Solitary Plasmacytoma of the Medial Clavicle

Eric W. Tan, MD, Amy L. White, PA-C, Samer Attar, MD, and Steve A. Petersen, MD

Abstract

Medial clavicular pain has a broad differential diagnosis that includes traumatic, atraumatic, and neoplastic etiologies. Dedicated imaging studies (eg, computed tomography, magnetic resonance imaging) play an essential role in evaluating and diagnosing disorders of the medial clavicle.

In this article, we report a case of medial clavicular pain caused by a rare neoplasm, a solitary plasmacytoma of bone. This case illustrates the importance of accurate diagnosis that is facilitated by thorough evaluation and computed tomographic imaging of the medial clavicle.

Medial clavicular pain has a broad differential diagnosis that includes traumatic, atraumatic, and neoplastic etiologies. Atraumatic medial clavicular pain has been related to osteoarthritis, condensing osteitis, postoperative sternoclavicular (SC) hypertrophy, sternocostoclavicular hyperostosis, Friedrich's disease, pyogenic arthritis, chronic osteomyelitis, rheumatic disease, and SC joint instability.[1-7] A neoplasm is an uncommon and often overlooked cause of medial clavicular pain. Primary bone neoplasms of the clavicle are rare and are more likely malignant than benign.[8-12] For a patient with medial clavicular symptoms, adequate imaging studies are required to determine the correct diagnosis.

Solitary bone plasmacytomas (SBPs) are localized plasma cell neoplasms. They represent less than 5% of all plasma cell tumors.[13,14] SBPs are found primarily in the axial skeleton, particularly the vertebrae, ribs, and pelvis, but may involve any bone in the body.[14,15]

In this article, we report a rare case of medial clavicular pain caused by SBP, the diagnosis of which was facilitated by computed tomography (CT). The patient provided written informed consent for print and electronic publication of this case report.

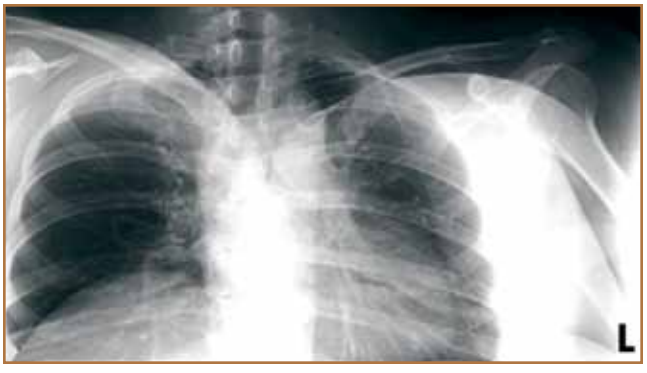
Case Report

A 53-year-old, right-hand–dominant woman, developed atraumatic left shoulder pain. She was initially evaluated by her primary care physician, who diagnosed impingement secondary to an acromioclavicular joint osteophyte and treated her with 2 cortisone injections in the acromioclavicular joint. After 3 weeks of symptomatic relief, the pain gradually increased.

Five months after pain onset, the patient presented to our office. Her chief concern was a dull pain in the SC joint, and in the left sternocleidomastoid and trapezius muscles, that persisted at night and at rest. The patient denied any previous history of trauma or pain in these locations. On physical examination, there was no evidence of shoulder atrophy, deformity, or scapular winging involving the left or right shoulder girdle or upper extremity musculature. The SC joints were asymmetrical; the left joint was moderately swollen and tender to palpation. There was no evidence of erythema in the SC joint, and the skin was intact and dry. Left crossed-arm adduction measured 20° and was symptomatic, reproducing left trapezius pain. Active elevation while sitting measured 160° and reproduced left trapezius pain. Passive internal rotation was asymptomatic, measuring to the left L2 spinous process. Active external rotation with the left arm by the side measured 60°. Impingement maneuvers, including the Hawkins-Kennedy test,[16] the Neer impingement sign,[17] and resisted abduction, were symptomatic, reproducing left trapezius pain. The patient was unable to perform a subscapularis liftoff because of decreased left internal rotation. The abdominal-press maneuver was intact bilaterally. The patient was neurologically intact on sensory and motor testing and had intact radial pulses.

Grashey, scapular lateral, axillary, and Zanca radiographs of the left shoulder showed a mild disruption of the scapulohumeral line with 3 mm of superior translation of the humeral head. No abnormalities were noted on the left serendipity SC joint radiographs reviewed in our clinic, and none was reported

Figure 1. Conventional oblique radiograph of left sternoclavicular joint shows no bony or soft-tissue abnormalities.



