Letters to the Editor

The relationship between pelvic torsion and anatomical leg length inequality: a review of the literature

To the Editor:

The Cooperstein and Lew¹ article, “The relationship between pelvic torsion and anatomical leg length inequality: a review of the literature,” referenced our work.² We feel that their statements should distinguish between anatomical leg length inequality (LLI) and functional LLI.

In the discussion section, they indicated that there was “... poor agreement found by Rhodes et al. between visual methods of leg checking and upright radiographs.” We reported the relationship between prone LLI measurements and standing radiograph as “The ... correlation coefficient (r) between the two variables was ... 0.719.”² Most statisticians characterize this as a moderate positive correlation and not “poor agreement.”

Anatomical LLI exists. The LLI incidence is not known perhaps because of confused definitions. Mannello³ stated, “It appears that the least controversial issue associated with LLI is its anatomical existence.” As we previously stated,² “Structural, anatomical or actual LLI are synonymous terms and are diagnosed when either the femur or tibia is longer in one leg than in the other, as shown on X-ray.” Mannello³ defined it similarly.

Anatomical LLI denotes different bones lengths of right and left lower extremities. The criterion standard for anatomical LLI is the scanogram, radiograph of both femurs and tibias; so comparisons can be made. Of the scanogram, Mannello³ said, “This procedure is considered a valid indicator of lower extremity length.”

The Cooperstein and Lew review on anatomical LLI did not include any studies involving actual bony differences in leg length. However, Mannello³ pointed out, “Others define anatomical short leg as that which is shorter in length from the floor to the weight bearing surface of the femoral head.” This seems to be the definition adopted by Cooperstein and

Lew, but no definition of anatomical LLI was included in their review.

Of the 9 studies in their review, 7 involved simulated LLI, with no anatomical bone length differences seen on radiograph. Of the other 2 included, one used tape measures of legs, which have been shown to be unreliable; as Cooperstein and Lew¹ pointed out in their article, “Tape measure methods for measuring LLI have been found to be of equivocal accuracy and may be less accurate than radiological criterion standard method for assessing anatomical LLI...” The other study included used radiographs of the femur heads, without full views of both lower extremities (Friberg⁴ method). A developer of that radiograph technique stated, “The method described here is not meant to substitute the methods for measuring accurately the length of the different parts of the lower extremity.”⁴ One cannot distinguish anatomical (structural) LLI from functional LLI with the Friberg method of comparison.

Methods that incorporate both anatomical and functional LLI without distinction (eg, Friberg method) necessarily overestimate the incidence of anatomical LLI⁵ compared with a stricter definition.

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The relationship between pelvic torsion and anatomical leg length inequality: a review of the literature

In Reply:

We appreciate the opportunity to explore issues related to the appropriate use of statistical analysis to

determine level of agreement between measuring methods. Our correspondent feels we misrepresented the findings by Rhodes et al¹ by stating there was “poor agreement found ... between visual methods of leg checking and upright radiographs.”² The authors found that the correlation coefficient (r) was 0.719 and conclude, “most statisticians characterize this as a ‘moderate positive’ correlation.” We did not consider this finding as relevant as the investigators’ own qualitative interpretation: “Results indicated ... the relationship was not as strong as anticipated. Measurement differences between methods in this investigation, which were greater than 3 mm 48% of the time, indicated that prone measurement by itself is not accurate as a predictor of X-ray leg length differences.” The results section of the Rhodes et al article documents considerable divergence of the prone leg check and radiographic findings. The highly dispersed scatter plot in their Fig 2 speaks for itself; the

Fig 1. Upper left, scatterplot and trendline for raw data; upper right, limits of agreement; lower left, Bland-Altman plot; lower right, histogram of differences. (Color version of figure is available online.)