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CASE STUDY REPORT

OsteoBridge™ IDSF

Intramedullary Diaphyseal Segmental Defect Fixation

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Case Information

Age:	80
Sex:	Male
Diagnosis:	Right thigh pleomorphic high-grade sarcoma with adipocytic differentiation
Joint:	Knee

Patient History

An 80-year-old male, community ambulator with cane, with past medical history of hypertension, hyperlipidemia, and gout initially presented with a 3 month history of right thigh "fullness". He was referred to orthopedic oncology after an MRI revealed a large soft tissue mass in the anterior thigh, thinning of the anterior femoral cortex, and signal changes within the marrow space of the femur concerning for a primary soft tissue lesion with invasion into bone. He subsequently underwent soft tissue biopsy which demonstrated a pleomorphic high-grade sarcoma with adipocytic differentiation and no amplification of MDM2. Following initial staging, he underwent two cycles of inpatient neoadjuvant AIM therapy prior to planned surgical resection. Unfortunately, his chemotherapy course was complicated by 17lb weight loss and additional hospitalization due to concern for neutropenic fevers and hypotension. Further, the mass increased in size despite neoadjuvant treatment and was indicated for surgical resection, with pre-operative MRI revealing >10cm segment of bony involvement and involvement of the vastus intermedius muscle. Pre-operative MRI also revealed marrow signal changes within this segment of bone concerning for possible marrow invasion by tumor cells.

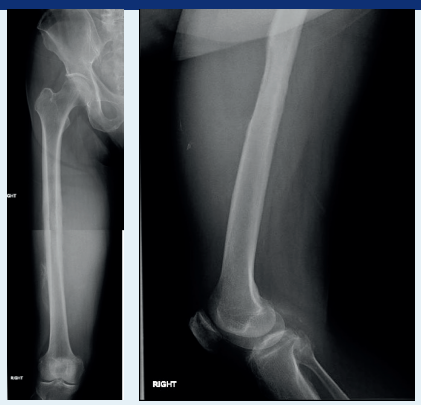

Figure 1A: Pre-operative x-ray demonstrating perosteal reaction and anterior femoral cortical thinning.

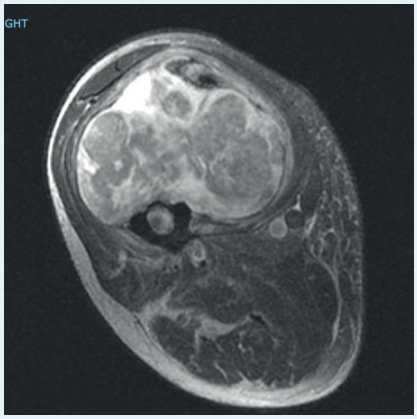

Figure 1B: Pre-operative fluid weighted axial MRI of right thigh demostrating significant bone erosion and intraosseos marrow signal changes.

Surgical Intervention Options:

- Induced membrane technique – able to reconstruct large defects, multiple fixation options, however requires multiple procedures, is better studied in pediatric populations and post-operative radiation may prevent membrane formation[1]
- Distraction Osteogenesis - able to reconstruct large defects, including those with compromised soft tissue envelopes, however has a prolonged reconstruction period, concern for potential tumor reactivation, more challenging to achieve adequate results in elderly patient and post-operative radiation may prevent regenerate bone formation[2]
- Allograft Reconstruction with Plate Fixation – Weight bearing and return to baseline function would be greatly delayed and high rates of infection, non-union and allograft fracture[3]
- Total Femur Replacement – results in a high rate of limb salvage but significant risk of aseptic loosening, wound-healing problems, infection, hip instability, and soft tissue contracture, which would impact long term function of the patient[4]
- Amputation – best chance at achieving negative surgical margins however, given the location of tumor, patient would require a hip disarticulation, which would significantly decrease his functional status (previously ambulated independently without assistive devices)
- Intercalary endoprosthesis – Allows for immediate weight bearing with cemented technique and spares the hip and knee joint, which reduces likelihood of other soft tissue complications with faster functional recovery.

Surgical Intervention Chosen:

Intercalary endoprostheses allow for early mobilization with preservation of the native hip and knee joints. Further, it alleviated many of the concerns of allograft or autograft that might rely on formation of new bone, allowing for post-operative radiation and chemotherapy early in his course.[4] We chose to supplement the stemmed components of the construct with screws and bone cement because we had concerns about the patients age and increased risk of osteoporosis.

Surgical Summary:

The patient was positioned supine on a Jackson flat table with a bump under the operative hip. An anterolateral approach was made to the femur; we marked our bony resection sites 11 cm of bone distal to the tip of the greater trochanter and proximal to the medial joint line, soft tissue resection 7cm distal to the tip of the greater trochanter and proximal to the medial joint line. We proceeded to perform a radical resection of femur with soft tissue, including vastus intermedius, portions of vastus lateralis, and vastus medialis. We also resected the deep portion of the quadriceps tendon to leave as part of our tumor margin. Prior to osteotomy and tumor resection, K-wires were placed proximal and distal to the site of resection to ensure restoration of appropriate length and rotation.

After copious irrigation, we reamed the proximal and distal canals and proceeded to trial a size 90 x 14mm proximal stem and 110 x 16mm distal stem. We assembled an 18cm intercalary segment using the 70 mm, 60 mm, and 50 mm components. Once satisfied with the trial implants and alignment, we cemented the proximal and distal stems into place, and placed 2 interlocking screws as the cement was curing. We then reconstructed the intercalary segment and set the rotational alignment based on the position of the previously placed K wires. Closure of the wound was performed by plastic surgery but required only local tissue rearrangement and use of topical antibiotics without need for flap coverage. The patient was made weight bearing as tolerated post-operatively.

