

Age Related Torsion of Lower Limbs in Normal Children

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Abstract: Lower limb torsion of 50 normal children were examined clinically, assessed and classified based on age groups. Tibial and femoral torsion were assessed individually, as gait pattern can vary because of alterations in them. In this study, the torsion of lower limbs were measured clinically by assessing the femoral torsion, the transmalleolar axis and the thigh foot axis. The gait pattern was assessed using foot progression angle and heel bisector angle for deformities of the foot. All the children were put into 3 groups based on age and the values of measured torsion varied in each group. Normal variations is to be known for better management and prognosis.

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I. Introduction

Rotational deformities of lower limbs in children such as in-toeing and out-toeing gait are benign and resolve spontaneously for which the normal variations in torsion should be understood. In-toeing gait is seen more than out-toeing. The cause for such deformities may be in the tibia, femur or the foot. In this study 50 children were examined prospectively. All the children had no prior pathologies that affects the torsion. All children were randomly picked among which a few presented to the orthopaedic out patient department for the same but complaining of cosmetic problems of the legs.

II. Aim

To find out the range of lower limb torsion in normal children

III. Materials And Methods

This is a prospective study done at Sri Ramachandra University, Chennai. 100 normal children were analyzed in the study. All the children were classified into three groups based on their age and the children varied from age 3-15 years. None of the children had any previous history of trauma, neurological disease or surgery of any reason that can alter the lower limb torsion.

All the children were assessed for the following:

1. Foot progression angle
2. Femoral torsion
3. Trans-malleolar axis
4. Thigh foot axis/angle
5. Heel bisector angle

(The following clinical methods were adopted from Staheli LT: Torsional deformity, Paediatr Clin North AM 24:799,1977)

IV. Results

50 children were included in this study. All the children were re-examined by the same examiner within a period of one month to prevent intra-observer error.

In this study, children were separated into three groups depending on age, 3-7 years, 7-11 years and 11-15 years. Metatarsus adductus was never a deformity in the examined children.

FIGURES AND TABLES:

TABLE 1.

CHARACTERISTICS	PATIENTS
GENDER (9 MALE/FEMALE)	27/23
AGE	3-15 YEARS

TABLE 2. The mean femoral in-torsion for each limb varying within the age groups were:

AGE	RIGHT	LEFT
3-7 YEARS	74.44°	71.94°
7-11 YEARS	68.81°	66.19°
11-15 YEARS	53.63°	50.91°

TABLE 3. The mean femoral out-torsion for each limb varying within each age groups were:

AGE	RIGHT	LEFT
3-7 YEARS	67.50°	69.72°
7-11 YEARS	66.19°	59.06°
11-15 YEARS	50.45°	51.36°

TABLE 4. The mean thigh foot angle for each limb varying within the age groups were:

AGE	RIGHT	LEFT
3-7yrs	13.39°	10.89°
7-11yrs	17.14°	15.67°
11-15yrs	20.36°	19.18°

Table 5. The mean trans-malleolar axis for each limb varying within the age groups were

AGE	RIGHT	LEFT
3-7yrs	17.72°	16.22°
7-11yrs	21.38°	20.24°
11-15yrs	23°	21.82°

TABLE 6. The mean variations of all the parameters varying with age including both the limbs are:

AGE	Femoral in-torsion	Femoral out-torsion	Thigh foot angle	Trans-malleolar axis
3-7yrs	73.19°	68.61°	12.14°	16.97°
7-11yrs	67.5°	60.36°	16.4°	20.81°
11-15yrs	52.27°	50.90°	19.77°	22.41°

FIGURE 1. The femoral in-torsion and out-torsion decrease with increase in age.

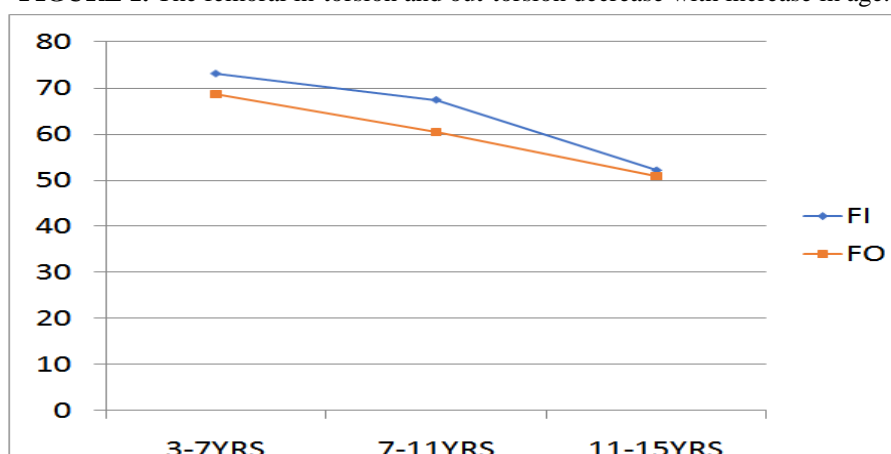
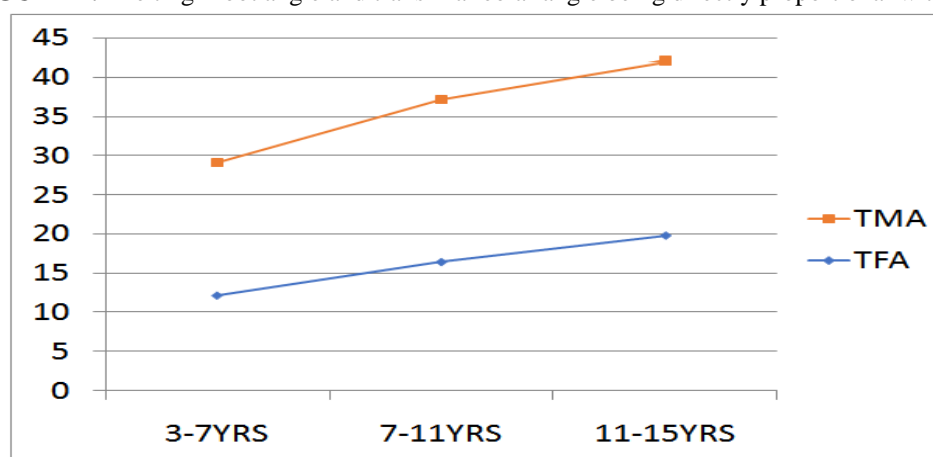


