



The Toddler Gait— Normal or Not

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Figure 2. An infant with typical appearance of metatarsus adductus.

Abstract

The first birthday is a time of great joy and relief for most parents as they celebrate the emergence of a toddler from the tiny newborn handed to them after entering the world. Along with this transition comes new conquests and concerns, including the milestone of walking. When parents view the toddler's ability to walk as delayed or abnormal, the pediatrician can be confronted with an anxious or confused parent. A thorough history with a detailed examination and reassurance will go a long way toward allaying parental fears and building trust. However, a sufficient understanding of the concerns most frequently voiced by parents and the ability to reassure them in an educated fashion is essential to the office clinician. [*Pediatr Ann.* 2015;44(5):187-190.]

The emergence of walking is thought by most parents to occur approximately at age 1 year. Developmental screening tools

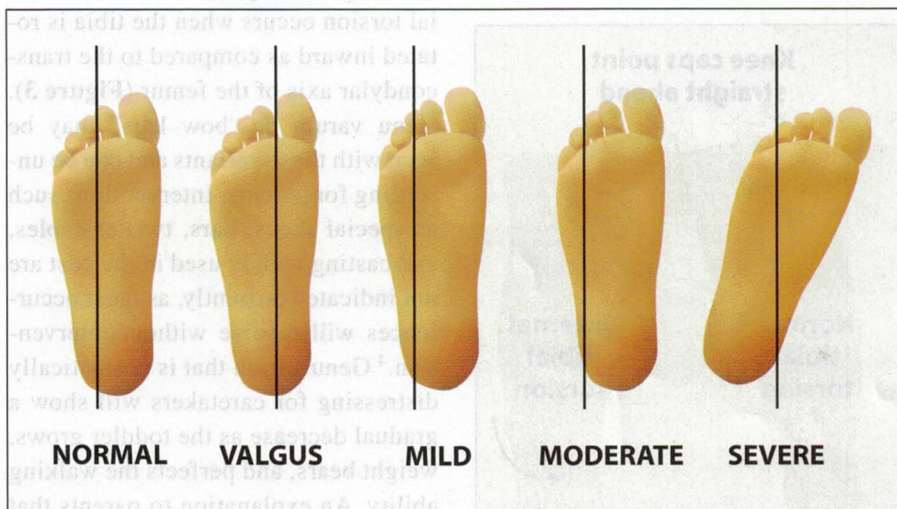


Figure 1. Classification of metatarsus adductus.

such as the Denver Developmental Screen II (DDS) and the Ages and Stages Questionnaire (ASQ) show this to be generally accurate.¹ The DDS indicates the 75th percentile for walking to be at approximately 13 and a half months, and the ASQ signifies that at age 13 months most children will be ambulating independently.² By the time the 15-month examination arrives, most parents will have at least some concern if the child is not yet close to walking. A thorough review of family and birth history, if not already known to the examiner, is essential during this visit, along with the physical examination, to provide appropriate referral or most often, reassurance. For those toddlers that have begun to walk, the anxiety of the

parent now shifts to the perfection of the gait itself as well as possible structural concerns.

THE EMERGING WALKER Variations and Structural Differences in Gait

The appearance of the lower extremity in young children can vary widely from child to child, but most usually represent normal-for-age structural variants. In-toeing, “bow-leggedness,” and out-toeing are the most commonly noted and the child who appears to have one of these issues will likely be a source of worry for most parents. In-toeing or walking with the toes pointing toward the midline is one of the most prevalent reasons for initial orthopedic consul-

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Figure 2. An infant with typical appearance of metatarsus adductus.

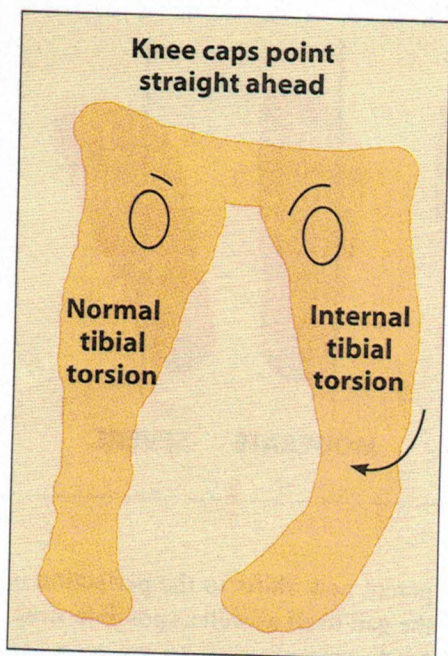


Figure 3. Relationship of the tibia to the knee and foot in internal tibial torsion.

