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Case Report

Proximal Fibular Autograft Reconstruction after Resection Giant Cell Tumor Distal Fibula

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ABSTRACT

Background: Giant cell tumor (GCT) is a destructive bone tumor. The predilection of the GCT is mostly on the epiphysial of long bones. GCT of the distal fibula is a very rare case that becomes challenging in surgical management. The chosen surgical management is crucial and still under debate.
Case Report: A 38-years-old male complaint of a painful lump in the lateral side of his left ankle for three months. Plain radiographs demonstrate a lytic lesion involving distal fibula, appropriate with 2nd-grade Campanacci. MRI showed a mass centered on the distal fibula with intermediate to high T2 signal, low T1 signal, and homogenous contrast enhancement. The patient underwent a wide excision and reconstruction of the distal fibula with a fibular head graft from the ipsilateral side. After fifteen months of evaluation, the result was excellent. The patient can full-weight-bearing with a full range of ankle joint movement, return to daily activities without pain, and no signs of recurrence. Functional status measured by the MSTS and CAIT showed good results, with total scores was 28 and 27.
Discussion: Ten centimeters distal fibula is a crucial component to form stability of the ankle. Reconstruction of the distal fibula after wide excision requires the bone graft and is considered to maintain ankle stability. It can be achieved using autograft from fibula or iliac crest.
Conclusion: Reconstruction of distal fibula GCT with proximal fibular autograft showed a great result. This method is a viable option as it provides good pain relief and functional improvement.

Keywords: Giant cell tumor; Proximal fibular autograft; Reconstruction; Human and medicine

INTRODUCTION

A giant Cell Tumor (GCT) is a benign but locally aggressive tumor of bone composed of a proliferation of mononuclear cells with scattered macrophages. GCT accounts for approximately 5% of all primary bone lesions and is most common between 20 and 45. GCTs typically affect the metaphyses of long bones with preponderance for the distal femur, proximal tibia, distal radius, and proximal humerus.[1] Involvement of the hand and foot bones is rare, with incidences ranging from (2-4%) in the hand and (1.2-1.8%) in the foot. The incidence of GCT of the distal fibula is reported to be less than 1% of all GCT.[2]

GCT has challenging and confusing features. These include the local aggressiveness with a high risk of recurrence. Different treatment modalities are reported with the aim of eradicating the tumor while maintaining

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function. Wide excision has been reported to be associated with the lowest risk of recurrence but can cause significant functional impairment.[3] Previous biomechanical studies have quantified the amount of distal fibular bone needed to maintain ankle stability and have an important effect on the long-term stability of the ankle.[4]

Resection of the lateral malleolus can induce instability of the ankle and can potentially induce arthrogenous valgus deformation. Restoring lateral ankle stability following distal resection of the fibula is a difficult procedure for which several surgical techniques have been proposed. Due to the rarity of the condition, reconstruction techniques vary, with variable results.[5,6]

We present fifteen months of follow-up of a case of grade 2 GCT of the distal fibula treated with wide excision and reconstruction of the distal fibula by ipsilateral proximal fibula to preserve ankle function.

CASE REPORT

A 38-years-old male came with the chief complaint of pain on the ankle's left lateral side three months ago, with a Visual Analog Scale was 6. The pain increases when the patient moves the ankle joint or when the patient walks. The patient has difficulty and limps when walking, so the patient uses one crutch when walking and doing daily activities for the last one month. The patient also complained about a lump on the left ankle, which getting bigger within three months (Figure 1).

Figure 1. Clinical of the Patient Preoperative

Physical examination demonstrated a lump on the left distal fibula, with no venectation or sinus. There was palpable solid mass with tenderness on deep palpation. The circumferential diameter was 27 cm, and the contralateral side was 25 cm. There was a restriction of range of movement (ROM), active ROM dorsoflexion and plantarflexion were 10° and 30° (normal values were 25° and 50°). In comparison, active ROM inversion and eversion were 5° and 0° (normal values were 10° and 5°).

