Treatment of the idiopathic clubfoot after the walking age: a systematic bibliographic review

Julieta Porta, Javier Masquijo

Orthopedics Department, Sanatorio Allende, Córdoba

Received on June 5th, 2016; accepted after evaluation on October 24th, 2016 • JAVIER MASQUIJO, MD • jmasquijo@gmail.com

Abstract

Introduction: Good results using the Ponseti's method in newborns have led professionals to broaden indications for elder patients. We carried out a systematic review of bibliography: 1) to define the evidence on the treatment of clubfoot with the Ponseti's method in children over one year old, 2) to determine the number of casts and associated procedures, 3) to establish the correction percentages and 4) to identify complication rates.

Materials and Methods: Using databases available in Ovid, PubMed, LILACS and Cochrane Library, we retrieved all the papers on patients over one year old with treatment of clubfoot using the Ponseti's method, published until May 1st, 2014. We reviewed those which met the pre-established inclusion and exclusion criteria.

Results: The analysis included 11 studies with 492 patients. The average age at the beginning of the treatment was 3.8 years old (ranging from 1 to 18). Average follow-up was 31 months. On average, patients received 8 casts (ranging from 4 to 12). Plantigade feet were achieved in 75% of the cases. Complication rates were 4.3%

Conclusions: Current evidence on children over one year old treated with the Ponseti's method for clubfoot is level IV. Although at this age the use of this technique requires a greater number of casts and associated procedures than those in newborns, it safely corrects the deformity in a high percentage of the cases.

Key words: Clubfoot; Ponseti; children; walking age.

Level of evidence: IV

Tratamiento del pie bot idiopático luego de la edad de la marcha: revisión sistemática de la bibliografía

Resumen

Introducción: La eficacia obtenida con el método de Ponseti en pacientes recién nacidos ha llevado a extender las indicaciones a pacientes de mayor edad. Llevamos a cabo una revisión sistemática de la bibliografía para: 1) definir el grado de comprobación científica con respecto al tratamiento del pie bot con el método de Ponseti en niños >1 año, 2) determinar el número de yesos y procedimientos asociados, 3) determinar el porcentaje de corrección y 4) identificar la tasa de complicaciones.

Materiales y Métodos: Utilizando las bases de datos informáticas disponibles en Ovid, PubMed, LILACS y Cochrane Library, se recogieron todos los trabajos sobre pacientes >1 año, con tratamiento de pie bot idiopático mediante el método de Ponseti, publicados hasta el 1 de mayo de 2014. Se revisaron aquellos que cumplieran con criterios de inclusión y exclusión prestablecidos.

Conflict of interests: The authors have reported none.

http://dx.doi.org/10.15417/625

Resultados: La muestra analizada incluyó 11 estudios con 492 pacientes. La edad promedio al iniciar el tratamiento fue de 3.8 años (rango 1-18). El seguimiento promedio fue de 31 meses. Se realizaron un número promedio de 8 yesos (rango 4-12). Se consiguió un pie plantígrado en el 75% de los casos. La tasa de complicaciones fue del 4,3%.
Conclusiones: La evidencia actual en niños >1 año tratados con el método de Ponseti es de nivel IV. Si bien el uso de esta técnica requiere de un mayor número de yesos y procedimientos asociados que en el recién nacido, permite corregir la deformidad, de forma segura, en un alto porcentaje de los casos.

Palabras clave: Pie bot; Ponseti; niños; edad de la marcha.
Nivel de Evidencia: IV

Introduction

Clubfoot is a congenital malformation with frequency of 1 per 1000 newborns.[1]Its onset can be isolated or idiopathic, or it can be associated with genetic syndromes or other deformities.

Over the past few years the treatment of this condition has changed substantially. Up to the late 1990s, most pediatric orthopedists used posterior-medial release as first line of treatment for the newborn's idiopathic clubfoot. This procedure allows the surgeon to correct the deformity and shows satisfactory short-term results. Most of these patients, however, in mid- and long-term evaluation show mobility limitation, weakness and biomechanic alterations which predispose to patients to joint degenerative disorders.[2,3] This scenario has led to the resurgence of the non-surgical treatment.