tation. The underlying cause for this type of gait is one or a combination of metatarsus adductus, internal tibial torsion, or femoral anteversion.³ Metatarsus adductus in the absence of other lower extremity deformities is usually caused by in-utero positioning and constriction of the fetus, and is present at birth. It is the most common congenital foot deformity and the likely cause of in-toeing in the early walker or infant. On physical examination, a normal hindfoot is present; however, the forefoot is devi-

ated medially causing a “c” or “kidney bean” shape to the foot (**Figure 1 and Figure 2**). In the vast majority of cases, careful monitoring along with reassurance is all that is required. Intervention, usually in the form of casting, is required in only the most severe cases in which the deformity is quite rigid and the foot is unable to be passively positioned to the midline.

Tibial torsion is one of the most frequent causes of toddler in-toeing and may accompany metatarsus. Tibial torsion occurs when the tibia is rotated inward as compared to the transcondylar axis of the femur (**Figure 3**). Genu varum or “bow legs” may be seen with these variants and can be unsettling for parents. Interventions such as special shoes, bars, twister cables, and casting widely used in the past are not indicated presently, as most occurrences will resolve without intervention.⁴ Genu varum that is cosmetically distressing for caretakers will show a gradual decrease as the toddler grows, weight bears, and perfects the walking ability. An explanation to parents that the normal transition of the toddler gait from varus to valgus can last from beginner walker to approximately age 4 years may be helpful. Noting that the varus may increase during the early phase of walking and may be more pronounced in early walkers may also comfort troubled parents.

Another frequent cause of in-toeing is femoral anteversion, which often coexists with tibial torsion. This developmental variant usually becomes apparent somewhat later in the young walker—between ages 2 and 4 years—and is most noticeable in the 5- to 6-year-old child. Anteversion is the most frequent cause of in-toeing in toddlers older than age 3 years. It is most often symmetrical, and for unclear reasons, more common in girls than boys.⁵ Femoral anteversion is caused by an excessive degree of tor-

sion on the femur near the hip, forcing it to turn inward. Most children with this deviation walk with both the knees and feet pointing toward the midline (**Figure 4**). The child may look awkward when running or participating in athletics, often tripping due to the catching of the heel by the front of the moving foot. Sitting in the “W” (**Figure 5**) position is often more comfortable than the “criss-cross” style for these children. Contrary to popular belief by parents, preschool teachers, and some health care professionals, correcting this posture does not necessarily change the natural course of the deformity.⁶

As alluded to above, bow legs, or genu varum, may include tibial torsion but also includes bowing of the femurs as well as the tibia bones. Toddlers with physiologic bowing are of normal stature and have symmetrical and bilateral deformities. This developmental deformity almost always resolves itself as the normal physiologic progression of lower extremity development takes place.

Although much less common than in-toeing, out-toeing, when present, still evokes uneasiness in the parents with toddlers. The appearance of out-toeing is usually symmetrical and bilateral with both the feet and knees pointing outward. This can be most evident during observation of a toddler’s gait walking to and/or away from the toddler’s parent, as well as when running. The most frequent causes of out-toeing are external rotation contracture of the hip, external tibial torsion, and femoral retroversion. Infants are born with the hips externally rotated and flexed, resulting in the appearance of out-toeing. This manifestation of out-toeing, due to external rotation contracture, usually corrects itself around the time of the first birthday. Likely caused by intrauterine positioning, external tibial

torsion is most common in the premature infant,⁷ although it is frequently not identified in the toddler but in a somewhat older child. This deviation is one that does not undergo physiologic self-correction and in rare cases may cause discomfort or coordination issues. Femoral retroversion is another albeit unusual cause of out-toeing. It results from a decrease in the amount of internal rotation of the hip joint as compared to external rotation. A history along with a focused lower extremity examination will likely provide the evidence needed for follow-up, and potential orthopedic referral.

THE PEDIATRIC EVALUATION

Obtaining family history is important as some gait variations can be familial, such as in-toeing caused by femoral anteversion or out-toeing as a result of femoral retroversion and external tibial torsion. Inquiries regarding the concern should include: (1) whether it is unilateral or bilateral, (2) the achievement of other developmental milestones, and (3) the presence of limping or excessive falling. Any constitutional symptoms such as weight loss, persistent fever, pain, or a worrisome birth history should prompt immediate referral and evaluation.

