Aggressive Distal Femoral Giant Cell Tumour: Resection And Reconstruction With Custom Mega-prosthesis: Report Of A Case And Review Of Literature

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Aggressive Distal Femoral Giant Cell Tumour: Resection And Reconstruction With Custom Mega-prosthesis: Report Of A Case And Review Of Literature

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Abstract

Introduction:
We consider worthwhile reporting a case of distal femoral aggressive GCT treated by enbloc excision and reconstruction with custom mega prosthesis with good functional outcome.

Case report:
A 30 years old female was admitted with aggressive distal femoral GCT for which resection and reconstruction with custom megaprosthesis was performed. Although there are studies available mentioning various treatment modalities, their advantages and disadvantages, definitive criteriae were not laid down regarding treatment.

Conclusion:
To conclude, achieving complete ablation of the tumor and preserving a functional extremity at the same time proves to be a daunting task. Custom mega prosthetic arthroplasty is effective in achieving the desired goals of reconstruction with good functional results and least complications in selected patients.

Background

Giant cell tumors (GCT) are neoplasms of mesenchymal stromal cells with varied manifestations. The preferred treatment modality is still a debate and juxta-articular lesions pose a major challenge. Although there are studies available mentioning various treatment modalities, their advantages and disadvantages, definitive criteriae were not laid down regarding treatment. We consider worthwhile reporting a case of distal femoral aggressive GCT treated by enbloc excision and reconstruction with custom mega prosthesis with good functional outcome.

Case report

We report a 30 years old female patient who came to outpatient department with pain and progressive swelling around right knee for one and a half years. She had difficulty in using right lower limb for one year. Patient was apparently alright one and a half years back when she developed dull aching pain in anterior aspect of right knee. Initially pain was aggravated by activities and relieved by rest and analgesics. Later on with appearance of swelling she had persistent pain along with disturbance of sleep and day to day activities. She noted progressively increasing swelling in the distal aspect of right thigh with significant progressive restriction of movements of right knee joint. Now she is not able to bear weight on right lower limb due to pain and any attempted movement of right knee induces pain. There was no significant past, personal or family history.

On general examination she was moderately built and nourished and was anaemic. No other significant findings were made out in general physical examination. Local examination revealed diffuse globular enlargement of entire right lower thigh with stretched skin and engorged veins. There were no abnormal pulsations. The knee joint was kept in around 30 degrees of flexion. On palpation there was local increase in temperature and the swelling was tender. Surface was irregular, lobular with firm to hard consistency. Swelling was about 20 × 25 ×15cms in dimension. Knee joint was hard to palpate as it was obliterated by the lesion. There was painful restriction of further flexion as well as extension. Clinically it appeared to be a sarcomatous lesion arising from bone. She was anaemic with haemoglobin of 7.2 gms%. The total and differential counts were normal. ESR was marginally elevated (35 mm at one hour). Routine biochemical investigations including RFT were normal. Radiography showed expansile destructive lesion involving distal femur with loss of cortical and medullary demarcations and margination. CT scan as well as MRI was done and the report came out to be suggestive of aggressive benign lesion. A nuclear bone scan was carried out to rule out metastatic lesions. CT angiography was carried out to
mark feeding vessels and the status of adjacent neurovascular bundle.

An open biopsy was carried out and it came out to be osteoclastoma. The available treatment options and the prognosis were explained considering her age and her marital status (unmarried). Patient's father opted for a limb salvage surgery. The possibility of an Intraoperative need for an above knee amputation was explained in detail and consent was obtained for the same. Custom made mega prosthesis was designed using patients radiography and preoperative transfusions to improve her haemoglobin were made. A medial extensive approach was used and the neurovascular bundle was first dissected out and isolated. An extraarticular excision of the lesion was made with wide femoral margin. Lesion was excised in toto with surrounding soft tissue attachments. Medulla of both femur and tibia were prepared for implantation. Hinged prosthesis was fixed over bone cement. Movements were checked. Preparation for a gastrocnemius flap was done initially but it was found unnecessary as closure was possible without tension. Postoperatively wound healing got delayed due to marginal necrosis, but eventually wound healed by three weeks. Knee mobilisation was started once wound healed and full weight bearing was allowed. Quadriceps strengthening exercises were initiated from immediate postoperative phase. At 6 weeks she had 30 degrees extensor lag and flexion up to 120 degrees was possible. At 12 weeks follow-up there was 20 degrees extensor lag which was persistent. At one year follow-up she is doing well, married and was able to carry out day to day activities although sitting cross legged and squatting were not allowed.