In 1940, Horacio Ponseti described a conservative treatment technique which was ignored during several decades.[4] The publication of his book in the late 1990s awoke keen interest in this technique and led to its worldwide difussion.[5] The report of excellent results in diverse centers proved the efficacy and reproducibility of the method; therefore, nowadays it is considered the gold standard for the treatment of the newborn's idiopathic clubfoot.[6] The results in these patients have made some orthopedists try to broaden this indication for elder patients or even those who have already undergone treatment.

We carried out a systematic review of bibliography: 1) to define the degree of scientific evidence on the treatment of clubfoot with the Ponseti's method in children over one year old, 2) to determine the number of casts and associated procedures that are necessary for correction, 3) to determine what percentage of patients this deformity can be corrected in, and 4) to identify the rate of recurrences and complications associated with this method.

Materials and Methods

Using databases available in Ovid, PubMed,, LILACS and Cochrane Library, we collected all the papers on >1-year old patients treated for idiopathic clubfoot with the Ponseti's method. The strategy for the search included the following terms: "neglected clubfoot", "Ponseti's method", "clubfoot after walking age", and "Ponseti luego de edad de marcha". We included all the studies published in Spanish, Portuguese and English up to May 1st, 2014. We also carried out manual review of the bibliographic references of the studies dealt with, so as to locate those papers that we had not identified by electronic search.

We only analyzed the studies evaluating the initial correction, functional results, complications and recurrence rates in >1-year old patients, with or without previous (surgical) treatment, with at least one-year follow-up. We excluded from our analysis those papers with insufficient/incomplete data or reporting series with fewer than five patients. The selection and revision of the studies were carried out independently by two reviewers who belonged to the researchers' team. We elaborated tables with detailed information about the studies that we included in and excluded from our review and, in the latter case, we give the reason for exclusion (Table).

The data from the selected studies were stored in Microsoft Office Excel 2010. The file includes information about bibliographic data, characteristics of the study, patient's demographic characteristics (age, sex), type of previous treatment, associated procedures, complications, functional results, and recurrence. The data collected were expressed in absolute figures and percentages.

Results

Upon searching databases we retrieved 492 studies out of which we analyzed 11 which met the inclusion criteria [6-16](Figure). All the studies included were series of cases which evaluated data retrospectively (level of evidence IV). The sample included 492 patients (721 feet). The males/females ratio in the studies that reported sex[6,8,9,11,15] was 2.5:1. The patients' average age at the time of beginning treatment was 3.8 years old (ranging from 1 to 18). Average follow-up was 31 months (ranging from 12 to 56).

Out of the whole sample, only 42 feet had been treated (Ponseti's method, Kite's casting method, surgery or orthosis). They applied eight casts on average (ranging from 4 to 12). They got a plantigrade foot in 75% of the cases on average (ranging from 66% to 95%). In seven of the 11 selected papers, they used functional scores: Dimeglio's

Table. Description of the papers selected for the review

	Author and quote	Year	Publication	Patients	Feet	Complications*	Correction rates
1	Lourenço AF, Morcuende JA[6]	2007	*J Bone Joint Surg Br*	17	24	4	66%
2	Spiegel DA, Shrestha OP, Sitoula P, Rajbhandary T, Bijukachhe B, Banskota AK[8]	2008	*Clin Orthop Relat Res*	171	260	7	94%
3	Garg S, Dobbs MB[7]	2008	*Indian J Orthop*	11	17	2	88%
4	Wang Y, Wang X, Zhang P, Wang X[16]	2009	*Beijing Da Xue Xue Bao*	76	114	-	83%
5	Khan SA, Kumar A[14]	2010	*J Pediatr Orthop Br*	21	25	6	76%
6	Adegbehingbe O, Oginni L, Ogundele O, Ariyibi A, Abiola P, Ojo O[10]	2010	*Iowa Orthop J*	55	80	3	95%
7	Yagmurlu MF, Ermis MN, Akdeniz HE, Kesin E, Karakas ES[9]	2011	*Pediatr Int*	27	31	4	87%
8	Verma A, Mehtani A, Sural S, Maini L, Gautam VK, Basran SS[11]	2012	*J Pediatr Orthop Br*	37	55	7	89%
9	Banskota B, Banskota AK, Regmi R, Rajbhandary T, Shrestha OP, Spiegel DA[15]	2013	*Bone Joint J Br*	36	55	6	83%
10	Ayana B, Klungsøyr PJ[12]	2014	*Acta Orthop*	22	32	4	85%
11	Faizan M, Jilani LZ, Abbas M, Zahid M, Asif N[13]	2014	*J Foot Ankle Surg*	19	28	3	92%

*: feet.

