Case Report

Pain Relief with Percutaneous Trochanteroplasty in a Patient with Bilateral Trochanteric Myelomatous Lytic Lesions

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Multiple myeloma is a hematologic malignancy associated with destructive bone loss. Lytic lesions, a hallmark of this cancer, can result in significant morbidity because of associated pain and structural osseous compromise. Osteoplasty has demonstrated efficacy in the treatment of myelomatous pain within the axial skeleton; however, there is limited evidence supporting the utility of osteoplasty to treat extra-spinal lesions. We describe a 67 year-old woman with stable IgA lambda multiple myeloma with sentinel bilateral greater trochanteric lytic lesions that was referred to our interventional pain management clinic for evaluation of bilateral lateral hip pain. Conservative treatment options including physical therapy, non-steroidal anti-inflammatory drugs (NSAIDs), oral opiates, and local corticosteroid injections to bilateral trochanteric bursae failed to offer pain relief. The patient underwent minimally invasive percutaneous trochanteroplasty with concomitant core biopsy of her bilateral trochanteric lytic lesions. The intended goals of this novel procedure were to determine the cause of the suspected lytic lesions, provide pain relief, and offer structural stability by safely implanting bone cement as part of a fracture prevention strategy. At 12 month follow-up, the patient's pain improved by 70% and she no longer required the use of pain medication. The patient also displayed a significant improvement in her day-to-day functioning and quality of life.

Key words: Pain, osteoplasty, trochanteroplasty, multiple myeloma, greater trochanter, percutaneous

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Multiple myeloma is an incurable hematologic malignancy that is associated with destructive bone loss. Although the exact mechanism of destruction remains unclear, it is believed that myelomatous cells promote the activity of osteoclasts through the release of osteoclast-activating factors by myelomatous cells (1-3). Furthermore, research shows that osteoblastic induced dysfunction also contributes to the lack of bone formation. Together, osteoclastic and osteoblastic dysregulation results in osteoporosis and lytic lesions which affect approximately 80% of individuals with multiple myeloma; 60% of these patients develop a pathologic fracture (2,4-6).

Myelomatous-induced bone pain can result in significant morbidity and limitation of function. Lytic lesions most commonly affect vertebrae, but may also be seen in a variety of extra-spinal locations (7,8). As such, the treatment for multiple myeloma and its sequelae may require an individualized approach. Treatment may include the use of non-steroidal anti-inflammatory drugs (NSAIDs), opiates, bisphosphonates, radiation,

chemotherapy, and surgery (9). Other novel treatment options exist including biologic therapy, stem cell transplant, and minimally invasive osteoplasty.

We offer support for the use of minimally invasive osteoplasty as a safe treatment modality for providing pain relief while limiting radiation exposure and postoperative complications (10-13).

Objectives

This case highlights the role of extra-spinal osteoplasty, and in particular percutaneous trochanteroplasty, as treatment for selected patients with pain secondary to trochanteric myelomatous lytic lesions. The primary goal was to offer pain relief; a secondary goal was for mechanical stabilization of the greater trochanter. This procedure can be considered as part of the armamentarium for interventional pain management physicians when developing a treatment plan.

Case

A 67 year-old female with medical history of stable IgA lambda multiple myeloma for 5 years, on chronic chemotherapy, presented with a one year history of worsening bilateral greater trochanteric pain. Her pain was refractory to conservative therapy which included physical therapy, oral opiates, and local greater trochanteric bursal corticosteroid injections. On initial examination her bilateral hip pain was 8/10 sharp, achy, and non-radiating. Significant exacerbation of her pain occurred when performing sit to stand transfers and with ambulation as well as side lying. The pain continued to wake the patient frequently throughout the night. She reported half block walking tolerance secondary to pain. Review of systems were negative for new onset numbness, weakness, or paresthesias. Bone survey at the time of presentation displayed bilateral greater trochanteric lucencies (Fig.1).

