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■ LOWER LIMB LENGTHENING OUTCOMES IN ACHONDROPLASIA: TIMING OF SURGERY AND IMPACT ON HEIGHT AND FUNCTIONALITY

Christoph BEGER¹, Inês ALVES^{2,7}, Marco SESSA^{3,7}, Patricia CARL-INNIG⁴, Moira S. CHEUNG⁵, Klaus MOHNIKE^{6,7}

¹ Growth Network CrescNet, Medical Faculty, Leipzig University, Leipzig, Germany; ² ANDO Portugal, University of Évora - CHRC, Évora, Portugal; ³ AISAC - Italian Association on Achondroplasia, Milan, Italy; ⁴ BKMf e.V., Leinestraße 2, 28199, Bremen, Germany; ⁵ Great Ormond Street Hospital, NHS Foundation Trust, London, UK; ⁶ Children's Hospital, Otto-von-Guericke-University, Magdeburg, Germany; ⁷ ERN BOND, Bologna, Italy; ines.alves@andoportugal.org

1. Introduction and objectives

Lower limb lengthening (LL) surgery is an option for individuals with achondroplasia to increase height¹. Surgical techniques offered for LL differ globally², with a gap between outcomes expectations from families and published medical papers. Despite recommendations for childhood intervention³, evidence comparing outcomes between early versus later intervention remains limited. This study analysed the impact of surgical timing on height outcomes and functionality in patients with achondroplasia.

2. Materials and methods

A cross-sectional online survey on LL experiences was conducted in 2024 across 11 languages. A total of 614 responses from 16 countries were collected through REDCap, a secure web application, and 50 met inclusion criteria (diagnosis of achondroplasia, >12 years for self-respondents or be a parent of a child with achondroplasia <12 years, history of LL surgery) and were categorized by timing of first LL surgery: childhood (<12 years, n=27, 15 females) or adolescence (≥12 years, n=23, 11 females). Outcomes included added length per limb, final adult height and functionality across 8 daily activities (bathing, brushing hair, wiping after toileting, dressing, driving, putting on shoes, walking upstairs and downstairs). Statistical analysis employed Student's t-tests and Fisher's exact tests (significance: p<0.05).

3. Results

Timing of surgery showed no statistically significant advantage

between groups. Added length per lower limb was comparable as females gained 12.3 cm (childhood) versus 12.6 cm (adolescence), males gained 8.0 cm versus 11.0 cm, respectively. Final adult heights for female were 134.3 cm (childhood) versus 137.7 cm (adolescence), while males showed an inverse relationship at 145.0 cm (childhood) versus 140.7 cm (adolescence). Functionality assessments showed similar improvements in daily activities regardless of timing of LL surgery.

4. Conclusion and perspectives

This study challenges the assumption that early LL surgery yields superior outcomes. Our findings suggest no significant differences in final height or functional improvements based on time of LL surgery. Importantly, the timing of surgery involves some trade-offs, with later intervention allowing greater patient involvement in decision-making, but may coincide with key academic periods, posing psychological and practical challenges due to prolonged immobilization^{4,5}. These results support a flexible approach to surgical timing, emphasizing individualized, patient-centered care and informed consent. While limited by sample size, this study provides real-world evidence to guide decision-making in achondroplasia.

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