Metastatic Cancer of the Thoracic and Lumbar Spine Presenting as Mid- and Low Back Pain in a Long Distance Runner

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ABSTRACT

Objective: The purpose of this case study is to describe the presentation of a patient with persistent back pain and a history of carcinoma.

Clinical Features: A 50-year-old female runner presented to a chiropractic office with persistent moderate low back and mid-back pain. She had a history of breast carcinoma. She had no positive neurologic signs or symptoms suggestive of radiculopathy. She denied any other health symptoms and received mild relief with only 1 office visit consisting of spinal manipulation, moist heat, and electrical stimulation. Although the patient experienced some pain relief after her chiropractic treatment, she continued to experience persistent mild pain in the thoracolumbar area.

Intervention and Outcome: Because of the patient's lingering back pain, she was referred for lumbar spine radiographs. On evaluation of the radiographs, a missing right L3 pedicle was seen. A subsequent computed tomography scan of the lumbar spine revealed marked metastatic changes to the lower thoracic and upper lumbar spine. The patient was immediately referred to her oncologist. The metastatic changes had progressed to her liver, and she succumbed to the disease 6 months later.

Conclusion: This case highlights the importance of patient health history and further investigation of the red flag of persistent pain in patients with a history of carcinoma. (J Chiropr Med 2018;17:121-127)

Key Indexing Terms: *Breast Neoplasms; Neoplasm Metastasis; Chiropractic; Diagnostic Imaging*

INTRODUCTION

Thoracic and lumbar spinal pain are 2 common complaints that patients present to the clinical chiropractic setting and are seen every day by various practitioners.¹ It is relatively uncommon that low back pain represents a serious disease, but metastatic disease can present as low back pain, especially in patients with a history of carcinoma. It is these unique cases that the clinician must be wary of, in which common mid-back and low back pain represents a more serious pathologic condition, especially when the pain seems reticent to reliable and proven conservative care.

It is estimated that more than 85% of acute low back pain can be categorized as nonspecific, which includes lumbar strain and sprain, degenerative disk or facet process, and spinal stenosis or spondylolisthesis. Less than 5% is pathologic in

origin, including neoplasia, infection, inflammatory arthritis, and visceral disease.² It is these rare but extraordinary cases that can easily slip by the clinical practitioner until the symptoms are so severe they are impossible to ignore.

Approximately 5% to 6% of women with breast cancer present with distant spread, with bone representing the most common site of metastatic lesions. The risk of developing bone metastasis 10 years after initial diagnosis is 7% to 9%.³ It is imperative that clinicians be able to detect any clues in the patient's history and physical examination to afford an early recognition of possible spinal metastasis and give the patient the best chance of survival. It is the purpose of this case report to describe the discovery of such a case in a seemingly healthy and active middle-aged athletic patient.

CASE REPORT

A 50-year-old woman presented to a chiropractic office with moderate right lumbar and thoracic pain and mild pain in the right cervical and upper trapezius area. The patient had been seen 2 and 3 months previously for right lower thoracic and lumbar pain and could not recall any recent injury to these areas of her spine. However, she had been running many miles per day training for several half-marathons. She responded well to the previous treatment regime of spinal

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Paper submitted March 28, 2017; in revised form October 13, 2017; accepted November 16, 2017.

1556-3707

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<https://doi.org/10.1016/j.jcm.2017.11.004>

manipulation, moist heat, and electrical stimulation and had been asymptomatic between those visits. On her third visit 2 months later, she again reported right lumbar pain and right upper thoracic pain. The patient denied any extremity symptoms or any constitutional symptoms such as nausea, vomiting, bowel or bladder changes, fever, or weight loss.