The patient underwent a core biopsy of the right greater trochanteric lytic lesion with concomitant trochanteroplasty. No intra-operative or postoperative complications occurred. Upon one week follow-up the patient reported resolution of her right hip pain. Given the success of her right trochanteroplasty, a left trochanteroplasty was performed 2 weeks afterwards without complication; this resulted in substantial left hip pain reduction. Her bilateral hip pain had improved by 70% at 12 month follow-up without reliance on additional pain medication; this translated into significantly improved walking, side lying, and sit to stand transfer tolerance, as well as non–reliance on daily pain medications.

Technique

Informed consent for the procedure was obtained from the patient. Before initiating the procedure 1 g Cefazolin was administered intramuscularly. Under image-intensifier control, a 13-gauge bone biopsy needle was successfully directed into the superior lateral aspect of the greater trochanter (Fig. 2).Therefore, cement could be injected under lower resistance while retracting the biopsy needle to fill the osseous void (Figs. 3, 4). This "top down" approach was also taken to ensure that our biopsy needle did not breach the lateral border of the femoral neck, minimizing risk of

Fig. 1. *Xray of lytic lesions at right and left greater trochanters.*

Fig. 2. *Right greater trochanter cannula and biopsy needle placement deep within the lytic lesion.*

Fig. 3. *Right greater trochanter administration of bone cement.*

Fig. 4. *Right greater trochanter post bone cement adminstration.*

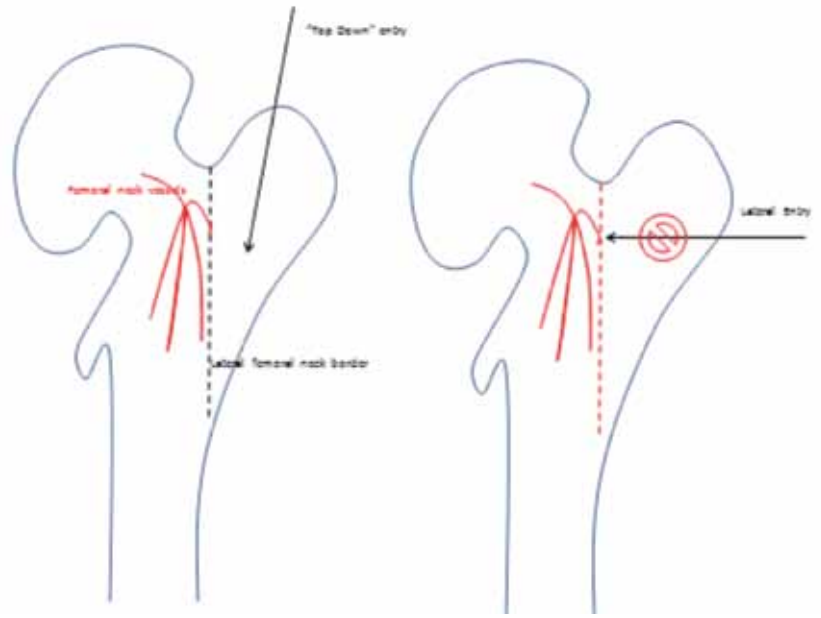

Fig. 5. *"Top down approach" reduces the risk of systemic uptake, local infarction or embolization. Cranio-caudal entry incrases fill of inferior recess.*

femoral neck injection while maximizing fill of the inferior cavity (Fig. 5). Traditional lateral approach, commonly used in greater trochanteric bursa injections may increase risk of vascular uptake (Figs. 5, 6). Otherwise, the approach was the same as above. Ten mL of methylmethacrylate cement were mixed in sterile fashion. The cement was introduced into a standard vertebroplasty injector system and then allowed to form a toothpaste-like consistency. Under live fluoroscopic guidance, 2.5 mL of cement were then injected into the right greater trochanter. No evidence of vascular or extra-cortical uptake was observed. The same procedure was repeated on the left side; however, this side required two 3.5 inch 25-gauge spinal needles prior to biopsy needle

