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Case Report

Giant Cell Tumor of the Proximal Tibia treated with En-Block Resection and Reconstruction with Total Knee Endo-Prosthesis: A case report

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ABSTRACT

Giant cell tumour (Osteoclastoma) is a benign, locally destructive tumour with low metastatic potential, but it has a tendency to recur after treatment. The primary areas of involvement are the ends of long bones, commonly the distal femur and proximal tibia. The most preferred treatment modality of the giant cell tumour is surgery.

Case report: A 52-year-old male presented with pain and slight swelling localized over the proximal left tibia and limited range of motion in the left knee. After histological confirmation of the diagnosis with open biopsy, en bloc resection of the lesion was made with a reconstruction of a knee joint with semi- constrained knee endoprosthesis and trabecular metal.

Conclusion: Selecting the appropriate treatment method is very important for the recovery of the function of the affected joint and for the whole extremity, as well. There is an advantage of en bloc resection and reconstruction with semi-constrained knee endoprosthesis in combination with trabecular metal in cases with extensive destruction of bone structure, recurrence, pathological fracture or difficulty in reconstruction after intralesional curettage. Advantages in functional aspect of this treatment modality are retaining the stability of the knee joint, substituting the bone defect and fast recovery of the function of the affected joint and limb.

Introduction

Giant cell tumor (osteoclastoma) is a benign, locally destructive tumor composed of three types of cells. Type I cells look like fibroblasts, produce collagen, and have capacity to proliferate. This population of cells share some features of mesenchymal stem cells and is likely the tumor component of giant cell tumor. Type II cells are interstitial but resemble the monocyte/macrophage family and express surface receptors. Type III cells are multinucleated giant cells that share characteristics of and have morphologies similar to those of osteoclasts. In some cases the lesion primarily manifests semi-malignant characteristics or secondary malignant transformation. Lung metastasis occurs in 3-5% of cases [1]. Giant cell tumor has propensity to locally recur after treatment but has a low metastatic potential. The tumor is not uncommon representing around 4–5% of all primary bone neoplasms, and more than 20% of benign primary bone tumors. Young adults are commonly affected and peak incidence is seen around 20–45 years of age and it occurs slightly more often in females than in males. The primary areas of involvement are ends of long bones commonly the distal femur, proximal tibia, proximal humerus and styloid process of distal radius [1, 2]. The macroscopic appearance of giant cell tumor is usually quite characteristic. The lesion is soft and dark brown, sometimes intermingled with areas that are yellow, corresponding to xanthomatous areas or white, corresponding to fibrous areas [3]. Giant cell tumors are highly vascular, often producing blood-filled cystic cavities with variable degrees of cortical expansion and disruption, however, the periosteum is rarely breached [1, 3]. Radiologically, the characteristic appearance of giant

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cell tumor is an eccentric geographical lytic lesion without matrix formation typically localized between the epiphysis and the metaphysis. Computed tomography scan provides a good evaluation of cortical continuity.

Magnetic resonance imaging is the investigation of choice for surgical planning especially in aggressive, forms where soft tissue extension needs accurate assessment [6]. Biopsy is mandatory to confirm a diagnosis and is achieved via core- needle or open biopsy [1]. Pain is the most common presenting symptom, along with swelling, deformity of joint, joint effusion and limited range of motion. Pathological fractures are seen in around 10-30% of patients [1, 2, 4]. The treatment can commence after the diagnostic protocol is completed. In some cases, especially in the cases of semi-malignant and malignant characteristics of the lesion, combination of surgical treatment and radiation therapy is used. The surgical treatment of giant cell tumor mainly includes intralesional curettage and its modifications and resection with reconstruction. The treatment with intralesional curettage has local recurrence rate of 10% to 20% while en block resection produces the lowest recurrence rate [1, 5].

Case report:

We report a case of a 52-year-old male presented at our Dr PMR Institute of Medical Sciences with pain and slight swelling localized over the proximal left tibia and limited range of motion in the left knee. After the admission and completing of the laboratory examinations,radiographic investigations have been made. Massive lytic, well-defined lesion, with secondary cortical breakthrough and typical involvement of the distal part of the extensor apparatus (Lig. patellae proprium) was visualized. After completing the clinical examinations, with open biopsy and histological confirmation of giant cell tumor and after the detailed pre-operative planning, the surgical procedure was performed. Using the medial parapatellar approach and utilizing the approach made for biopsy, exposure and removal of the tumor were managed in strict accordance with the principles of surgical treatment of bone tumors. Complete removal of the lesion was followed by implantation of the semi-constrained knee endoprosthesis. Tibial component was implanted and fixed using bone cement. Trabecular metal cone augment was used for substituting the bone defect and achieving anatomical reconstruction. Once the distal femur was completely prepared, implantation of the femoral component with adequate spacer followed. The femoral component was fixed with bone cement, as well, In the whole procedure, special attention was dedicated on the preservation of the collateral ligaments and reconstruction of the extensor apparatus. At last, motion and stability of the knee joint was checked.