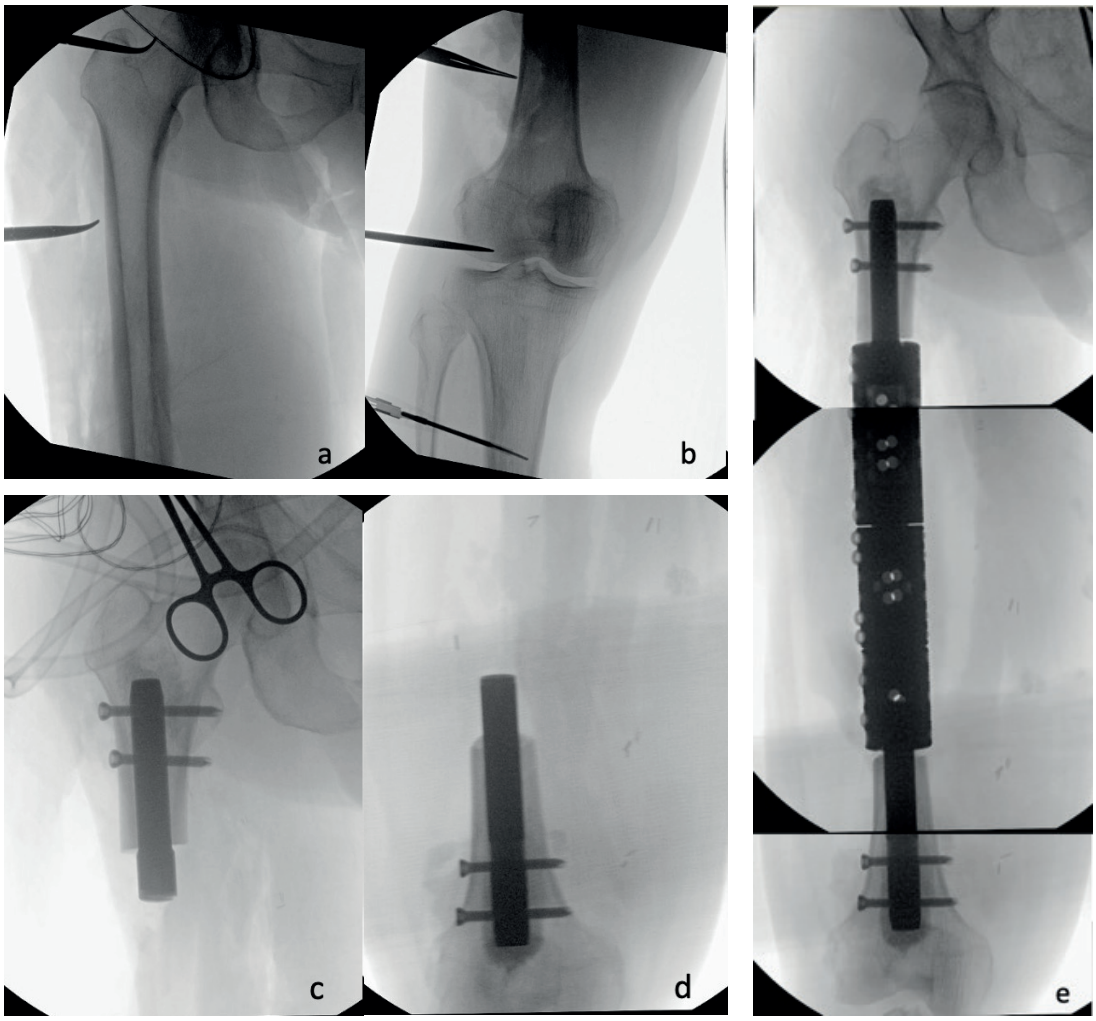

Figure 2: Intra-operative fluoroscopic images

(a-b) Marking greater trochanter and knee joint for planning of proximal and distal osteotomy sites;

(c-d) Following bony resection, proximal and distal stems were cemented and fixed with interlocking screws;

(e) Stitched fluoroscopic imaging of final implant.

Patient Outcome:

The patient was initially resuscitated in the SICU for hemodynamic monitoring and was transferred to floor status on POD2. He first took steps with physical therapy on POD7 and was discharged to SAR POD8. At 6-month follow up, he had significant quadriceps muscle atrophy in the area of resection with an extensor lag of 30°, but intact quadriceps tendon and an intact patella tendon. The patient was ambulating with use of a walker around the house and for short distances, and using a wheelchair for longer distances. The patient and family were very satisfied with the functional outcome and he currently remains cancer free and pain free.

Summary/Conclusion

In this formerly healthy 80-year-old man with newly diagnosed pleomorphic high-grade sarcoma of the thigh with adipocytic differentiation, the Merete® Intramedullary Diaphyseal Segmental Defect Fixation System allowed for a well fixed construct with preservation of native hip and knee joint anatomy, restoration of pre-operative limb alignment, early post-operative weight bearing, and permits post-operative chemoradiation without risk of damaging the implant.[5,6]

Although the patient did not return to baseline functional status of walking only with a cane, he was satisfied with his level of function and was able to participate in all activities of daily living that were important to him at most recent follow-up.

References:

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