The lower extremity examination in the toddler can be a challenging, but telling event. Although measurement of the angles necessary for an exact diagnosis are beyond the scope of the general pediatric examination, familiarity with these standards are most helpful in assessing the need for orthopedic referral.

All toddlers should be examined while sitting, lying prone, and running both toward and from the pediatrician. Ideally, this should be accomplished at the beginning of the visit before the patient becomes more fearful and therefore less cooperative. The gait

should be studied for in-toeing and out-toeing, unilaterality, or clumsiness out of proportion to age.

The running toddler may also better demonstrate the concern in question. An accurate height and weight should be obtained as these measurements can be helpful in the decision to refer orthopedically or for follow-up care with the pediatrician. The child should also be placed in the sitting position with legs dangling as well as with both legs folded on the examination table. The position of the medial and lateral malleoli should be noted as well as the position in which the child seems most comfortable, whether "W" or legs crossed. When the toddler is in the prone position, the examiner will again observe the position of the feet, lower legs, and thighs when the knee is bent and the foot flexed. The heel bisector line, which travels from the midpoint of the heel to the toes, will ideally bisect the second toe. A line that bisects lateral to the second toe is consistent with metatarsus adductus. (This is also the case when the lateral malleolus is anterior to the medial malleolus in the sitting position with the legs dangled.) When seated on the examination table with legs dangling, a child's knees and feet can be observed relative to the position of the long axis of the thigh. A forefoot that points away from the midline (outward) as opposed to toward the midline (inward) is likely consistent with rotation in the normal range. Alternatively, an inward-pointing foot is possibly consistent with internal tibial torsion. The presence of femoral anteversion can be determined with some accuracy by internal and external rotation of the hips while the child is lying prone. Internal rotation greater than 50 degrees is evidence of femoral anteversion. At times, the child is able to lay the legs completely flat on the examination table. Limited external



Figure 4. A child with femoral anteversion.

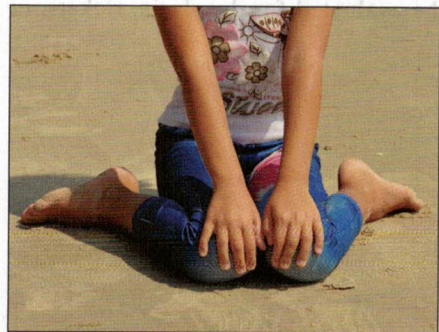


Figure 5. A child sitting in the "W" position.

rotation (when the child is prone) is an indicator of possible femoral retroversion.

Once the check has been completed, the office clinician now has evidence on which to offer parents appropriate reassurance or orthopedic referral. Metatarsus adductus, tibial torsion, and femoral anteversion in the great majority of instances can be monitored by the primary care physician. Parents can be asked to return in a few months, usually at the next routine well-child visit. If the child's baseline changes in the interim, such

as emergence of a limp, pain, or decreased activity, the family should be instructed to come in for an urgent visit. Other defined causes of a gait abnormality such as external rotation contracture or femoral retroversion should prompt an initial referral to a pediatric orthopedic specialist. If further observation is all that is required, it is likely it can be accomplished during routine pediatric visits, as long-term morbidity from these conditions is still quite rare. Other indications from the examination, such as unsolicited toe walking after age 3 years or walking unilaterality, may be best handled by a pediatric neurologist to assess for cerebral palsy or other neurologic causes, assuming hip and lower leg deformities have already been excluded. Toddlers with stature below the 3rd percentile or a possible underlying metabolic etiology should be evaluated for dysplasia, rickets, or

renal disease. Most often these toddlers are considered to be late walkers as compared to their cohorts.

FINAL THOUGHTS

Toddlers who are early walkers, larger children, and children with genu varum beyond age 2 years may be affected with Blount disease. There are both infantile and adolescent forms with the former more common in African American girls.⁷ It is an illness of unknown etiology and is diagnosed by a distinctive radiographic appearance of a "beaked" medial tibial physis. It is generally treated with surgical intervention.

Insight into the normal progression of the infant-toddler gait is essential for the primary care physician. Familiarity with the common causes of gait variants can aid the practitioner with the decision to observe or refer to an orthopedic specialist, as well as providing the clinician with the ability to comfort concerned

parents. These issues will almost always resolve normally, with relieved parents and a fearless toddler scurrying through your office.

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