To evaluate left lower extremity function, we used the musculoskeletal tumor society (MSTS) scoring. In this patient, the MSTS score before surgery was 10 (the scoring range was between 0-30, a higher score indicating better function). While measuring the functional ankle instability, we used the Cumberland ankle instability tool (CAIT). In this patient, the preoperative CAIT score was 16. The CAIT maximum score is 30, with a lower score indicating more severe functional ankle instability.

Figure 2. X-ray of the ankle

The ankle's plain radiographs of the left ankle demonstrate a lytic expansile lesion involving distal fibula, appropriate with 2nd-grade Campanacci (Figure 2). Magnetic resonance imaging confirms the plain radiograph features. A mass centered on the distal fibula is solid with intermediate to high T2 signal and low T1 signal and demonstrates relatively homogenous contrast enhancement (Figure 3).

The patient had undergone an open biopsy and an investigation was reviewed in Pathology of Anatomy of our institution. The histopathological features showed multinucleated giant cells. There was regular and uniform distribution of stromal cells and giant cells, which suggested a diagnosis of GCT (Figure 4). This case was bought and discussed in the Clinicopathological Conference (CPC – A board consisting of experts from Orthopaedics, Radiology, and Pathology Anatomy department). The patient we decided for wide excision and reconstruction with ipsilateral proximal fibular autograft.

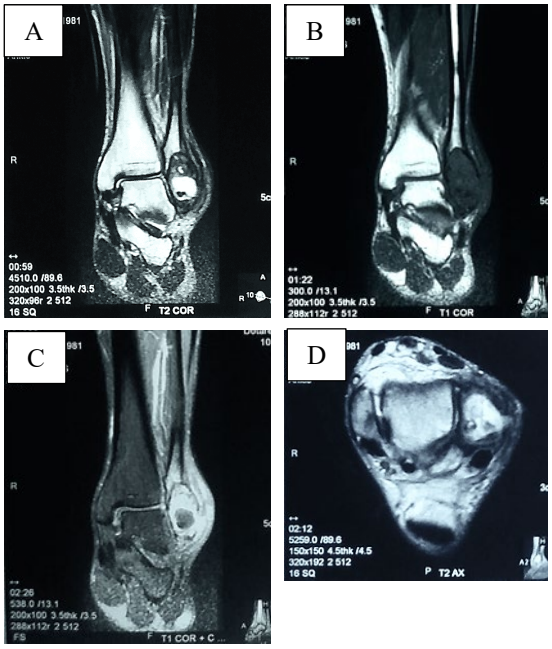

Figure 3. MRI of the ankle: (A) coronal T2, (B) coronal T1, (C) coronal T1 + contrast, (D) axial T2.

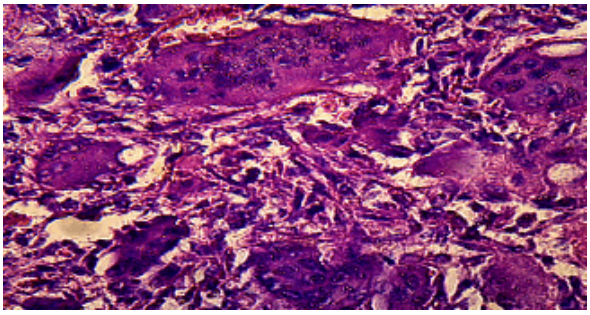

Figure 4. Histopathological slide

The margin of the tumor was determined precisely on plain radiography and MRI before surgery. We did surgery through a posterolateral incision of the distal fibula and found the tumor was easily demarcated. After the tumor was exposed, we evaluated the margin of the wound. Then we did distal fibula osteotomy at the desired length (with at least 2.5 cm intact bone margin). The margin of tumor excision that we did was tumor-free, and the tumor specimen was delivered to the pathology anatomy department (Figure 5). Continue taking autograft, via posterolateral approach to the ipsilateral proximal fibula, along the

posterior margin of the fibular head. The common peroneal nerve is isolated and watched carefully. Osteoarticular autograft was applied and internally fixed with One-Third Tubular Plate and screws, and one syndesmosis screw was inserted through the plate (Figure 6A).

