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A comparison of four in vivo methods of measuring tibial torsion

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ABSTRACT

Tibial torsion, twisting of the tibia about its longitudinal axis, varies during development and early childhood. Knowledge of the normal range of tibial torsion at various ages and its accurate clinical measurement is important in the assessment of the extent of a torsional deformity. To evaluate tibial torsion a reliable technique for its measurement in vivo is therefore required. The aim of this study was to determine which of 4 existing in vivo methods of measuring tibial torsion was the most accurate and had the highest repeatability, by comparing them with direct measurement of the tibia. A wide range of mean values for tibial torsion was observed, using the various techniques, with none of the indirect techniques employed having a strong correlation with direct measurement of tibial torsion. The repeatability of the indirect techniques was observed to be low both in cadavers (n = 4) and the living (n = 3). Since none of the in vivo techniques appear to measure true tibial torsion or be of a reasonable repeatability, alternative easy to use and inexpensive methods need to be developed. Accurate clinical measurement of tibial torsion is important in the assessment of the extent of a torsional deformity. It is recommended that data gained using the methods reviewed here are interpreted with caution.

Key words: Skeleton; tibial torsional deformity.

INTRODUCTION

Tibial torsion was first described by Le Damany (1903); it is the twisting of the tibia about its longitudinal axis, resulting in a change in alignment of the planes of motion of the proximal (knee) and distal (ankle) articulations (Hutter & Scott, 1949). The difference between torsion and rotation has been highlighted by Rosen & Sandick (1955), torsion being described as a twisting in the axis of the same unit, while rotation is a turning of one unit about another.

The degree of tibial torsion varies during development and early childhood. In utero, it is internal (medial), mainly due to the space constraints placed upon the fetus. Derotation occurs after birth so that in the new-born the axes of the knee and ankle are parallel, i.e. torsion is neutral. External torsion then develops during the first few years of life as a firm walking base develops, resulting in an average external (lateral) torsion of 20° in normal adults (Le Damany, 1903).

Knowledge of the normal range of tibial torsion at various ages and its accurate clinical measurement is important in the assessment of the extent of a torsional deformity before corrective surgery is undertaken. Furthermore, the accurate determination of less extreme tibial torsion deformities is important in the evaluation of conditions such as chondromalacia patellae (Butler-Manuel et al. 1992). It is particularly important that tibial torsion can be accurately determined in children, in order to reduce lower-limb rotational defects such as in-toeing and out-toeing in adults. However, the accurate determination of tibial torsion in vivo is relatively difficult as there are no obvious relevant landmarks that can be used as reference points. Consequently, several techniques have been suggested using various mechanical, radiological, computed tomography and ultrasound methods.

To study and evaluate tibial torsion an effective and reliable technique for its measurement in vivo is required. Taking into account factors such as cost,

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