Discussion

Clinical symptoms in patients with Giant Cell tumor are non- specific. They include pain usually reduced by rest, local swelling and limitation of range of motion in the adjacent joints. When a lesion is located in the spine, neurologic symptoms may be present [6]. The imaging features of giant cell tumor are characteristic. It is a purely osteolytic, radiolucent lesion with narrow zone of transition lacking sclerotic margins, revealing geographic bone destruction and usually no periosteal reaction. The cortex is expanded and thinned with frequent breach of the tumor in the soft tissue.

For the accurate evaluation of the soft tissue involvement, magnetic resonance imaging is investigation of choice. Giant cell tumor typically shows low to intermediate signal intensity on T1 weighted images and intermediate to high intensity on T2 images.

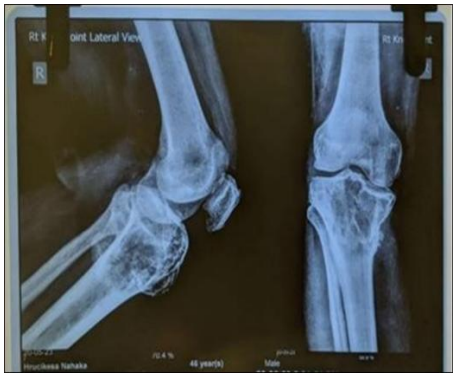

Fig A pre-Op Xray

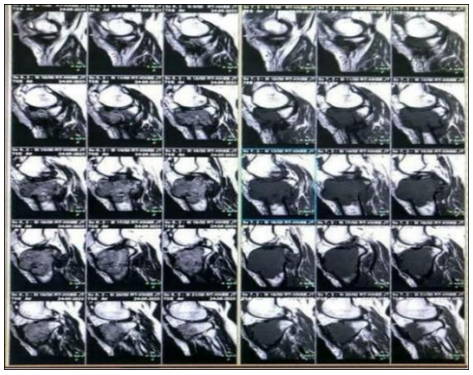

Fig B MRI Scan

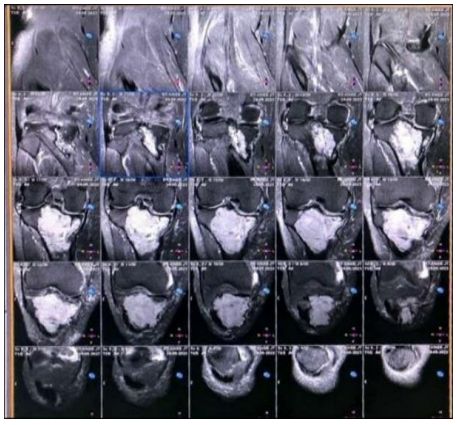

Fig C MRI T1 Image

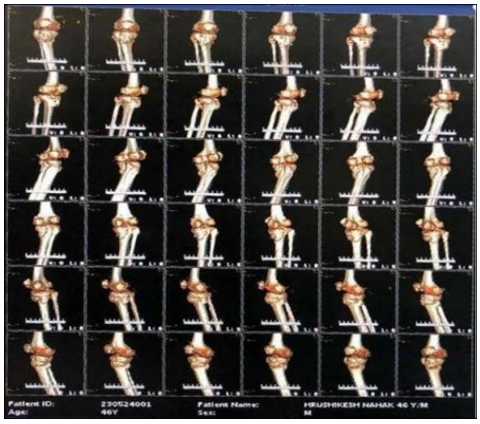

Fig E CT Scan

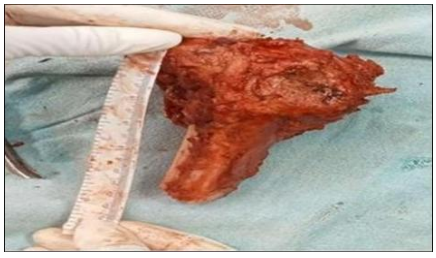

Fig 1: En bloc of proximal tibia resected

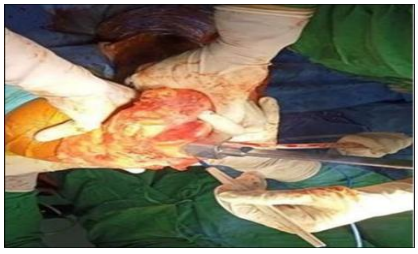

Fig 2: Box cut of distal fem

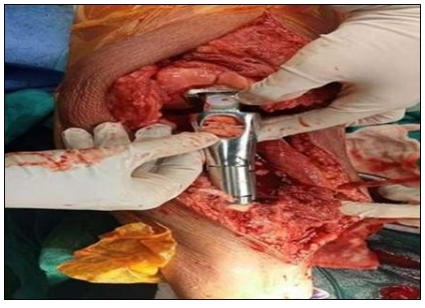

Fig 3: Impaction of the bone graft on the implant

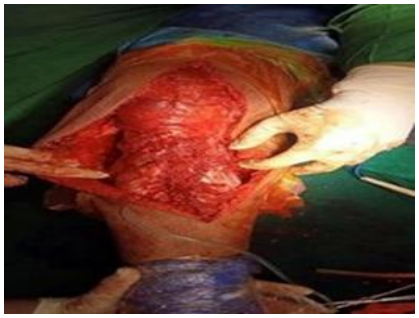

Fig 4: Prosthesis completely encirclled by muscle flap

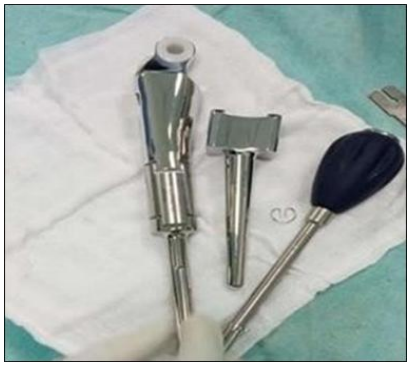

Fig5: Implant of distal femur and proximal tibia

Fig6: Cementation of proximal tibial implant

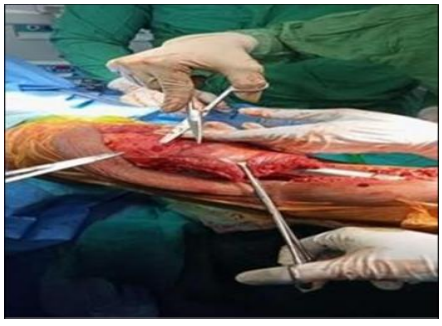

Fig 7: Patella tendon suturing

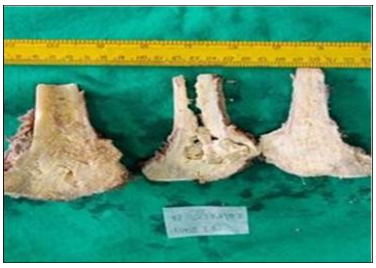

Fig 8: Histopathology section

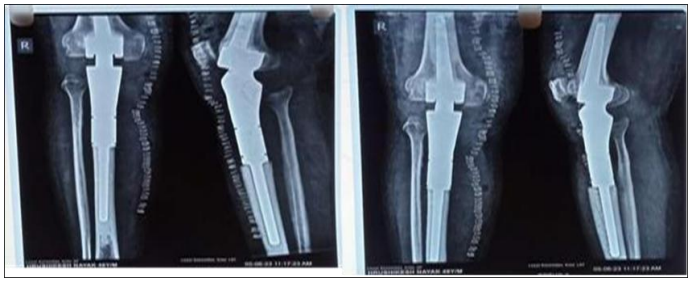

Fig 9: Post Op X ray

Scintigraphy may show more intense uptake of the tracer around the periphery of the lesion than within the lesion itself and is presumably caused by hyperemic changes in the bone surrounding the tumor [4, 5, 6]. The tumor has been classified into three types by Campanacci. Type 1 or inactive lesions, with well-defined borders, intact cortex and benign histologic appearance. Type 2 or active tumors, demonstrates a more aggressive radiographic appearance, with extensive remodelling of bone, thin cortex but without loss of continuity and intact