



RESECTION OF AN ENORMOUSLY LARGE GIANT CELL TUMOR OF PROXIMAL FIBULA: A CASE REPORT AND REVIEW OF LITERATURE

Orthopaedics

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ABSTRACT

The Giant Cell Tumor (GCT) of the proximal fibula is a rare entity. We report the case of a 42-year gentleman who presented with an enormously large GCT arising from the proximal fibula for the past 7 years. Radiographs depicted 4 large lobules of tumor and Magnetic Resonance Imaging (MRI) showed multiple round hyperintense lesions in the proximal aspect of the leg. The patient was given the injection Denosumab for 4 weeks. Type II fibula resection was done by salvaging the limb with no recurrence for the past 3 years. This case report describes an enormous GCT of the proximal fibula and serial lobulectomy approach to tackle such large benign tumors in the proximal leg. With meticulous pre-operative planning and an appropriate surgical approach, limb salvage can be done even in the case of enormously large GCT.

KEYWORDS

Enormous, Giant Cell Tumor, Denosumab, Proximal Fibula, Type II Resection

INTRODUCTION

The tumors of the proximal fibula are rare, accounting for 2.5% of all primary bone tumors.¹ The benign tumors require marginal or intralesional resection² whereas benign aggressive require a more radical approach. Giant Cell Tumor (GCT) is known to have an aggressive course in about 1-9% of the lesions.³ These tumors grow rapidly and present as a large palpable swelling. Such lesions require radical or wide en-bloc resection.⁴ Type I and II resection of the proximal fibula is well described in the literature.¹ This case describes an approach to deal with the resection of such a large-sized proximal fibula tumor. The primary aim of these surgery includes resection of the tumor and limb salvage with maintaining the function of the joints.

Case Report

A 42 years gentleman reported to the orthopedic department with huge multilobulated swelling of the right proximal & mid-leg (Figure 1).



Figure 1: Lateral aspect of the leg with multilobulated tumor

The patient had a swelling similar to the size of a tennis ball on the lateral aspect of the proximal leg but progressively increased to football size over the 7 years. Four lobules were palpable, three on the lateral aspect and one on the medial aspect of the proximal & mid-leg. The swelling was now large enough to circumscribe the proximal leg. The excisional biopsy was performed 3 years back on the posterolateral aspect of the leg near the proximal fibula head. The overlying skin was discolored and not adherent to the tumor.

The swellings were variegated in consistency with ill-defined margins. There was no neurological deficit although the distal pulses were not palpable. The patient had weak plantar flexion of the ankle. The radiographs depicted Campanacci grade III GCT with four spherical masses (one mass posteromedial and the rest on the posterolateral aspect of the proximal leg) with the destruction of the proximal fibula (Figure 2).

Figure 2: Radiographs (Anteroposterior and lateral views) of the proximal leg pre-operatively



The largest mass has a size of 14 x 12 x 8 cm. Contrast-enhanced MRI depicted multiple round to oval variable-sized hyperintense lesions with fluid-fluid levels mainly in the posterior aspect of the proximal leg on the T2 weighted image (Figure 3).

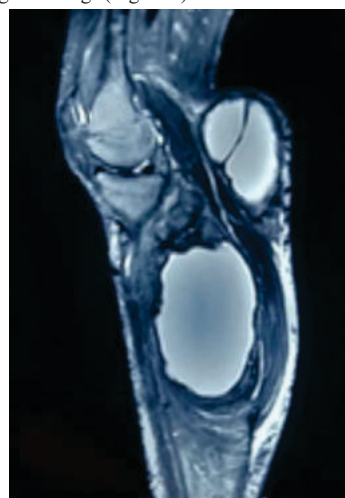


Figure 3: Sagittal section of the MRI

The Computer Tomography (CT) angiogram depicted the tumor causing a mass effect on the left popliteal artery with tortuous dilatation of popliteal and great saphenous veins. There are numerous feeder vessels from the popliteal artery to these masses. There was non-opacification of the distal anterior tibial and dorsalis pedis artery with weak contrast opacification of the posterior tibial artery (Figure 4).

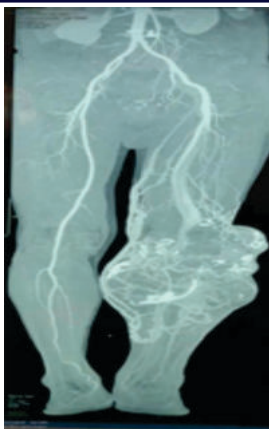


Figure 4: CT angiogram of both lower limbs with tumor and feeder vessels

There was no spillage of the contrast in the soft tissues. The Common femoral artery, profunda femoris artery as well as superficial femoral artery were normal in the course, caliber, and contrast opacification. The CT scan of the chest was normal. The initial biopsy done 3 years back suggested GCT. A repeat biopsy was done depicting GCT with secondary aneurysmal changes. The variable consistency and ill-defined margins of the tumor make the dissection difficult during the surgery. Injection Denosumab 120 mg was administered subcutaneously for 4 weeks to achieve better resection planes. The surgery was planned for the following week after the last dose.

The surgery was done in a prone position under a tourniquet. The 'S'-shaped 6 cm incision starting proximal to the popliteal fossa curving laterally on the tumor extending to the distal leg. After superficial dissection, the tumor was dissected lobule-wise, starting with the medial lobule and then removing the rest lobules (Figure 5).



Figure 5: Lobule-wise dissection of the tumor

During the dissection, the common peroneal nerve (CPN), anterior tibial artery, and peroneal vessels were ligated and cut. Posterior vessels and posterior tibial nerve were preserved. The lateral head of the gastrocnemius was taken down from its attachment to access the deeper lobules. The proximal fibula was resected with 4 cm of safe margin (Figure 6).