She exhibited full range of motion of the cervical, thoracic, and lumbar spine, although movement of these areas did exacerbate her symptoms. She was mildly tender to palpation to the right upper trapezius and right thoracolumbar para spinal muscles and had marked hypertonicity of these involved muscles. She exhibited hypomobility and tenderness to spinal palpation over her thoracic and lumbar spine in a sitting position. She was not given a full neurologic workup because she denied any radicular, radiating, or sensory symptoms. She again was treated with spinal manipulation, moist heat, and electrical stimulation and tolerated the treatment well. The patient was not instructed in any spinal exercises because she was in excellent physical condition and very flexible.

The patient appeared to be in good health because she had run 3 half-marathons in 45 days, although her medical history included a left breast carcinoma 5 years previously and she had undergone a total mastectomy of the involved left breast and a right breast mastectomy for prophylactic purposes. It is unknown whether the patient had undergone genetic testing for the *BRAC* mutation. Her father had died of colon cancer 18 years earlier. The patient had previously received chemotherapy postoperatively and followed up on her routine checkups, including laboratory analysis, religiously.

She presented 2 days after follow-up and had improved spinal range of motion and less pain. At this time the patient, although somewhat improved, reported that she was still experiencing some residual right thoracolumbar spinal pain. She asked about the possibility of obtaining spinal radiographs. Both the clinician and the patient agreed that she should undergo a radiographic examination of her lumbar spine because of her mild but residual pain and medical history. She was referred to the local hospital for routine weight-bearing anteroposterior and lateral radiographs of the lumbar spine.

The lumbar radiographs were viewed that day shortly after they were obtained. The lateral view of the lumbar spine revealed mild spondylosis deformans present at multiple levels, and the AP lumbar view revealed an absent right L3 pedicle (Fig 1). After consulting with the attending radiologist the next day and informing him of the patient's medical history, it was decided that further assessment with a computed tomography scan of the lumbar spine was warranted.

Axial computed tomography imaging of the lumbar spine was performed without contrast. That study revealed multiple punched-out lytic lesions throughout the osseous structures, noted particularly in the right pedicle of T12 and L3 (Figs 2, 3, and 4). There was a minor compression deformity to a portion

of the posterior superior element of T12 with an additional nondisplaced, vertically oriented fracture to the most anterior aspect of the right T12 pedicle. There was also a compression deformity to the right lateral L1 inferior endplate. No other paraspinal, intrathecal, or extrathecal masses were identified. The patient was seen in the chiropractic office the same day. After she was informed of the CT scan results, she immediately contacted her oncologist for further workup. The metastatic changes had progressed to her liver, and she succumbed to the disease 6 months later. The patient provided consent to publish this study.

DISCUSSION

Spinal metastasis represents an extension of neoplastic disease, and early detection and accurate diagnosis provide the patient with the best chance of successful treatment and optimize the quality of an afflicted patient's life. The vertebral column is the most common site of skeletal metastasis, with up to 70% of patients with cancer harboring secondary spinal disease.⁴ The spinal lesion represents the first manifestation of cancer in 12% to 20% of patients who present with symptoms related to spinal metastasis.⁴ Approximately 95% of metastases are extradural lesions, with intradural extramedullary lesions making up the majority of remaining lesions, whereas intramedullary lesions comprise approximately 0.5% of spinal metastases.⁴

Spinal radiographs are often the first investigation used to define the future course of action. Isotope bone scanning has been reported to be the most sensitive screening procedure for the identification of general pathologic bone conditions but has been reported to have low specificity.⁵ Computed tomography and magnetic resonance imaging often are used after the general area of metastatic involvement is located and are more often used in cases of neurologic symptoms.⁶

Red flags associated with low back pain include age >50 years; fevers, chills, or recent urinary tract or skin infection; penetrating wound near the spine; significant trauma; unrelenting night pain or pain at rest; progressive motor or sensory deficit; saddle anesthesia, bilateral sciatica or leg weakness, difficulty urinating, or fecal incontinence; unexplained weight loss; history of cancer or strong suspicion for current cancer; history of osteoporosis; immunosuppression; chronic oral steroid use; intravenous drug use; substance abuse; and failure to improve after 6 weeks of conservative therapy.⁷