periosteum and still a benign histologic pattern. Approximately 5% of giant cell tumors are malignant de novo. Having no characteristic imaging features, malignant lesions cannot be diagnosed radiologically. It is also well known that benign giant cell tumor may evolve into malignant lesion [4, 5]. Giant cell tumors in bones around knee joint are clinically challenging in orthopaedics, as the knee joint is the most important weight-bearing joint with high functional requirements.The most common treatment of giant cell tumor is surgical removal using the following different modalities: curettage and bone grafting, curettage and chemical cytotoxic agents such as phenol, zinc chloride,

alcohol, hydrogen peroxide, carbolic acid, curettage and physical agents (polymethylmethacrylate and

cryosurgery), heat cauterization of the walls of the lesion (using electrocautery), extended curettage with high-speed burr and adjuvants, primary resection for expendable bones, wide excision and reconstruction using grafts or custom prosthesis.

En bloc resection of major joints produces massive bone defects and it is a technically difficult procedure with many early and late complications. The progress in biomedical engineering along with better surgical techniques has improved overall longevity of endoprosthesis [7].

Conclusion

The key factor of good prognosis in this type of tumors is an early diagnosis and a radical treatment. Giant cell tumors often occur in bones around the weight-bearing joints and directly affect the function of the extremity. The ideal aim in the management of giant cell tumors is to eradicate the tumor with complete joint salvage. Selecting the appropriate treatment method is very important for the recovery of the function of the affected joint and also for the whole extremity. There is an advantage of En Bloc Resection and reconstruction with, knee endoprosthesis in combination with trabecular metal in cases with extensive destruction of bone structure, recurrence, pathological fracture or difficulty in reconstruction after intralesional curettage. Advantages in functional aspect of this treatment modality are retaining the stability of the knee joint, substituting the bone defect and fast recovery of the function of the affected joint and limb.

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