Case Report

abstract

This article describes the cases of 3 patients who were treated for impending pathologic fractures with intramedullary stabilization who developed soft tissue tumor recurrence along the surgical tract site postoperatively, with confirmed histologic diagnoses consistent with each of their prior-known metastatic primaries. This sequela of treatment can lead to additional surgical procedures, longer recovery, and a delay in further systemic treatment, which negatively affects patient outcomes and survival. This can occur despite the use of adjuvant radiation therapy to the surgical site. Between June 2008 and July 2010, our institution surgically treated 71 pathologic (or impending) fractures, of which 52 were femoral nails and 19 were humeral nails. Three of these patients sustained soft tumor tissue recurrence along the surgical tract.

Due to the unfavorable long-term prognoses for patients with metastatic disease, these surgeries are palliative and not curative in nature. The purpose of this article is to draw attention to this sequela and heighten awareness for physicians who treat impending or pathologic fractures. It is difficult to make strong recommendations based on a series of 3 patients, but some general principles can be used. We recommend copious intraoperative irrigation of the wound sites and consideration for routine surveillance with physical examination and prompt imaging and biopsy if any suspicion for local soft tissue recurrence arises. Our approach includes fine-needle aspiration of suspicious lesions followed by resection. The plastic surgery team is consulted pre- or intraoperatively if the resection defect cannot be closed primarily. The patient is also referred back to a medical oncologist for consideration of systemic chemotherapy because soft tissue tumor recurrence is a sign of progressive disease.

Figure: Coronal computed tomography scan showing extensive skin defects caused by the soft tissue resections (A). Intraoperative photograph of anterolateral thigh free flap/vastus lateralis free flap from the opposite thigh to cover the skin and soft tissue defects (B).
The life expectancies and mean survival times of patients with malignant tumors have increased over the past several decades, along with an increase in the incidence of bone metastases. Operations for fixation or stabilization of impending or pathologic fractures secondary to skeletal metastases or other secondary malignancies, such as myeloma or lymphoma, are some of the most frequent surgeries performed in orthopedic oncology and are commonly performed by nonfellowship-trained surgeons.

Many of these bone lesions create impending pathologic fractures by triggering an osteoclastic response that destroys the underlying bone and eventually expands the defect to a critical size, which weakens the mechanical integrity of the bony cortex. Surgical stabilization methods, such as intramedullary fixation, are often necessary to prevent or treat fractures, help restore function, and provide pain relief. The spine is the most common location for skeletal metastasis due to the high venous flow, and the proximal humerus is the most common appendicular skeletal site for bony metastases. The humerus is also a common site. Impending or pathologic fractures in these locations can affect the patient’s quality of life and functional abilities. Extensive evidence in the literature supports intramedullary stabilization as a safe, effective, and reliable method of fixation for impending pathologic fractures of the femur and the humerus. Postoperative external beam irradiation can prevent disease progression and subsequent loss of fixation and is usually recommended once the surgical incisions heal.

Although several reports in the literature document the benefits of surgical stabilization of impending pathologic fractures in terms of restoring function and providing pain relief, little documentation exists of postoperative complications, specifically the development of local soft tissue tumor recurrence at the incision sites (surgical tract recurrence) despite the use of postoperative irradiation of the surgical field.

The current article describes the clinical courses of 3 patients who were treated for impending pathologic fractures with intramedullary stabilization. They developed soft tissue tumor recurrence along the surgical tract postoperatively, with confirmed histologic diagnosis consistent with each of their prior-known malignancies. This sequelae of treatment can lead to additional surgical procedures, longer recovery, and a delay in further systemic treatment, all of which can negatively affect patient outcomes. Between June 2008 and July 2010, our institution surgically treated 71 pathologic (or impending) fractures, of which 52 were femoral nails and 19 were humeral nails. Three of these patients experienced soft tissue tumor recurrence along the surgical tract. Informed consent was granted from each of the patients. The purpose of this article is to draw attention to these sequelae and heighten awareness for physicians who treat impending or pathologic fractures.