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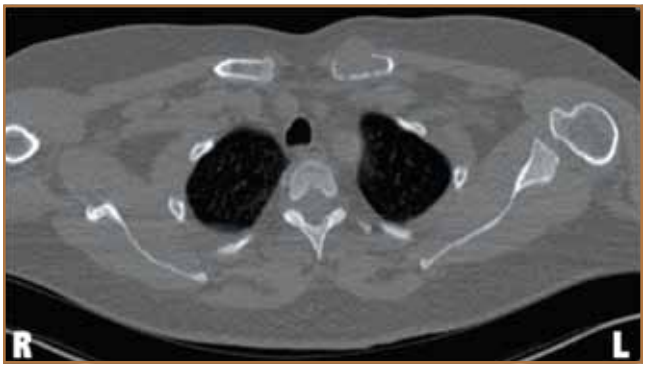


Figure 2. Axial computed tomography shows destructive, expanding lesion in left medial clavicle.

by the attending radiologist (**Figure 1**). Radiographs of the cervical spine were unremarkable. Magnetic resonance imaging (MRI) of the left shoulder showed a subchondral cyst involving the superior glenoid but not the SC joint. We suspected a diagnosis of SC joint arthritis and recommended CT-guided injection of the left SC joint for diagnostic and therapeutic purposes.

Before SC joint injection, scout CT images of both SC joints were obtained. A lytic lesion involving the anterosuperior cortex of the left medial clavicle was identified (**Figure 2**). This lesion measured 3.2 × 2.3 × 2.8 cm. The radiologist performing the study immediately notified us of the findings, and recommended and performed fine-needle percutaneous aspiration and a core biopsy of the lesion. The histology of the lesion was consistent with plasmacytoma (**Figures 3A, 3B**).

The patient was subsequently evaluated by orthopedic oncology. No other lesions were noted on a skeletal survey. Complete blood cell count, serum levels, and urinary protein electrophoresis results were normal. No surgical intervention was indicated, and the patient was referred to radiation oncology for further treatment. She started radiation therapy with follow-up at another facility.

Discussion

Clavicle injuries, which represent 35% to 44% of all shoulder girdle injuries, are associated with sports, falls, motor vehicle accidents, and assaults.[18-20] The shoulder girdle, which consists of the proximal humerus, the scapula, the clavicle, and surrounding soft tissues, is the third most common site of primary bone tumors.[8] However, clavicular neoplasms represent less than 5% of shoulder girdle tumors and less than 1% of all primary bone tumors.[8-10] Clavicular bone tumors are more likely to be malignant than benign.[9,11,12]

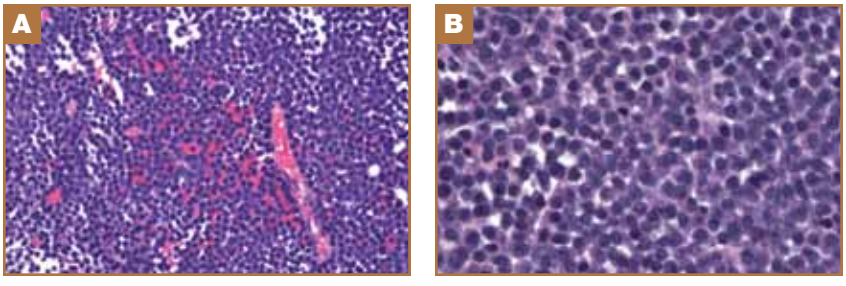
Plasma cell tumors encompass a group of entities that are characterized by a monoclonal neoplastic proliferation of plasma cells. Multiple myeloma is the most common plasma cell neoplasm, accounting for 10% of all hematologic cancers.[21,22] It is a disseminated neoplasm associated with a variety of clinical and radiographic findings. Alternatively, SBPs are localized bone plasma cell neoplasms. They are uncommon, representing less than 5% of all plasma cell tumors.[13,14] Multiple myeloma and SBPs are histologically identical. SBP is the appropriate diagnosis when there is a negative skeletal survey and no bone marrow involvement.

SBPs are found primarily in the axial skeleton but may involve any bone in the body.[14,15] They are 2 times more likely to develop in the spine than in any other bony site.[23] Solitary plasmacytoma of the clavicle is rare, and most of the reported SBPs of the clavicle involve the lateral clavicle.[12,24-26] To our knowledge, only 2 cases[12,27] of SBP of the medial clavicle were reported before ours. Smith and colleagues[12] identified only 1 case (a 57-year-old man) out of all the clavicular lesions encountered at an institution over a span of 50 years. There was no mention of the patient's diagnostic workup, treatment, or results. Shahid and colleagues[27] reported a case in a 28-year-old farmer who had shoulder pain and swelling. This patient was undergoing chemotherapy at time of publication.

