

Case Series

Tumors around the ankle: a reconstructive challenge

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Received: 25 November 2023

Accepted: 07 February 2024

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ABSTRACT

Tumors around the ankle can be either bone or soft tissue sarcomas. The aggressive nature of these tumors and the complex anatomy of the ankle mortise make for a challenging reconstructive ladder. We have explored four different histological tumors which required tailor made resection and reconstruction. All our patients had reasonably good functional outcomes.

Keywords: Distal tibia, Osteosarcoma, Rhabdomyosarcoma, Calcanectomy, Endoprosthesis

INTRODUCTION

Sarcomas of the distal upper and lower extremities always present a challenge for limb salvage. Lack of adequate soft tissue cover in leg and foot makes the procedure cumbersome and complicated. In upper limb it is dexterity of hand and finger movements and in lower limb it is stability of ankle joint that matters. Primary osteosarcomas of the tibia account for 20% of all osteosarcomas, with only a fraction of these occurring in the distal tibia.¹ Due to the subcutaneous nature of the distal tibia, as well as its close proximity to vital neurovascular and musculotendinous structures, adequate tumour excision with wide surgical margins will be difficult to achieve. Primary tumors of the calcaneum and the soft tissue around the ankle joint are equally challenging to manage.

Consequently, the traditional treatment offered to patients with malignant bone tumours of the distal tibia and calcaneum was amputation.² However, with the development of newer surgical techniques, modern imaging methods, and new chemotherapy regimens, limb salvage has become a more practical option compared to amputation for these patients. The various methods of limb salvage include free vascularised or non-vascularised fibular autograft with arthrodesis, osteo-articular allograft, and endoprosthetic reconstruction. Although the long-term

oncological and functional outcomes of prosthesis are currently unclear, it enables ankle mortise preservation and earlier mobilisation, without significant risks of non-union and infection.

CASE SERIES

We report a limited but varied retrospective study of clinical and functional outcomes in two patients who underwent excision of distal tibia with custom made prosthesis reconstruction and two patients who underwent calcanectomy and reconstruction. We have explored four different reconstructive modalities around the ankle joint with reasonable functional outcomes

Case 1

56-year-old male was diagnosed with rhabdomyosarcoma of right leg with involvement of soft tissues, skin and tibia. He was treated with VAC IE 4 cycles, wide excision including resection of bone was done along with reconstruction by custom mega prosthesis and lateral thigh free flap. Post-operative biopsy was pT3 high grade spindle cell sarcoma. All resected margins were free.

Two more cycles of chemotherapy and radiation were proceeded with.

This patient was denied a chance at limb salvage in a couple of tertiary care centres. He had both bone fracture of right leg and head of femur in 1996, for which nailing for tibia and hemi arthroplasty of right hip was done. He underwent THR and right fibulectomy with bone grafting from opposite iliac crest for prosthesis failure of hip and non-union of tibia respectively 4 years later. In 2012 in another accident he had fracture right humerus for which internal fixation was done. He developed infection, prosthesis was removed and sequestrectomy was done in 3 staged procedures leading to flail right upper limb. In 2015, he had crack fracture of lumbar vertebra which was managed conservatively.

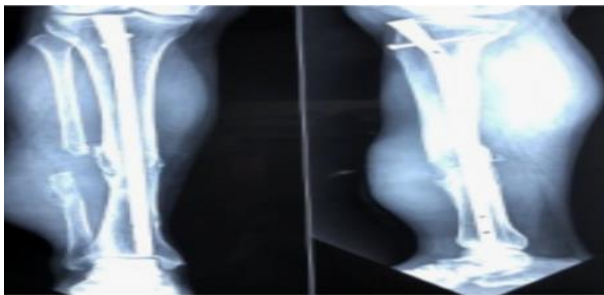


Figure 1: Tibia with intramedullary nail in situ.

