Introduction

The surgical management of segmental tibial defects following wide resection in malignant bone tumors is debated in the literature. The current gold standard treatment is vascularized fibular graft (VFG). The question remains whether a simple intercalary allograft to bridge the defect can obtain equivalent long-term results to VFG. The clinical outcome of fifteen cases are presented in this series.

Materials and methods

From 1984 to 2012, 15 patients with malignant tibial bone tumors underwent segmental resection and reconstruction using freeze-dried allograft. There were 6 children with open physes and 9 adults. Adult fixation was obtained with plating, intramedullary nailing, or combination nail and plate. Children were treated with plating in order to preserve the physis. Muscle flap coverage over reconstruction was performed in all cases and consisted of soleus muscle flap for distal tibia defects or gastrocnemius muscle flap for proximal tibia defects.

Results

All case went on to boney union. No infections occurred in the population. Complications included allograft fracture treated with revision plating. One local recurrence treated with below knee amputation. All cases progressed to full weight bearing in less than one year. Leg length discrepancy was minimized in children in this series by preservation of growth plates.

Discussion

This case series demonstrates that segmental tibial defects can be successfully treated with cryopreserved allograft. Vascularized fibular graft is associated with potential donor site morbidity. There are many advantages of allograft reconstruction. Firstly, elimination of the fibular autograft with vascular pedicle decreases the technical difficulty of the procedure. There is faster return to weight bearing when compared to fibular autografts and a lower rate of graft fracture

The biomechanics and anatomy of the tibia make it more suitable for allograft reconstruction than the femur. The tibia's anatomical and mechanical axes are the same, thus decreasing shearing and bending forces across the donor-host bone interface. This makes healing more likely. The metaphysis and diaphysis of the tibia have a large amount of cancellous bone that allows for infiltration of bone precursor cells. This anatomy differs from the femur where the anatomic and mechanic axes are far different and the cortices are thicker. It is these differences in anatomy and biomechanics that necessitate the surgeon to consider different reconstructive option when treating these anatomic locations.

The decision of fixation must be done on a case-by-case basis with attention paid to maintaining the integrity of an open physis and preservation of the knee and ankle joints. Maintenance of a biomechanically stable construct is imperative to the success of reconstruction.

Conclusion

Segmental tibia surgical defects from wide resection of malignant bone tumors are unique lower extremity defects that can be successfully treated with cryopreserved allograft.