[9,14] (two articles), Pirani's [6,8,11,12] (four articles) and both (one article).[13] In these patients, the average Dimeglio's score before the treatment was 8.03 and after the treatment, it was 1.26. The average Pirani's score before the treatment was 4.89 and, after the treatment, it was 0.89. In 96 feet, it was necessary to carry out some procedure associated with the Ponseti's method to achieve correction: posterior release (32 feet), transference of the anterior tibial tendon (23 feet), posterior-medial release (39 feet), osteotomy (2 feet). Nineteen feet required a second Achilles tenotomy for foot drop recurrence. The complications rate was 4.3%. All of them were minor (redness, edema, contact ulcer and superficial infection) and did not affect final outcomes.

Discussion

The excellent long-term results reported with the Ponseti's method in newborns have made professionals debate if the method could be equally effective if it were applied to patients already walking. Although there are publications about the Ponseti's method in >1-year old patients, there has not been any systematic review of the bibliography dealing with the subject, therefore, the aim of this work was to analyze the efficacy of the initial correction and if in these patients it was necessary to apply more casts and associated procedures. Moreover, it was to analyze if the complications and recurrence rates were acceptable.

While evaluating the efficacy of this method at this age, we found that, in three out of four feet treated, the deformity was corrected. Although these results were inferior to those achieved in newborns (correction= 95-98%), [17-20] we believe that they are acceptable, because this technique keeps joints undamaged with a flexible foot. On the other hand, when full correction is not achieved, the method reduces deformity and the degree of difficulty for the surgery, avoiding extensive release. In this review, the correction rate showed no correlation with the age the treatment had started at.

Although some authors[21] recommend surgical treatment for elder children because of the challenge that feet rigidity represents at this age, others [9] have reported that the Ponseti's method improves significantly the deformity and recommend the use of the method at any age. Yag-

murlu et al.[9] consider that, although the deformity is not totally corrected, the looks of the foot improve and, later one, results in surgery, if any, are better. Given the data retrieved for this review, we cannot determine if there is an upper age limit to use the method somewhat effectively. The eldest patient reported was 18 years old when starting treatment and required eight casts plus Achilles tenotomy to get an asymptomatic plantigrade foot.[10]

The number of casts that this technique requires in >1-year old patients is greater than that a newborn needs. The reason for this would be the lesser flexibility of the foot as it develops and the greater difficulty in applying casts to a walking patient with greater muscular development. Lourenço and Morcuende [6] recommend feet manipulation at least 5-10 minutes in every foot to improve the correction of the deformity, and cast changing every 15 days to facilitate re-modeling. We could speculate that, since these patients have more rigid feet and greater muscular development, technical difficulty in casting would increase, what would result in greater complication rates. However, in the patients evaluated in this review, complication rates were comparable to those reported in newborns—4.7% vs. 0-10%.[22,23] Most complications were related to casting: cutaneous irritation, skin maceration, injuries while removing the cast and contact ulcers. In no series there are reports on serious complications using this method.

