

IDIOPATHIC TOE WALKING: TO TREAT OR NOT TO TREAT, THAT IS THE QUESTION

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ABSTRACT

The natural history and optimal treatment for idiopathic toe walking are unknown. The literature is full of poorly documented treatment regimens with few even medium term follow up studies. The senior author reports his nearly 30 year approach to this disorder and his failed attempt to perform a follow up study of his particular treatment regimen. We conclude with our considered interpretation of the present state of knowledge about idiopathic toe walking and our treatment opinions.

INTRODUCTION

What should one do when confronted by a 4 year old entirely normal child who attends clinic with his parents because he walks on his/her toes 90% of the time? Lovell and Winter's *Pediatric Orthopaedics*, sixth edition states the following:

"The treatment of ITW [idiopathic toe walking] begins with instructions given to the parents regarding the importance of a long-term commitment to assisting the child with both heel cord stretching and dorsiflexion strengthening exercises.... If toe-walking persists, serial heel cord dorsiflexion casts should be considered....After casting, articulated AFOs with plantar-flexion stops are used fulltime.... If the use of serial stretching casts does not realize a satisfactory clinical improvement in the tendency to toe-walk, then heel cord lengthening procedures will be necessary to effect a change in gait. Persistent toe-walking secondary to a heel core contracture can potentiate both forefoot splay and a disproportionately wide

forefoot compared to the heel. Standard footwear may not accommodate the wide forefoot and narrow heel. External tibial torsion frequently develops to compensate for the lack of foot flat contact. This external tibial torsion deformity becomes more obvious once the heel cord has been lengthened. It may be severe enough to warrant corrective osteotomy."¹

Cincinnati Children's Hospital Medical Center expended great effort and developed an Evidence-Based Care Guideline for Management of Idiopathic Toe Walking. They recommended a similar sequence of PT, casts, AFO and TAL for failures.² Treatment was determined largely by amount of passive dorsiflexion measurements and percentage of time spent toe-walking. A podiatric review recommended a similar program.³

On the other hand, a summary of the evidence for "What is the appropriate evaluation and treatment of children who are toe walkers?" in the *Journal of Family Practice* concluded simply that "There is no convincing evidence that any treatment is necessary for toe-walking."⁴ Others have reached similar conclusions.^{5,6} Middle ground suggesting that treatment is rarely needed are common.⁷ The literature is unclear on the natural history of ITW, whether non-operative treatment is effective, and whether treatment is ever needed.

Since beginning Practice in 1984, the senior author has used the same treatment algorithm for ITW. Children who walked on their toes and were 3 years old (younger if there was a fixed equinus contracture) were treated with 6 weeks in walking plaster casts. If serial casts were necessary to gain neutral dorsiflexion, the 6 weeks began after the serial casts. If the casting failed, an AFO with neutral plantar-flexion stop was used until the child out-grew the device or the family abandoned it. If both these non-operative treatments failed, a tendo-Achilles lengthening was offered. We recently attempted to ascertain the effectiveness of this treatment protocol. Typically, after each treatment, the patient was given a PRN return and the parents were asked to call and make a new appointment if their child began toe walking again. Therefore, we identified 98 patients and sent questionnaires about the effectiveness of my treatment. We received only 14 responses to my questionnaire.

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TABLE 1: Questionnaire

1. How old is your child now? _____

2. Has your child walked with feet flat on the ground since treatment by Dr. Dietz?
 Yes No

If NO:
 a. How long after treatment did your child start toe-walking again?
 Right after treatment stopped
 Number of weeks after treatment stopped _____
 Number of months after treatment stopped _____
 Can't remember

3. Did your child eventually stop toe-walking on his/her own?
 Yes (at what age? _____) No

4. Did your child have other treatment AFTER treatment by Dr. Dietz?
 Yes No

If yes, what treatment? _____

Did this treatment work in eliminating toe-walking?
 Yes No

5. Is your child presently toe-walking? Yes No

If Yes, Does the toe-walking cause problems: Yes No
 What activities does it limit? _____

Therefore, we are unable to determine the effectiveness of my treatment. This prompted us to review the literature once again to try to determine what treatment, if any, is appropriate for ITW.

