Penn Medicine

CLINICAL BRIEFING™

Department of Orthopaedics • Orthopaedic Oncology Service

Surgical and Medical Management of Osteosarcoma

The Penn Orthopaedics Sarcoma Program is devoted to the management of patients with benign and malignant tumors of bone and soft tissues. The Program's mission is to build a world-class multidisciplinary clinical team complemented by a strong foundation of basic and translational research to better diagnose and treat patients with bone and soft-tissue sarcomas.

The most common primary malignant bone lesions (sarcomas) include osteosarcoma, chondrosarcoma and Ewing sarcoma. Primary bone sarcomas are rare (~1% of all adult cancers) and can occur from infancy through late adulthood. The majority of patients with these tumors have pain at the bony site in addition to swelling or a stiff adjacent joint. Because symptoms can mimic those of many common injuries or conditions, individualized bone cancer management at Penn Medicine begins with a confirmative diagnosis.

A complex process, accurate diagnosis of sarcoma involves imaging studies and an image-guided needle biopsy. These assays are then analyzed by an interdisciplinary team of musculoskeletal radiologists and pathologists, medical/pediatric oncologists, radiation oncologists and surgeons from orthopaedics, neurosurgery, plastics surgery and general surgery. MRI scans with specific tumor sequences allow Penn orthopaedic oncologists to better plan surgical procedures by accurately determining the tumor characteristics and extent of disease.

Once the diagnosis of bone sarcoma has been confirmed, treatment plans are designed. Treatment varies depending on tumor type and stage, location, patient age, and adjuvant or neoadjuvant medical treatments. The objectives of treatment include prevention of disease recurrence, progression or metastasis and preservation of limb function. **Limb preservation techniques** for malignant tumors of bone and soft tissue are a specialty of the Penn Orthopaedics Sarcoma Program.

Surgical management of bone sarcoma at Penn has benefited from advances in the technology of internal fixation, soft tissue attachments to prostheses, and biologic options to recreate living bone. Metal prosthetic joints have become the most common method of reconstruction for patients when bone sarcoma is near a joint. Improvements in biomechanics, metallurgy and engineering have allowed for the development of advanced, modular prostheses that provide a more durable, long-lasting reconstruction for patients who are candidates for limb salvage surgery.

Future advances in the treatment of patients with osteosarcoma or other sarcomas will come from the laboratory in the form of new drugs or biologic agents that can specifically target the tumor cells to prevent metastasis.

CASE STUDY

RK, an 18-year-old, began experiencing pain in his right hip during his Senior year of high school. The pain gradually worsened, requiring increasing doses of pain medication. Imaging studies at an outside institution initially suggested a benign synovial condition called pigmented villonodular synovitis. When RK developed worsening symptoms and a limp, repeat imaging studies were ordered, and these showed a destructive bone-producing lesion in the proximal femur with a surrounding soft tissue mass (Figs. 1 & 2).

(Continued on the back)

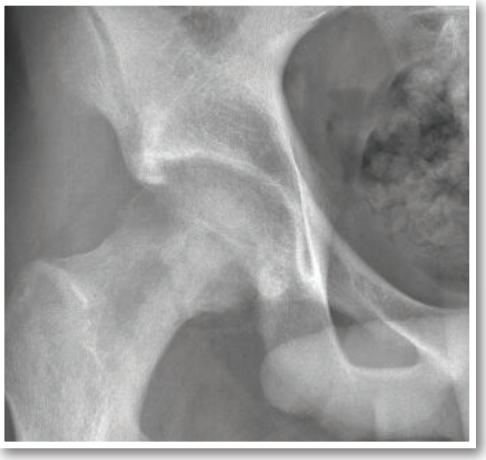

Figure 1: Radiograph of the right proximal femur showing high-grade osteosarcoma.