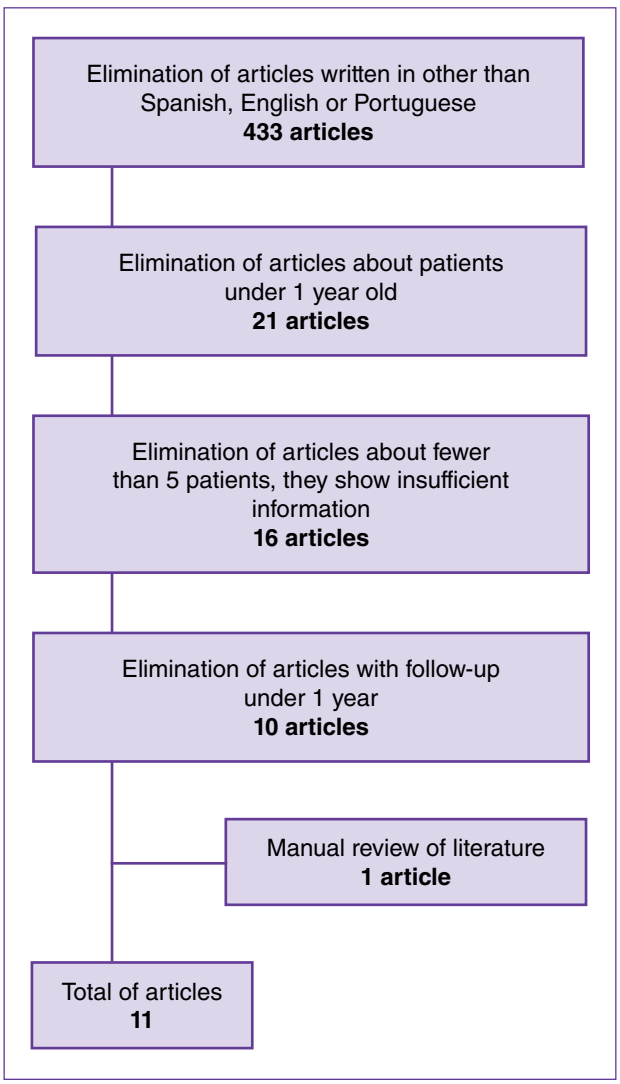

Figure. Information about databases search.

Our study has several limitations worth mentioning. Most publications about this subject are based on small cohort studies and retrospective analysis. Most of them neither report appropriately important methodological data, nor do they describe sheer data to analyze the differences between the patients with and without previous treatment, nor do they carry out meta-analysis. Only seven out of the analyzed studies used functional scales to evaluate results: some used the Dimeglio's score, others used the Pirani's score, and one study used both scales. These scales are the most frequently used to classify the newborn's clubfoot, but they show limitations to predict response to treatment, because they do not take etiology into account. On the other hand, these classifications are vague for patients already walking, and other authors [8,24] have reported the need for new evaluation scales for patients this age. Most of the analyzed studies were carried out in low and moderate resources countries and have short-term follow-up, so, the possibilities of determining if late beginning of the treatment has influence on recurrence rates are low. Adegbehingbe et al.[10] and Ponseti[17] coincide on the fact that recurrence is not associated with the patient's age at the time of beginning treatment. However, Khan and Kumar,[14] and Lourenço and Morcuende[6] have reported recurrence rates of 24% and 29%, respectively. In spite of these limitations, we believe that this study summarizes relevant information about the treatment of idiopathic clubfoot in walking age patients, which can be used at the time of making decisions about the treatment of this condition.

Conclusions

Actual evidence on the treatment of idiopathic clubfoot with the Ponseti's method in >1year-old patients is level IV. This technique is safe and corrects the deformity in high percentages. However, it requires a greater number of casts and associated procedures, what implies great efforts on the part of not only the doctor but also the patient's family. Parents should be warned about the fact that their children will not be able to walk for several months because of immobilization, and they will need assistance for daily activities. Doctors have to be persistent and they have to be aware of the fact that the treatment will take long. Longer follow-up studies in the future will determine if the late beginning of the treatment has influence on the recurrence rates of the deformity.

