 1-6. [\[PubMed\]](#)
3. Dobbs MB, Morcuende JA, Gurnett CA, Ponseti IV. Treatment of idiopathic clubfoot: an historical review. *Iowa Orthop J* 2000 20: 59-64. [\[PubMed\]](#)
4. Anand A, Sala D. Clubfoot: Etiology and treatment. *Indian J Orthop* 2008 42: 22-28. [\[PubMed\]](#)
5. Manzone P. Clubfoot surgical treatment: preliminary results of a prospective comparative study of two techniques. *J Pediatr Orthop* 1999 8: 246-250. [\[PubMed\]](#)
6. Zions LE, Zhao G, Hitchcock K, Maewal J, Ebramzadeh E. Has the rate of extensive surgery to treat idiopathic clubfoot declined in the United States? *JBJS* 2010 A92: 882-889. [\[PubMed\]](#)
7. Halanski MA, Davison JE, Huang J-C, Walker CG, Walsh SJ, Crawford HA. Ponseti method compared with surgical treatment of clubfoot: a prospective comparison. *JBJS* 2010 A92: 270-278. [\[PubMed\]](#)
8. Laaveg S, Ponseti I. Long-term results of treatment of congenital club foot. *JBJS* 1980 62A:23-31. [\[PubMed\]](#)
9. Morcuende J, Dolan L, Dietz F, Ponseti I. Radical reduction in the rate of extensive corrective surgery for clubfoot using the Ponseti method. *Pediatrics* 2004 113: 376-80. [\[PubMed\]](#)
10. Ignacio Ponseti [Internet]. Wikipedia. [cited 2013 Jan 29]. Available from: http://en.wikipedia.org/wiki/Ignacio_Ponseti Date accessed? Not sure they mean this by stating cited?
11. Dobbs MB, Gurnett CA. Update on clubfoot: etiology and treatment. *Clin Orthop and Rel Res* 2009 467: 1146-1153. [\[PubMed\]](#)
12. Niki H, Nakajima H, Hirano T, Okada H, Beppu M. Ultrasonographic observation of the healing process in the gap after a Ponseti-type Achilles tenotomy for idiopathic congenital clubfoot at two-year follow-up. *J Orthop Sci* 2013 18: 70-75. [\[PubMed\]](#)
13. Carroll N. Editorial: Clubfoot: What Have We Learned in the Last Quarter Century? *J Pediatr Orthop* 1997 17: 1-7. [\[PubMed\]](#)
14. Rijal R, Shrestha BP, Singh GK, Singh M, Nepal P, Khanal GP, Rai P. Comparison of Ponseti and Kite's method of treatment for idiopathic clubfoot. *Indian J Orthop* 2010 44: 202-207. [\[PubMed\]](#)
15. Andriess H, Roos EM, Häggglund G, Jarnlo G-B. Validity and responsiveness of the Clubfoot Assessment Protocol (CAP). A methodological study. *BMC Musculoskelet Disord* 2006 7: 28. [\[PubMed\]](#)
16. Ponseti I. Clubfoot management. *J Pediatr Orthop* 2000 20: 699-700. [\[PubMed\]](#)
17. Xu RJ. A modified Ponseti method for the treatment of idiopathic clubfoot: a preliminary report. *J Pediatr Orthop* 2011 31: 317-319. [\[PubMed\]](#)
18. Morcuende J, Abbasi D, Dolan L. Results of an accelerated Ponseti protocol for clubfoot. *J Pediatr* 2005 25: 623-625. [\[PubMed\]](#)
19. Harnett P, Freeman R, Harrison WJ, Brown LC, Beckles V. An accelerated Ponseti versus the standard Ponseti method: a prospective randomised controlled trial. *JBJS* 2011 B93: 404-408. [\[PubMed\]](#)
20. Garg S, Porter K. Improved bracing compliance in children with clubfeet using a dynamic orthosis. *J Children's Orthopaedics* 2009 1: 271-276. [\[PubMed\]](#)
21. Boehm S, Sinclair M. Foot abduction brace in the Ponseti method for idiopathic clubfoot deformity: torsional deformities and compliance. *J Pediatr Orthopaedics* 2007 27: 712-716. [\[PubMed\]](#)
22. Ippolito E, Fraracci L, Farsetti P, Di Mario M, Caterini R. The influence of treatment on the pathology of club foot. CT study at maturity. *JBJS* 2004 B86: 574-580. [\[PubMed\]](#)
23. Chapman C, Stott NS, Port RV, Nicol RO. Genetics of club foot in Maori and Pacific people. *J Med Genet* 2000 37: 680-683. [\[PubMed\]](#)
24. Shack N, Eastwood D. Early results of a physiotherapist-delivered Ponseti service for the management of idiopathic congenital talipes equinovarus foot deformity. *JBJS* 2006 88: 1085-1089. [\[PubMed\]](#)
25. Ponseti I. Treatment of congenital club foot. *JBJS* 1992 74: 448-454. [\[PubMed\]](#)
26. Pirani S, Naddumba E, Mathias R, Konde-Lule J, Penny JN, Beyeza T, Mbonye B, Amone J, Franceschi F. Towards Effective Ponseti Clubfoot Care: The Uganda sustainable clubfoot careproject. *Clin Orthop Rel Res* 2009 467:1154-1163. [\[PubMed\]](#)
27. Evans AM, Van Thanh D. A review of the Ponseti method and development of an infant clubfoot program in Vietnam. *JAPMA* 2009 99: 306-316. [\[PubMed\]](#)
28. Evans AM. Preliminary evaluation of implementing the Ponseti method for correction of clubfoot in Vietnam. *J Children's Orthop* 2010 4: 553-559. [\[PubMed\]](#)
29. Lourenço AF, Morcuende JA. Correction of neglected idiopathic club foot by the Ponseti method. *JBJS* 2007 89B: 378-381. [\[PubMed\]](#)
30. Ponseti IV, Zhivkov M, Davis N, Sinclair M, Dobbs MB, Morcuende JA. Treatment of the complex idiopathic clubfoot. *Clin Orthop Rel Res* 2006 451:171-176. [\[PubMed\]](#)