

Natural History of Leg Length Discrepancy in Posteromedial Bowing of the Tibia: A Multicenter Longitudinal Analysis

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What was the question?

Posterior medial bowing of the tibia (PMB) is a rare congenital deformity characterized by profound initial tibial angulation with expected spontaneous improvement over childhood and persistent leg length discrepancy (LLD). Current literature is limited to series of up to 44 patients. Treatment strategies range from conservative observation with deferred growth modulation or lengthening in adolescence, to early surgical intervention. To better inform surgical planning and patient counselling, we aimed to describe the natural history of angular correction and LLD progression over time in a large multicenter cohort, and to determine whether sex or initial deformity severity predict LLD accumulation rate.

How did you answer the question?

Seven pediatric orthopaedic hospitals contributed to this IRB-approved retrospective multicenter study. Patients were identified within the electronic medical record with confirmed posterior medial tibial bowing and more than one radiographic evaluation. Data collected included demographic information, laterality, surgical interventions, and radiographic measurements of angular deformity and long bone length obtained by pediatric orthopaedic surgeons. Pre-intervention LLD slopes (cm/month) were calculated by linear regression restricted to measurements at or after 60 months of age to mitigate the geometric confound of active tibial bowing on straight-line length measurement. Sex differences in LLD slope were assessed by Mann-Whitney U test and further evaluated after normalization against age- and sex-specific expected limb growth velocities from Green-Anderson reference data. Spearman correlation assessed whether initial oblique plane deformity severity – quantified as the resultant angle ($\sqrt{AP^2 + Lat^2}$) at first presentation within 12 months of birth – predicted LLD accumulation rate.

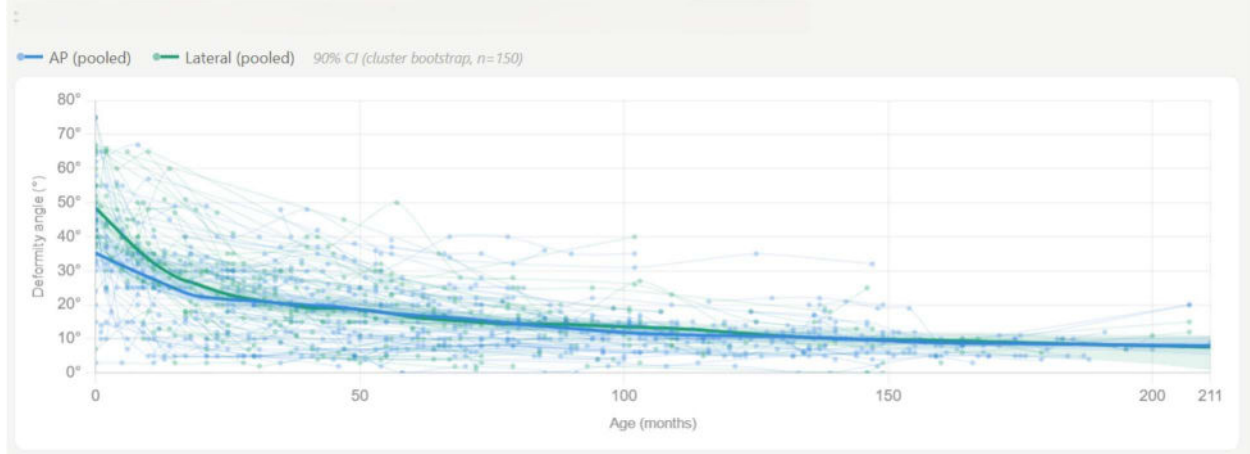
What are the results?

100 patients were included (57 female, 43 male); 99 were unilaterally affected and 1 bilaterally, with each side included for deformity analysis but excluded from LLD comparison. Radiographic evaluation spans birth to just under 18 years of age. 655 AP and 369 lateral deformity measurements were recorded, demonstrating consistent spontaneous angular improvement across the cohort. 206 LLD measurements were available for 30 patients. After restricting LLD analysis to measurements at or after 60 months, males and females accumulated LLD at median rates of 0.0272 and 0.0264 cm/month respectively (Mann-Whitney $p = 0.887$). After normalization for expected growth velocity, both sexes accumulated LLD at approximately 9% of their expected limb growth velocity ($p = 0.887$), indicating no sex-specific difference in growth inhibition fraction. Initial oblique plane deformity severity at presentation did not significantly predict LLD accumulation rate (Spearman $r = 0.393$, $p = 0.295$, $n = 9$).

What are your conclusions?

Spontaneous angular correction and leg length discrepancy accumulation occur at varying rates over childhood in PMB. LLD accumulates at a consistent rate relative to normal growth velocity regardless of sex, suggesting standard growth models are applicable without sex-specific correction in this condition. Initial deformity severity at birth does not reliably predict LLD trajectory, limiting early radiographic counselling. This largest multicenter natural history dataset for PMB to date supports the need for prospective long-term follow-up to skeletal maturity to fully characterize LLD progression and better inform surgical timing decisions.

DEFORMITY ANGLES OVER AGE



Rate of change (°/month)

