Anteversion and Coxa Valga

In-toeing gait in children is one of the most common paediatric conditions seen by the podiatrist. Thirty per cent of children in-toe at the age of 4 years but the condition persists in only 4 per cent of adults. Resolution of in-toeing usually occurs spontaneously between the ages of 4 and 11 years unless a structural abnormality of the foot or leg exists. Femoral anteversion is considered to be the most common cause of in-toeing gait in children (Thackeray and Beeson, 1996).

The angle of inclination is the angle of the femoral neck in the frontal plane and is approximately 125 degrees with respect to the femoral shaft. If the angle is greater than 125 degrees it is termed coxa valga. This increase in the angle of inclination lengthens the limb, reduces the effectiveness of the hip abductors, increases the load on the femoral head and decreases the stress on the femoral neck. (Hill, 1995, Spencer 1978).

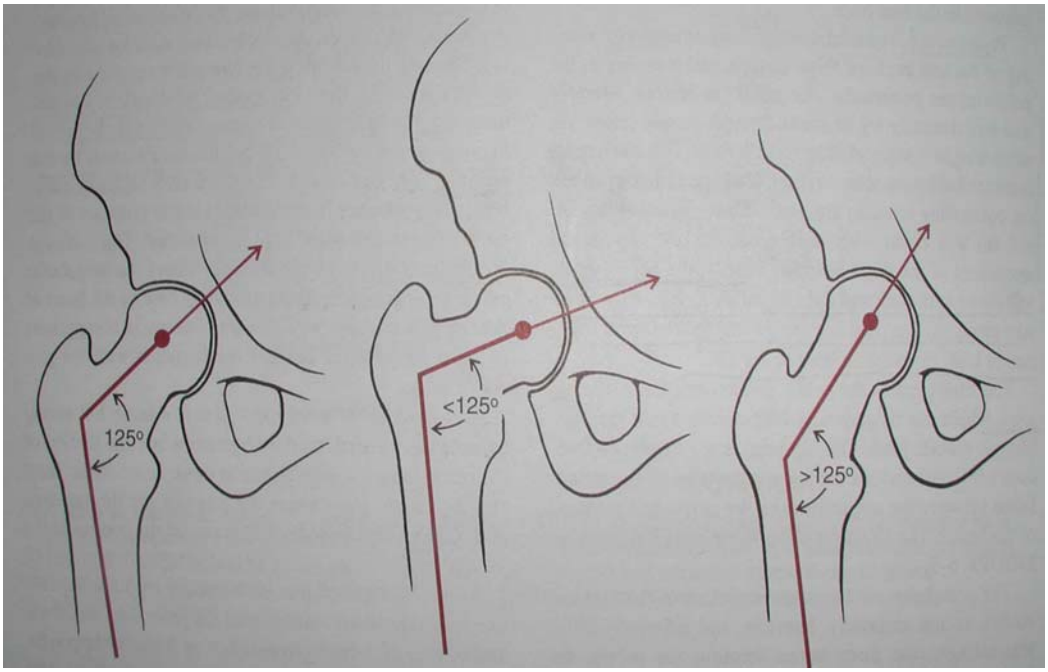

Fig 1: Angle of Inclination in the neck of the femur
(Hamill, 1995 p208)

The angle is larger at birth by almost 20-25 degrees and it lowers as the person matures and assumes weight-bearing positions. It is also believed that the angle continues to lower into later adult years by approximately 5 degrees. The range of the angle of inclination is usually within 90 – 135 degrees.

The angle of inclination is important as it determines the effectives of the hip abductors, the length of the limb, and the forces imposed on the hip joint (Hamill, 1995 p208
)
(Spencer,1978 p21), defines coxa valga as an increase in the angle of inclination (Alsberg's Angle) such that the distal end of the femur is directed away from the midline and the knees are further apart. It is a frontal plane deformity. The Alsberg's angle is the angle formed by a line through the base of the epiphyseal plane with the axis of the shaft of the femur. Normal adult value is 41.4 degrees. A decrease in the Alsberg's angle is Coxa vara.

