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Case report

Wide margin excision followed by tibialisation of fibula and ankle arthrodesis as novel surgical technique in giant cell tumor patient

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1. Introduction

Giant cell tumor (GCT) of bone are relatively rare, constituting about 3% of all bone tumors.[1] Its location in the distal tibia is quite rare and present a challenge in its management. This is due to the fact that the site has few direct muscle attachments and minimal vascularity. Wide margin excision followed by tibialisation of fibula and ankle arthrodesis is a relatively straightforward procedure but only few studies have evaluated its role in the reconstruction of tumor-related defects.

2. Case report

A 17-year old girl presented to the orthopedic outpatient department with complaints of pain in the left ankle that started since 8 months ago. The pain was described as non-radiating dull pain, which is aggravated by movement and alleviated with rest. There was no history of fever, nocturnal pain or trauma. The patient also reported no history of alternative therapy. A couple of months prior to presenting to our outpatient department, she noticed a lump on her left ankle that increases in size, as well as some weight loss. Physical examination revealed a 6-cm mass in the anterior side of her left ankle with visible swelling that is tender with palpation. The range of motion of her left ankle was hindered by the mass. The patient was previously assessed with clinical suspicion of malignant bone tumor of the left tibia and was sent for further evaluation. Routine laboratory investigations were unremarkable.

Plain radiographs revealed an expansile, solitary lytic lesion in her left distal tibia with no sign of reactive sclerosis or periosteal reaction. Matrix calcification was also absent (Fig. 1). Magnetic Resonance Imaging (MRI) of the distal third of the tibia revealed a 7.1 × 7.9 x 11.3 cm solid tumor that was not enhanced with contrast. The mass has relatively distinct borders, with no evidence of infiltration to the fibula, soft tissues and surrounding muscles (Fig. 2).

Open biopsy was inherently done and cytology examination revealed proliferation of mononuclear cells showing partially

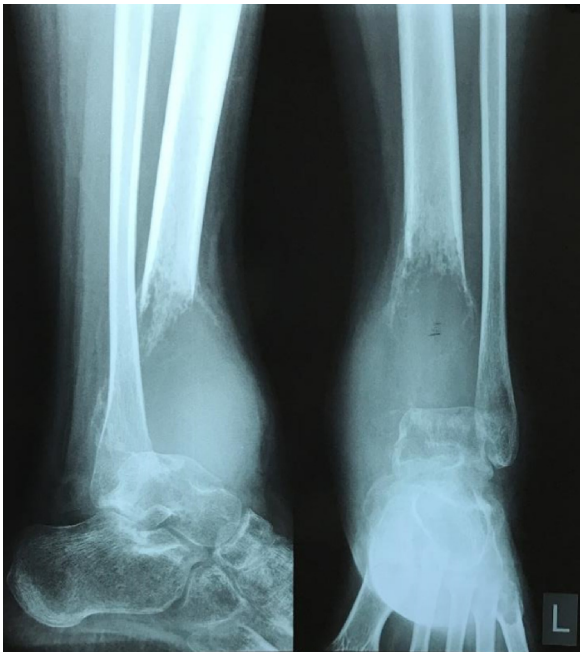

Fig. 1. AP and lateral X-ray view of left distal tibia and fibula at initial presentation.

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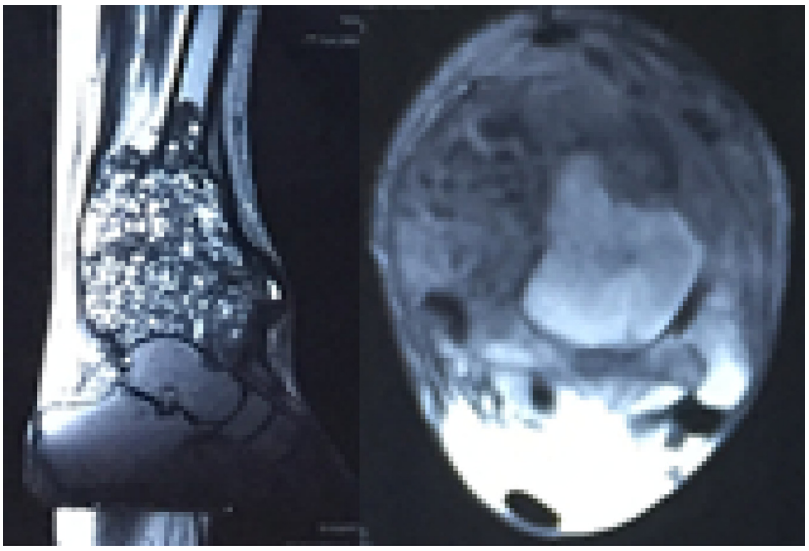

Fig. 2. MRI showing no perilesional edema and no soft tissue extension. The mass was diagnosed radiologically as primary bone tumor of giant cell type.

spindle and oval morphology. Eosinophilic cytoplasm, monomorphic and spherical nucleus, regular nuclear membrane with partially visible nucleolus, and mitosis can also be seen. There is also a distribution of multinucleated giant cells with similar morphology to mononuclear cells, some containing 10–15 nuclei. The cells were surrounded by extravasation of erythrocyte. Histopathological report identified the specimen as Giant Cell Tumor of the bone (Fig. 3).

