ORIGINAL ARTICLE

RESULTS OF TREATMENT OF IDIOPATHIC CONGENITAL CLUBFOOT IN CHILDREN: A 3-YEAR FOLLOW UP STUDY

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ABSTRACT

The aim: Was to analyze the outcome, recurrence rate and complications between Ponseti method and soft-tissue release 3 years after the initial treatment.

Materials and methods: This prospective cohort study was conducted in congenital idiopathic clubfoot patients who underwent primary treatment by either Ponseti serial casting or soft tissue release between 2006 to 2016 at department of traumatology and orthopedics National Children's Specialized Hospital "Okhmatdet". Total of 113 feet in 95 patients (61 males and 34 females), sixty-two feet (62 patients) were in the Ponseti group and thirty-three feet (33 patients) were in the surgical treatment group.

For both groups, descriptive statistics were calculated Pirani score (2004) result before and 3 years after treatment, recurrence rate and complications. The comparison of the Pirani score result and complications between the two groups was analyzed by nonparametric tests (Mann-Whitney U-tests). Statistical data processing was performed in SPSS 17.0 program.

Results: The results of Pirani score reveal satisfactory outcomes for both groups. But Ponseti method has the more conservative approach and lower complication rate (11,29±5,27% and 24,24±11,74%, p=0,52).

Conclusions: Ponseti method is a safe, effective method for treatment of congenital idiopathic clubfoot in children from first days after birth. Open surgery should be reserved for deformity that cannot be completely corrected or for treatment of recurrences.

KEY WORDS: clubfoot, treatment, Ponseti method, Zatsepin protocol, surgical treatment

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INTRODUCTION

Congenital idiopathic clubfoot is a complex congenital deformity and ranges approximately 40% in the structure of congenital diseases of the lower extremities in children [1,2]. The frequency of congenital clubfoot is approximately from 0,6 to 3 cases per 1000 live births [3]. It is three times more common in males. In 30-50% present bilateral lesion of the feet. Combination with other congenital defects (hip dysplasia, infant torticollis etc.) is observed in about 10% [4,5]. Congenital clubfoot can be an idiopathic malformation or accompany systemic diseases, arthrogryposis, diastrophic dysplasia, Freeman-Sheldon syndrome, Larsen syndrome [6].

The anomaly occurs in the 3rd month of intrauterine life and is characterized by dysfunction of the posterior and medial aspects of the lower leg, ankle and foot [7,8]. The muscles are smaller and there is increased collagen synthesis resulting in fibrosis in the posteromedial tarsal ligaments, deep fascia, Achilles tendon and tibialis posterior tendon.

Congenital clubfoot develops under the influence of endogenous and exogenous pathological factors. Basic theories of clubfoot development: mechanical, embryonic, neuromuscular. Mechanical theory, which postulates that clubfoot results from an elevated intrauterine pressure during pregnancy. Embryonic theory associated with toxicosis during pregnancy, viral infection, toxoplasmosis, avitaminosis during embryogenesis. Some authors suggested that the etiology of clubfoot is neuromuscular in origin and has genetic implications. A genetic basis for isolated clubfoot is supported by the fact approximately 25% of all patients with isolated clubfoot report a positive family history for clubfoot [9]. The role for genetic factors in clubfoot is also supported by a twin study that demonstrates a higher concordance rate for identical twins compared to fraternal twins (33% versus 3%). Further evidence for a genetic basis for clubfoot is the differences in clubfoot prevalence across ethnic populations, with the lowest prevalence in Chinese (0.39 cases per 1000 live births) and highest in the Hawaiians and Maoris (7 per 1000) [10,11]. The neuromuscular etiological concepts in congenital clubfeet yield important information regarding recurrent deformities, especially dynamic supination [12,13,14].

For almost 3 decades prior to 2010, we treated congenital clubfoot with manipulation (following the modified T. Zatsepin protocol, 1947) [15] and casting from 3-4 and up to the age of 6-8 months followed by modified posteromedial release, subtalar or/and plantar incision. Since 2010, we started to use Ponseti method and serial casting from first days after birth.

THE AIM

The aim of this study was to analyze the outcome, recurrence rate and complications between Ponseti method and soft-tissue release 3 years after the initial treatment.

Table I. Pirani scores before and three years after treatment.

Pirani score	Start of the treatment		Three years after treatment	
	Surgical treatment group (n=33)	Ponseti group (n=62) surgery	Surgical treatment group (n=33) (mean score)	Ponseti group (n=62) (mean score)
0 – 0,5	-	-	7 (14,21±8,47%)	37 (12,67±5,53%)
0,5 – 1,5	-	-	18 (12,54±4,19%)	18 (14,03±5,37%)
1,5 – 2,5	3 (9,09±3,24%)	12 (8,35±3,81%)		
2,5 – 5,0	12 (6,37±2,61%)	24 (18,71±9,69%)	3 (9,09±5,34%)	3 (4,83±2,23%)
5,0 – 6,0	18 (9,54±4,81%)	26 (17,94±7,19%)	5 (3,15±1,01%)	4 (6,45±2,15%)

Table II. Complications associated with treatment.

