

Correction of Pigeon Toe or In-Toeing in a 2½ y female with Chiropractic treatments: A case report

Lisa M Stowell and Charles Blum

Introduction: Pigeon-toe or in-toeing is a relatively common condition in childhood causing the toes to point inward or feet to excessively internally rotate when standing or walking. While this condition usually resolves as the child ages it does appear to affect a child's gait, causing repetitive falls. Sometimes a child's self-esteem may also be adversely affected by this condition. This case report discusses care rendered to a 2 ½ year old female child presenting for chiropractic care with bilateral in-toeing in an interdisciplinary clinic.

Methods: Treatment was rendered that included "low force techniques," Sacro-occipital technique, and cranial techniques to address spinal, lower extremity, and postural imbalances ~ possibly contributing to the patient's in-toeing.

Results: Following the third treatment, the patient was able to walk with one foot pointing straight ahead and by the fourth office visit was walking and standing with both feet pointing straight ahead. Further care continues to sustain progress with intervals between treatment extended as the patient's progress is maintained.

Conclusion: This case may demonstrate a conservative, effective treatment for a subset of children presenting with in-toeing ~ particularly when watching and waiting is not preferred and the child's gait, repetitive falls, and self-esteem are being adversely affected by this condition.

Indexing Terms: Chiropractic, Sacro-Occipital Technique (SOT); Pigeon Toe; In-Toeing

Introduction

Pigeon toe, also known as in-toeing, is a condition that causes the toes to point inward or feet to excessively internally rotate when walking. It is most commonly found in infants and children around two years of age and is said to gradually resolve as the child ages during their various growth and development phases. (1) In-toeing is not a newly found condition but has been studied in literature since the turn of the 20th century. (2, 3, 4) This condition is best treated by conservative methods and only (very rarely) does a child need to be seen by an orthopedist for casting or surgery. (5, 6, 7)

Some literature suggests in-toeing may be a normal variant occurring in childhood (8) though may be related to 'constrained intrauterine position', associated with 'arrested normal postnatal development.' (9) Another study

... In-toeing is common in toddlers and in this case a 2½ y child responded and achieved normal posture and gait with a short schedule of low-force care including to the iliotibial bands, and cranials in the SOT manner'



suggest that in-toeing type presentations 'in children are most frequently the result, either directly or indirectly, of sleeping, sitting, and play habits of infancy.'(10) Some of the most common causes of in-toeing are: *Metatarsus adductus*, internal rotation of the tibia, and or *femoral anteversion*. (11) While most cases will resolve by the time a child is 4 years old, 'bilateral in-toeing after the age of four and unilateral in-toeing after the age of seven should be monitored.' (12)

If this condition will tend to resolve as the child ages ~ is it important to even consider conservative interventions for treatment purposes?

In-toeing is a persisting condition which is seen with a child at rest, standing, walking and running. During formative growth and development its effect on the kinematic myofascial chain may be profound or nuanced. Since this can affect a child's ability to walk or run without tripping over themselves and falling, it can affect a child's confidence with their peers and cause concern for parents. Therefore 'watching and waiting' does not often feel like therapeutic consideration a parent wants to pursue.

Conservative low risk options that treat the child's myofascial skeletal system, their kinematic chain, and offer an effective viable alternative to the child/parent 'waiting it out,' may be something worthy of consideration. This paper discusses conservative chiropractic treatment of a 2½ y female presenting with bilateral in-toeing.

Case Report

Assessment

A 2 ½ y female presented to my office with her mother for correction of in-toeing while walking. The mother noted that her child would often trip over her feet and fall, believed due to her child's foot position when walking or running.

The patient was a very healthy young female, 2 ½ years old. Her mother primarily gave her a diet of organic food such as child's snacks consisting of seaweed crunch wafers and other plant based snacks. The patient had no serious illness or history of surgeries, she was not on any medications and had not had any serious traumatic events happen to her in her life at the time of her examination and chiropractic treatment.

