The Footprint method to assess transmalleolar axis

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Abstract

Torsional deformities of the lower extremities are a common reason for an orthopaedic consultation and are also part of the evaluation of a patient in gait analysis. This study assessed the level of agreement between, and the repeatability of, the Footprint method and two other methods (Prone and Jig) of measuring the transmalleolar axis (TMA) clinically. The Footprint method measures the TMA as the patient sits by projecting the position of the malleoli downwards onto lined paper while the lines of the paper are aligned with the knee axis. The Prone method projects the position of the malleoli upwards onto the sole of the foot and this is related to the visually estimated knee axis. The Jig method uses a tropometer to relate the angle between the tibial tubercle and the two malleoli. Two assessors measured twelve subjects using the three methods and six subjects were re-measured approximately 1 week later for repeatability. There was poor agreement between the three methods but the Footprint method was the most repeatable (coefficient of repeatability: 5.4). One observer then assessed the repeatability of the effect of simulated equinus on the Footprint method in 10 normal subjects on 2 separate occasions 1 week apart. Equinus was obtained by having the subjects sit and firstly extend their knee and place the foot on the floor and secondly by placing the foot under consideration on a wedge. Both conditions introduced an offset into the measurement of the TMA when compared to the measurements with the ankle at neutral in the same subjects. The reliability of the Footprint method was then assessed using 10 inexperienced observers who measured nine normal subjects each on 2 separate occasions and their results compared with those from an experienced observer. The inexperienced observers were less repeatable than an experienced observer (coefficients of repeatability 9.2 and 6.9, respectively).

We recommend that different methods of measuring TMA should not be used interchangeably in clinical practice. The Footprint method was the most repeatable of the three methods tested and can be used for patients who have fixed equinus but the measurement was less repeatable when used by inexperienced observers.
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1. Introduction

The transmalleolar axis angle (TMA) is one of several measurements made in clinical practice to give an estimation of an underlying tibial torsion. These clinical measurements can help to identify the degree to which misalignment of the foot is due to bony torsion rather than dynamic causes such as muscle action: essential information when considering management options. The TMA is also used in three-dimensional gait analysis as part of the definition of the ankle axis. Ideally the clinical measurement of tibial torsion should give a reliable and repeatable indication of the underlying anatomical deformity [1].

There are a number of different methods to measure tibial torsion [1–11]. In clinical practice an indirect assessment of tibial torsion can be obtained by relating the TMA to the transcondylar (flexion/extension) axis of the knee or the

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