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Bonseti method: Non-major surgical treatment for club foot

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Abstract---Background: The club foot is a common, classic paediatric orthopedic problem. Every orthopedic surgeon knows what deformity looks like but most find it more difficult to describe or to define. The etiology is still largely unknown but ideas about treatment have changed considerably over the last few years. Method: Ponseti technique of treatment was applied on 14 babies with congenital club feet from April 2010 to June 2011, a total of 26 club feet were managed at Orthopedic department in AL Basrah General Hospital by serial manipulation and casting as described by Ponseti, included serial manipulation and casting of the deformity, minimal corrective surgery (tenatomy of Achilles tendon) and maintenance of correction by orthosis. Result: Club feet correction was obtained in all feet, 100% of feet required (10-12) cast for correction, average time for full correction ranging from (10-12) weeks. No one of our patient required extensive corrective surgery, no relapse during the period of our study. Conclusion: Ponseti method is a safe and effective treatment for congenital idiopathic club foot and significantly decrease the need for extensive corrective surgery, this technique can be used in children up to 2 years of age.

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Introduction

The overall picture of a talipes equinovarus (club foot) deformity is one of ankle equinus hind foot varus, and forefoot adduction with pronation of the first ray giving the appearance of cavus. The typical, isolated clubfoot is congenital and idiopathic in origin [1]. Some cases are positional or postural in which case the deformity, by definition, resolves completely by 3 months with minimal treatment At the other end of the spectrum some examples of rigid clubfoot are associated with syndromic conditions and more generalized musculoskeletal problems. A further subgroup of foot problems are seen in neuromuscular disorders such as spina bifida where the deformity may worsen with time as the neuromuscular imbalance develops [2, 3].

The incidence of isolated clubfoot varies between racial groups: in Caucasians the rate of idiopathic cases is approximately 1:1000 live births; in Asians, slightly lower at 0.7:1000; and in Aboriginals, Polynesians, Maoris, and native Hawaiians, the rate of 4-6:1000 is significantly higher [3]. All studies agree that boys are more commonly affected than girls: the ratio is usually quoted as 2:1 but rising to 4:1 in the Aboriginal groups. Among live births, approximately 50% of cases bilateral [3-6]. The complex clubfoot, one that is associated with other congenital anomalies, has an incidence of 0.7-0.9:1000 births and is significantly more likely to be bilateral [3, 6]. Other factors associated with an increased incidence are first-trimester amniocentesis [4], maternal smoking [5, 6] hyperemesis, and maternal anemia [3].

Increasingly, ultrasonography is used to detect fetal anomalies such as a clubfoot but the false-positive rates can be high, depending upon the timing of the scan, the skill of the operator, and whether or not the scan is primarily assessing the pregnancy or the fetus [8]. The overall detection rate of talipes equinovarus foot deformities in utero has improved with time and, currently, in a large non selected Norwegian population, 77% of cases were identified antenatally [7]. The diagnosis of a clubfoot deformity is clinical. A full assessment of the child will help to distinguish the idiopathic foot from the "syndromic" foot and identify any obvious underlying neuromuscular imbalance.

Both of the commonly used classification systems of Dimeglio [9] and Pirani [10] are apply a point score to various physical findings which when summated differentiate between mildly affected feet that require little no treatment and the more severely affected foot that is likely to require treatment. Wainwright et al [11] looked at four commonly used classification systems in the United Kingdom and found the Dimeglio system to be the most reliable. Traditionally, plain radiographs have formed part of the baseline evaluation of the clubfoot deformity. Computed tomography (CT) and magnetic resonance (MR) scans define the pathoanatomy of the deformity and have been used to document the effects of treatment on the foot [12].

The Ponseti [13] method of treatment corrects the clubfoot by a process of serial manipulations and cast applications that sequentially correct the three essential deformities of the foot namely the cavus, the adduction, and the equinovarus. The standard protocol involves weekly cast changes and an extensive surgical procedure can be avoided in around 95% of cases. Treatment is usually started within a few days of birth. The cavus deformity in clubfoot is principally a problem of the first ray. In order to correct this, the first ray must be dorsi-flexed effectively supinating the forefoot further. Correction of the cavus realigns the meta-tarsals-navicular, cuboid, and cuneiforms into the same plane. With the initial cast application, the forefoot is also abducted with laterally based counter pressure applied over the talar head. Successive casts continue to correct the talo-navicular alignment and simultaneously the calcaneus rotates under the talus with the posterior aspect rotating away from the fibula as the calcaneo-fibular ligament stretches.