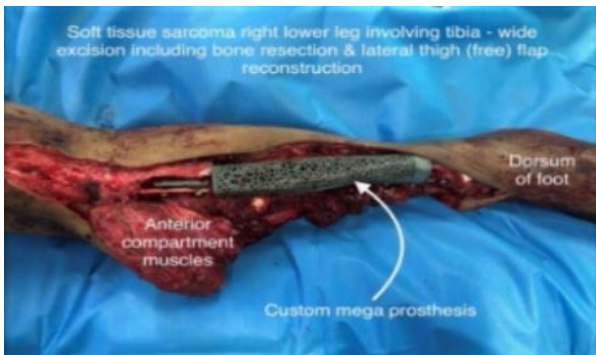


Figure 2: Endo prosthesis reconstruction 3D printed.



Figure 3: Soft tissue cover with lateral thigh free flap.

Many patients refuse amputation as treatment for their distal tibial tumour due to psychosocial reasons. With careful patient selection, endoprosthetic reconstruction of

the distal tibia could bridge the gap. This patient was resilient throughout the course of treatment and persisted for limb salvage.



Figure 4: Post operative.

Case 2

18-year-old female patient presented with osteosarcoma of distal tibia – resection with CMP reconstruction was done after 3 cycles chemotherapy. Initial functional outcomes were excellent, but unfortunately she developed infective complications and ended up with below knee amputation because as a college student she was not ready to undergo the tedious process of limb salvage at the cost of her studies.

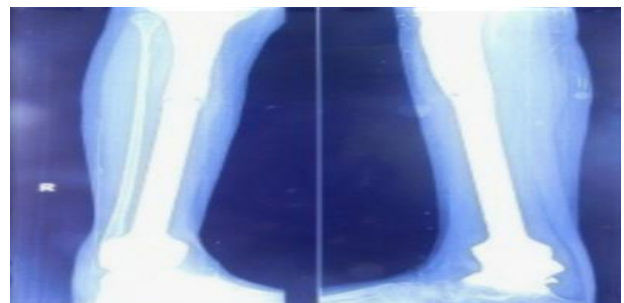


Figure 5: Post prosthetic reconstruction.



Figure 6: Intraoperative prosthesis fixation.

Case 3

13-year-old girl child had Ewings sarcoma of calcaneum – after 3 cycles of neoadjuvant chemotherapy, calcaneotomy

with allograft reconstruction was done. Patient is ambulatory and recurrence free.

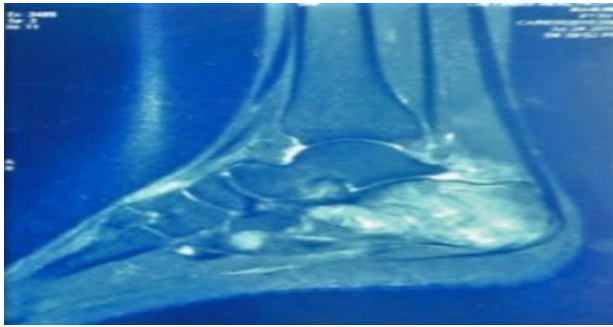


Figure 7: Calcaneal tumor.

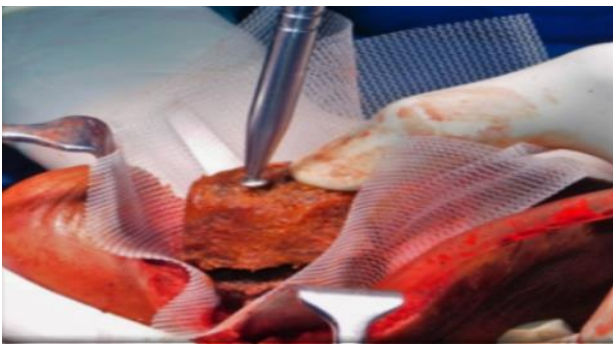


Figure 8: Allograft with mesh reconstruction.

