Lower Extremity Rotational and Coronal Plane Parameters Are Relatively Stable After Eight Years of Age Using CT Scanning in a Random Cohort

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What was the question?
While coronal lower–extremity alignment in children follows a predictable transition from physiologic genu varum to genu valgum, developmental patterns of rotational alignment remain less clearly defined despite growing clinical interest in rotational–guided growth. Normative data across the full pediatric age yearby–year reference values to determine how coronal and rotational lower–extremity alignment parameters change from birth through adolescence and to identify the age at which these parameters stabilize using CT–based measurements.

How did you answer the question?
212 CT scans (ages 0–18; 115 males, 97 females) from the New Mexico Decedent Image Database were reconstructed into three–dimensional models. Femoral version was measured as the axial angle between a line between the posterior femoral condyles and a line from the femoral head to the neck, and tibial torsion as the axial angle between a line connecting the centers of the tibial plateaus and a line drawn from the lateral to medial anterior edge of the tibial plafond. Age–related differences were evaluated using one–way ANOVA (α=0.05) with Tukey post hoc testing.

What are the results?
All measurements demonstrated excellent interrater reliability (ICC $\geq$ 0.75). mLDFA decreased significantly from birth through age 5 (101.4 to 85.8) and stabilized thereafter. MPTA remained stable during the first five years (91 to 92), then declined gradually with a significant decrease by age 8 (86.7). Femoral anteversion declined significantly from birth to age 8 (36.6 to 10.4), after which values stabilized. Tibial torsion showed no significant differences across the age range.

What are your conclusions?
Femoral version settled into mature values by approximately age 8, identifying this as a threshold beyond which further spontaneous improvement in rotational alignment is less likely. These findings help clarify how rotational and coronal plane alignment changes with growth, which can help guide timing recommendations for correcting rotational deformity.