

Efficacy of percutaneous needle tenotomy during ponseti technique in the management of congenital club foot deformity in children

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Abstract:

Objective: To determine the efficacy of percutaneous needle tenotomy during ponseti technique in the management of congenital club foot deformity in children

Study design: Descriptive case series

Place and duration of study: Orthopaedic unit, Lady Reading Hospital, Peshawar 17th August 2018 to 17th February 2019

Material and Methods: In this study a total of 139 patients were observed. All children were operated with aseptic precautions under short general anaesthesia. A 16/18 gauge needle chosen to cut the tendon, Thereafter, patients was followed up on a monthly basis and efficacy was evaluated after six months

Results: In this study mean age was 12 months with SD \pm 7.31. 57% patients were male while 43% patients were female. 40% patients had bilateral foot while 60% patients had unilateral foot. More over percutaneous needle tenotomy was effective in 92% patients and was not effective in 8% patients.

Conclusion: Our study concludes that percutaneous needle tenotomy is 92% effective during ponseti technique in the management of congenital club foot deformity in children

Keywords: Efficacy, percutaneous needle tenotomy, Ponseti technique, congenital clubfoot deformity, children.

Introduction:

The management of congenital talipes equino varus (clubfoot deformity) has been transformed in the last two decades as surgical correction has been replaced by the non-surgical Ponseti method.¹ The Ponseti method, consists of corrective serial casting, a percutaneous Achilles tenotomy, followed by maintenance bracing.² This method has been repeatedly demonstrated to give the best results and is globally regarded as the 'gold standard' treatment for paediatric clubfoot.³⁻⁶ Approximately 80% of children with congenital club foot deformity reside in low and middle income countries. Un-treated the child with a clubfoot becomes increasingly disabled, suffers social stigma, pain, and poverty. The low-cost Ponseti method is applicable to clubfoot deformity globally, and particularly

relevant in LMIC's where disability will usually diminish individual productivity. The original method described by Ponseti involves a series of plaster casts changed weekly for a period of six weeks, followed by percutaneous elongation of the Achilles tendon (PAT), and application of a further 'healing' cast for three weeks. The foot abduction bracing phase, is commenced immediately after the tenotomy cast is removed.⁷ Level 4 evidence indicates that the use of a needle rather than a scalpel blade, may be advantageous for severing the Achilles tendon percutaneously. A number of reports advocating the use of percutaneous elongation of the Achilles tendon using the needle technique have now appeared in the literature, and are positive in recommendation.^{8,9} The advantages are ease of technique, reduced complications (bleeding), minimal

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Table-1: Age Distribution (n=139)

Age	Frequency	Percentage
5-12 months	86	62%
13-24 months	53	38%
Total	139	100%

Mean age was 12 months with SD \pm 7.31

Table-2: Gender Distribution (N=139)

Gender	Frequency	Percentage
Male	79	57%
Female	60	43%
Total	139	100%

Table-3: Side of Foot (N=139)

Side of foot	Frequency	Percentage
Bilateral	56	40%
Unilateral	83	60%
Total	139	100%

Table-3: Efficacy (N=139)

Efficacy	Frequency	Percentage
Effective	128	92%
Not effective	11	8%
Total	139	100%

scarring, reduced cost as an out patient procedure using local anaesthesia. In a study by Sirsikir A, et al has showed the efficacy by 90% of percutaneous needle tenotomy during ponseti technique in the management of congenital club foot deformity in children.¹⁰

Rationale: Being a new method, and very few publications in its support, this surgical technique needs further validation by more similar studies. As no such study has been conducted in our setup for the last 5 years to this study will provides us the latest and updated information regarding efficacy of percutaneous needle tenotomy during ponseti technique in the management of congenital club foot deformity in children. Results of my study will produced local evidence and pave the way for further research in this topic in our local population

Material and Methods:

In this study a total of 139 patients were observed. All children were operated with aseptic precautions under short general anaesthesia. The limb was cleaned with 5% povidone iodine

and draped without a tourniquet. Keeping the knee extended, the foot will be dorsi-flexed to make the tendo achilles tight and was palpated as a tight cord posteriorly. A 16/18 gauge needle chosen to cut the tendon, was introduced near the medial border of the tendon 1cm above its insertion over the calcaneum. 18 gauge for children below six months whereas 16 gauge was preferred for those more than six months of age. The tendon was cut by the tip of the needle from medial to lateral direction. While doing so, grating sensation could be felt as fibers of the tendon are severed. The dorsi-flexion force over the ankle was continuously maintained. The completion of tenotomy was marked by a snap and visible correction of equinus allowing at least 10 degrees of dorsi-flexion. Thompson's test was performed in every case to further confirm the completion of section. A complete tenotomy gives a negative Thompson's test due to absence of transmission of movements from calf to heel. The needle was then removed and passive dorsiflexion re-checked. A knee cast with the knee in 90 degree flexion and foot in maximal abduction and 10 degree dorsi-flexion was applied for three weeks. There after, patients was followed up on a monthly basis and efficacy was evaluated after six months.