Because the patient was so young and only compliant to a certain extent, the initial examination was somewhat minimal and brief. Upon checking her *iliotibial band* bilaterally, at the same time I noticed she was hypermobile on passive pronation. Visual examination showed hyper-pronation with toe abduction bilaterally in her stance and gait. Range of motion of her lower torso was unremarkable. Although the patient appeared to walk in a somewhat normal fashion (without any limp or other impaired action), in-toeing bilaterally was notable. Palpation of the *iliotibial bands* bilaterally demonstrated some sensitivity illustrated by the patient's apprehensive response. The pre and post assessment measurements used were primarily visualisation and palpation, as well as communication with the mother if the patient had diminished tripping and falling at home after treatments and any diminution of her in-toeing presentation.

The diagnostic or assessment strategies used to test for the integrity of the *iliotibial bands* were assessing palpatory tension and the *iliofemoral* assessment and treatment (13) utilised in Sacro-Occipital Technique (SOT). The patient would be watched when entering the office, walking in the hallway, and on her presentation during treatment. While it wasn't clear if the definitive cause of the patient's in-toeing related to femoral or tibial inner rotation there did seem to be some over compensation of the iliotibial bands likely affecting the lower extremity kinematic chain position and function.

Treatment/Intervention

Treatment consisted of a chiropractic technique informally learned in chiropractic college from a classmate for the purposes of this study called '*Low Force Technique*.' It consists of gentle realignment of the entire spine using a force that is not defined by an audible/cavitation and is applied with my right thumb and middle finger contact to the patient's vertebra on either side of the transverse process. Tissue tension is applied inferior to superior, with a straight arm of the same hand while the opposite hand utilises a medium force slide down it to apply the force to the selected vertebral segment. A vertebral segment is considered subluxated when there is reduced intersegmental motion, increased local paravertebral muscle tension, and/or an indication of sensitivity (verbal or body apprehensive cue) by the patient upon palpation.

Due to the unusual tension in the *iliotibial bands*, trigger point therapy to the *iliotibial bands* bilaterally was also administered until relaxation was obtained. This was performed with the child sitting in what was her customary manner, with her legs extended and feet internally rotated, as low force technique was applied on both articular processes of various vertebrae in the *lumbothoracic* region and to her *iliotibial bands* bilaterally. As treatments continued we noticed that she was sitting with her feet angled in a more straight or externally rotated angle in this same position. It was believed that the position of her feet while sitting and being treated for her *iliotibial bands* may have contributed to facilitating the correction of her in-toeing, though clearly more study is needed to see if this can be generalised.

Due to the patient's apprehension the treatment rendered initially had to be improvised based on the position of preference, which was sitting with her legs extended and feet internally rotated however, as treatments continued and she would sit with her hips more relaxed and feet less internally rotated. This allowed better success with the outcome and it is possible that this position may have contributed to the effectiveness of the care to her spine and *iliotibial band*.

By the third and fourth office visit the patient felt like she could trust that I wouldn't be hurting her and allowed me to also administer some cervical manipulation adjustments and eventually cranial manipulation was also allowed by the sixth visit. Also, in later visits, when the patient would agree to be in a supine or prone position, her spine and pelvis could be more thoroughly assessed and treated. During this time SOT pre and post assessments for pelvis and cervical spine balancing could be performed (14) which also seemed to confirm improved static and functional position of the spine and lower extremities.

Cranial misalignment was noted as well in her occipital, parietals, and temporal bones as determined by palpation of the cranial sutures. With a 2½ y child the sutures and cranial bones are more pliable than in an adult so the forces applied were gentle, with slight pressure and then waiting for the tissue response. While working on her cranial sutures if a particular suture felt compressed or if palpated to have more space than anticipated light pressure would be applied to either spread apart the bones of a compressed suture or bring a suture that palpated as expanded closer together. Post treatment I was looking for balanced sutural and global cranial symmetrical motion.

With children that are not compliant with positioning, such as with this child in the first couple sessions it is difficult to determine the effectiveness of any intervention. However with this child one important indication following treatment was her diminished in-toeing. She also demonstrated an ease to sit with a more comfortably erect spine as opposed to prior treatment when she was unconsciously sitting with her thoracolumbar spine in a crouched/forward position.