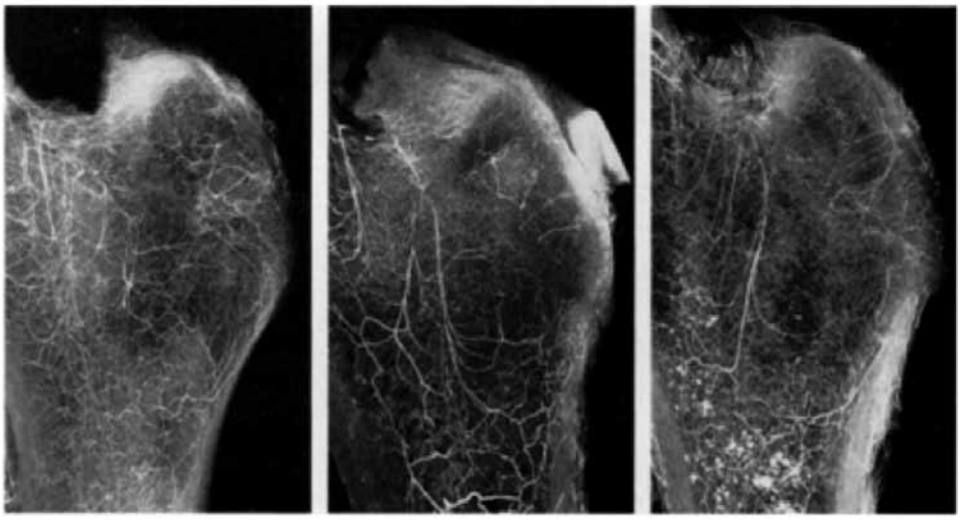

Fig. 6. *Vasculature demonstrating separation of fascularization of femoral neck and the greater trochanter. Adapted from Churchill et al. The blood supply of the greater trochanger. J Bone Joint Surg Br 1992; 74: 272-274 (16).*

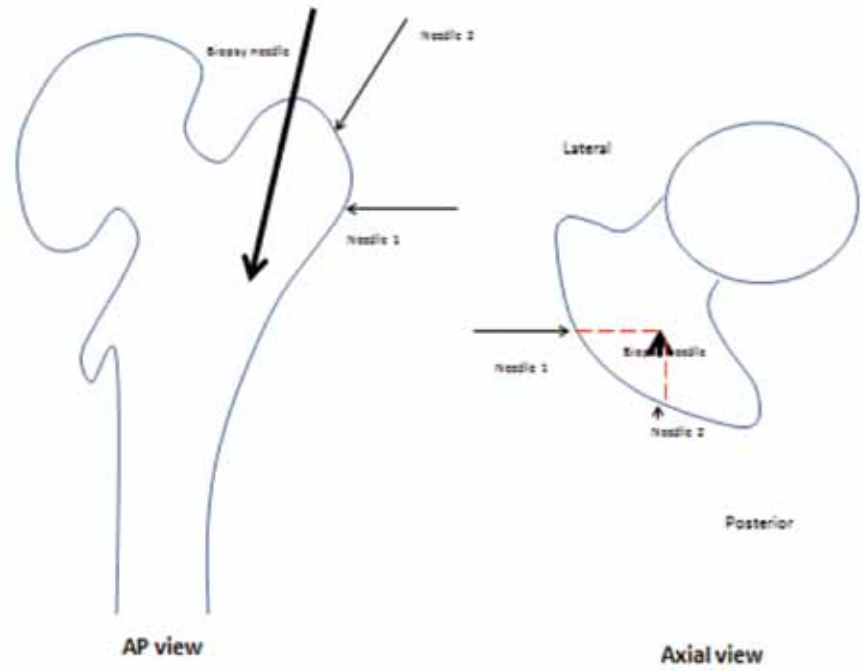

Fig. 7. *Needles placed on lateral and posterior ridge of the greater trochanter to localize osseous borders. Biopsy needle was placed between these 2 points to ensure proper greater trochanteric entry.*

insertion to triangulate the core biopsy needle entry due to a relatively narrow superior greater trochanteric entry angle (Figs. 7 -10).

Results

The patient underwent bilateral percutaneous core biopsies of greater trochanteric lytic lesions with con-

Fig. 8. Left greater trochanter trochar placement within a lytic lesion. Also pictured are 2 spinal needles placed on periosteum to ensure proper trochar placement within the greater trochanger.

Fig. 9. *Left greater trochanter administration of bone cement.*

Fig. 10. *Left greater trochanter post bone cement administration.*

comitant trochanteroplasties. Both procedures were performed without vascular or extra-cortical uptake. No intra-operative or postoperative complications occurred. The patient reported 70% reduction in bilateral hip pain at 12 month follow-up and no longer required pain medication.

