SUMMARY

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Patient with intoeing gait represents a very common referral group in a pediatric orthopaedic practice. It may be due to a variety of abnormalities of congenital or acquired origin. The level of pathologic involvement may be in the hip, femur, leg, ankle, or the foot. Excessive femoral anteversion, internal tibial torsion and metatatrsus varus are the most common causes of toeing-in gait. This deformity may also occur in some paralytic conditions as in cerebral palsy and myelomeningocle.

Tachdjian (1990), on the other hand, suggested that protective intoeing due to pronated feet and developmental genu-valgum is the most common causes of this gait.

Some deformities are simple, occurring at a single level, where as other are more complicated. A combination of mild metatarsus varus and medial tibial torsion together with increased femoral anteversion may produce a severe intoeing gait ***(Staheli,1990).***

Genetic factors play a role in many of these deformities. ***Ponseti and Becker (1966), Kite (1967) and Giannestras (1973)*** reported a definite familial diathesis in congenital metatarsus varus. ***Blumel et al., (1957)*** reported eight cases of hereditary bilateral medial tibial torsion. Medial femoral torsion has been reported in siblings of children with the disorder ***(Tachdjian, 1990).***

The effect of posture upon the rotational development of the growing bone has been the subject of much speculation. ***Hutter and Scott (1949), Knight (1954), Crane (1950) Axer et al., (1971),*** suggested that sitting and sleeping positions will influence rotational alignment of the bone. ***Staheli (1980)*** is of the opinion that the posture is an effect rather than a cause.

With careful physical examination, an accurate diagnosis can actually be made without complex roentgenographic measurements. A clear understanding of the deformity and its natural history is important to care for children with these conditions since many of them correct spontaneously.

For accurate clinical determination of the deformity and its level and severity, ***Staheli (1990)*** devised what he has called the torsional profile, which include the following measurements:

- Foot progression angle which measures the over all torsions present along the whole length of the lower limb.
- Hip rotation which is used for assessment of femoral anteversion.
- Thigh-foot angle which reflects the degree of torsion of tibia and hind foot.
- Angle of toransmalleolar which measures the degree of tibial torsion.

A number of roentgenographic methods are available for measuring femoral anteversion. These methods are not necessary in routine orthopedic office practice. If surgery is planned, however, it may be helpful to obtain some of these special views to document the extent of femoral anteversion, ***(Staheli, 1980, Kumar and MacEwen 1982).***

According to ***Ruby et al., (1979), Staheli (1980), and Sullivan et al., (1982),*** the methods developed to radiologically evaluate anteversion can be classified into three distinct groups: fluoroscopic, axial and biplanar.

Ryder and Crane (1953); evaluated fluoroscopic method and concluded that fluoroscopy is not reproducible between independent investigators, dose not provide a permanent record, and potentially subjects the patient to more radiation exposure.

La Gasse and Staheli (1972), Ruby et al., (1979), and Staheli (1980) concluded that biplane techniques art the preferred methods, and they are the safest and least difficult to apply.

In addition, the methods are reproducible, provides a clinically useful set of x-rays for a permanent record, and can be done by x-ray personnel after limited instruction.

Axial view include: plain film with an axial projection and computerized tomography.

La Gasse, and Staheli (1972) and Ruby et al., (1979) concluded that plain film with an axial projection is the least satisfactory method because of the difficulties in penetration of soft tissues. They also concluded that after the age of 6, this method is quite unsatisfactory. In addition, radiation exposure is excessive and the final radiographs have limited clinical usefulness.

There is a general agreement that the computerized tomography is the most accurate method. ***Weiner et al., (1987), and Peterson (1981)*** cautioned against using computerized tomography for the measurement of femoral neck anteversion. The dose of radiation was reported to be too large to make it safe for routine use.

Ultrasound scanning has been employed for the measurement of femoral, neck anteversion. Although it is an easy, non invasive and safe method, yet the results are not sufficiently accurate to recommend its general use ***(Berman, 1987).***

According to ***Tachdjian (1972), Kumar and MacEwen (1982), and Harris (1983),*** a number of roentgenographic methods are available for measuring tibial torsion, but these are cumbersome and unnecessary in routine office practice. A sufficiently accurate estimate can be made clinically.

To manage the problem effectively, it is essential that the level of the deformity be determined, as it may occur anywhere between the foot and hip, and management for each condition is different.

The mild passively correctable metatarsus varus deformity tends to improve spontaneously. If the foot appears rigid in the early stages then serial plasters will propably be effective. If there is still a significant varus deformity which is rigid and uncorrectable, then exploration and release of the tibialis posterior or anterior, if anomalous, are worthwhile. If these abnormalities are not present, then release of the abductor hallucis and capsulotomy of the first metatarsocuneiform joint may well correct the foot.

If the foot is still not correctable, then a tarsometatarsal release up to the age of 8 years will correct the foot. Finally, over the age of 8, multiple metarasal osteotomies can be considered ***(Fixen, 1983)***.

In most patients increased medial tibial torsion will improve spontaneously. Treatment is needed for children who have not improved by 15 to 18 months of age or who have positive family history of persistent increased medial tibial torsion, according to ***Knight (1954), Staheli (1977), Kumar and MacEwen (1982)*** tibial torsion is best treated by Denis-Browne splints. In the exceptional case in which increased medial tibial torsion persists past 8 years

and the gait is awkwad and cosmetically displeasing, derotation osteotomy should be considered.

Fabry et al., (1973), Staheli (1980), Kumar and MacEwen (1982) concluded that there is no conservative treatment for excessive femoral anteversion, Roentgenographic evaluations have shown that there is no significant natural decrease in anteversion after the age of 8 years. If femoral anterversion is severe in children of these age, surgical intervention, in the form of derotation osteotomy of the femur may be considered.

Many variations exist in the method of treating deformity. Conservative treatment in the form of night splints, special braces or twister cables, although it seems helpful in treating many cases of tibial torsion it is proved to be totally ineffective in correcting increased femoral anteversion. Most orthopaedists reported that tibial torsion is best treated by Denis-Browne splints, and excessive femoral anteversion can not be effectively treated by non operative methods.

In many instance treatment should be prescribed for the parents rather than the child, and it perhaps wiser to educate the family rather than to subject the child to ineffective and sometimes expensive methods of treatment. It appears that in many cases improvement occurs spontaneously, consistent with the natural history of the disease, and is not due to treatment prescribed by the physician.