Complications	Surgery group n = 33	Ponseti group n = 62	p-value
Cast complication			
Cast loosening	-	17 (27,41%)	
Cast-associated pressure sore	3 (9,09%)	-	
Surgical complication			
Infection	2 (6,06%)	-	
Wound edge necrosis	3 (9,09%)	-	
Recurrence	8 (24,24%)	7 (11,29%)	0,52

MATERIALS AND METHODS

This prospective cohort study was conducted in congenital idiopathic clubfoot patients who underwent primary treatment by either Ponseti serial casting or soft tissue release between 2006 to 2016 at department of traumatology and orthopedics National Children's Specialized Hospital "Okhmatdet". Clubfeet in both groups were of comparable severity at the start of the treatment as documented by the scores of Pirani et al. (2004) [16].

Inclusion criteria – healthy infants younger than 2 weeks born with clubfoot/clubfeet and without any other congenital anomalies.

Exclusion criteria included non-congenital idiopathic clubfoot, such as postural clubfoot, neuropathic or another syndromic clubfoot, and incomplete medical data.

Treatment of patients in the Ponseti group followed the standart protocol (1963) [17,18]. Cast applications were performed on an outpatient basis with weekly changes. In all cases, a persistent hindfoot equinus made a tenotomy of the tendo-Achilles under local anesthesia.

The tenotomies were performed according to the method described by Ponseti using a No. 11 blade, and no neurovascular compromise was experienced. After tenotomy of the tendo-Achilles, plaster casts were applied for 3 weeks. Orthotic management for abduction and external rotation of the feet started once correction of the deformity was achieved (braces with 70 external rotation for clubfoot and to 45 external rotation for the normal foot in unilateral cases).

Patients in the soft tissue surgical treatment group were treated with manipulation, serial casting by modified Zatsepin technique [15] then underwent one or more of the following procedures such as posteromedial release and plantar release with modified Carrol incision and plantar incision for cavus deformity correction (average age at the time of surgery, 8.5 months; range, 4.7–11.4 months). After correction, the talonavicular and the talocalcaneal joints were pinned using smooth three Kirschner wires and toe to groin plaster casts were applied. Preventive antibiotics were given intravenously for 5 days. The average hospital stay was 14 days (range, 12–15 days). There were no neurovascular complications or skin problems in any of the cases. Kirschner wires were removed 12 weeks after surgery. Orthotic management was applied after removed of the Kirschner wires and included shoes with insoles and nighttime splinting. All patients of both groups were followed up for at least three years.

For both groups, descriptive statistics were calculated Pirani score (2004) result before and 3 years after treatment, recurrence rate and complications. The comparison of the Pirani score result and complications between the two groups was analyzed by nonparametric tests (Mann-Whitney U-tests). Statistical data processing was performed in SPSS 17.0 program.

RESULTS AND DISCUSSION

Total of 113 feet in 95 patients (61 males and 34 females), sixty-two feet (62 patients) were in the Ponseti group and

thirty-three feet (33 patients) were in the surgical treatment group. The mean age at the start of the treatment was 4.18±2.07 weeks in the Ponseti group, and 7.68±4.74 weeks in the surgical treatment group. Pirani scores taken to document initial severity of the clubfeet showed no group differences at the start of the trial and differences before three years after treatment (Table I).

In the first group, 72.73±34,51% (24 patients) started treatment on 4-7 days after birth, in the remaining 27.27±12,36% (9 patients), treatment was initiated up to 2 months of age through a later appeal. All patients in the traditional treatment group required surgery at the age of 6 to 8 months.

The average amount of plastering of one foot to full correction was 42 days (range 35–49 days). The average period from the beginning of plastering to tenotomy was 38,5 days.

The minimum follow up time was 36 months (range, 36 – 42 months) in the Ponseti group and 45 months (range, 45 – 60 months) in the surgical treatment group).

The results of Pirani score reveal satisfactory outcomes for both groups. But Ponseti method has the more conservative approach and lower complication rate (Table II).

The complications associated with the treatment were 11.29% in the Ponseti group and 24.24% in surgical treatment group. In the Ponseti group, all of the complications were cast loosening. In the surgical treatment group, the most common complications were necrosis of the edge of wound, infection and cast-associated pressure sore. In surgical treatment group, the surgical related wound infection was found in 2 patients (6,06%). All of which were treated with wound dressing and oral antibiotics. The number of recurrences (appearance of one of the deformation elements) were 8 (24,24%) cases in surgery group and 7 (11,29%) in Ponseti group.

The Ponseti technique has become the standard for treatment of congenital clubfoot in the last 10 years. For more than almost 3 decades at our hospital, following the modified T. Zatsepin protocol (1947), the deformity was treated by initial casting and posteromedial release to correct residual deformities at the age of 6 to 8 months.

The main advantage of the Ponseti method (1963) is the high efficiency, the lack of a preparatory period, the opportunity to begin casting immediately after diagnosis. Also the gradual correction of the deformation, which has become an important social aspect. However, early onset of treatment is important to achieve this efficacy. Considering all aspects of the Ponseti method, particularly the more conservative approach and lower complication rate, we changed the standard treatment of congenital clubfeet at our institution to the Ponseti method of treatment.

CONCLUSIONS

Ponseti method is a safe, effective method for treatment of congenital idiopathic clubfoot in children from first days after birth. After analysis of the results, we changed the standard treatment of congenital clubfoot at our hospital to the Ponseti method of treatment. Open surgery should be reserved for deformity that cannot be completely corrected or for treatment of recurrences.

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Conflict of interest:
The Authors declare no conflict of interest.

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