FIGURE 2. The thigh foot angle and trans-malleolar angle being directly proportional with age



V. Discussion

In this study, 100 lower limbs were examined for their femoral and tibial torsions. Foot progression angle was assessed to find out the gait abnormality. The gait abnormality included either an in-toeing or out-toeing gait. The femoral torsion decreases with increase in age. The tibial torsion increases with increase in age. Re-examination of the child is very important as the torsion varies with age. The above mentioned values of torsion can be used as a reference range for normal children between the specified age groups. In-torsion of the femur is majorly responsible for in-toeing gait and tibial external rotation is responsible for out-toeing gait. None of these children require surgical correction as they may resolve spontaneously. If operated, there is always a chance of torsional exaggeration in the opposite way as they further tend to get corrected with ageing.

VI. Conclusion

1. Values do not have to be equal on both limbs of the same child, they can alter within the normal range or more
2. Even normal children may have increases or decreased torsional values without any clinical deformity, called as compensatory type of rotation
3. Clinically child may have a deformity, but values of measured torsion will be normal producing an additive deformity clinically
4. Femoral and tibial torsion have a pattern of correction with growth which needs to be understood for appropriate management.
5. Intervention for these children is not required as they get corrected with progression of age

References

- [1]. **Staheli LT, Corbett M**, In the journal of bone and joint surgery, 1985 Jan;67(1):39-47
- [2]. **Fabry G, Cheng LX, Molenaers G**. Normal and abnormal torsional development in children. Clin Orthop Relat Res. 1994;302:22-6
- [3]. **Badelon O, Bensahel H, Folinai D, et al**. Tibiofibular torsion from the fetal period until birth. J Pediatr Orthop. 1989;9(2):169-73.
- [4]. **Guidera KJ, Ganey TM, Keneally CR, et al**. The embryology of lower-extremity torsion. Clin Orthop Relat Res. 1994;302:17-21.
- [5]. **Katz K, Naor N, Merlob P, et al**. Rotational deformities of the tibia and foot in preterm infants. J Pediatr Orthop. 1990; 10(4):483-5.
- [6]. **Staheli LT**: Torsional deformity, Pediatr Clin North Am 24:799, 1977.)
- [7]. **Staheli LT**. Rotational problems of the lower extremities. Orthop Clin North Am. 1987;18(4):503-12.
- [8]. **Lee SH, Chung CY**, In clinical orthopaedic relat res, 2009 aug;467(8):2098-104.
- [9]. **Hernandez RJ, Tachdjian MO, Poznanski AK, Dias LS**. CT determination of femoral torsion. Am J Roentgenol. 1981;137(1):97-101.
- [10]. **Simon AL, Lharreborde, Bregrest F, mallet C**, Journal of paediatric orthopaedics, 2015 Sept;31(6); 576-82
- [11]. **Cahuzac JP, Hobatho MC, Baunin C, et al**. Classification of 125 children with rotational abnormalities. J Pediatr Orthop. 1992; Pt B 1:59-66.
- [12]. **Carriero A, zovatsky A, Stebbins**, Journal of paediatric orthopaedics 2009 Feb;29(1):73-79.
- [13]. **Gaumentou E, Quijano S, Lharreborere B, Presedo A**, In Orthopaedic traumatology surgical res, 2014 Feb;100(1):147-51
- [14]. **Lee KM, Chung CY, Sugh KH**, Journal of neuroeng rehabilitation, 2013 June
- [15]. **Rethlefsen SA, Healy BS, Wren TA**, Journal of bone and joint surgery AM. 2006 Oct;88(10):2175-80
- [16]. **Venkataramani Abhishek, Thuduraman Ashok, Menon**, Comparison of femoral and tibial torsion in cerebral palsy, Journal of medical and dental sciences, Volume 16, Issue 6 ver.3 (June 2017), PP 01-03.