CASE REPORTS

Patient 1

A 64-year-old woman had a history of diffuse B-cell lymphoma and a remote history of nonmetastatic colon cancer. Her lymphoma was originally diagnosed as stage IV 6 years previously. She was treated with rituximab and CHOP, a type of chemotherapy that consists of 4 drugs: cyclophosphamide, doxorubicin, vincristine, and prednisolone, and obtained complete remission. A bony lesion consistent with metastatic colon cancer of the colon, with no evidence of primary bone tumor or lymphoma. The patient underwent placement of a prophylactic intramedullary nail of the left femur, with 2 proximal and 2 distal locking screws. No intraoperative complications occurred. The patient later received 30 Gy of adjuvant radiation in 10 fractions. This was treated in the anteroposterior/posteroanterior arrangement with field-in-field technique to improve dose homogeneity, using 18 megavolt photons, starting approximately 2 weeks postoperatively.

Three weeks after completing radiation therapy, the patient returned to the hospital and reported right hip pain. Imaging revealed an impending pathological fracture of her right proximal femur. In addition, the patient developed a painful nodule over the distal incision of the left hip. Biopsy was consistent with metastatic colon cancer, and the patient underwent subsequent prophylactic intramedullary nail for the right femur, as well as removal of soft tissue nodule on the left hip. On exploration, the mass extended down to the fascia of the iliotibial band and was approximately 3.2×2.4×1.9 cm. The mass was consistent with metastatic colon carcinoma.

Patient 2

A 59-year-old woman had a known diagnosis of metastatic breast cancer. She presented with hip pain and evidence of an impending fracture in her left femoral neck.
based on imaging studies. Biopsy confirmed metastatic carcinoma. Prophylactic stabilization of the left femoral neck was performed by placement of a left hip cephalomedullary nail with 2 screws in the neck, bypassing the metastatic lesion, and 1 distal interlock screw. No immediate complications occurred. The surgical field was postoperatively irradiated with 30 Gy in 10 fractions encompassing the entire femur and surgical incisions and was started 2 weeks postoperatively.

Over the next 6 weeks after completion of the radiation therapy, she had increasing pain over her left thigh. She had a growing soft tissue mass in her proximal incision and a mass in her mid-thigh where the 2 interlocking screws had been placed in the femoral head. The distal of the 2 masses threatened to fungate out of the skin. The patient underwent biopsy and radical resection of the proximal and distal soft tissue masses, both of which were >5 cm (Figure 2). Intraoperative biopsy was consistent with metastatic cancer. The proximal mass had extensive musculature involvement and a few more nodules in the tensor fascia lata that were sent as separate specimens. Given the large skin and soft tissue defect created by the resection, reconstruction with a free vastus lateralis flap from the right leg was required (Figure 2).

**Patient 3**

A 74-year-old man with known multiple myeloma presented with increasing shoulder pain and a pathological fracture of the right humerus, just distal to the anatomic neck. He underwent fixation with an intramedullary nail of the right humerus with 4 proximal screws and 2 distal locking screws (Figure 3). Postoperatively, he was treated with external beam radiotherapy to a total dose of 34 Gy in 14 fractions. Following this, he received 4 cycles of velcade and cexamethasone and had an excellent response.

The fracture healed uneventfully. Approximately 6 months postoperatively, he developed a growing mass at the distal interlocking screw incision site. Biopsy was consistent with a plasma cell neoplasm. After conferring with his hematologist and radiation oncologist, he underwent a wide resection of the soft tissue mass of the right arm. The mass was 6.2×4.5×3.8 cm. Approximately 4 months after this resection, the patient had systemic relapse of his multiple myeloma and died.

**DISCUSSION**

This article describes a series of 3 patients, in which a local recurrence of an impending or pathologic fracture was treated with an intramedullary nail for metastatic disease or bone involvement of myeloma. To our knowledge, this is a previously unreported event. All 3 patients required further surgery.

Little doubt exists that the benefits of prophylactic stabilization of impending pathologic fractures outweigh the postoperative complication risks and the potential consequences of not having stabilization surgery. If an impending fracture is not treated with stabilization, subsequent fractures can be particularly devastating and debilitating, considering 65% of pathologic fractures eventually require surgery. Pathologic fractures can lead to more extensive surgery, more blood loss, a hospital stay, a longer recovery, and more discomfort compared with treatment of the impending fracture. The pathologic fracture is a significant negative criterion for prognosis.

