Topics in Diagnostic Imaging

Presumptive Late-Onset Ankylosing Spondylitis Simulating Osteoblastic Skeletal Metastasis in a Patient With a History of Prostate Carcinoma: A Diagnostic Challenge

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Abstract

Objective: The purpose of this report is to present a presumptive case of ankylosing spondylitis with late stage progression that simulated osteoblastic metastasis in a patient with a history of prostate carcinoma.

Clinical Features: A 67-year-old white man presented to a chiropractic clinic complaining of severe and worsening acute low back pain and right foot “numbness.” Further questioning also revealed a history of prostate carcinoma.

Intervention and Outcome: Imaging examination revealed a sclerotic pedicle and increased uptake of radiopharmaceutical on a nuclear medicine bone scan highly suggestive of osteoblastic skeletal metastasis. Further evaluation, however, revealed that the bone sclerosis was not the result of skeletal metastasis, but more consistent with a seronegative spondyloarthritis such as ankylosing spondylitis.

Conclusion: This report describes a presumptive case of ankylosing spondylitis simulating skeletal metastasis in a patient with a past medical history of prostate cancer. This atypical presentation illustrates the inherent uncertainty of diagnosis and how that uncertainty can be challenging in clinical practice. It also reinforces that it is critical for healthcare providers to consider a wide spectrum of differential diagnoses to avoid misdiagnoses and inappropriate interventions.

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Introduction

The seronegative spondyloarthritis complex is composed of reactive arthritis, psoriatic arthritis, “undifferentiated,” and ankylosing spondylitis (AS).¹ AS has a common clinical presentation of inflammatory back

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pain and has a classical onset between 20 and 30 years of age.²⁻⁴ Up to 80% of all diagnoses occur before 30 years of age, with few patients experiencing AS symptoms after 50 years of age.^{1,5-8} Those who are diagnosed after the age of 50 may have had mild symptoms in the previous years of life and may have experienced lengthy delays between the age of onset and the age at time of diagnosis.⁵ As a result, late stage progression AS may be underdiagnosed.^{5,8} The incidence of late-onset AS (2.2/100,000 people) is notably lower compared to the rate of AS diagnosed before 50 years of age (7.3/100,000 people).^{1,5}

The diagnostic criteria for AS are multifactorial. Clinical laboratory analyses such as erythrocyte sedimentation rate and C-reactive protein are frequently normal and HLA-B27 will only be elevated in approximately 80% of patients.^{2,8,9} Conventional radiography is important for arriving at a definitive diagnosis of AS.^{2,6,8} The major radiographic findings of AS include sacroiliitis (often the first alteration), syndesmophytes (which may result in the “bamboo spine” appearance), ligament calcification, vertebral body squaring, osteitis, and rarely, complete osseous ankylosis of the sacroiliac joints.^{2,6,8,9}

The purpose of this report is to present a case that at first was believed to be osteoblastic metastasis in a patient with a history of prostate carcinoma, but that was eventually presumed to be AS. This case also illustrates the need to remember that seronegative spondyloarthritis may infrequently result in new bone formation and sclerosis, simulating other diseases and must be considered while diagnosing a patient, even if the patient’s presentation does not exactly match a ‘hallmark’ or ‘textbook’ presentation of the disease.

Case Report

A 67-year-old white man presented with a chief complaint of severe and worsening acute low back pain and right foot “numbness.” He injured his back 10 days earlier, moving a refrigerator down a flight of stairs at his home. The pain severity was graded as 8/10 on a numeric rating scale (where 0 equals no pain and 10 equals the worst pain ever experienced). Disability was graded using the Back Bournemouth Questionnaire, with his overall score totaling 60/70 (where 0 equals no disability and 70 equals complete disability).¹⁰ His back pain was noticeably worse at night, disrupting his sleep. Over-the-counter anti-inflammatory medication (Ibuprofen) did not provide any relief of symptoms.

The patient had been treated by Doctors of Chiropractic for various low back injuries over the previous 40 years, each time with favorable results. His last chiropractic intervention involved treatment for a right shoulder injury 9 and 1/2 years earlier.

On physical examination, the patient had difficulty arising from a chair (ie, Minor’s sign) and he walked with a moderately bent-forward antalgic gait pattern. Lumbar spine range of motion was painful and limited by 30% in right rotation, right lateral flexion, and extension. The combination of those 3 movements (i.e. Kemp’s Test) was also provocative, resulting in localized low back pain. Motion palpation performed with the patient prone revealed restricted motion at the sacroiliac joints and lumbar paraspinal muscle spasm on the right. The Straight Leg Raise Test did not reproduce or exacerbate symptoms. Lower limb neurologic examination was also unremarkable, except for hypoesthesia along the distal S1 dermatome. Based on these examination findings, the working diagnosis was a right-sided lumbar sprain/strain injury, with S1 hypoesthesia.