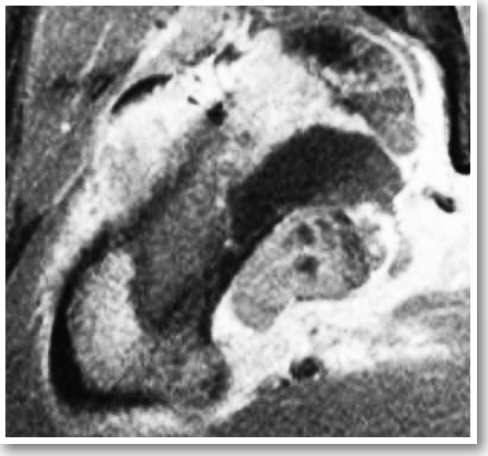

Figure 2: Coronal MRI of the same patient demonstrating surrounding soft tissue mass.

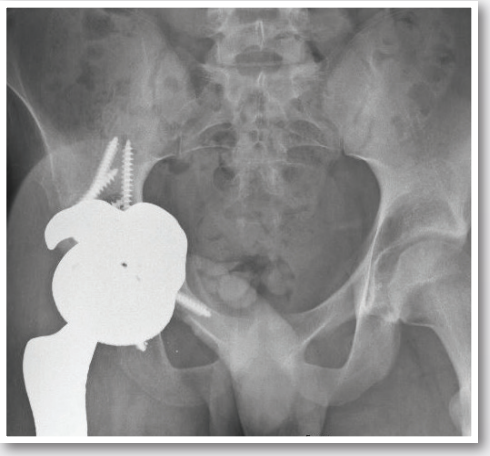

Figure 3: Acetabular reconstruction with a tantalum uncemented component and multiple augments.

CASE STUDY *(Continued)*

RK was referred to the Penn Orthopaedic Oncology service and had a CT-guided needle biopsy of the right proximal femur lesion that revealed a high-grade osteosarcoma. Staging studies showed no evidence of metastasis. Subsequently, he began systemic chemotherapy and was scheduled for resection of the primary tumor.

Because his osteosarcoma was located in the proximal femur and extended into the hip joint, RK's surgical options included a hindquarter amputation or an extraarticular wide resection and complex hip/acetabular reconstruction. He opted for limb salvage, and a team of hip reconstruction and orthopaedic oncology surgeons was assembled.

A successful extraarticular resection of the right hip joint and proximal femur was performed with negative margins and 70% necrosis of the tumor as a result of chemotherapy. Reconstruction involved a proximal femoral megaprosthesis with reconstruction of the abductor and iliopsoas tendons and a complex acetabular reconstruction with a tantalum uncemented component and multiple augments (Fig. 3).

After surgery, RK was in a hip abduction brace for 6 weeks and protected weight bearing for three months to allow bony ingrowth into the tantalum acetabular component. Having completed chemotherapy, RK continues to be monitored carefully for metastasis or recurrence. He is walking normally, has good strength of the leg and is attending college with a goal to become a physician someday.

ACCESS

Orthopaedic Oncology

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West Pavilion, 3rd Floor
3400 Civic Center Boulevard
Philadelphia, PA 19104

Penn Medicine Radnor
145 King of Prussia Road
3rd Floor, Suite 305 South
Radnor, PA 19087

Penn Hematology/Oncology

Abramson Cancer Center
Pennsylvania Hospital
Farm Journal Building, 2nd Floor
230 West Washington Square
Philadelphia, PA 19106

FACULTY TEAM

The Sarcoma Program at Penn Medicine has one of the few medical teams in the world devoted to bone and soft-tissue sarcomas. We use the most advanced technology and treatments to pinpoint the type of cancer and spare limbs. Our team approach to treatment means specialists in several areas collaborate in the care of each patient and create a personalized plan to provide the most successful outcome, while focusing on quality of life.

Treating Sarcoma at Penn Medicine

Orthopaedic Oncology

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Abramson Family Professor in Sarcoma Care Excellence

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Musculoskeletal Pathology

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