Following tenotomy, dorsiflexion is achieved and the corrected position is held in the final cast for a period of 2-3 weeks, by which time both clinically and by ultrasound assessment [14], the tendon has reconstituted. The older the child, the longer it takes for the tendon to reconstitute. This may necessitate adjustment of the post tenotomy casting and splinting regime. Following removal of the final cast, a foot abduction orthosis (FAO) is applied. Many authors have been able to duplicate Ponseti's results, and in the idiopathic foot, full correction should be achievable in around 95% of cases following a mean of 5-8 casts depending upon the age at which treatment started. A percutaneous tenotomy will be needed in between 65 and 85% of cases depending upon the severity of the foot deformity at the start of treatment. A Pirani score of 5 or more at presentation or a Dimeglio grade IV foot is highly predictive of the need for tenotomy [14]. The aim of this study is to evaluate the effectiveness of Ponseti method in treating idiopathic talipes equinovarus.

Methods

This is a prospective study which conducted at orthopedic department in Al Basrah General Hospital from April 2010 to June 2011. The study include fifteen patients with idiopathic congenital club feet who were treated conservatively by Ponseti method, non- major surgical treatment. All other cases of syndromic club feet like spina bifida and arthrogryposis were excluded. Non -compliance families also excluded from the study. All babies were assessed clinically after explaining the method to the parents and taking their acceptance according to the special questioners which include: Pregnancy Delivery Post-delivery and Family history. Orthopedic: spine, hip, upper extremities, and lower extremities. The scoring system of Dimeglio have been employed for all patients, according to this system we classified our patients into four graded (mild, moderate, sever, very sever This score was repeated weekly or at each visit: To assess the progress of correction and to guide us for further management e.g. if the child need tendoachilles tenotomy.

Procedure [15-18]

The cavus deformity, which results from pronation of the forefoot in relation to the hind foot, is corrected primarily by supinating the forefoot in proper alignment with the hind foot; with the longitudinal arch of the foot well molded and the forefoot in some supination, the entire foot then abducted gently and gradually under the talus, which is secured against rotation in the ankle. Mortise by applying counter pressure with the thumb against the lateral aspect of the head of the talus; until the anterior part of the calcaneum is abducted from underneath the talus, heel varus then correct when the entire foot is fully abducted under the talus; the heel is never touched. Finally, the equinus is corrected by dorsiflexing the foot; (15 -20 degree), any lack in proper dorsiflexion of the foot corrected by a simple percutaneous tendoachilles tenotomy under general anesthesia. For maintaining the correction obtained by gentle manipulation, a plaster cast is applied in 2 sections in one cast. The first section extends from the toes to just below the knee, and the second covers the knee and the thigh. The knee is immobilized at a right angle. The plaster cast is molded to fit the anatomy precisely. Abduction of the foot is increased progressively with each manipulation and plaster cast application until hypercorrection to 70° of foot abduction is obtained. All of the casts in all of the patients included in this study were applied under the supervision of my senior.

The average period of casting is (8) weeks prior to tenotomy if needed, then we need a further four weeks of casting before starting with the brace. If full, initial correction is not achievable, then surgical treatment is indicated. We used the number of casts required to obtain a full correction of the deformity as a proxy for severity of the deformity. After correction, a foot-abduction brace is used to maintain the correction. This brace consists of a bar with shoes attached at the ends at 70° of outward rotation on the affected side and 40° on the normal side. The length of the bar should be equal to the width of the child's shoulders The brace is used on a full- time basis for to 3 months and then advice the parent to used it at night for 3 to 4 years.

Results

In our study the preliminary result was as the following: Fourteenth patients their age were up to one year, sex patients below 2 month, six patient from (2-6) month and two patients from (6-12) months as shown in table (1). A total of eleven (78, 5%) patients were boys, three (21, 5%) patients were girls as shown in table (2). A total number of feet were twenty-six feet, twelve patients with bilateral club feet and two patients with unilateral club feet as shown in table (3).