Discussion

Our patient presented with unusually local and stable cortical myelomatous lesions. Intra-osseous bone cement has demonstrated efficacy in the treatment of myelomatous pain, especially in the spine (5,14,15). In select cases, pain caused by extra-spinal myelomatous lytic lesions can be effectively treated by performing percutaneous trochanteroplasty. The primary goal was to offer pain relief; a secondary goal was for mechanical stabilization of the greater trochanter. Though it is not a weight-bearing site it serves as an anchor for gluteus medius and gluteus minimus muscles, handling significant dynamic stress especially when performing standing and sitting transfers.

Systemic uptake, local embolism, and infarction are risk factors associated with trochanteroplasty; however, it is believed that the greater trochanter is a safe location for bone cement introduction. The risks of systemic bone cement leakage may not be as high as vertebroplasty because of the relative containment of greater trochanteric vasculature. The greater trochanter arterial supply is independent from the femoral neck and shaft making cement embolism to the femoral neck unlikely. Furthermore, if local embolism were to occur we submit that infarction may not produce clinical sequelae due to the robust anastomosis of the greater trochanter (Fig. 7) (16). The bony landmark is easily palpable, and easily identified and injected with fluoroscopic guidance, making it an ideal cement injection site for patients with known local osseous disease. Thus, we believe that bone osteoplasty, as described in this report, is a safe, cost and clinically effective treatment for painful trochanteric myelomatous lesions.

Cortical lytic lesions at the greater trochanter can predispose patients to pathologic fractures by virtue of the tensile forces of the gluteal muscles on the periosteum of the greater trochanter; therefore, it is conceiv-

able that this procedure may also decrease the patient's risk of avulsion fracture (17,18). The importance of patient education on fall prevention strategies and the use of an ambulatory aid in such settings should also be stressed as part of a comprehensive treatment plan.

To our knowledge there have been 2 prior studies which evaluate the use of extra-spinal osteoplasty in the setting of multiple myeloma. The results from both studies were concordant with the findings in our case study suggesting that percutaneous osteoplasty is a safe and effective option for treating pain secondary to lytic lesions (5,10-13). However, osteoplasty was not the only available treatment option for our patient. Several treatments are available for patients suffering from myelomatous pain refractory to conservative therapy. Examples include radiofrequency ablation, cryoablation, radiation, and surgery with fixation. These may offer pain relief but may fail to provide the cortical support achieved through osteoplasty (17,19-23). Radiofrequency has been performed in the axial spine but not widely practiced in other anatomical locations due to concern about thermal nerve injury. Combined therapy utilizing radiofrequency ablation and osteoplasty has been suggested to address this problem (24). Radiation therapy can be considered but carries an inherent risk of decrease of osseous integrity by radiation-induced osteonecrosis (25-29). Surgery with fixation is another option but hardware induced osseous fracture are not uncommon problems with this modality (30,31). Complementary alternative medicine such as acupuncture, massage, and homeopathy are gaining popularity for treating various types of chronic pain; though they may serve as additional conservative treatment options, there is poor science supporting widespread use (32).

The applicability of our study is limited to treating pain secondary to myelomatous lytic lesions. Furthermore, we acknowledge that our case report is only one example of successful pain relief from osteoplasty. More evidence is needed in the form of a case series or randomized, controlled trials to evaluate the efficacy of osteoplasty as treatment for lytic lesions of various etiologies in regard to both pain relief and fracture prevention.

Conclusion

Osteoplasty is not indicated in all cases of myelomatous-induced lytic lesions. Several factors that must be considered when deciding candidacy for osteoplasty include the extent of bony involvement, rate of disease progression, underlying comorbidities, or the presence of any absolute contraindications such as sepsis, osteomyelitis, overlying abscesses, or uncorrectable coagulopathy (33). Although percutaneous osteoplasty is not indicated for all cases of myelomatous lytic lesions, the authors believe that it should be considered as part of the armamentarium for interventional pain management physicians when developing a treatment plan.

Disclaimer

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Conflict of interest

Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.

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