Prior to treatment, the patient was asked if there had been any changes in health history since his last visit 9 and 1/2 years ago. He stated that 18 months earlier he had undergone a complete prostatectomy for prostate cancer. Relevant family history included 2 brothers who had recently died from metastatic prostate cancer. The patient insisted that multiple follow-up blood tests since his surgery had shown his prostate-specific antigen (PSA) levels to be normal. Nonetheless, because of his cancer history and age, radiographs were obtained.

Lumbopelvic radiographs revealed moderate-to-severe degenerative disc and facet joint disease involving the lower lumbar spine as well as bilateral ankylosis of the lower two-thirds of the sacroiliac joints. Both hip joints exhibited moderate concentric joint space narrowing which tends to be more consistent with an inflammatory arthropathy rather than a degenerative process. In addition, increased sclerosis within the right pedicle and body of the T12 vertebra was observed (Fig 1). That finding raised concern about the possibility of skeletal metastasis of the prostate carcinoma. The chiropractor subsequently consulted with a chiropractic radiologist who also suspected spinal metastasis and recommended a radionuclide bone scan to confirm the diagnosis.

The patient was immediately referred to his family physician. Prior medical records were sought and reports from his oncologist revealed that prior to his prostate cancer diagnosis, the PSA had risen to 5.0 ng/ml, but that following prostatectomy, 4 consecutive assays obtained

Fig 1. Anteroposterior (A) and lateral (B) lumbar spine radiographs revealing an osteosclerotic lesion involving the right pedicle (arrow) and vertebral body of T12. Other radiographic findings include bilateral osseous ankylosis of the sacroiliac joints, mild disc space narrowing and osteophytes at multiple levels (most notably at L3-4, L4-5, and L5-S1), mild degenerative spondylolisthesis at L3-4 and L4-5, slight right lumbar convexity, and bilateral concentric narrowing with axial migration of the hip joints. Of incidental note are multiple surgical staples located along the anteroinferior aspect of the pelvic basin from a previous prostatectomy. (C) Spot view of the sacroiliac joints revealing osseous ankylosis bilaterally.

over the span of 16 months showed the total PSA level to be “undetectable” (<0.04 ng/mL; normal range = 0-4.0 ng/mL).

Radionuclide scintigraphy was also conducted and revealed several sites of focal radionuclide uptake, most notably at the T12 vertebral level (Fig 2). Based on these scintigraphic findings, computed tomographic (CT) scans of the chest, abdomen, and pelvis were ordered to evaluate for other sites of primary (eg, lung, liver, pancreas, adrenal, or kidney) and/or secondary (metastatic) tumor involvement. The CT study confirmed the T12 radiographic findings which included diffuse sclerosis of the right side of the T12 vertebral body and neural arch (Fig 3), but no other lesions were identified

Fig 2. Radionuclide whole-body bone scan, after injection of 866 MBq of technetium 99m methylene diphosphonate, shows abnormal osseous activity evidenced by increased uptake at the T12 vertebra on the right (arrows). Note also the increased uptake within the bilateral tibiae (distal on the right, proximal on the left). All other sites of uptake in the lower lumbar vertebrae and several other joints likely indicate degenerative/arthritis changes. It is unclear the significance of the increased uptake in the tibiae.

on this examination. A follow-up magnetic resonance (MR) imaging study was also performed. Sagittal (Fig 4) and axial (Fig 5) T1-weighted sequences revealed low signal intensity with intermixed mottled regions of intermediate signal within the right side of the T12 vertebral body and neural arch consistent with the radiographic and CT findings at T12.

At follow-up visits at 6 and 12 months, further laboratory and CT imaging studies failed to show any respective changes to the patient’s PSA and T12 vertebral findings. Owing to the lesion’s benign

Fig 3. Axial CT scan showing osteosclerosis involving the right half of the vertebral body and pedicle of T12.

appearance, the oncologist opted to forego a bone biopsy of T12. Instead, a watch and wait (expectant management) approach was taken in order to closely monitor the osseous lesion as well as the other scintigraphic findings (see Fig 2), with future imaging and laboratory studies to be scheduled. Because primary carcinoma and skeletal metastasis from the prostate were virtually excluded, we narrowed the potential differential diagnoses to the following: (i) reactive sclerosis secondary to inflammatory seronegative spondyloarthritis such as AS, (ii) benign hemangioma, or (iii) Paget's disease. We presumed, based on history, physical examination, and imaging, that the diagnosis was most consistent with AS having late stage progression.

Fig 5. Axial T1-weighted MR images of the T12 vertebra, without (A) and with (B) gadolinium. Note the “mottled” appearance (ie, hypo- and hyper-intense foci of mixed signal intensity) within the right half of the vertebral body and pedicle of T12.

Most recently at a 2-year follow-up, the patient reported that his lower back pain was only intermittent and had improved to 2/10. However, he still complained of persistent “numbness” in his right foot (S1 dermatome). His PSA test at this time was once again negative. As a result, the oncologist has decided to follow-up with the patient only once per year for further PSA testing.