Clinically, patients with SBPs present with pain localized to the medial clavicle or SC joint secondary to bony destruction. Dedicated conventional radiographs of SC joints, including the serendipity view, may show a lytic lesion with evidence of cortical involvement. Advanced imaging (CT, MRI) is needed to further identify marrow infiltration and define bony destruction. A skeletal survey, serum analysis, and urinary protein electrophoresis are essential parts of the workup. Definitive diagnosis requires a tissue biopsy. We do not necessarily advocate tissue biopsy at time of imaging. Typically, a staging workup is completed before a lesion is biopsied.[28] Given the CT findings on scout imaging and the immediate accessibility of a CT-guided biopsy, our patient's situation was atypical.

Local radiotherapy remains the standard of treatment for SBPs.[14,15] Surgical resection is seldom necessary but has been used for SPBs of the spine to achieve local disease control, to decompress neural elements in cases of cord compression, and to provide subsequent spinal stability.[29,30] In addition, surgery has been used to treat fractures and impending fractures caused by long bone

Figure 3. Microscopic examination of left medial clavicle lesion reveals sheets of plasmacytoid cells, consistent with plasmacytoma. (A) Original magnification ×200. (B) Original magnification ×400.



tumors.[31] Adjuvant chemotherapy has had inconclusive results and is not recommended for initial treatment of SBPs.[15,30] On the other hand, high-dose chemotherapy with autologous stem cell treatment has had promising initial results.[32]

Even with treatment, SBPs progress to multiple myeloma in up to 45% of patients.[13-15,33] Age less than 60 years, male sex, axial skeleton lesions, presence of serum paraprotein at diagnosis, persistent postradiation serum protein levels of 5 g/L or higher, lower doses of local radiotherapy, and other factors have been associated with progression of SBPs to multiple myeloma.[13-15,33-35] Median time to progression is 2 to 3 years. However, given that multiple myeloma has developed up to 15 years after treatment,[15] long-term follow-up is necessary.

In the evaluation of medial clavicular pain, traumatic and atraumatic causes must be considered. The differential diagnosis of atraumatic medial clavicular pain is broad and includes benign causes such as osteoarthritis, osteitis, SC joint hypertrophy or hyperostosis, and infection. A neoplasm represents a rare yet potentially ominous cause of medial clavicular pain. Solitary plasmacytoma of the clavicle is a rare tumor of the medial clavicle. To our knowledge, our patient is only the third reported case of a solitary plasmacytoma involving the medial end of the clavicle. Despite their rare occurrence, neoplasms should always be included in the differential diagnosis for medial clavicular pain, with CT or MRI obtained during the workup of this disorder. Delays in diagnosis and treatment adversely affect patient outcomes.