Results:

In this study age distribution was analyzed as 86(62%) were in age range 5-12 months while 53(38%) patients were in age range 13-24 months. Mean age was 12 months with SD \pm 7.31. (table no 1).

Gender distribution was analyzed as 79(57%) patients were male while 60(43%) patients were female. (table no 2).

Side of foot involved was analyzed as 56(40%) patients had bilateral foot while 83(60%) patients had unilateral foot. (table no 3).

Efficacy of percutaneous needle tenotomy was analyzed as percutaneous needle tenotomy was effective in 128(92%) patients and was not effective in 11(8%) patients. (table no 4).

Table-5: Stratification of efficacy w.r.t age distribution (n=139)

Efficacy	5-12 months	13-24 months	Total
Effective	79	49	128
Not effective	7	4	11
Total	86	53	139

chi square test was applied in which P value was 0.9000

Table-6: Stratification of efficacy w.r.t gender distribution (n=139)

Efficacy	Male	Female	Total
Effective	73	55	128
Not effective	6	5	11
Total	79	60	139

chi square test was applied in which P value was 0.8730

Table-7: Stratification of efficacy w.r.t side of foot (n=139)

Efficacy	Bilateral	Unilateral	Total
Effective	51	77	128
Not effective	5	6	11
Total	56	83	139

chi square test was applied in which P value was 0.7157

Stratification of efficacy of percutaneous needle tenotomy with respect to age, gender, side of foot is given in (table no 5,6,7)

Discussion:

The management of congenital talipes equino varus (clubfoot deformity) has been transformed in the last two decades as surgical correction has been replaced by the non-surgical Ponseti method.¹ The Ponseti method, consists of corrective serial casting, a percutaneous Achilles tenotomy, followed by maintenance bracing.² This method has been repeatedly demonstrated to give the best results and is globally regarded as the 'gold standard' treatment for paediatric club foot.³⁻⁶ Approximately 80% of children with congenital club foot deformity reside in low and middle income countries. Un-treated the child with a club foot becomes increasingly disabled, suffers social stigma, pain, and poverty. The low-cost Ponseti method is applicable to club foot deformity globally, and particularly relevant in LMIC's where disability will usually diminish individual productivity.

Our study shows that mean age was 12 months with $SD \pm 7.31$. 57% patients were male while 43% patients were female. 40 percent patients had bilateral foot while 60% patients had unilateral foot. More over percutaneous needle tenotomy was effective in 92% patients and was

not effective in 8% patients.

In a study by Sirsikar A, et al¹⁰ has showed the efficacy by 90% of percutaneous needle tenotomy during ponseti technique in the management of congenital club foot deformity in children.

In another study conducted by Soomro ZI et al had reported that the correction was obtained in 47 (94%) cases but three infants required Posteromedial release (PMR) operation. Average number of casts applied was 5.7 (range: 4-8), average time for full correction was 10 weeks (range: 4-12 weeks), percutaneous Achilles tenotomy was required in 84% of cases. Mean comparison of Pirani score was significantly decreased at final stage. The Ponseti method is a safe and effective treatment, that PMR surgery is no longer necessary for the majority of idiopathic congenital clubfeet.

Similar results were observed in another study conducted by Alva S et al in which mean age was 102 months with $SD \pm 5.66$. 62% patients were male while 38% patients were female. Efficacy of percutaneous needle tenotomy was 92% during ponseti technique in the treatment congenital club foot deformity in children.

Similar results were observed in another study conducted by Haft GF et al in which 52 patients, bilateral involvement was found in 18 patients (34.61%), involvement of right foot was in 19 patients (36.53%) and left foot involvement in 15(28.84%). Efficacy of percutaneous needle tenotomy was 89% during ponseti technique in the treatment congenital club foot deformity in children. Similar type of result was previously found by Laaveg and Ponseti in which efficacy of percutaneous needle tenotomy was 91% during ponseti technique in children with congenital club foot deformity. In another study, Yamamoto found that bilateral and unilateral affected cases were almost equal in numbers. Changulani et al reported 52% bilateral and 48% unilateral club feet more over the efficacy of percutaneous needle tenotomy was 88% during ponseti technique in children presenting with congenital club foot deformity.

Conclusion:

Our study concludes that percutaneous needle tenotomy is 92% effective during ponseti technique in the management of congenital club foot deformity in children.

Conflict of interest: None**Funding source:** None**Role and contribution of authors:**

Dr Aimal Sattar, collected the data, references and did the initial write up

Dr Muhammad Shabbir, helped in collecting the data and introduction writing

Dr Inayat Ur Rehman, helped in collecting the references and helped in discussion writing

Dr Zeeshan Faisal, helped in collecting the references and also helped in result writing

Dr Wali Muhammad, critically review the article and made the final changes.

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