Spinal metastasis is the most common form of secondary osseous involvement by a variety of cancers, usually presenting clinically in the form of backache.⁸ This secondary metastasis occurs 20 times more often than primary neoplasms of the spine.⁹ It is estimated that 18 000 new cases with spinal secondary involvement are diagnosed each year in North America in all age groups, with the highest incidence during

Fig 1. *Anterior-posterior view of lumbar spine with missing right L3 pedicle.*

mid-life (40-65 years), corresponding to the period of increased cancer risk.⁹ Of the more than 500 000 people who will die of cancer yearly, almost all will have metastasis to some part of the body.¹⁰ It is estimated that about 350 000 people with bone metastasis die each year in the United States, although some bone metastasis is not clinically visible and is only identified at autopsy.¹⁰ Bone is the most common place for metastasis after lung and liver, and any form of metastasis results in a poorer prognosis for the patient.¹⁰

No treatment has been proven to increase the life expectancy of patients with spinal metastasis, and the goals of therapy are pain control and preservation of function.¹¹ Radiotherapy and surgical resection are preferred treatments to control local disease.¹¹ Cancer can metastasize through different ways of propagation; the most common overall is hematogenous, and the most common for spinal lesions is intravenous.¹⁰ Patients with solitary metastasis have longer survival times compared with patients with multiple osseous

Fig 2. *Computed tomography axial view of T12 with erosion of vertebral body.*

Fig 3. *Computed tomography axial views of T12 and L3 vertebral bodies with marked metastatic changes.*

or viscera metastasis.¹² The vertebral body is the most common initial site of metastatic seeding, although, as in this case, an absent pedicle on the plain radiograph is the first sign of metastatic disease.¹³ Involvement of the pedicle occurs by direct extension from either the vertebral body or the posterior elements and is therefore a late occurrence in the disease process.¹³

A somewhat higher incidence of spinal metastasis occurs in men compared with women, paralleling the incidence of prostatic versus breast carcinoma.⁹ The breast, prostate, and lung constitute the most common primary sites, although kidney, thyroid, and large bowel are other common identifiers.¹⁴ The distributions of metastatic bone lesions in prostate cancer involve mainly the pelvis and spine,

Fig 4. *Computed tomography sagittal view of lumbar spine showing marked metastatic destruction of vertebral bodies.*

whereas breast cancer has a high frequency of involvement of the spine, ribs, and sternum.¹⁴ The most common involvement sites in lung cancer are the spine and ribs.¹⁴ Breast cancer is the most common cancer in women and the leading cause of cancer mortality worldwide in women.¹⁵ Most vertebral metastasis is osteolytic, although prostate lesions are almost exclusively sclerotic in nature. One unusual study¹⁶ revealed that progesterone receptor-positive patients with breast cancer were more likely to present with blastic rather than lytic lesions, contrary to previous studies.

The patient in this case study followed up on her routine postmastectomy and chemotherapy treatment, as instructed by her oncologist, although it is unknown to the author what was involved with these follow-up examinations. It has been stated by some authors that postoperative follow-up should

include consultations every 4 to 6 months, with physical examination and evaluation of serum carcinoembryonic antigen, tissue polypeptide antigen, and breast cancer-associated antigen 115 D8/DF3 at each visit. Additionally, imaging methods such as bone scintigraphy, liver echography, and chest radiograph should be performed biannually. Computed tomography and magnetic resonance imaging should be performed if suspicion arises when using the aforementioned methods.¹⁷ Tumors metastasizing from the breast, lung, and kidney present largely as lytic lesions on radiographs, and prostate metastasis usually presents as sclerotic lesions. It should be noted that breast and lung metastases can present as both sclerotic and lytic lesions.¹⁸

The red flag in this case was the persistent symptom of pain. This may have been considered normal progression with many patients and not warranting radiographic examination,

but this patient had always made good improvement after initial episodic treatment and usually did not seek further follow-up care. The lesson learned is that a patient with previous carcinoma and family history of cancer who does not respond in the usual manner to nontraumatic spinal pain may require further investigation. A thorough history and physical examination, including questioning of any systemic symptoms, is imperative especially for new patients.