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References

1. Gerscovich EO, Greenspan A, Szabo RM. Benign clavicular lesions that may mimic malignancy. *Skeletal Radiol*. 1991;20(3):173-180.
2. Goossens M, Vanderstraeten C, Claessens H. Sternocostoclavicular hyperostosis. A case report and review of the literature. *Clin Orthop*. 1985;(194):164-168.
3. Hsu CY, Frassica F, McFarland EG. Condensing osteitis of the clavicle: case report and review of the literature. *Am J Orthop (Belle Mead NJ)*. 1998;27(6):445-447.
4. Levy M, Goldberg I, Fischel RE, Frisch E, Maor P. Friedrich's disease. Aseptic necrosis of the sternal end of the clavicle. *J Bone Joint Surg Br*. 1981;63(4):539-541.
5. Muir SK, Kinsella PL, Trebilcock RG, Blackstone IW. Infectious arthritis of the sternoclavicular joint. *CMAJ*. 1985;132(11):1289-1290.
6. Searle AE, Gluckman P, Sanders R, Breach NM. Sternoclavicular joint swellings: diagnosis and management. *Br J Plast Surg*. 1991;44(6):403-405.
7. Yood RA, Goldenberg DL. Sternoclavicular joint arthritis. *Arthritis Rheum*. 1980;23(2):232-239.
8. Cleeman E, Auerbach JD, Springfield DS. Tumors of the shoulder girdle: a review of 194 cases. *J Shoulder Elbow Surg*. 2005;14(5):460-465.
9. Klein MJ, Lusskin R, Becker MH, Antopol SC. Osteoid osteoma of the clavicle. *Clin Orthop*. 1979;(143):162-164.
10. Malawer MM, Meller I, Dunham WK. A new surgical classification system for shoulder-girdle resections. Analysis of 38 patients. *Clin Orthop*. 1991;(267):33-44.
11. Smith J, McLachlan DL, Huvos AG, Higinbotham NL. Primary tumors of the clavicle and scapula. *Am J Roentgenol Radium Ther Nucl Med*. 1975;124(1):113-123.
12. Smith J, Yuppa F, Watson RC. Primary tumors and tumor-like lesions of the clavicle. *Skeletal Radiol*. 1988;17(4):235-246.
13. Bolek TW, Marcus RB Jr, Mendenhall NP. Solitary plasmacytoma of bone and soft tissue. *Int J Radiat Oncol Biol Phys*. 1996;36(2):329-333.
14. Reed V, Shah J, Medeiros LJ, et al. Solitary plasmacytomas: outcome and prognostic factors after definitive radiation therapy. *Cancer*. 2011;117(19):4468-4474.
15. Dimopoulos MA, Moulopoulos LA, Maniatis A, Alexanian R. Solitary plasmacytoma of bone and asymptomatic multiple myeloma. *Blood*. 2000;96(6):2037-2044.
16. Hawkins RJ, Kennedy JC. Impingement syndrome in athletes. *Am J Sports Med*. 1980;8(3):151-157; discussion 157-158.
17. Neer CS 2nd. Anterior acromioplasty for the chronic impingement syndrome in the shoulder: a preliminary report. *J Bone Joint Surg Am*. 1972;54(1):41-50.
18. Nordqvist A, Petersson C. The incidence of fractures of the clavicle. *Clin Orthop*. 1994;(300):127-132.
19. Postacchini F, Gumina S, De Santis P, Albo F. Epidemiology of clavicle fractures. *J Shoulder Elbow Surg*. 2002;11(5):452-456.
20. Robinson CM. Fractures of the clavicle in the adult. Epidemiology and classification. *J Bone Joint Surg Br*. 1998;80(3):476-484.
21. Caers J, Vande broek I, De Raeve H, et al. Multiple myeloma—an update on diagnosis and treatment. *Eur J Haematol*. 2008;81(5):329-343.
22. Kyle RA, Rajkumar SV. Criteria for diagnosis, staging, risk stratification and response assessment of multiple myeloma. *Leukemia*. 2009;23(1):3-9.
23. Chang MY, Shih LY, Dunn P, Leung WM, Chen WJ. Solitary plasmacytoma of bone. *J Formos Med Assoc*. 1994;93(5):397-402.
24. Carter PM, Rushman RW. Solitary plasmacytoma of the clavicle. *Proc R Soc Med*. 1974;67(11):1097-1098.
25. Panagopoulos A, Megas P, Kaisidis A, Dimakopoulos P. Radiotherapy-resistant solitary bone plasmacytoma of the clavicle. *Eur J Trauma*. 2006;32(2):190-193.
26. Shih LY, Dunn P, Leung WM, Chen WJ, Wang PN. Localised plasmacytomas in Taiwan: comparison between extramedullary plasmacytoma and solitary plasmacytoma of bone. *Br J Cancer*. 1995;71(1):128-133.
27. Shahid M, Hali NZ, Mubeen A, Zaheer S, Julfiqar. Solitary plasmacytoma of clavicle—a rare case presentation. *J Cytol Histol*. 2010;1(1):103.
28. Rougraff BT, Kneisl JS, Simon MA. Skeletal metastases of unknown origin. A prospective study of a diagnostic strategy. *J Bone Joint Surg Am*. 1993;75(9):1276-1281.
29. Mendoza S, Urrutia J, Fuentes D. Surgical treatment of solitary plasmocytoma of the spine: case series. *Iowa Orthop J*. 2004;24:86-94.
30. Weber DM. Solitary bone and extramedullary plasmacytoma. *Hematology Am Soc Hematol Educ Program*. 2005:373-376.
31. Kivioja AH, Karaharju EO, Elomaa I, Böhling TO. Surgical treatment of myeloma of bone. *Eur J Cancer*. 1992;28A(11):1865-1869.
32. Dimopoulos MA, Papadimitriou C, Anagnostopoulos A, Mitsibounas D, Fermand JP. High dose therapy with autologous stem cell transplantation for solitary bone plasmacytoma complicated by local relapse or isolated distant recurrence. *Leuk Lymphoma*. 2003;44(1):153-155.
33. Frassica DA, Frassica FJ, Schray MF, Sim FH, Kyle RA. Solitary plasmacytoma of bone: Mayo Clinic experience. *Int J Radiat Oncol Biol Phys*. 1989;16(1):43-48.
34. Bataille R, Sany J. Solitary myeloma: clinical and prognostic features of a review of 114 cases. *Cancer*. 1981;48(3):845-851.
35. Dingli D, Kyle RA, Rajkumar SV, et al. Immunoglobulin free light chains and solitary plasmacytoma of bone. *Blood*. 2006;108(6):1979-1983.

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