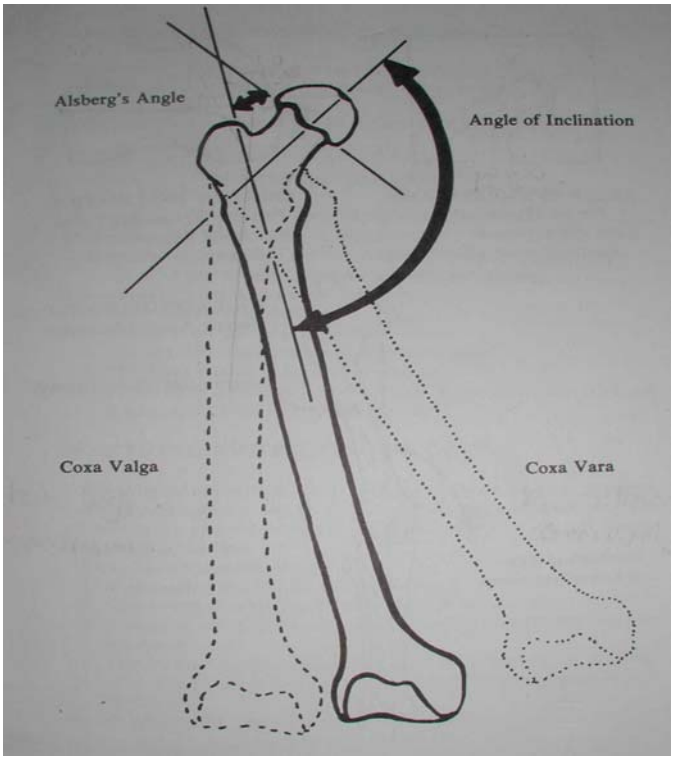

Fig 2:Alsbergs Angle and Angle of Inclination of femur

Spencer, 1978 p23

Genu Varum is a deformity of the knee or tibia in which the distal end of the tibia is directed toward the midline. It is usually associated with Coxa Valga.
The angle of the femoral neck in the frontal plane is termed the angle of anteversion. The femoral neck is twisted forward or anteriorly in relation to the frontal plane of the femoral condyles. Normally the femoral neck is rotated anteriorly 12 to 14 degrees with respect to the femur. If this angle increases, a toe-in position is created in the extremity. If the angle of anteversion is reversed so the femoral neck moves posteriorly, it is termed retoversion. Retroversion causes a toeing-out of the extremity (Hamill, 1995 p209, Tachdijan, 1972 p1442).

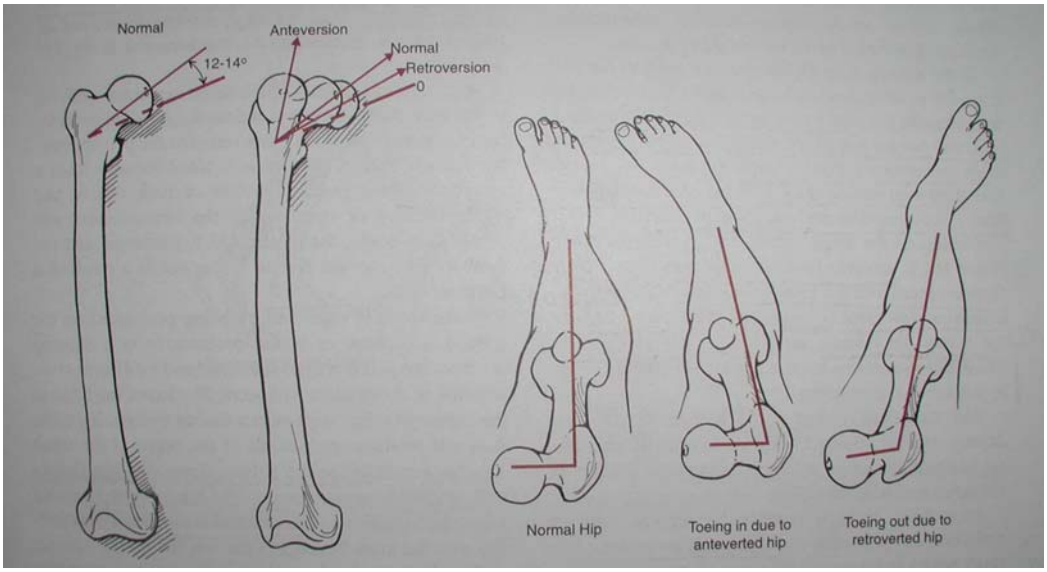

Fig 3: Angle of Anteversion Hamill, 1995 p209

At birth, the mean angle is approximately 30 degrees; in the adult the mean angle is 8 degrees as it decreases with age (McGee, 1997). Fabray et al, 1973, in their paper on torsion of the femur found the anteversion figure in normal children of 3-6 years to be 27 degrees and in 7-10 years old was only 22 degrees.

Increased anteversion leads to squinting patellae and toeing-in. Excessive anteversion is twice as common in girls as in boys. A common clinical finding of excessive anteversion is excessive medial hip rotation (more than 60 degrees) and decreased lateral rotation (McGee, 1997 p475).