Due to the unfavorable long-term prognosis for patients with metastatic disease, these surgeries are palliative, not curative. The relatively short mean survival time most likely contributes to the lack of long-term data on surgery-induced soft tissue tumor recurrence along the surgical site, although all of our cases occurred within 6 months postoperatively. This phenomenon seems analogous to the iatrogenic seeding of a tumor along a biopsy tract, a rare yet documented complication of core biopsy and fine-needle aspiration.
In the majority of cases, surgery for surgical stabilization of impending fractures improves function and provides pain relief for the remainder of the patients’ lives, with no need for further surgical intervention. However, postoperative complications can be significant in select cases. Review of the mostly retrospective studies in the literature revealed variable ranges of postoperative survival, with mean times reported anywhere between 5 and 14.7 months in patients with metastatic disease undergoing surgical stabilization, dependent on the primary tumor type and aggressiveness.

The literature offers several studies on a variety of topics relating to skeletal metastases and pathologic fractures. The majority of the studies focus on the treatment of metastatic disease and the surgical benefits of stabilization by assessing pain relief and restoration of function. Many of these studies report complication rates in the short-term or perioperative period, but few studies mention the possibility of local soft tissue tumor recurrence at the incision site or attempt to quantify the number of patients with local recurrence or calculate and assign any statistical risk. The incidence in our series during the 2-year review was 4% (3 of 71 patients).

Several studies advocate the use of large surgical resection for metastatic disease. Although this approach is unlikely to lead to the complication described in the current article, it would expose the patient to a longer, more complex surgery and increase the risks of other complications (eg, blood loss, infection, and longer recovery time). In addition, most authors only advocate for this approach for isolated metastasis or tumor types that are not radiation sensitive.

The use of adjuvant agents (eg, poly- methylmethacrylate, phenol, or cryotherapy), which are often used for decreasing local recurrence of primarily benign bone tumors, could also be considered. The use of polymethylmethacrylate has been described in the setting of metastatic disease and can be used after curettage of the lesion to improve immediate initial stability to pathologic bone.

Phenol instillation or cryotherapy using liquid nitrogen may also be applied to help reduce the risk of local recurrence, which is tumor specific. Although these adjuvant therapies would likely also have a local effect on microscopic tumor cells, the patients in our article had soft tissue recurrence, which is unlikely to be affected by the local adjuvant in bone.

In general, a lack of data and discussion exists on the incidence of soft tissue tumor recurrence caused by intramedullary stabilization of impending pathologic fractures and factors that may increase or mitigate this risk, apart from routine local postoperative irradiation. The fact that these patients have disseminated metastatic disease at baseline with relatively short median survival makes quantifying long-term sequelae more difficult. The purpose of this article was to bring attention to this phenomenon and to help initiate further discussion relating to its incidence and related positive or negative risk factors.

It is difficult to make any strong recommendations based on a series of 3 patients, but some general principles can be used. We recommend copious intraoperative irrigation (with the use of pulsatile lavage) of the wound sites and consideration for routine surveillance with physical examination and prompt imaging and biopsy if any suspicion for local soft tissue tumor recurrence arises. Our approach includes fine-needle aspiration of suspicious lesions followed by resection. The plastic surgery team should be consulted pre- or intraoperatively if the resection defect cannot be closed primarily. The patient is also referred back to a medical oncologist because soft tissue tumor recurrence may be significant in select cases. Review of the mostly retrospective studies in the literature revealed variable ranges of postoperative survival, with mean times reported anywhere between 5 and 14.7 months in patients with metastatic disease undergoing surgical stabilization, dependent on the primary tumor type and aggressiveness.

In addition, postoperative complications can be significant in select cases. Review of the mostly retrospective studies in the literature revealed variable ranges of postoperative survival, with mean times reported anywhere between 5 and 14.7 months in patients with metastatic disease undergoing surgical stabilization, dependent on the primary tumor type and aggressiveness.

References
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