

## Femoral Anteversion

The clinical significance of femoral anteversion is controversial. The contribution of excessive anteversion to childhood intoeing is accepted, whereas the relationship, if any, between anteversion and osteoarthritis of the hip and knee in adulthood remains uncertain.

### DEFINITION

Femoral anteversion is defined by the angle of the femoral neck in relation to the femoral shaft in the coronal plane (Fig. 19–1). The degree of anteversion is greatest in infancy and gradually decreases as skeletal maturity is approached. In infants, the mean degree of anteversion is about 40 degrees, which by adulthood has decreased to 16 degrees. When anteversion is increased or when it fails to decrease with age, the gait is altered and the person walks with the hip internally rotated. This rotation produces a gait in which the patella is medially rotated in stance phase and the foot is also internally rotated, resulting in intoeing. In some individuals there is excessive internal rotation of the tibia, which increases the degree of intoeing. In others there is external rotation through the tibial segment, which reduces the intoeing. The latter combination produces an awkward gait that is accentuated during running; the feet swing out to the side in swing phase.

### CLINICAL CHARACTERISTICS

Children with excessive femoral anteversion come to medical attention because of an intoeing gait. This gait may be noted when the child first begins to walk, or it may be noted later in childhood, when the intoeing fails to resolve. Parents also note that the child trips on the intoed feet and that the intoeing is more prominent with running. The condition is not painful.

The physical examination confirms the diagnosis (Fig. 19–2). The knees are internally rotated in the stance phase of gait and the feet follow unless external tibial torsion is present. There is excessive internal rotation of the hips and decreased external rotation. This is best demonstrated in the prone position (Fig. 19–3). The degree of tibial torsion, which is measured by the thigh-foot angle, is also noted in the prone position. In severe cases there may be 90 degrees of internal rotation of the hip and no degree of external rotation.

### DIFFERENTIAL DIAGNOSIS

Intoeing may be due to increased femoral anteversion, internal tibial torsion, and metatarsus adductus. A child with some residual of a clubfoot deformity will intoe because of internal rotation of the foot. Intoeing may be the presenting symptom of a child with mild cerebral palsy; the reflex examination, muscle tone evaluation, and a developmental assessment will suggest the correct diagnosis.

### PROGNOSIS AND NATURAL HISTORY

Most children with excessive anteversion gradually outgrow the tendency to intoe. In most cases this occurs through a gradual reduction in the degree of anteversion. In some children the intoeing resolves as external tibial torsion increases. This is especially likely to occur in children with spastic cerebral palsy. In a small group of children, however, the intoeing fails to improve.

Shands and Steele found that the reduction in anteversion continued throughout growth. Children between ages 3 and 12 months had an average of 39 degrees of anteversion, which decreased to 31 degrees by the end of the second year. Subsequently the anteversion decreased by 1 or 2 degrees a year through age 10 to an average of 24 degrees. Between ages 14 and 16 there was a further decrease, from 21 to 16 degrees (Fig. 19–1).<sup>25</sup> Fabry and co-workers studied 1,148 hips over 20 years and found that anteversion decreased from 40 degrees at birth to 16 degrees at age 16.<sup>7</sup> In 175 patients with intoeing the average anteversion was 42.7 degrees, which they considered to be 18.5 degrees above normal.<sup>7</sup> Over a 5-year period they saw no reduction in anteversion and concluded that after age 8 there would be no spontaneous correction of anteversion. Half of the patients walked without intoeing at the second examination, and this improvement was attributed to the development of external tibial torsion. Matovinovic and co-workers reported that children with normal gait and children who intoed experienced a gradual reduction in anteversion between ages 7 and 14. Anteversion in the children with normal gait decreased by 1 degree per year and in the intoeing children by 1.6 degrees per year. Children with outtoeing did not experience any change during the study period.<sup>15</sup> Svenningsson and colleagues studied 30 children with intoeing and found that in all but 5, the intoeing resolved spontaneously over 9 years. The degree of internal rotation of the hip decreased from 74 degrees to 53 degrees during the same period.<sup>29</sup>



