

Distal Tibia Intercalary Reconstruction with Modified Capanna Technique (Free Fibula Flap and Strut Allograft)

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Background:

Surgical treatment options for Ewing sarcoma of the distal tibia must balance effective oncologic control with the preservation of limb function. Below-knee amputation is a reliable method for eradicating the malignancy. However, limb-sparing techniques, such as the modified Capanna technique, offer an alternative that can preserve the limb's function. This approach combines a vascularized free fibula flap with a strut allograft to reconstruct the resected bone.

Case Presentation:

A 14-year-old boy presented with a few months' history of pain and swelling in the right lower leg and ankle. Imaging studies revealed a mixed lytic and sclerotic lesion in the distal tibia. A confirmed diagnosis of Ewing sarcoma was obtained through image-guided core needle biopsy. The patient received preoperative chemotherapy, with post-chemotherapy staging indicating localized disease without epiphyseal involvement.

Surgical Technique:

The decision was made to perform distal tibia resection and reconstruction using the modified Capanna technique. This involved a vascularized free fibula flap combined with a strut allograft. The distal tibia was resected while preserving the ankle joint. The allograft was prepared by shaving and carving a distal tibia allograft to replace approximately 60% of the resected bone. The vascularized fibula graft was harvested from the contralateral leg and subsequently cut, creating a double-barrel graft. The allograft and fibula graft were fixed to the host bone with a long medial malleolus percutaneous plate and 2.4mm screws.

Outcomes:

Postoperative radiographs at three months showed early bone bridging at the proximal osteotomy site and solid distal contact of the dual-barrel construct with the host bone. At one year, there was significant bone formation and functional recovery, with the patient displaying near-normal gait and no major functional restrictions.

Conclusion:

This case demonstrates the successful use of the modified Capanna technique for limb-sparing surgery in a pediatric patient with distal tibia Ewing sarcoma. The combination of a vascularized fibula flap and strut allograft provided excellent structural and functional outcomes, highlighting the effectiveness of this approach in preserving limb function while ensuring oncologic control.