Interestingly, a recent blood test (ie, complete blood count with differential) ordered by the family physician revealed elevated bone alkaline phosphatase (152 U/L; normal range, 40-129 U/L). While elevated serum alkaline phosphatase indicates increased osteoblastic activity and is consistent with the new bone formation visualized on previous diagnostic imaging, it is non-specific in determining the precise cause of the new bone formation. No further laboratory analysis or imaging studies have been performed, but the patient stated that he was pleased with the prompt medical referral that he received from the chiropractor. He also provided written consent to having his personal health information, including radiographs and other imaging studies, published.

Discussion

To our knowledge a case of AS that simulates skeletal metastasis, specifically in a patient with a history of prostate cancer, has not yet been published. In 2012, Pottecher et al published one case in which a 73-year-old patient with late-onset spondyloarthritis presented with sclerotic lesions on radiographs, intense uptake in the vertebral bodies at scintigraphy, and new bone formation, all of which suggested a diagnosis of

Fig 4. Sagittal T1-weighted MR images of the thoracolumbar spine, without (a) and with (b) gadolinium contrast, revealing abnormal signal intensity within the T12 vertebra that enhances only slightly after gadolinium administration.

multiple osteoblastic skeletal metastases.¹¹ However, this patient did not have a previous history of cancer and proved not to have skeletal metastasis.¹¹

It has been documented that AS can also simulate other diseases such as reflex sympathetic dystrophy (complex regional pain) syndrome.¹² In our case, given the medical history, the presence of localized increased uptake on bone scintigraphy, combined with a sclerotic pedicle, strongly suggested the possibility of skeletal metastasis. According to Lomasney et al, skeletal metastasis should be considered especially in the presence of localized increased uptake on bone scintigraphy, sclerotic pedicle, and a history of primary carcinoma from the gastrointestinal system, breast, bladder, or prostate.¹³

While skeletal metastasis, especially from prostate carcinoma, is one of the leading causes of a unilateral sclerotic pedicle, several other conditions must also be considered in the differential diagnosis, such as: (i) benign neoplasms (enostoma, osteoid osteoma, osteoblastoma, hemangioma), (ii) congenital disorders (hypoplastic facet or pedicle, asymmetric facets, spina bifida occulta), (iii) unilateral spondylolysis with contralateral stress sclerosis, (iv) other malignant tumors (Ewing's sarcoma, myeloma, lymphoma), and tumor-like disorders (Paget disease, fibrous dysplasia, sarcoidosis, tuberous sclerosis), and (v) infection.^{13–15} Seronegative spondyloarthritis may also infrequently result in new bone formation and sclerosis simulating osteoblastic skeletal metastasis.^{12,13,15} It is presumed, in this case, that the sclerosis is a manifestation of reactive new bone formation secondary to osteitis. In the presence of bilateral ankylosis of the lower two-thirds of the sacroiliac joints, and concentric narrowing with axial migration of the hip joints, a presumptive diagnosis of late-onset AS was most plausible in the current case.

This case is atypical and unique because the original suspicion of skeletal metastasis could not be substantiated. Nevertheless, the diagnosis of skeletal metastasis was strongly supported by several characteristics including patient age (67), history of prostate cancer, sclerotic pedicle, and focal uptake on bone scintigraphy. Moreover, this case illustrates the diagnostic uncertainty in certain cases. A definitive diagnosis is not always clear cut and each case may not demonstrate all of the classical or typical findings associated with a single pathologic process. Accurate diagnosis depends on the cooperation of all healthcare providers involved, and access to necessary diagnostic tests. Unfortunately, in this case, such cooperation and access to tests was not ideal. This case also reinforces the need for

healthcare professionals to consider alternative differential diagnoses and that signs and symptoms may be misleading. Failing to do so may result in misdiagnosis, especially if its clinical presentation is not a classic “hallmark” of the disease.

Limitations

Several limitations of this case make it difficult to arrive at a definitive diagnosis of AS. First, the absence of previous lumbar radiographs makes it difficult to identify the age of onset of the pathologic process. Second, while some blood tests were performed at various time intervals, the absence of an arthritic panel despite repeated unsuccessful requests is a major limitation. In addition, the atypical nature of this case, especially, the absence of any changes in the adjacent vertebral levels, the adjacent discs, endplates or vertebral margins make the diagnosis of AS difficult. Finally, the current chief complaint with which the patient presented appears to be unrelated to the spine and sacroiliac findings. As a result, the diagnosis in this case is only presumptive and not definitive.

Conclusion

Ankylosing spondylitis has a common clinical presentation of inflammatory back pain with an onset between the ages of 20 and 30 years and rarely causes symptoms after 50 years of age. Seronegative spondyloarthritis such as AS may also simulate other diseases but to our knowledge, it rarely simulates skeletal metastasis.

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