MATERIAL AND METHODS FOR STUDY OF SENIOR AUTHOR'S PATIENT COHORT

After obtaining IRB approval, a search of our electronic record for patients coded for "toe walking" was done. Many children with ITW were probably coded as "leg deformity" or some other code, but we did not attempt to find these as we had sufficient patients coded as "toe walking" for a reasonable case series study. We reviewed the charts to eliminate all neurological and traumatic causes of toe walking and identified 98 children with ITW. The treatment was abstracted from the medical record. A questionnaire (Table 1) was sent to the last address in the medical record along with consent forms. When a questionnaire was returned to a wrong address, the commercial address service Intelius was used to find a more recent address. We received 14 completed questionnaires.

RESULTS OF THE STUDY OF THE SENIOR AUTHOR'S PATIENT COHORT

Fourteen of ninety-eight patients responded. The mean age treatment was 4 years 8 months (range 2-9 years). Mean age at followup was 10 years 6 months (range 5-21)

Of 10 patients treated by 6 weeks of short leg casts, 5 permanently stopped toe walking and 5 did not. Of 3 patients treated with 6 weeks of short leg cast and botox, all continued to toe walk. The one patient who presented with AFOs prescribed by a neurologist continued to toe walk. Of two patients treated with AFO after failed short leg cast, one quit toe walking and one did not. Of 3 patients treated with AFO after failed short leg cast and botox, 2 quit toe walking and one did not. Of two patients who under went TAL after failed short leg cast and AFO, one quit toe walking and one did not.

Return to toe walking after treatment with a cast or AFO occurred immediately to 6 months after stopping treatment. One patient quit toe walking on his own 2 years after treatment with casts. No patient had treatment elsewhere.

At present eight children were not toe-walking at an average age of 12 years (range 7-21 years) and six children continued to toe walk at an average age of 8 years and 6 months (range 5-14 years). No present toe walkers reported pain or any other foot problem.

MATERIALS AND METHODS FOR ITW LITERATURE REVIEW

A Pub Med review of "idiopathic toe walking" articles in English was performed. The bibliographies of these articles were perused for further references. Articles that reported outcomes of treatment were included.

RESULTS OF ITW LITERATURE REVIEW

Review of treatment literature is summarized in Tables 2-5.

Natural history (Table 2)

Of 103 subjects in three studies who were never treated (except some with physical therapy) 45 resolved and 53 did not. One study of 48 patients had 40 patients continuing to toe walk but the average age at presentation was 3.2 years and the average followup was only 2 years.⁸ A study with 20 year follow up had 8 subjects resolve and one continue to toe walk.⁹ The third study had 29 patients resolve with followup of 3-8 years and 12 continue to toe walk at a followup of 9-14 years.¹⁰

Study**	Patient Number	Ave age at presentation	Range yrs.	Ave F/U	Range	Resolved or improved	Continued Toe walk	comments
8	48	3.2 yrs	?	2 yrs	2-8 yrs	8	40	
9	14	6.2 yrs	3-9.9	20 yrs	14-27 yrs	8	1	
10	41		1-4	?	3-14 yrs	29	12	
Total	103					45	52	Shorter followup, fewer resolved

**Reference number

Study**	Patient Number	Ave age at presentation	Range yrs	Ave F/U	Range	Resolved or improved	Continued Toe walk	comments
9	5	6.8 yrs	5.5-8.8	22.8 yrs	13.8-28.5	3	2	
11	8	7.5 yrs	5-10	6 weeks	NA	7	1	
13	6	5.1 yrs	3.6-7.6	11 yrs	8-12	6	0	
12	44	5 yrs	2-14	14 months	?	29	16	
Total	63					45	19	

**Reference number

Study**	Patient Number	Ave age at presentation	Range yrs	Ave F/U	Range	Resolved or improved	Continued Toe walk	comments
14	5	4.3 yrs	3.3-6.3	1 yr	?	5	0	Improved % of heel strikes?
15	11	11 yrs	5-13	12 yrs	?	8	3	
Total	16					13	3	