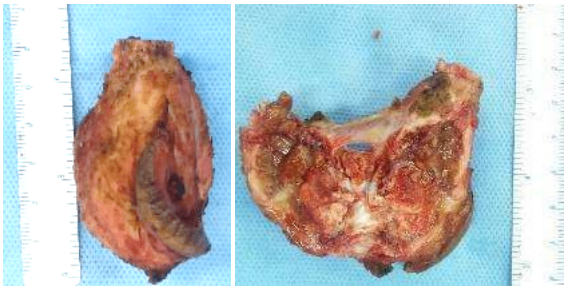

Figure 5. Tumor tissue after excision

After surgery, the ankle is immobilized in a posterior plaster splint in a neutral position and elevated. On the 3rd day, the splint was removed, and ankle and knee ROM exercises were started to overcome ankle stiffness and muscle weakness. On the 4th day, the patient started to non-weight-bearing mobilize with two crutches. Then follow-up is done at the 3rd, 9th, and 15th months. The clinical evaluations were assessed for pain using a visual analog scale, range of motion, and functional status at the latest follow-up using MSTS and CAIT scoring. Anteroposterior and lateral radiographs were obtained and reviewed for signs of device failure, tumor recurrence, and union.

Three months after surgery, the patient still felt pain, with a VAS score was 4. Range movement of the ankle was limited, dorsoflexion and plantarflexion were 5° and 20° while inversion and eversion were 5° and 0°. The control x-ray showed that the implant and graft were still in a good position, and signs of consolidation had started to appear (Figure 6B).

Nine months after surgery patient started to partial-weight-bearing mobilize with tiptoeing, and walking on the heel was possible. Range movement of the ankle was slightly limited, dorsoflexion and plantarflexion were 10° and 30° while inversion and eversion were 5° and 0°. The control x-ray showed that the implant and graft were still in a good position, and consolidation signs had appeared (Figure 6C).

Fifteen months after surgery, there was an excellent functional result. There was a good full-weight-bearing stepping motion, and a complete return to daily activities without any complaints of pain with VAS was 0. Functional status as measured by the MSTS showed good results, with the total score was 28. while the ankle stability as measured by the CAIT also showed good results with a total score was 27. The ankle was stable during clinical evaluation, and there is no valgus deviation. Range movement of the ankle was full, dorsoflexion and plantarflexion were 25° and 50° while inversion and eversion were 10° and 5° (Table 1). The control x-ray showed that the graft had been unionized, with no recurrence signs (Figure 6D). Finally, we did the implant removal and did a final x-ray examination (Figure 6E).

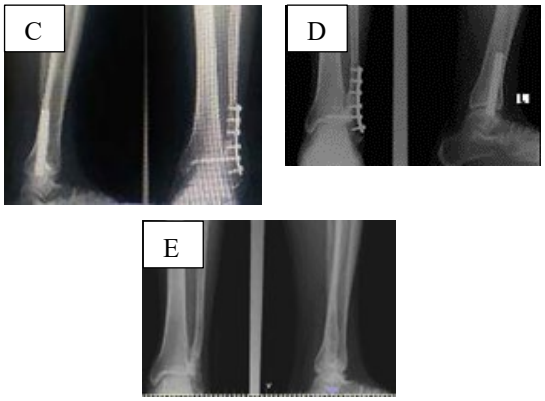

Figure 6. Postoperative Radiograph: (A) postoperative x-ray, (B) postoperative x-ray 3 months after surgery, (C) postoperative x-ray 9 months after surgery, (D) postoperative x-ray 15 months after surgery, (E) X-ray post removal of implant.

DISCUSSION

The management of GCT distal fibula becomes challenging because very few cases have been reported, and there was no guideline management for this case. Literature review on the surgical treatment of distal fibular tumors showed a paucity of results with only case reports and small case series.[7]

Local surgery of tumors of the distal fibula presents two problems: the adequacy of the resection and the reconstruction of the ankle.[8] The treatment mode of choice for GCT is surgical resection. Most GCT cases are benign and are predilected in the proximity of joints. Therefore, several studies favor an intralesional approach that aims to salvage the anatomy of the bone and joint instead of wide resection. Other studies suggest that wide resection is linked to the decreased recurrence, increasing the recurrence-free survival rate from 84% to 100% compared to other procedures such as intralesional curettage.[9]

