Salter Harris III and IV Medial Malleolus Fractures in Children <10: Is This a Fracture of Necessity?

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INTRODUCTION: Salter-Harris (SH) III and IV medial malleolar fractures are often associated with physeal bar formation and subsequent growth arrest. The purpose of this study was to compare operative and non-operative management of these fractures to assess the risk of physeal bar formation and identify factors predictive of physeal injury.
METHODS:
A retrospective cohort analysis was performed including children ≤10 years old who were treated for SH III or IV medial malleolar fractures from 2012-2024 at a single institution. Patients underwent open reduction internal fixation (ORIF) or non-operative management (casting/boot) and had a minimum radiographic follow-up of 6 months. Exclusion criteria included previous ipsilateral tibia surgery, open or pathologic fractures, and underlying neuromuscular or metabolic disorders. Demographics, clinical, and radiographic variables including articular displacement, lateral distal tibial angle (LDTA), and physeal bar formation were compared between treatment groups and subgroups with or without bar formation.
RESULTS: Thirty-two patients (16 ORIF, 16 closed treatment) were analyzed. There were no significant differences in the incidence of physeal bar formation between ORIF and closed treatment groups (25% vs. 19%, p=1.0). Patients who developed physeal bars had significantly greater pre-reduction articular displacement (median: 9.1mm vs. 2.4mm, p=0.045), greater changes in LDTA (6.2° vs. 1.0°, p=0.006), and higher rates of delayed healing (57% vs. 4%, p=0.004). Clinically significant physeal bars occurred exclusively in patients with comminuted fractures (p=0.029). Final articular displacement was lower in ORIF versus closed treatment (0.0mm vs. 1.0mm, p=0.012). However, ORIF had greater reoperation rate for hardware removal (p<0.001).
DISCUSSION AND CONCLUSION: The risk of physeal bar formation following SH III and IV medial malleolar fractures was not influenced by treatment modality (ORIF vs. closed). Greater initial fracture displacement and comminuted fracture morphology significantly predicted physeal injury. Treatment decisions should prioritize injury severity, emphasizing the importance of achieving anatomic reduction in displaced fractures.