Bibliography

1. Roye D. Idiopathic congenital talipes equinovarus. *J Am Acad Orthop Surg* 2002;10:239-248.
2. Van Gelder JH, Van Ruiten AG, Visser JD, Maathuis PG. Long-term results of the posteromedial release in the treatment of idiopathic clubfoot. *J Pediatr Orthop* 2010;30(7):700-704.
3. Dobbs MB, Nunley R, Schoenecker PL. Long-term follow-up of patients with clubfeet treated with extensive soft-tissue release. *J Bone Joint Surg Am* 2006;88(5):986-996.
4. Laaveg SJ, Ponseti IV. Long-term results of treatment of congenital club foot. *J Bone Joint Surg Am* 1980;62:23-31.
5. Ponseti IV. *Congenital clubfoot. Fundamentals for treatment,* Oxford: Oxford University Press*;* 1996.
6. Lourenço AF, Morcuende JA. Correction of neglected idiopathic club foot by the Ponseti method. *J Bone Joint Surg Br* 2007; 89(3):378-381.
7. Garg S, Dobbs MB. Use of Ponseti method for recurrent clubfoot following posteromedial release. *Indian J Orthop* 2008;42(1): 68-72.
8. Spiegel DA, Shrestha OP, Sitoula P, Rajbhandary T, Bijukachhe B, Banskota AK. Ponseti method for untreated idiopathic clubfeet in Nepalese patients from 1 to 6 years of age. *Clin Orthop Relat Res* 2009;467(5):1164-1170.
9. Yagmurlu MF, Ermis MN, Akdeniz HE, Kesin E, Karakas ES. Ponseti management of clubfoot after walking age. *Pediatr Int* 2011;53(1):85-89.
10. Adegbehingbe OO, Oginni LM, Ogundele OJ, Ariyibi AL, Abiola PO, Ojo OD. Ponseti clubfoot management: changing surgical trends in Nigeria. *Iowa Orthop J* 2010;30:7-14.
11. Verma A, Mehtani A, Sural S, Maini L, Gautam VK, Basran SS, et al. Management of idiopathic clubfoot in toddlers by Ponseti's method. *J Pediatr Orthop Br* 2012;21(1):79-84.
12. Ayana B, Klungsøyr PJ. Good results after Ponseti treatment for neglected congenital clubfoot in Ethiopia. A prospective study of 22 children (32 feet) from 2 to 10 years of age. *Acta Orthop* 2014;85(6):641-645.
13. Faizan M, Jilani LZ, Abbas M, Zahid M, Asif N. Management of idiopathic clubfoot by Ponseti technique in children presenting after one year of age. *J Foot Ankle Surg* 2014;54(5):967-972.
14. Khan SA, Kumar A. Ponseti´s manipulation in neglected clubfoot in children more than 7 years of age: a prospective evaluation of 25 feet with long-term follow up. *J Pediatr Orthop Br* 2010;19(5):385-389.
15. Banskota B, Banskota AK, Regmi R, Rajbhandary T, Shrestha OP, Spiegel DA. The Ponseti method in the treatment of children with idiopathic clubfoot presenting between five and ten years of age. *Bone Joint J Br* 2013;95(12):1721-1725.
16. Wang YZ, Wang XW, Zhang P, Wang XS. Application of Ponseti method in patients older than 6 months with congenital talipes equinovarus. *Beijing Da Xue Xue Bao* 2009;41(4):452-455.
17. Ponseti IV. Relapsing clubfoot: causes, prevention, and treatment. *Iowa Orthop J* 2002;22:55-56.
18. Dobbs MB, Corley CL, Morcuende JA, Ponseti IV. Late recurrence of clubfoot deformity: a 45-year follow-up. *Clin Orthop Relat Res* 2003;(411):188-192.
19. Morcuende JA. Management of congenital talipes equinovarus using the Ponseti method: a systematic review. *J Bone Joint Surg Br* 2011;93(9):1160-1164.
20. Ponseti IV. Long-term results of treatment of congenital clubfoot. *J Bone Joint Surg Am* 1980;62(1):23-31.
21. Faldini C, Traina F, Di Martino A, Nanni M, Acri F. Can selective soft tissue release and cuboid osteotomy correct neglected clubfoot? *Clin Orthop Relat Res* 2013;471(8):2658-2665.
22. López Lobato R, Downey Carmona FJ, Farrington Rueda, DM. Complicaciones del método Ponseti: Edema de miembro por efecto ventana. *Rev Soc Andal Traumatol Ortop* 2014;31(2):73-76.
23. Halanski MA. Ponseti method compared with surgical treatment of clubfoot. A prospective comparison. *J Bone Joint Surg Am* 2010;92(2):270-277.
24. Agarwal A. Ponseti method for late presentation of clubfoot. *Int Orthop* 2014;38(1):207-209.