Due to the presence of juxta-articular neoplasm with no evidence of cortical breech or soft tissue involvement, the patient was planned for a wide margin excision followed by tibialisation of fibula and ankle arthrodesis. Intra operatively there was no evidence of pathological fracture or soft tissue extension, although extensive ballooning was seen. Resection of the tumor in the tibia was done with a 2-cm margin, both proximally and distally, and concomitant size of the middle fibula was excised to fill the gap in the tibia. Internal fixation for the fibular graft was performed using plate and screws, and ankle arthrodesis was done using screws (Fig. 4). The excised specimen was sent for histopathological examination.

Sutures were removed on postoperative day 10 and gradual weight bearing was started using a walker. Six weeks post-

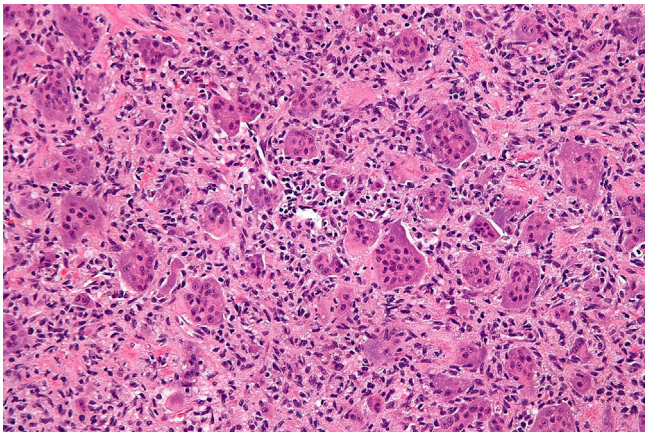

Fig. 3. Microphotograph showing appearance of multinucleated giant cells with varying number of nuclei with uniform arrangement interspersed between mononuclear giant cells. (H&E, x200).

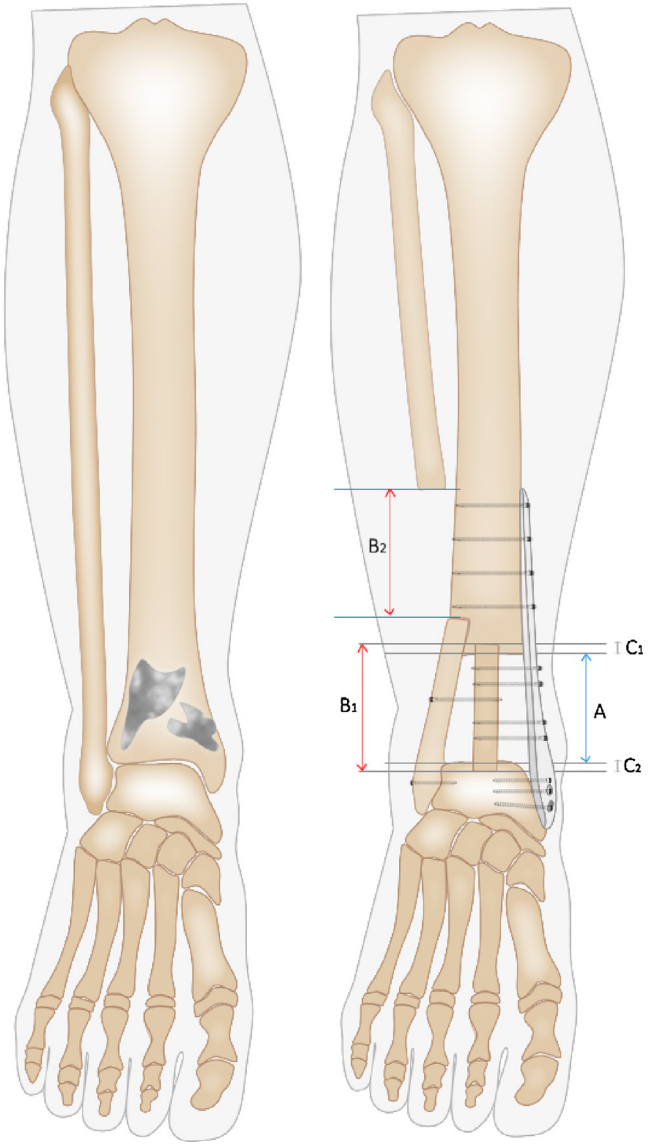

Fig. 4. Resection of the tumor in the tibia (A) was done with a 2-cm margin, both proximally (C_1) and distally (C_2), and concomitant size of the middle fibula (B_2) was excised to fill the gap in the tibia (B_1).