Case 4

44-year-old male patient with malignant fibrous histiocytoma of heel, wide excision with reverse sural artery based flap reconstruction was done. Functional outcomes were good with proper weight bearing.

DISCUSSION

Loss of limb has traditionally been equated to loss of livelihood. Even in modern ages, the stigma surrounding an amputee is a fact and cannot be refuted. All the patients in this study and many more whom we treated, were offered amputation as the initial modality in many places. The current published literatures also suggest that amputation achieves the most reliable clinical and functional outcomes whilst accepting the significant psychological and physical burdens. The question on how to strike a balance between oncological principles and function preservation in this subset of patients still remains.

Endo prosthetic reconstruction offers an appropriate alternative in the management of aggressive distal tibial tumours wherein amputation was the first option considered. Table 1 shows the excellent MSTS scores for patients who underwent both endoprosthetic as well as free flap reconstruction. Prosthetic reconstruction techniques have an easy learning curve, better reproducible and the

ability to be revised if needed.² There have only been a small number of reports on the longterm outcomes of prosthetic reconstruction so far as distal tibial tumours are extremely rare. The medium and long term outcomes of these prostheses therefore still remain unclear.

Table 1: MSTS SCORE for the patients.

Primary tumor	Reconstructive procedure	MSTS score %
Rhabdomyosarcoma (R) leg	CMP + ALT free flap reconstruction	88
Osteosarcoma (R) tibia	CMP reconstruction	82 initially
Ewings sarcoma - calcaneum	Allograft with mesh	75
Malignant fibrous histiocytoma of heel	WLE + reverse sural artery flap	80

A number of studies have reported the best functional outcomes and oncological results in patients treated with free vascularised or non-vascularised fibular autograft with arthrodesis, with mean MSTS between 75% and 80%. There is an undisputed advantage where soft tissue cover is needed.³ However free flap reconstruction is more time-consuming to perform and requires a longer recovery period.

Earliest studies on prosthetic reconstruction outcomes had shown functional results around 70%. Most of the studies had only limited number of patients and a shorter follow up. Abudu et al followed up 6 patients of prosthetic reconstruction over 4.6 years and reported a functional outcome of 64%. Wound infection and local recurrence were seen in 1 patient respectively.⁴ Shekkeris et al reported a longer follow up for 9.6 years of 6 patients, 2 of whom ended up in amputation after 6 years.⁵ Follow up by Lee et al showed the best outcomes with functional score of 80% in 6 patients.⁶ Finally a retrospective analysis by Natarajan et al addressed the need for revision surgery in two of their 6 patients who ultimately had functional scores exceeding 80%.⁷

Evidently, we too have less numbers and shorter median follow-up periods. However, we have shown a similarly low rate of local recurrence and complications to existing studies. Our data reflects that patients with distal tibial bone tumour treated by wide resection and reconstruction with endoprosthetic and microvascular free flap reconstruction do very well, provided that they do not develop local recurrence or metastases. The risks of disease recurrence may further be reduced by chemotherapy. With an optimally done reconstruction, early recovery helps in appropriately initiating adjuvant therapy too.

There was only one case of mechanical failure in our study involving delayed septic complications. This patient required regular close follow-up, conservative

management but chose to have amputation. Although prosthetic reconstructions can have significant complications, these can be treated without having to result in need for further revision or amputation in all cases. Ultimately, function is adequate following reconstruction of the distal tibia and ankle, with median MSTs of 80%.

CONCLUSION

With all technical difficulties taken into consideration, limb salvage for distal upper and lower limbs is still feasible on most of the occasions because of modern prosthetics and availability of microvascular free flaps. Gone are the days when amputation was standard of care in distal extremities. Survival rates are similar if not better in those patients with limb salvage.⁸

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Shanmugam S, Vijayalakshmi G. Tumors around the ankle: a reconstructive challenge. *Int J Res Orthop* 2024;10:424-7.