Discussion

Bloodgood in 1912 coined the term giant cell tumor and emphasized the benign nature of this tumor. Modern view of GCT began in 1940 when Jaffe and associates proved these tumors as a benign aggressive.1 This terminology is misleading, because 3% of giant cell tumors are primarily malignant or will undergo malignant transformation and metastasize.2 They represent 3-4% of all primary tumors of bone, occurring in young healthy adults in the third and fourth decade of life. The ends of long bones in skeletally mature individuals are involved in more than 80% of cases and 75% of them occur around the knee joint. Eighty per cent of the GCT have a benign course, with a local recurrence rate of 10-50%; about 10% of GCT undergo malignant transformation through their recurrences and 1-4% give pulmonary metastases even in case of a benign histology.3 The principal treatment modality of this locally aggressive benign tumor is surgery. The surgical treatment of this tumor has always been controversial, with the desired treatment being a balance between adequate removal and retention of function.4 The available surgical options include curettage with bone grafting, extended curettage using chemical cautery/ cryosurgery with bone grafting, cementation with or without bone grafting, and wide resection with suitable reconstruction. Although extended curettage has produced good results in well-contained GCTs, it has not done so in tumors with cortical breach and large soft tissue masses. Hence, wide resection becomes indicated. The defects resulting from tumor resection can be reconstructed using various approaches. At present, there is no single generally accepted satisfactory method for reconstructing massive osseous and soft tissue defects after wide resection of a malignant or aggressive bone tumor. When patients or orthopaedists are given a choice, they prefer limb salvage procedures that allow for knee motion. However, functional mobile knee reconstruction requires active knee extension.5 The ideal reconstruction of the defect created after en block resection of the tumor is still a subject of debate. Endoprosthetic replacement incurs a high cost, requires adequate motor reconstruction and repeated surgeries.6, 7 Massive allografts are widely used in many centers. However, it requires substantial time and money, and for a variety of reasons, it is not available in many countries. An arthrodesis is less attractive initially, but once it is achieved, it provides a stable limb, and the patient is unlikely to require revision surgery. The ideal aim in the management of GCT is to eradicate the tumor and still save the joint. Wide resection is the treatment of choice, especially for situations such as pathological fractures, recurrences and tumors which are high-grade or frankly malignant tumours. 8, 9, 10 & 11 Progress in biomedical engineering along with better surgical techniques has improved overall 10-year prosthetic survival rate after endoprosthetic replacement from 20% to 80% in the past three decades.6, 7 The rotating hinge custom mega prosthesis was used. Measurement hinge, CT scans and MRI were used to estimate the size of the prosthesis to be used. Extended medial parapatellar approach encircling the biopsy scar was used. This approach aids in vascular dissection, so that the popliteal vessels can be isolated and the tumor dissection carried out. A sleeve of quadriceps musculature all around the tumor was removed. The
excision removes a portion of the vastus lateralis; medialis and intermedius, but preserves enough musculature to provide soft tissue cover for the prosthesis and retain adequate extension power. The use of mega prosthesis has become the method of choice after bone tumor resection at the knee. It is the primary modality in the management of malignant bone tumors of lower limb. Custom mega prosthesis has proved to be a simple, technically superior method of replacing the lost segment of the bone in benign aggressive lesions with pathological fractures and where disease progression has resulted in a clinical situation that prevents skeletal reconstruction after intralesional curettage. The advantages of custom mega prosthetic arthroplasty are cost-effectiveness, early resumption of knee function with unassisted ambulation and least rates of recurrence. The possible complications include flap necrosis, secondary infection, aseptic loosening fracture and breakage.

**Conclusion**

To conclude, achieving complete ablation of the tumor and preserving a functional extremity at the same time proves to be a daunting task. Custom mega prosthetic arthroplasty is effective in achieving the desired goals of reconstruction with good functional results and least complications in selected patients.

**References**

Illustrations

Illustration 1

Clinical Photography

Illustration 2

Radiography 1
Illustration 3

Radiography 2

Illustration 4

CT Angiography
Illustration 5

Excised lesion

Illustration 6

Cut section
Illustration 7

Postoperative radiography
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Reviews

Review 1

Review Title: Distal Femur GCT

Posted by Dr. Naveen tahasildar on 08 Jan 2011 10:33:00 PM GMT

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Rating: 8

Comment:
Giant cell tumour, besides being a common tumour, is a difficult tumour to handle with, considering the high rates of recurrence seen with routine modalities of treatment.... Aggressive GCT in the distal femur is not such a common occurrence as most of the distal femur GCTs are Stage I or II... I congratulate the authors on their efforts in reporting this rare tumour managed successfully and compilation of a comprehensive review of literature...

Competing interests: No

Invited by the author to make a review on this article?: Yes

Experience and credentials in the specific area of science:
We have been treating a number of bone tumours at our centre....

Publications in the same or a related area of science: Yes

References: Dhatt S, Tahasildar N, Tripathy S, BK S, Tamuk T. Excision And Endoprosthesis Implantation For Proximal Femur Giant Cell Tumor. WebmedCentral ORTHOPAEDICS 2010;1(11):WMC001236

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