Wide resection is associated with a higher degree of surgical complications and disability. Most cases end up being surgically reconstructed. The reconstruction method can be using bone grafts taken from the tibia, proximal fibula, iliac crest, or distal part of the ulna. Ten centimeters from the distal of the fibula is a crucial component to form stability of the ankle. After a wide excision, reconstruction of a quarter distal fibula is essential to maintain ankle stability, especially in a young patient with active daily activity.[10,11]

Table 1. Clinical evaluation

Evaluation	VAS	MSTS	CAIT	ROM			
				Dorso flexion	Plantar flexion	Inversion	Eversion
Preoperation	6	10	16	10°	30°	5°	0°
3 months	4			5°	20°	5°	0°
9 months	3			10°	30°	5°	0°
15 months	0	28	27	25°	50°	10°	5°

If the distal fibula has to be resected completely, it is advisable to reconstruct the tibiofibular mortise with a bone graft, preferably the proximal fibula rotated 180° and placed distally. The cartilaginous facet of the proximal fibula will then articulate with the talus, and the styloid apophysis will become the apex of the neo malleolus, rendering stability to the ankle.[8]

Rehabilitative physiotherapy is needed to improve the grade of range of motion of the joint and weight-bearing ability. Informed consent is a procedure that should be done to help the patient understanding the aim of every proceeding.[12]

CONCLUSION

Reconstruction of distal fibula GCT with proximal fibular autograft showed a great result. This method is a viable option as it provides good pain relief and functional improvement.

REFERENCES

1. Ashley B, David W, Michael W. Apley and Solomon's System of Orthopaedics and Trauma. CRC Press; 2018.
2. Bhowmick K, Boopalan PRJVC. Saving the ankle in distal fibular giant cell tumour – A case report. J Clin Orthop Trauma. 2019; 10(6): 1054-8.
3. Mohaidat ZM, Al-jamal HZ, Bany-Khalaf AM, Radaideh AM, Audat ZA. Giant cell tumor of bone: unusual features of a rare tumor. Rare Tumors. 2019;11.
4. Uchiyama E, Suzuki D, Kura H, Yamashita T, Murakami G. Distal Fibular Length Needed for Ankle Stability. Foot Ankle Int. 2006;27(3):185-9.
5. Maury E, Granier C, Sleth C, Peraut E, Maury P. Distal Fibular Reconstruction Using Iliac Grafting and Emslie-Vidal's Ligamentoplasty after Exeresis of Single Renal Carcinoma Metastasis. Case Rep Orthop. 2020; 2020: 1-5.
6. Izzeldin Abbasher M. Reconstruction of the ankle after wide resection of distal fibula tumours: case report and review of the literature. MOJ Orthop Rheumatol. 2016; 5(4).
7. Saadon I, Amit B, Zolquarnian A, Muhamad F. Primary osteosarcoma of the distal fibula treated with distal fibulectomy with a five-year follow-up: A case report. Malays Orthop J. 2017; 11(2): 64-7.
8. Jamshidi K, Mazhar FN, Masdari Z. Reconstruction of distal fibula with osteoarticular allograft after tumor resection. Foot Ankle Surg. 2013; 19(1): 31-5.
9. Taraz-Jamshidi MH, Gharadaghi M, Mazloumi SM, Hallaj-Moghaddam M, Ebrahimzadeh MH. Clinical Outcome of En-Block Resection and Reconstruction with Nonvascularized Fibular Autograft for the Treatment of Giant Cell Tumor of Distal Radius. J Res Med Sci. 2014; 19(2): 117-21.
10. Abubakar I. Wide excision and reconstruction surgery using NVFG for giant cell tumor of the right proximal radius campanacci 3. MOJ Clin Med Case Rep. 2019; 9(5): 128-33.
11. Raju V, Chirag K, Paresh G, Amit KA, Vipul V. A rare Giant Cell Tumor of the Distal Fibula and Its Management. Cureus J Med Sci. 2016; 8(7): e666.
12. Kevin R, Joseph S, Henry JM, Dempsey S, Francis JH. Giant Cell Tumor of Bone. J Am Acad Orthop Surg. 2013; 21(2): 118-26.