



## In-toeing

In-toeing is a common concern a pediatric orthopaedic surgeon is asked to evaluate in a young child, even though it almost always corrects without treatment. The goals of this article are to help the primary care physician establish the cause of a child's in-toeing, provide information on the natural history, and offer recommendations about when to refer a child to a pediatric orthopaedic specialist.

The most common conditions resulting in in-toeing are: metatarsus adductus, internal tibial torsion, and femoral anteversion. All three of these conditions can be caused by developmental issues in utero and/or by genetic predisposition. Prevention of these conditions is not possible.

**METATARSUS ADDUCTUS** The hallmark of metatarsus adductus is a forefoot that is curved inwards. It is typically noticed during infancy. It can be mild & flexible, severe & rigid, or anywhere in between. Metatarsus adductus usually improves on its own over 4-6 months (particularly if it is flexible) with full resolution expected by age 2. Stretching exercises are often recommended to hasten the resolution, although the efficacy of this is unclear. The parent is instructed to hold the heel firm between the thumb and index finger of one hand while the other hand applies gentle lateral pressure to the forefoot (Fig. 1). This should be done several times a day, such as with diaper changes.



Figure 1. Metatarsus adductus, before and during stretching.

Referral to a pediatric orthopaedic surgeon is indicated if the metatarsus adductus has not had a noticeable improvement by age 6 months, or if it is rigid (i.e. the curvature of the foot cannot be straightened during the aforementioned stretch maneuver). The orthopedist will typically use casting and/or special shoes to correct the more severe cases of metatarsus adductus, with surgery as a rare indication in the most severe persistent cases.

**INTERNAL TIBIAL TORSION & FEMORAL ANTEVERSION** Internal tibial torsion is an inward twist of the tibia. It occurs before birth but is often unnoticed until the child starts to walk. Internal tibial torsion is best diagnosed on physical exam by looking at the thigh-foot angle (TFA), which is the angle between the axis of the thigh & foot when viewed from above with the patient lying prone and the knees flexed to 90° (Fig. 2). In a young child, the average TFA is about 5° external. Children with obvious in-toeing due to internal tibial torsion often have a TFA of more than 10° internal.

Femoral anteversion occurs when there is an inward twist of the femur. Although present before birth, it does not often lead to noticeable in-toeing until age 2-4. The normally limited internal rotation of the hips in infants and young toddlers "masks" the in-toeing effects of femoral anteversion early on. The in-toeing then becomes more obvious as the hips gain internal rotation, and is often most prominent at age 5-6. Femoral anteversion causes the knees and feet to point inward when walking. Children with femoral anteversion often prefer to sit in the "W" position as opposed to the crossed-leg position. Femoral anteversion is best diagnosed by measuring hip rotation with the child lying prone and the knees flexed to 90° (Fig. 3). Care must be taken to make sure the pelvis is flat and level on the examination table. Although hip rotation varies greatly in young children, a good rule of thumb is that a normal 5-year-old child will have about 50° of internal rotation and 50° external rotation. Femoral anteversion is present when the internal rotation significantly exceeds the external rotation.

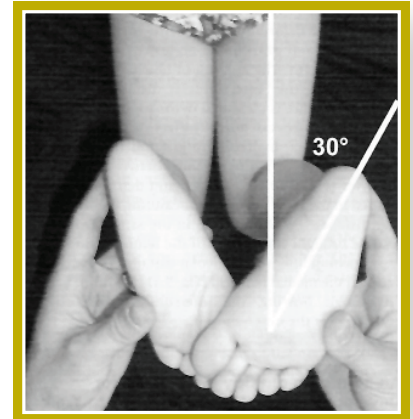


Figure 2. Internal thigh-foot angle indicates internal tibial torsion.

Referral to a pediatric orthopaedic surgeon is indicated if the femoral anteversion has not improved by age 6-8. Femoral anteversion is best diagnosed by measuring hip rotation with the child lying prone and the knees flexed to 90° (Fig. 3). Care must be taken to make sure the pelvis is flat and level on the examination table. Although hip rotation varies greatly in young children, a good rule of thumb is that a normal 5-year-old child will have about 50° of internal rotation and 50° external rotation. Femoral anteversion is present when the internal rotation significantly exceeds the external rotation.