Table 1
Distribution of patients by the age

Age (months)	No.	%
0-1	4	28.5
1-2	2	14.2
2-4	3	21.4
4-6	3	21.4

6-8	1	7.1
8-12	1	7.1
Total	14	100

Table 2
Distribution of the patients by the sex

Sex	No.	%
Boys	11	78.5
Girls	3	21.5
Total	14	100

Table 3
Distribution of the patients by the side

Side	No.	%
Bilateral	12	85.7
Unilateral	2	14.3
Total	14	100

The average time from first cast to the tendoachills tenatomy 6-8 Weeks. The casts applied weekly and some time every 2 week according to the response to treatment. No difference in response to the management between different age group. Tendoachills tenatomy was applied for 26 feets followed by 4 weeks in cast. as shown in table (4).

Table 4
Follow up of the patients by Dimeglio

No.	Sex	Age (Month)	1st week		4th week		6th week		Percutenous tenatomy		8th – 12th week	
			RT	LT	RT	LT	RT	LT	RT	LT	RT	LT
1	M	2	4	3	3	2	2	1	+ ve	+ ve	1	1
2	M	4	3	3	2	2	1	1	+ ve	+ ve	1	1
3	M	2	4	3	3	2	2	1	+ ve	+ ve	1	1
4	M	1	2	3	2	2	1	2	+ ve	+ ve	1	1
5	M	11	3	3	2	3	1	2	+ ve	+ ve	1	1
6	F	5 days	3	2	2	2	1	1	+ ve	+ ve	1	1
7	M	7 days	3	2	3	2	2	2	+ ve	+ ve	1	1
8	M	11	2	3	1	2	1	1	+ ve	+ ve	1	1
9	M	1	3		2		2		+ ve		1	1
10	M	8		3		2		2		+ ve	1	1
11	F	4	3	3	2	3	1	2	+ ve	+ ve	1	1
12	M	2	2	2	2	1	1	1	+ ve	+ ve	1	1
13	M	3	3	3	2	2	1	2	+ ve	+ ve	1	1
14	F	4	4	3	3	2	2	2	+ ve	+ ve	1	1

The early result of our study demonstrates that with use of the ponseti method all of feet with idiopathic club foot can be corrected without the need for extensive

corrective surgery. No any complication occurs apart of slipping casts in two cases, showed in table (5).

Table 5
Distribution of feet according to the grading system

No.	No of feet	Grade
1.	3	Very sever
2.	17	Sever
3.	6	moderate

Discussion

Our study includes the patients treated with ponseti method. The study population was comprised of 26 club feet in 14 infant with no associated neuromuscular disease, their age were from one week to one year. The early result in our study foot can be corrected without the need for extensive corrected surgery. Follow demonstrates that with use of ponseti method all of feet with idiopathic club up period from 3-9 month. In Elshenawy EM, et al [19]. The age of patients was range :3to 346 days mean age 64.6 days with success rate of 95.5%, average follow up period:24-29 months. We used 6-8 casts during period of correction of the club foot by ponseti tenotomies were performed in all but one patient (2 feet). In Jawadi AH [20] age of the patients range from one week to 48 week, the average follow up was 37 month, average cast to obtained correction was 5.3 weeks (range 4-10weeks), tenotomies were performed in all but one patient, full correction was obtained in 96.6%

We used Dimeglio score as a method of clinical assessment of the a degree of deformity, we found that it is reliable and valid measurement, it documents the degree of deformity and allow us to know the progress and response to the treatment, also it guides us to known when tenotomy indicated and reassures the parents regarding the progress. And we found that there is no any difference in final Dimeglio score between the patients whose cast were applied in the newborn as compared with those who had the first cast after 30 days of age. In ILtar and Uysal, et al. [21] The study population was comprised of 40 club feet in 29 infants with no associated neuromuscular disease casting began in the newborn period on 26 feet of 18 patients (newborn group), and after 1 month of age on 14 feet of 11 patients (older infants group), final Dimeglio score were significantly worse for the patients whose cast were applied in the newborn, compared with those who had the first cast after 30 days of age.