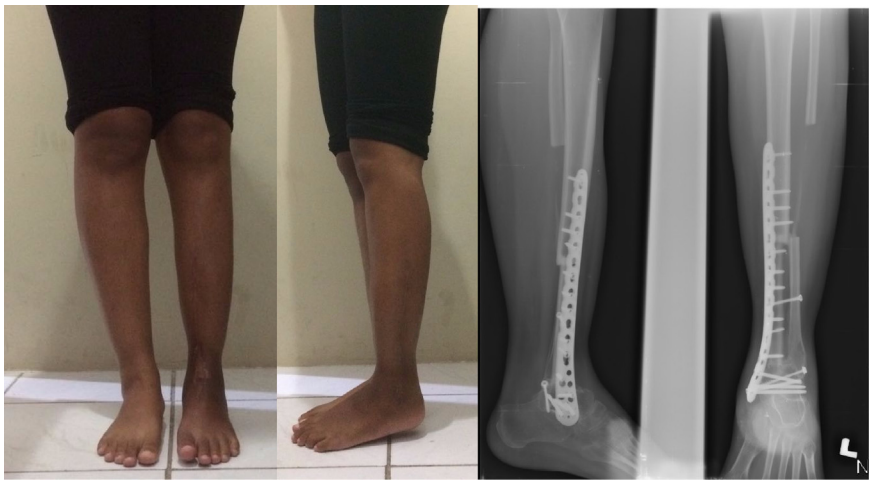

Fig. 5. Patient condition at 24 months, clinically (left) and radiographically (right).

operatively, the patient was permitted to walk with no aid. A follow up at 24 months showed that patient experienced no pain and was able to walk without any support. Gait patterns were normal, no limb length discrepancy was reported and the range of movements for the ankle were close to normal (Fig. 5a). The radiological image showed normal bone alignment and no complication was ever reported (Fig. 5b).

3. Discussion

Giant cell tumor (GCT) of the bone is a relatively rare entity. The incidence rate of malignant GCT is revealed to only be about 3% of all malignant bone tumor, and it has no gender predilection.[1] In Indonesia, Cipto Mangunkusumo National General Hospital (RSUPNCM) recorded in the period of 1990–1997 that the most frequent sites of GCT are proximal tibia, distal radius, distal femur, distal ulna, proximal humerus, distal humerus, cervical vertebra, and proximal femur.[2] The presence of such tumor in the distal tibia is a rare occurrence.

Recent advances in the treatment of musculoskeletal neoplasm has made it possible to replace the long-held standard surgical procedure for aggressive bone tumors involving the distal tibia and fibula (below-knee amputation) with several limb salvage reconstructive procedures.

The free vascularized fibular graft for bridging large skeletal defects is preferred by many surgeons due to its great versatility to manage a wide variety of different pathologies, even for the most complex cases, but the complexity of its preparations and possible complications might serve as a deterrence. This technique relies on using intramedullary nail for arthrodesis and support.[3] It requires a dedicated microsurgical team who are expected to work a considerable length of time to deal with its micro-vascularity. Complications such as deep soft-tissue infection, thrombosis of the pedicle, osteomyelitis, fixation failure, compartment syndrome, and vascular injury were also reported.[4,5] There are also reports regarding the associated ankle deformity, ankle instability, foot pain, muscle weakness, and donor-site morbidity.[6]

Resection-arthrodesis of the ankle with non-vascularized bone graft reconstruction can be an effective procedure for surgical management of bone tumor located in the distal tibia with successful functional results.[7] The advantages of an arthrodesis are that it restores skeletal continuity, provides excellent stability and avoids problems related to prosthetic implantation. Centralization of the fibula is usually performed for post-traumatic and post-infective tibial defects but only a few studies have evaluated its role in the reconstruction of tumor-related defects.[8,9] Fixation of the remaining distal fibula to the distal tibial metaphysis is also done to avoid ankle valgus deformity.[8]

In conclusion, GCT of bone is relatively rare, and its occurrence in the distal tibia is a distinct rarity for a GCT. This present as a challenge because the distal half of the tibia has few direct muscle attachments and minimal vascularity. Wide margin excision followed by tibialisation of fibula and ankle arthrodesis is a relatively straightforward procedure, requiring no microsurgical expertise, and offers a durable, satisfactory oncological and functional results.

Authors' contributions

The author (I Gede Eka Wiratnaya) cared for the patient; gathering the histopathological examinations results; and also prepared the draft of the manuscript for finalizing this version to be published. The author read and approved the final manuscript.

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Conflicts of interest

All authors have none to declare.

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