The radiographic examination showed a missing right pedicle at L3. The pedicle is an important radiologically detectable site for osteolytic metastatic carcinoma.¹⁹ Any component of the neural arch may be involved, but the pedicle is the most common location.¹⁹ Destruction of the posterior vertebral body with contiguous involvement of the pedicle attachment results in loss of the cortical outline of the pedicle. This is often referred to as the 1-eyed pedicle sign or the “winking owl sign” and is most common in the lower thoracic and lumbar spine.¹⁹ It is most easily visualized on an anteroposterior radiograph. Most cases of pedicle destruction involve a single vertebra; however, multiple levels can be affected. Occasionally, bilateral pedicular destruction may occur; this is referred to as the blind vertebra.¹⁹

The most common cause for a missing pedicle is osteolytic metastatic carcinoma; however, agenesis of a pedicle may occur.¹⁹ The key to radiologic differentiation is to search for stress-related sclerosis and enlargement of the contralateral pedicle. If this sign is present, it may signify that osteolytic metastatic carcinoma is not present. Those cases of agenesis of the pedicle, as seen in congenital anomalies that create no stress hypertrophy of the opposite pedicle, must be considered metastasis until proven otherwise. Another disease process that may exhibit a similar radiographic appearance is multiple myeloma.²⁰ Although multiple myeloma may result in pedicular destruction, it remains a significantly lesser cause than metastatic disease.²⁰ The primary neoplastic plasma cells of myeloma possess a distinct tendency toward vertebral body involvement as opposed to favoring pedicular structures, which are usually spared until late in the disease.²⁰

Other nonmalignant conditions, including extradural and intradural intraspinal masses, because of their expansile nature may produce mechanical osseous erosion of adjacent pedicular structures.²⁰ Vertebral sarcoidosis has also been reported to masquerade as breast metastasis.²¹ Arachnoid cysts, although uncommon, may produce loss of pedicles or widening of interpedicular distance.²⁰ Extramedullary masses, such as neurofibromas in neurofibromatosis, may cause expansion of the intervertebral foramina, thinning of the pedicles, and osseous expansion with resultant deformity.²⁰ An infectious disease process such as tuberculosis of the spine, although uncommon, can cause pedicular destruction and occurs only late in the disease process.²⁰ Benign processes, including aneurysmal bone cysts and giant cell tumors, may result in marked pedicular expansion, to the extent of appearing to obliterate the cortical margins of the

pedicle.²⁰ Osteblastomas are primary benign tumors of bone that are typically lytic; have a predilection for the neural arch of the thoracolumbar junction; and generally affect the laminae, transverse processes, and pedicles.²⁰ Destruction of a pedicle in a patient under the age of 30 years most commonly is due to aneurysmal bone cyst, osteblastoma, neurofibroma, or other cord tumors.¹⁹

Limitations

This is a singular case report and the findings may not necessarily be generalizable to other patients.

CONCLUSION

This case illustrates the importance of follow-up with patients who currently have or previously had cancer. It also emphasizes that further diagnostic evaluation may be warranted in patients with mild but persistent symptoms who have a history of carcinoma.

Practical Applications

- A detailed history and examination are imperative in helping to distinguish between benign musculoskeletal pain and metastatic musculoskeletal pain.
- Further investigation, including detailed diagnostic imaging, is often needed to determine the generators of spinal pain.
- Previous breast carcinoma may result in spinal metastasis years later.

ACKNOWLEDGMENTS

The author thanks Dr. Michael Schneider for his help with this manuscript.

FUNDING SOURCES AND CONFLICTS OF INTEREST

No funding sources or conflicts of interest were reported for this study.

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