Conclusion

The Ponseti method is a very safe, efficient treatment for correction of club foot that significantly decreases the need for extensive corrective surgery. The decline in extensive clubfoot surgery should encourage us to make this method standard in the treatment of congenital idiopathic clubfoot. The Ponseti method does not involve major surgery except for a tenotomy which is minor procedure. The period of the study was short and we need long period at least 2 years for good evaluation and follow up of the patients. The Ponseti method for correction of the

club foot is a safe and effective in the treatment of idiopathic congenital club foot, and significantly reduce the need for extensive surgery and this should encourage us to make this method as standard in the management.

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Conflict of interesting

None

References

1. Siapkara A, Duncan R. Congenital talipes equinovarus: A review Of current management. J Bone Joint Surg 2007; 89-B: 995-1000.
2. Carey M, Bower C, Mylvaganam A. Rouse 1. Talipes equinovarus In Western Australia. Paediatr Perinat Epidemiol 2003: 17:87-194.
3. Byron-Scott R. Sharpe P, Hasler C, et al. A South Australian Population-based study of congenital talipes equinovarus. Paediatr Perinat Epidemiol 2005; 19:227-237.
4. Cederholm M, Haglund B, Axelsson O. Infant morbidity following Amniocentesis and chorionic villus sampling for prenatal karyotyping. BJOG 2005, 112:394-402.
5. Dickenson KC, Meyer RE, Kotch J Maternal smoking and the risk For clubfoot in infants. Birth Defects Res A Clin Mol Teratol 2008; 82:86-91.
6. Alderman BW, Takahashi ER, LeMier MK. Risk indicators for talipes equinovarus in Washington State 1987-1989. Epidemiology 1991 ; 2: 289-292.
7. Offerdal K, Jebens N, Blaas HG, Eik-Nes SH. Prenatal ultrasound Detection of talipes equinovarus in a non-selected population of deliveries in Norway Ultrasound Obstet Gynecol 2007 ; 30:838-844.
8. Keret D, Ezra E, Lokiec F. et al. Efficacy of prenatal ultrasonography In confirmed club foot. J Bone Joint Surg 2002 ; 84-B: 1015-1019.
9. Dimeglio A, Bensahel H, Souchet P, et al. Classification of clubfoot J Pediatr Orthop B 1995; 4:129-136.
10. Pirani S. A reliable and valid method of assessing the amount of deformity in the congenital clubfoot. St Louis MO: Pediatric Orthopaedic Society of North America; 2004.
11. Wainwright AM, Auld T, Benson MK, Theologis TN The classification of congenital talipes equinovarus. J Bone Joint Surg 2002 ; 84-B: 1020 – 1024.
12. Coley B, Sheils WE 2nd, Kean J, Adler BH. Age-dependent dynamic sonographic measurement of pediatric clubfoot. Pediatr Radiol 2007; 37: 1125-1129.
13. Ponseti IV. Current Concepts Review: Treatment of congenital club foor. J Bone Joint Surg 1992; 74-4:448-454.
14. Scher DM, Feldman DS, van Bosse HJ, et al. predicting the need for tenotomy in the Ponseti method for correction of clubfeet. J Pediatr Orthop 2004: 24:349-352.

15. Ponseti IV Congenital Clubfoot: Fundamentals of Treatment. Oxford University Press 1996.
16. Ponseti IV. Common Errors in the Treatment of Congenital Clubfoot. International Orthopaedics, 1997; 21(2): 137-141 .
17. Ponseti IV. Correction of the Talar Neck Angle in Congenital Clubfoot with Sequential Manipulation and Casting. Iowa Orthopaedic Journal. 1998; 18: 74- 75 .
18. Ponseti IV. Clubfoot Management. [Editorial] Journal of Pediatric Orthpedics. 2000;20(6):699-700 .
19. Elshanawy EM, Hassanen EY, Ramadan MM. The mansoura Experience in the treatment of Idiopathic Club foot deformity by the ponseti technique.mansoura university hospital. Acta orthop. Belg. 2008;74(5):654.66.
20. Jawadi AH.Club foot manangment by the ponseti technique in Saudi patients. Department of surgery, King Abdulaziz Medical city. Saudi Med J. 2010;31(1):49-52.
21. Iltar S, Uysal M, Alemdaroglu K, Aydogan NH, KaraT, Atlihan D. Treatment of the Club foot with ponseti method, shoud begin casting in the new born period or later. Ankara. Treaning and reaserch hospital. J foot ankle surg. 2010;49(5):426-431.