  
**IN ABOUT 90% OF CHILDREN, THE TIBIAL TORSION OR FEMORAL ANTEVERSION SLOWLY RESOLVES BY AGE 6-8 (TIBIAL TORSION TENDS TO RESOLVE MORE QUICKLY THAN FEMORAL ANTEVERSION).**  


Nearly all of the other 10% of children function perfectly well despite the residual in-toeing. The residual in-toeing will not lead to arthritis, and will not inhibit any future athletic aspirations. Studies have shown that the use of casts, braces, splints, special shoes, and exercises do not hasten the correction, and are therefore not recommended. Younger children with in-toeing tend to stumble and fall frequently due to their toes hitting the opposite heel. This resolves as the child grows and gets stronger and more coordinated, even well before the in-toeing itself resolves. In the rare case of a child that has significant walking problems that has not improved by age 8, a referral to a pediatric orthopaedic surgeon is indicated for consideration of a derotational osteotomy, where the surgeon cuts and rotates the bone straight.

**OTHER INDICATIONS FOR REFERRAL** Table 1 lists other recommended indications for a referring a child with in-toeing to a pediatric orthopaedic specialist.

**TABLE 1. OTHER REFERRAL INDICATIONS**

**Symptoms:**

- Pain
- Swelling
- Limp

**History of:**

- Significant hip or foot problems (in the patient and/or in family members)
- Problems during the pregnancy, delivery, or perinatal period

- Developmental delay
- Neurologic or muscular disorders
- In-toeing noticed only after recent trauma

**Examination findings:**

- Other lower extremity deformities
- Only in-toes during swing phase of gait
- Muscle spasticity
- Limited hip, knee, or ankle motion
- In-toeing is significantly asymmetric

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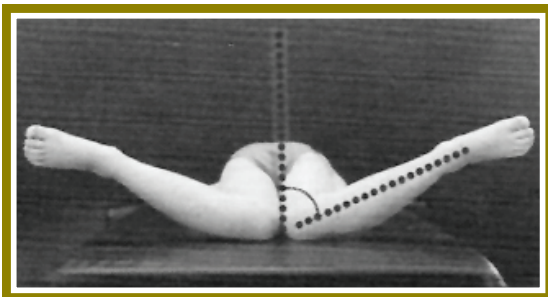


Figure 3. Internal hip rotation significantly exceeds external rotation in femoral anteversion.

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 Children's Orthopaedics of Atlanta provides referrals that are worthy of your reputation.

**AND, HERE'S WHY:** We have six board eligible/certified pediatric fellowship trained orthopaedic surgeons, two sports medicine trained pediatricians and seven orthopaedic physician assistants, and one athletic trainer. These providers comprise the majority of orthopaedic providers at Children's Healthcare of Atlanta at Scottish Rite. The Orthopaedic Program at Children's was ranked fifth in the country by Newsweek Magazine in 2009.

Children's Orthopaedics of Atlanta, PC has four bilingual scheduling operators and one pediatric orthopaedic surgeon fluent in Spanish. The availability of a Spanish speaking surgeon and support staff will be very valuable to your Spanish speaking parents and patients.

**THE TESTIMONIALS FROM REFERRING PRACTICES CONFIRM THE FACT THAT OUR PATIENTS AND FAMILIES ARE TREMENDOUSLY SATISFIED WITH OUR PHYSICIANS AS WELL AS OUR SUPPORT AND OFFICE STAFF.**

We have six convenient locations throughout greater Atlanta for initial evaluation and follow-up. These locations throughout the area make it easier to refer your patients to one of our offices near your patient's home or parent's workplace.

Our surgeons provide twenty four hour a day seven days a week emergency room coverage at Children's Healthcare of Atlanta at Scottish Rite Hospital - the only hospital in Georgia to have its emergency room continually covered by a fellowship trained pediatric orthopaedic surgeon.

