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Commentary
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Challenges in Treating Parosteal Osteosarcoma in Pregnant Patients: A Case of the Proximal Tibia

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Abstract

Parosteal osteosarcomas are rare low-grade bone tumors arising from the periosteum that present most commonly in the posterior distal femur. Parosteal osteosarcomas are typically slow growing and managed with wide resection. We present a 10-month post-partum patient with a painful mass of the right proximal tibia that rapidly enlarged in the post-partum period. Parosteal osteosarcomas are typically easily detectable by x-ray and then confirmed by incisional biopsy. In this case report, we describe a surgical technique to address tumors of the proximal tibia via proximal tibia replacement with consideration to preserve optimal knee function. Three-month follow-up of demonstrates no recurrence, a functional implant, and knee range of motion of 20-85 degrees.

Keywords: Parosteal osteosarcoma, proximal tibia replacement, radical resection, proximal tibia

Introduction

Parosteal osteosarcomas (POS) are a rare subset of surface osteosarcomas that originate from the periosteum. POS presents most commonly in young females between the ages of 20-30 years and most frequently in the posterior aspect of the distal femur [1]. They are classically low-grade, slow growing tumors that are well-differentiated with malignant osteoid formation and a spindle cell stroma on histology. The prognosis for POS is generally favorable with a high survival rate (80-90%) when negative margins are obtained. The work-up of POS requires an algorithmic approach including clinical exam, imaging, and tissue biopsy. Clinical presentation typically includes symptoms of local swelling, pain, and limitations in range of motion of adjacent joints [2]. X-rays classically show large lobulated exophytic, osseous lesions projecting from bone cortex that have a tendency to grow circumferentially and MRI can detect soft tissue or intramedullary invasion. Incisional biopsy is required to confirm diagnosis and guide treatment as POS generally require wide resection. This differs from other osteosarcomas that generally require neoadjuvant and adjuvant chemotherapy in combination with surgical resection [3]. POS are generally resected with wide surgical margins to prevent complications of local tissue and bony invasion, recurrence, and systemic metastasis.[5] Surgical planning for POS depends on grade, size, and location of the tumor as more extensive tumors may require bony reconstruction in addition to resection [4].

The surgical procedure was performed through an extensile medial parapatellar approach which was placed in line with our previous incision to ellipse the previous incisional biopsy tract en bloc with the specimen. The approach extended from the distal anteromedial leg leaving adequate tissue to perform a medial gastrocnemius flap and extended proximally into a medial parapatellar arthrotomy with a sub-vastus exposure allowing adequate exposure and margins of the tumor [5]. The arthrotomy was carried distally to the point where the patellar tendon was known to contact the tumor based on the pre-operative MRI. Circumferential dissection was then performed around the proximal tibia from anteromedial to posteromedial. The hamstring tendons were tenotomized at the level of the pes anserine with care to not inadvertently injure the saphenous nerve. The medial collateral ligament, anterior cruciate ligament, and posterior cruciate ligament were released as well in order to further mobilize the tibia. The origin of the medial gastrocnemius was preserved in this process. The patellar tendon dissection was then carried out from proximal to distal leaving a small portion of the most medial aspect of the tendon with the specimen as a margin. The majority of the patellar tendon was able to be saved with a close but grossly negative margin [6]. The tendon was then released from the tibial tubercle and reflected laterally to be incorporated into the mega prosthesis later in the procedure. From here the anterior compartment fascia was divided off the anterolateral tibial crest from anterior to posterior [7]. The anterior neurovascular bundle was mobilized at the lateral intermuscular septum and the interosseous membrane was released off the posterolateral aspect of the tibia and then dissection was again carried posteriorly. The posterior musculature was reflected off the backside of the specimen itself, taking care to maintain a mobile layer of tissue as a margin, and then the dissection converged around the fibular head releasing the proximal tibiofibular ligaments. Prior to this dissection, the distal osteotomy site was identified at approximately 11 cm from the joint surface with dissection planned with this in mind. Upon completion of the dissection, this bone cut was created saving a small cuff of periosteum for overlay onto the prosthetic collar. The wound was copiously irrigated and meticulous hemostasis was confirmed [8].

At this point, direction was turned to harvesting the medial gastrocnemius for pedicle rotation of the proximal tibial body. The medial head of the gastrocnemius was circumferentially dissected. This was carried out distal to the musculotendinous junction, which was freed using the LigaSure device. The raphae between the medial and lateral heads of the gastrocnemius was identified bluntly and was carefully dissected to free the medial head of the gastrocnemius for rotation. The proximal medial sural vascular pedicle was found to be intact. The deep fascia of the gastrocnemius was cross hatched for added spread of the muscular flap. Attention was then redirected for

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prosthetic implantation. The components were definitively installed in standard fashion and were then re-articulated using the associated polyethylene bushings and axle components. The knee was carried through a range of motion to insure satisfactory range of motion. The patellar tendon was secured to the prosthesis using the prosthetic spiked plate and associated machine screws. This achieved excellent reattachment of the patellar tendon to the device itself. Attention was then directed towards inset of the medial gastrocnemius flap. The flap was positioned over the body of the proximal tibial prosthesis. The wound was once again copiously irrigated [9].

Discussion

Our patient had noted the presence of a mass prior to pregnancy, although her symptoms and the size of the mass rapidly progressed during the peri-partum and post-partum periods. While certain bone tumors such as osteosarcoma, Ewing's sarcoma, and chondrosarcoma have known associations with pregnancy, to our knowledge there is not currently literature supporting a relationship between POS and pregnancy In our patient, physical exam and imaging revealed an osseous circumferential bony mass of the medial tibia plateau. Radical resection with proximal tibia replacement (PTR) was indicated due to significant involvement of the medial plateau requiring significant bone removal. More conservative procedures such as hemicortical resection with bony allograft may be considered in select patients with lesions that do not involve any neurovascular bundles and would allow for more than one third of the bony circumference to be preserved. However, marginal resections and intralesional excisions are associated with high recurrence rate. After resection, it is important to consider limb salvage and preservation of knee ROM. Homogenous massive grafts have been attempted post-tibial resection with low success [10].

Conclusion

Thus, we opted for proximal tibia replacement with a hinged device for increased stability after extensive bony and soft tissue removal. A medial gastrocnemius flap was attached to the implant for soft tissue coverage. In our patient, radical resection with PTR successfully treated her primary POS and allowed for optimal outcomes in regard to limb salvage and knee function. Her low-grade well differentiated tumor did not require chemotherapy, though high-grade tumors should may require additional adjuvant chemotherapy. Patients should continue to be monitored with serial imaging and exam for recurrence of tumor, distant metastasis, and implant function.

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