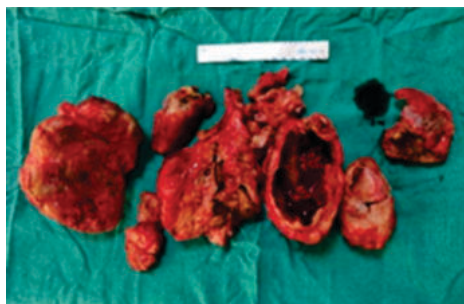


Figure 6: Resected tumor

The post-operative radiographs depicted resected proximal fibula and the tumor (Figure 7).



Figure 7: Post-operative radiographs

The lateral collateral ligament was preserved. The lateral soft tissue along with the biceps femoris was apposed to strengthen the lateral aspect of the knee to provide stability. The lateral head of the gastrocnemius was reattached to the posterior condyle of the femur. The wound healed in 3 weeks with the post-operative complication of foot drop. The patient was mobilized with the help of a foot drop splint after 4 weeks post-operatively. The patient had no recurrence after 3 years of the surgery with good knee function.

DISCUSSION

The proximal fibula is an uncommon site for the tumor. Mostly the tumors are benign accounting for one-third of such tumors.⁵ Such lesions can be managed by intralesional and en-bloc resection. Total en-bloc resection of the proximal fibula is recommended as intralesional curettage itself is a risk factor for recurrence.⁴ The en-bloc-wide resection depends on the size, extent, and type of tumor.² Studies have reported less recurrence rate (7%) in resection of GCT than in procedures involving curettage and bone grafting (41%).^{2,4} Inatani et al.⁶ reported 4 cases of proximal fibula GCT, managed with curettage and adjuvant therapy whereas 2 cases of recurrent GCT were treated with marginal excision.

In this case report, we describe an enormous GCT of proximal fibula so large in size that only amputation was offered to the patient for management by other orthopaedic oncologists. Such a large GCT of the proximal fibula is not yet reported in English literature. But precise surgical planning could help to salvage limbs even in such cases. The choice of proximal fibula resection depends upon the aggressiveness of the tumor.⁴

The benign lesions are managed by the type I resection with preservation of the CPN. Type II resection involves resection of the aggressive tumor along with the CPN and surrounding muscles. The posterior tibial artery and tibial nerve are the most important structures to be preserved. Guo et al.⁷ reported 52 proximal fibula tumor patients, out of which GCT constitutes 13.5%. Type I resection was done in all such lesions. Abdel et al.⁴ also advocated en bloc resection of the proximal fibula in cases of aggressive tumors. Out of the 23 GCT patients, 18 required a type I resection. Permanent peroneal nerve palsy accounts for 2.5% of the complications. Dieckmann et al.⁸ reported poor functional outcome of proximal fibula resection along with the peroneal nerve.

Due to the enormous size of the tumor, en-bloc resection was a challenging task. Three approaches (Figure 8) were planned to resect this tumor.

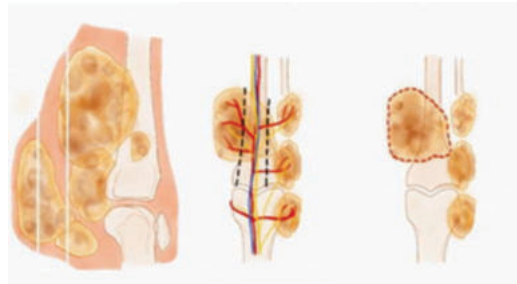


Figure 8: Diagrams depicting different approaches

1) Layer-wise dissection: This approach involves removing the large lobules of the tumor layer by layer dissecting the neurovascular structure at all layers. But this approach had more chances of injury to neurovascular structures and involves going through the tumor thus contaminating the soft tissues nearby. 2) Directly dissecting the neurovascular structures first and then removing the tumor. This approach was not feasible with the enormous size of the tumor as well as a plexus of neovascularisation and nerves around the tumor mass. 3) Serial Lobulectomy: It was then planned to remove the four large lobules of the tumor one by one preserving the neurovascular structures as much as possible. This approach helps to split the task by handling one lobule at a time and better haemostasis. Thus, giving modularity to extend the incision according to the required surgical exposure. CPN along with anterior tibial and peroneal arteries was sacrificed in the dissection, preserving the posterior tibial artery and tibial nerve. The large benign aggressive GCT of the proximal fibula, in this case, was resected extra-articularly to provide a wide margin and reduces the chances of local recurrence. Paul A Einoder and Peter F M Choong⁹ reported good functional outcome in 6 cases of GCT proximal fibula managed with wide resection (type I) without ligamentous reconstruction.

Injection Denosumab has a role in aggressive GCT lesions, as its slowdowns the progression of the lesion and delineates the tissue planes better. Denosumab acts by inhibiting osteoclastogenesis, thus helping in reducing the size of GCT. This cannot be extrapolated to reduce the incidence of tumor recurrences. But Denosumab helps to decrease recurrence in cases where complete tumor excision is not feasible.¹⁰

CONCLUSION

This case report describes an enormous GCT of the proximal fibula and serial lobulectomy approach to tackle such large benign tumors in the proximal leg. With meticulous pre-operative planning and an appropriate surgical approach, limb salvage can be done even the in case of enormously large GCT. Denosumab helps in better-defining margins of otherwise non-resectable-looking GCT. There is a definitive role of Denosumab in GCT lesions with difficult resection. This also helps to resect the lesions completely, thus decreasing the chances of recurrence.

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