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Tibial Torsion Transformer

Journal of the American Podiatric Medical Association
January 1992

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The Tibial Torsion Transformer®[1]

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Tibial torsion refers to a twist within the shaft of the bone of the tibia around its long axis. This twist determines the axial relationship between the proximal and distal tibial articular surfaces. Medial (some refer to it as internal) tibial torsion is a twist of the distal tibial articular surface (ankle joint) in the transverse plane toward the body's midline relative to the proximal tibial joint surface (knee joint). This determines the position of the foot and ankle nonweightbearing and in gait.

Medial tibial torsion has been recognized as a clinical entity for many years. Some authors believe that it is a normal finding in children and that it will improve spontaneously with normal growth and development.[1-5] Other investigators label the condition a deformity but recommend treatment only in severe cases or when there has been no improvement in several months or years.[2] However, surgical treatment of medial tibial torsion in adolescents has been commonly described.[1,2,6-10] In any event, many authors discuss the presence and diagnosis of medial tibial torsion, but the treatment remains controversial.

For the purposes of this discussion, a few terms should be defined. Ontogeny refers to the natural course of physiologic growth and development of a body part that occurs consistently within a normal part of the population. A deformity is an abnormal physiologic finding that may negatively influence appearance or function of that affected part. Once it is determined that a deformity exists, a treatment plan must be instituted to correct the deformity to reduce present or future morbidity.

Tibial torsion in a population can be evaluated by several clinical methods. Most methods indirectly measure tibial torsion by malleolar position or foot position.[1-3, 11-20] Malleolar position relative to the frontal body plane can be used to determine tibial torsion.[12] Engel and Staheli[13] described a method of evaluation using a thigh-foot axis or angle. Evaluating the medial and lateral range of motion of the lower leg on a flexed knee joint, as described by Ganley,[17] closely reflects tibial torsion. In any event, normal and abnormal findings have been closely correlated with the amount of twist within the tibia.[14, 15, 20] In addition, radiographs,[15, 21] ultrasound, and computed tomography[22] have been used diagnostically with varied results.

In the authors' opinion, once medial tibial torsion deformity is identified, treatment must be initiated. The basic treatment philosophy is application of a gentle corrective force in a direction opposite that of the deformity in the same plane. Treatment in infants is best accomplished with regular gentle manipulation and serial clubfoot casting above the knee with the leg flexed 60° to 90°. The leg should be laterally rotated to the limit of lateral knee range of motion to provide a gentle corrective force.[17, 19, 23, 24]

The Tibial Torsion Transformer

The authors have used the Tibial Torsion Transformer in approximately 60 cases over the past 3½ years.

The device is a metal brace that is applied to the foot and leg above a flexed knee by means of well padded hook and eye (Velcro®[2] type) straps (Fig. 1). The brace is brightly colored to be somewhat more appealing to children. The foot plate is strapped onto a well fitted, boot-style shoe and is adjusted in the transverse plane in 10° increments (Fig. 2).

The manufacturer recommends use on children from 18 months to 5 years of age. The authors have found it effective earlier, in children 10 to 12 months of age or the approximate age walking begins for that child. The manufacturer offers two sizes; however, the majority of patients over 1 year of age require the large size.

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®[1]Bremer Medical, Jacksonville, FL.

®[2]Velcro USA, Inc, Manchester, NH.

Figure 1. The Tibial Torsion Transformer

Figure 2. Method of application of the Tibial Torsion Transformer on a patient

The splint is applied nightly during sleeping hours only. The initial brace setting should be set to the end range of lateral motion of the leg on a flexed knee in the transverse plane. The patient's progress is followed monthly, and the lateral rotation of the splint's foot plate is adjusted and increased as the body tissues gradually adapt to the previous setting. The position of the foot plate should not be increased too rapidly. In the authors' opinion, the lateral position should not exceed 40°, because the force applied to the foot and leg may induce pronation of the subtalar and midtarsal joint areas. The length of treatment varies, depending on the age of the patient, the severity of the deformity, and the child's ability to tolerate the device.

The greatest advantage the Tibial Torsion Transformer has over the other devices is that it is applied to the lower extremity across a flexed knee. Therefore, the corrective torque force is isolated to the tibia itself and not transmitted more proximally to the hip joint, as occurs with most other devices because these devices are used with the knee extended. The corrective force is transmitted through the more resilient knee joint ligaments to the proximal and distal tibial physes. This force changes the direction of growth of the physeal cells as they ossify and more or less "derotate" the tibia itself throughout the treatment period.

A practical advantage of the Tibial Torsion Transformer is that it seems to be well tolerated because the feet are not "linked" together as they are with most other night splints in bilateral cases. The child has a greater degree of freedom of movement when the Transformer is used. Likewise, a unilateral case of tibial torsion deformity can be treated with a single Transformer without attach- ing a device or shoe to the other extremity.

While the force is transmitted through the knee joint capsule and ligaments, these are not "stretched" by this force. This can be verified clinically by comparing the total range of transverse plane motion of the knee joint before and after treatment. A force stretching of the knee joint ligaments would increase the total range of motion, which is not seen clinically with this device, nor has it been observed with the use of other devices or serial casting.

Finally, the treatment should be continued until the corrected tibial position has been maintained for an appropriate period to prevent relapse. The total treatment period is usually several months; however, the authors have observed a shorter period of use with the Tibial Torsion Transformer as compared with other available night splints.

Conclusion

Medial tibial torsion should be recognized as a deformity. It is not normal ontogeny in children. It is not outgrown spontaneously without treatment. The Tibial Torsion Transformer has been used clinically to effectively treat this deformity with good results. The authors' opinion is that better results are obtained with this device.

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