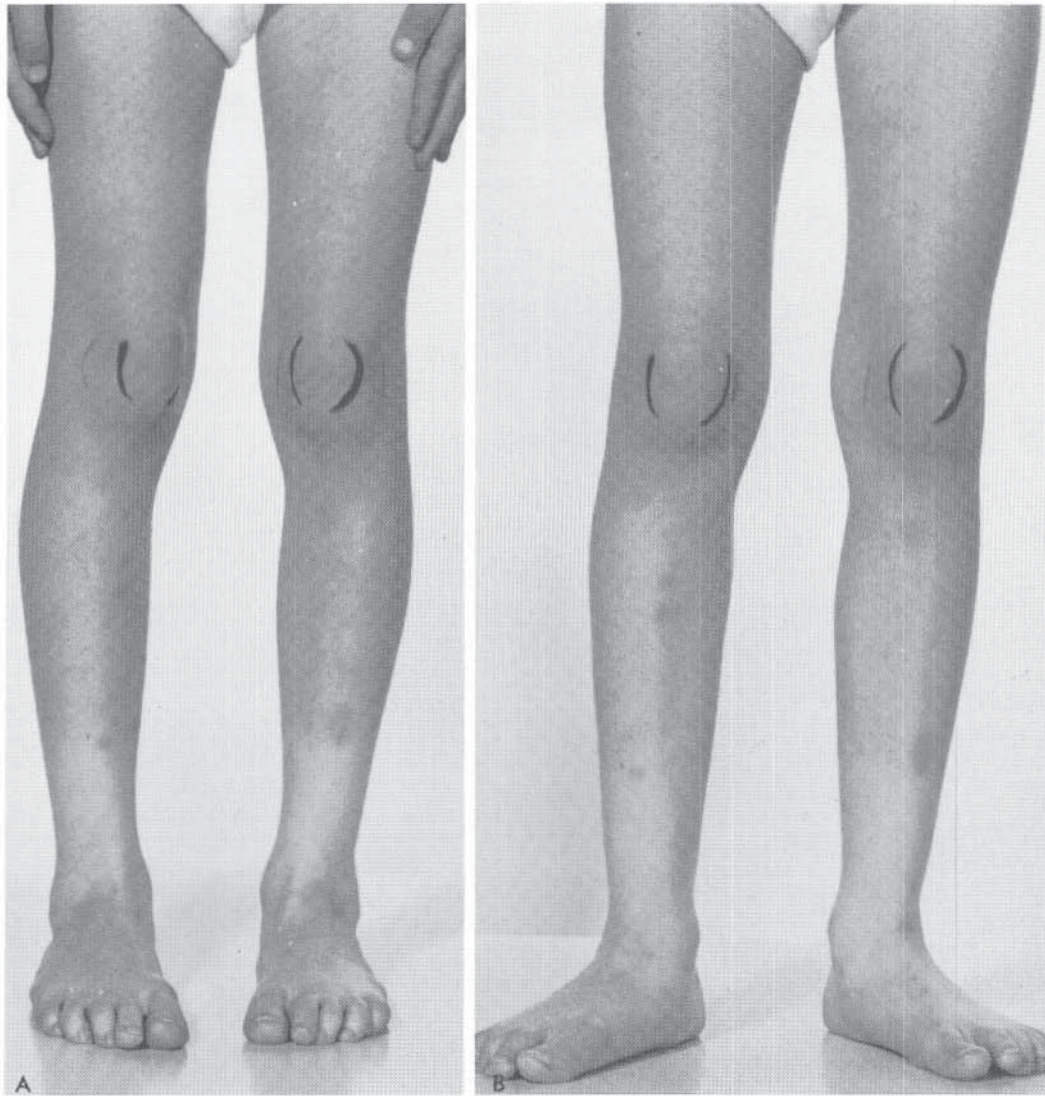


FIGURE 19-2 Clinical appearance of excessive femoral torsion in a girl. **A**, With the knees in full extension and the feet aligned (pointing straight forward), the legs appear bowed and the patellae face inward. **B**, On lateral rotation of the hips so that the patellae are facing to the front, the feet and legs point outward and the bowleg appearance is corrected.

excessive anteversion entails either no treatment or surgical correction.

The indications for surgical treatment of femoral anteversion are controversial, with investigators failing to agree over whether excessive femoral anteversion is a significant pathologic entity with negative health consequences or a minor variation of normal that should be left alone. Staheli and colleagues studied a number of indicators of athletic performance and found that excessive anteversion had no demonstrable negative effects.<sup>28</sup> Staheli reviewed the cases of 78 patients who underwent bilateral derotational osteotomies and noted a 15 percent complication rate. He concluded that the operation was indicated only in a child with persistent severe disability from femoral torsion.<sup>26</sup> In a later publication he listed the following five indications for surgical correction: (1) a child older than age 8, (2) a deformity severe enough to create a significant cosmetic and functional disability, (3) measured anteversion exceeding 50 degrees, (4) medial hip rotation greater than 85 degrees and lateral rotation of less than 10 degrees, and (5) a family

aware of the risks of the procedure.<sup>27</sup> We rarely perform corrective surgery for normal children with excessive anteversion. Most rotational femoral osteotomies in our institution are done in children with cerebral palsy who have severe intoeing.

A femoral osteotomy to correct excessive femoral anteversion may be done at the intertrochanteric level, the subtrochanteric level, or the supracondylar level. Several authors report better results with the more proximal osteotomies.<sup>21</sup> The intertrochanteric femoral osteotomy is usually fixed with a blade plate or a screw-side plate combination.<sup>21</sup> Staheli prefers crossed pin fixation.<sup>27</sup> With stable internal fixation, older, reliable children may be managed without a cast, whereas spica cast immobilization is preferred for the younger, less cooperative child. The prone position for surgery is preferred by several authors, as the leg may be used to more precisely gauge the degree of anteversion and the amount of correction.<sup>21</sup> Svenningsen and co-workers reviewed results in 95 children who underwent derotational subtrochanteric osteotomies for excessive femoral antever-



## Snapping Iliotibial Band Syndrome

The clinician occasionally encounters a child or adolescent who complains of a popping or snapping sensation over the greater trochanteric area. This sensation usually appears while the individual is walking and is usually not painful, although at times the area will become sore. The examination is best done by palpating the greater trochanteric area as the child walks. The examiner must walk along with the child or move along on a rolling stool. A snap is felt as the tensor fascia lata subluxates over the greater trochanter.

The condition is mostly annoying, and some patients can control it by changing their gait pattern. Treatment is usually symptomatic, with NSAIDs used to reduce pain from a supposed bursitis beneath the muscle. Surgical releases of the tensor fascia lata have been performed but have often been unsuccessful, and at times have increased the pain.<sup>2,8,20,36</sup> Brignall and Stainsby reviewed the literature and noted that success rates for release or lengthening of the iliotibial band ranged from 21 to 100 percent, with a mean success rate of 57 percent. They described a Z-plasty of the tensor fascia lata, with three of eight hips having some residual pain and one requiring repeat release.<sup>2</sup> Fery and Sommelet reviewed 24 cases treated by iliotibial band release and concluded that the operation was rarely justified. Sixty percent of the patients had continued pain, and only 30 percent were considered to have a good result.<sup>8</sup> Our experience in a small number of cases has also been unsatisfying, and we rarely recommend surgical treatment for this entity.

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