

ORIGINAL COMMUNICATION

A Comparison of Three Methods of Measuring Tibial Torsion in Children with Myelomeningocele and Normally Developing Children

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Abnormal tibial torsion is a common pediatric problem, and there are many existing measurement methods. The purpose of this study was to compare three methods of measuring tibial torsion for its evaluation: computed tomography, physical examination, and motion capture. Twenty healthy children and 20 children with myelomeningocele underwent measures of tibial torsion bilaterally. Measurements were compared using correlation and Bland–Altman plots of the difference between measurements. All three measurements were moderately correlated in controls ($r \geq 0.49$, $P < 0.002$) and in patients ($r \geq 0.51$, $P < 0.001$). In controls, the motion capture measurements were on average 2° more lateral than the clinical measurements whereas motion capture and clinical measurements were 13° and 15° more medial than CT measurements, respectively. Similarly for patients, motion capture measurements were on average 5° more medial than clinical measurements, and motion capture and clinical measurements were 26° and 22° more medial than CT measurements. The approximate 20° difference between the clinical or motion capture measures and the CT measure suggests that clinical evaluation identifies different axes than those defined based on skeletal anatomy. Clinical or motion capture methods may be used in lieu of imaging methods for measuring tibial torsion with the knowledge that these methods provide less lateral measurements than measurements obtained using CT. Clin. Anat. :1043–1048, 2017. © 2017 Wiley Periodicals, Inc.

Key words: tomography; X-ray computed; physical examination; pediatrics; meningomyelocele

INTRODUCTION

Abnormal tibial torsion is a common problem that may significantly impact muscle lever arms and force production, particularly in patients with neuromuscular disorders such as cerebral palsy and spina bifida. Measurement of tibial torsion helps to determine the extent of torsional deformity and direct treatment decision-making including the need for derotational osteotomy (Milner and Soames, 1998; Davids and Davis, 2007; Hazlewood et al., 2007). While various methods exist to measure tibial torsion, imaging using computed tomography (CT) or magnetic resonance imaging (MRI) offers the greatest objectivity because it provides three-dimensional (3D) data that allows the

determination of appropriate anatomic axes (Jakob et al., 1980; Eckhoff and Johnson, 1994). However, CT and MRI are expensive, inconvenient, may not be readily accessible and, in the case of CT, may not be appropriate for routine clinical use as it requires radiation.

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