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Results of 90 Consecutive Noninvasive Prosthetic Expansions in Children treated for Bone Tumors

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Introduction: Limb salvage in pediatric patients presents a unique challenge when resection includes an active physis. Early expandable prostheses required several open surgical procedures to achieve lengthening, increasing the infection risk. Newer prostheses are capable of achieving expansion without open procedures through the use of an electromagnetic field.

Purpose: This study reports our results with 90 consecutive expansion procedures using a noninvasive expandable prosthesis.

Methods: We retrospectively reviewed the records of 20 patients (22 limbs) who underwent limb salvage using the Repiphysis® noninvasive expandable prosthesis from 2003-present. There were 9 males and 11 females with a mean age of 9 years and 9 months. Reconstruction included the distal femur in 11 cases, total femur in four, proximal tibia in three, proximal humerus in three, and total humerus in one. Complications were reviewed and functional status was assessed using the MSTS scoring system. Five patients had a second prosthesis implanted during the course of the study for a total of 27 prostheses.

Results: The mean follow-up was 50 months. Four patients have not been expanded; Ninety expansion procedures were performed in the other 18 patients with a mean of 9mm gained per expansion and 4.6cm per patient. Seven patients have reached skeletal maturity and been converted to an adult endoprosthesis. These patients averaged 8 expansions per patient and a mean of 7.4cm length gained. There were 15 complications in 11 patients including one dislocation, one contracture, four cases of aseptic loosening, five structural failures (three expansion mechanism failures and two tibial fractures), three deep infections, and one case of local recurrence. The mean MSTS score was 80% and the limb retention rate was 95%.

Conclusion: The results of this study are comparable to previous studies involving non-invasive prostheses and contribute to the body of literature supporting their use for limb salvage in pediatric patients with substantial growth remaining.