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 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.

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.

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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,
occuring 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
cauterization/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 radiography, 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

![Clinical Photography](image1)

Illustration 2

Radiography 1

![Radiography 1](image2)
Illustration 3

Radiography 2

Illustration 4

CT Angiography
Illustration 5

Excised lesion

Illustration 6

Cut section
Illustration 7

Postoperative radiography
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