Results

By the third office visit the patient was walking with one foot straight and by the fourth visit she was walking with both feet mostly straight ahead, though the left foot still had some signs of in-toeing. The fifth and follow up visits showed her to continue to walk without in-toeing. The patient's mother reported that the child did on occasion tend to stand somewhat in-toed for a moment or so, as well as still sometimes trip a little but her coordination and ability to catch herself on these occasions is much better than it was prior to treatment.

Other indicators that showed success of chiropractic intervention are the reports by her mother noting that although her child would sit with both legs and feet externally rotated, she was beginning to sit back more on her buttocks and less positioned in a forward lean on her knees. This suggests that her hips and upper thighs were beginning to relax, allowing for improved balanced anatomical sitting posture.

Discussion

As with any case report it is difficult to generalise the findings of any intervention due to not being able to rule out the placebo or ideomotor effect, regression to the mean, or other common confounders. Since in-toeing is often a self-limiting condition and usually resolves on its own it is possible that early intervention assisted her condition to resolve. However resolution of toe-in would reasonably be expected to occur over time and the temporal relationship between the treatment and her relatively immediate recovery, suggest that the care may likely have had an influence in her recovery.

With children it is often difficult to rule out hypermobility considerations affecting her initial presentation and it may be possible that patients with *benign joint hypermobility syndrome* could be predisposed to toeing-in type presentations. Since the patient's feet were not directly treated it is more likely that the treatment was successful due to its effect on the tibial or femoral rotation patterns, (15, 16) kinematic chain due to improved spinal function, (17, 18) or possibly a central nervous system effect on postural righting affecting the plantar mechanoreceptors. (19, 20, 21)

Further clinical research is needed to determine if there are different conservative care applications for children with in-toeing and whether this care would vary if the cause of the presentation is due to metatarsus adducts, internal rotation of the tibia, femoral anteversion, spinal imbalanced function, and/or related to central nervous system component contributions. Differentiation between hypermobile presentations whether pathological (e.g. *Ehler Danlos*, *Marfan Syndrome*, etc.) or a normal variant (e.g., *Benign Joint Hypermobility Syndrome*) (22, 23) will need to be explored since the approach to care may differ. This is because a hypermobile presentation might warrant different strategies than a patient presenting with joint restriction or hypomobilities in the spine, pelvis, or lower extremity kinematic chain.

The care rendered appeared to be safe and well received. One contraindication might be if there was an osseous related pathology contributing to her presentation and delay of treatment might have an adverse effect on her outcome. However by the fourth office visit the patient appeared to be in a more symmetrical (no in-toeing) position statically (viewed at rest) and functionally (visualised during gait assessment), so further care was rendered to sustain this positive outcome.

As the patient maintains this improved position and function, length between treatments will increase, though the parents are currently generating the treatment schedule due to their concern for their child and positive outcome to care to date. It is believed that in the future some physical therapy may be also helpful to sustain correction and function of the iliotibial bands for proper maintenance of the bilateral in-toeing correction.

Conclusion

This study presented information about chiropractic care incorporating a 'low force technique,' SOT, and cranial manipulative strategies for a 2½ y female presenting with pigeon toe/in-toeing in both static and functional assessments.

Following the third treatment, the mother noted significant improvement and her condition appeared to resolve almost completely by the fourth treatment, approximately within a 2 week period.

Further case reports must be published with other children to determine if this was an isolated case or whether this type of care could represent a conservative effective treatment for a subset of children presenting with toeing-in, particularly when watching and waiting is not preferred and the child's gait, repetitive falls, and self-esteem is being adversely affected by this condition.

Charles L Blum

DC

Director of Research

Sacro Occipital Technique Organization - USA

Private practice of Chiropractic

Santa Monica, CA

Lisa M Stowell

DC

Private practice of Chiropractic

Austin, Texas

synergizedhealthhb@gmail.com

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