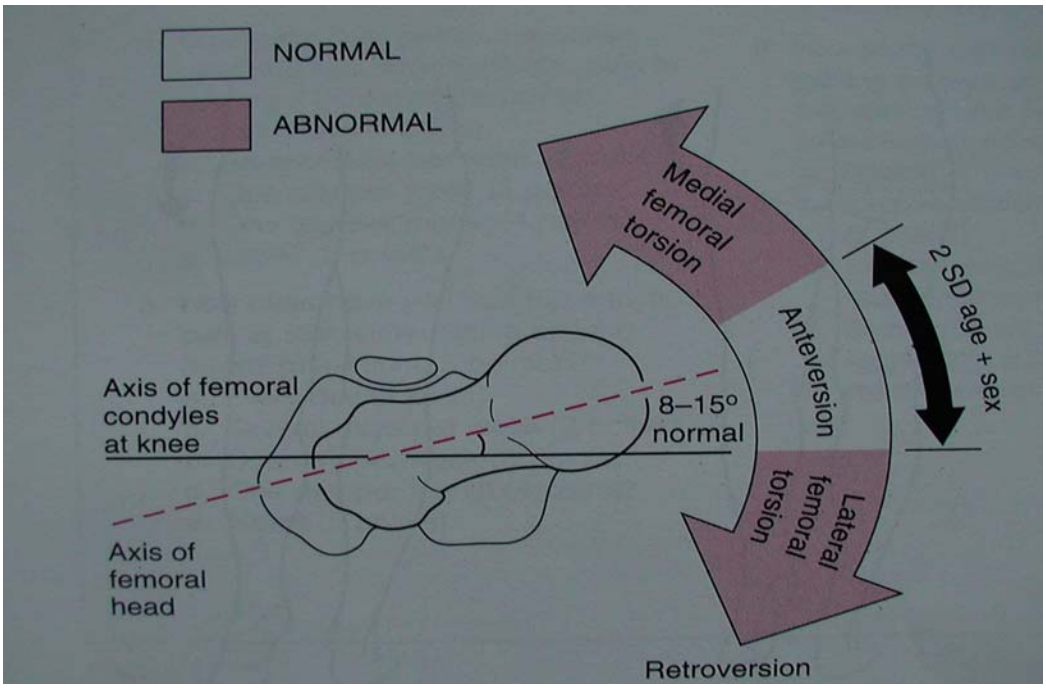

Fig 4: Normal range of anteversion and torsional deformity beyond McGee, 1997 p475

A genetic factor is partly responsible in the causation of abnormal femoral anteversion and femoral torsion. Tachdijan, 1972 p1442 also found intrauterine malposture as an important causation of this deformity and that inappropriate sitting or sleeping habits might well influence the persistence of these positional deformities as well as increase their severity.

Anteversion in the hip increases the mechanical advantage of the gluteus maximus, making it more effective as an external rotator.
If there is excessive anteversion in the hip joint in which it rotates beyond 14 degrees to the anterior side, the person must assume an internally rotated posture or gait to keep the head in. Other accompanying lower extremity adjustments to the excessive anteversion include an increase in the Q –angle, patellar problems, increase in leg lengths, more pronation at the STJt, and increase in the lumbar curvature. (Hamill, 1995 p208/209)

(Valmassy, 1996 p249) describes femoral anteversion as the angle of femoral version made when the femoral neck axis is directed forward or anteriorly from the femoral shaft. Femoral version is the angular difference between the transverse axis of each end of a long bone.

Although femoral torsion is considered the most common cause of the development of an in-toed gait in the early walker up to the age of 10 years, a host of conditions influence the overall function of the femoral component. These varieties of factors most likely responsible for an adducted gait were called the ‘anteversion syndrome’. The factors in this syndrome included an anteriorly located acetabulum, a tight hip capsule, a tight iliotibial band, or short or tightened anterior hip muscles (Valmassy, 1996 p250).

(Fixsen1990) stated that in femoral anteversion, spontaneous correction of in-toeing gait can be expected to occur in 80% of patients by the age of 8. Whereas (McSweeny 1971) studying femoral torsion in children, found that all the children reverted to a normal angle of gait by an average age of 7.

(Valmassy, 1996) discovered that torsional deformities of the femur often demonstrate angle of gait changes which seem to respond to overall growth spurts and increases in height. Growth spurts not only affect the length of the long bones but are also responsible for contributing in part to transverse plane alterations of those structures.

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