**Reference number

Study**	Patient Number	Ave age at presentation	Range yrs	Ave F/U	Range	Resolved or improved	Continued Toe walk	comments
16	10	?	?	?	3 mo-6.5 yrs	10	0	5 lost to f/u
13	7	10.5 yrs	7.5-14	10yrs	5.4-15.6 yrs	7	(2 of 7 occasionally)	
17	15	9 yrs	9.2-13.1	2.9 yrs	1.1-6 yrs	15	(3 of 15 occasionally)	
18	13	7.5 yrs	?	3yrs	1.5-7 yrs	13	Some older still occasionally	
Total	45					45		

**Reference number

Casting and/or AFO (Table 3)

Of 63 patients treated variably with casts and/or AFOs, 45 resolved and 16 continued to toe walk. Casting was 3-10 weeks. AFO treatment length was not clear.

Followup was an average of 6 weeks in one study and 14 months in another.^{10,12} The other studies had followup averages of 23 years and 11 years but comprised a total of only 10 patients.^{9,13}

Botox alone (Table 4)

Of 16 patients reported in 2 studies, 13 were “improved” or resolved and 3 were unchanged at an average followup of 12 months in both studies.^{14,15}

Triceps surae lengthening (Table 5)

Of 45 children treated surgically in 4 studies who reported whether the children quit toe walking or not^{13,16,17,18}, all were reported to have resolved with the caveat that 5 of 17 children in 2 studies occasionally toe walked^{13,17} and of 13 children in another study “some older children walked on their toes occasionally”.¹⁸ One study of 15 patients reported that 10 parents were “satisfied” and 5 were “neutral” or “dissatisfied”.⁸ A gait analysis outcome paper reported that all 14 had improved but not normal gait parameters.¹⁹ A final paper reported that 14 patients surgically treated had increased muscle lengths.²⁰

DISCUSSION

Idiopathic toe walking is not rare in a pediatric orthopaedic clinic and it often, but not always, engenders significant concern for parents. What do we know? The natural history is not known. It appears clear that adults who were toe walkers do not continue to walk in the severe equinus (“ballet position”) that causes much of the concern in childhood. Anecdotally, adult toe walkers have a “bouncing” or “mincing” gait with less than normal heel contact during stance phase. Whether this results in any problems is unknown. The adult foot and ankle surgeons at our institution do not see patients with forefoot or midfoot problems or Achilles tendonitis with a history of persistent childhood ITW. It is quite possible that it is a physiologically benign condition. Evidence to the contrary is lacking. Using surrogates for a history of toe walking, such as a tight gastrocnemius in adulthood is poor evidence.²¹ This does not mean the condition should not be treated. An abnormal gait can be a cosmetic problem that causes social problems for children and adolescents. Treatment of such deformities is a common and valuable part of orthopaedic surgery. We should, however, be clear on the reasons for treatment. Without better evidence for long-term harm, we believe that treatment should be offered if the cosmetic aspects of toe walking trouble the patient or parents. If the toe walking troubles neither the child nor the parents, no treatment is appropriate.

If the decision to treat is taken, what treatment is effective? It is not clear from the variable and poor quality studies that botox, casting, or AFO affects the ultimate natural history of toe walking. It is possible that these treatments speed resolution of toe walking in some children who were destined to stop toe walking anyway. Since they are non or minimally invasive, an argument can be made to try any or all of them if the

alternative is surgical lengthening. On the other hand, there are costs (time, direct expenses for casts/braces, doctor visits) that are not insubstantial in an aggressive non-operative approach that is not proven to be effective. Surgery seems to be effective in most patients in eliminating or improving toe walking. The gait is not always normalized and sub-clinical weakness is still apparent after a year. The risks of surgery are small and the expense is significant.

CONCLUSIONS

1. We believe idiopathic toe walking should be considered a cosmetic deformity and treated only if the gait troubles the family.
2. Non-surgical treatment can be used in surgery-averse families even though its effectiveness is uncertain.
3. Surgical treatment is a reasonable choice for families desiring rapid resolution of the toe walking.

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