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Metastatic Prostate Cancer Associated with Lumbar Compression Fracture and Spinal Stenosis: A casereport and Literature Review

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We reported a 72 y/o male who had past history of old L1 compression fracture for 1 year. He suffered from falling down accidentally and was operated under impression of L1 burst fracture with cauda equina syndrome. He could ambulate with walker, but persistent back pain was still complained. Two months after operation, he became paralyzed rapidly in 2 days. Neurological examinations showed decreased motor strength of bilateral lower extremities to grade 0-1/5, sensory deficit below T10 dermatome and bilateral extensor plantar response. X-ray film showed an osteoblastic lesion in T9 vertebra body. Magnetic resonance imaging (MRI) of thoracic spine revealed multiple iso-to-hyposignal intensity lesions diffusely involving of thoracic spine and compression of spinal cord at T9 level. Metastatic tumor was highly suspected. Prostate needle biopsy confirmed the primary origin of prostatic adenocarcinoma.

This case illustrated that metastatic bone tumor should be considered as one of the etiologies of recurrent back pain, even in elderly patients with known history of compression fracture and spinal stenosis. We emphasize the importance of careful clinical examination of patients with back pain, including an assessment of motor strength, sensation, deep tendon reflexes and upper motor neuron signs. The use of spine radiographs and MRI is recommended for patients with back pain and bony destruction for early diagnosis of epidural spinal cord compression before the onset of neurologic symptoms. (J Rehab Med Assoc ROC 2001; 29(4): 213 - 219)

Key words: cancer, spinal cord compression, MRI

INTRODUCTION

The spine is a common site of metastatic disease and accounts for up to 40% of bone metastases. These often occur in an elderly population from primary neoplasms including breast, prostate, lung or kidney. The principal signs and symptoms of metastatic bone disease are pain and pathologic fracture. The pain is usually insidious in onset with bouts of remission and exacerbation. Classi-
cally the pain is persistent and nocturnal, but these characteristics are often lacking. Patients frequently harbor bony metastases without any overt symptoms.

We described a 72 y/o male who was a victim of vertebral compression deformity without obvious radiologic evidence of malignancy for 1 year. Unfortunately, he became paralyzed after an falling down accident and was operated on under impression of L1 burst fracture. He could ambulate with walker postoperatively, but a persistent low back pain was still complained. Two months after operation, he became paralyzed in 2 days. After a series of examinations, prostatic cancer with multiple metastases including T5, T8, T9 and spinal cord compression at T9 level were diagnosed.

## CASE REPORT

A 72-year-old male was admitted on February 5th, 1999 with chief complaints of low back pain and unable to stand and walk after a slipping down accident 2 days ago. He had been generally well until 1 month before admission when he noted the onset of back pain with bilateral lower extremities numbness and weakness on ambulation. He had past history of a falling down accident with L1 compression fracture 1 year ago. Neurological examinations revealed paraplegia (muscle power 0-1/5) and sensory impairment below inguinal region. No pathological reflexes or Babinski response was noted. Digital examination showed decreasing anal tone and digital rectal examination revealed no abnormality. Foley catheter was inserted due to acute urinary retention. Cystometry examination showed detrusor hypocontractility. Plain radiographs of lumbar spine showed degenerative change and compression fracture of L1 with kyphosis of the spine. MRI demonstrated burst fracture of L1 with collapse causing moderate spinal stenosis (Figure 1). L2-3 and L3-4 showed mild spinal stenosis. L4-5 showed severe spinal stenosis. Post-contrast study showed no evidence of abnormal enhanced mass lesion in the spinal canal at lumbar spine region.

Decompression laminectomy, T11, T12, L2, L3 transpedicle screw fixation and posteriolateral fixation of T11-L3 were done. Foley catheter was removed soon and no constipation was noted. The subsequent hospital course was smooth and he received strenuous rehabilitation training for 1 month. Much improvement in motor strength of bilateral lower extremities (grade 3-4/5) was noted and he could ambulate with walker at the time of discharge on March 4th, 1999. However, persistent mild back pain had still been complained.

Unfortunately, he came to this hospital on April 7th, 1999 with chief complaints of exacerbated back pain and progressive weakness of bilateral lower extremities for 2 days. He could not stand and ambulate with walker. Palpation of the entire spine revealed tenderness at thoracolumbar junction and lower lumbar spines. Neurological examination showed decreasing motor strength to grade 0-1/5 in all major muscle groups of his bilateral lower extremities and bilateral Babinski’s response.

Figure 1. T1-weighted (TR/TE: 600/20) sagittal MR scan shows old burst fracture in the L1 vertebral body, isointense with normal marrow, causing moderate spinal stenosis.
Sensory deficits below T10 dermatome were also noted. Digital rectal examination showed normal sphincter tone and intact perianal sensation. Thoracic myelopathy was suspected and he was admitted for further study. X-ray of thoracolumbar junction surprisingly showed an osteoblastic lesion over the T9 vertebral body (Figure 2A). MRI of thoracic spine showed multiple relative hypointense intensity lesions diffusely involving of thoracic spine including the T5, T8, T9 and compression of spinal cord at T9 level (Figure 2B, 2C). Metastatic cancer was highly suspected. Sonography of prostate showed an irregular hard nodule over right lobe of prostate gland and the serum prostate specific antigen (PSA) level was elevated to 18.09 nanogram/ml (normal < 4 nanogram/ml). Prostate needle biopsy confirmed the diagnosis of adenocarcinoma. Gallium scan tumor survey showed several hot spots in favor of multiple metastases.

Palliative radiotherapy with total dose 3000 rads was completed and he received hormone therapy subsequently. After discharge, he had received luteinizing hormone releasing hormone (LHRH) analogue therapy with subcutaneous injection leuprolide monthly for 7 months. Back pain was much relieved, but he remained paralyzed and transferred with wheelchair.

**DISCUSSION**

The spine is the most common osseous site for metastasis to occur, accounting for approximately 40% of all lesions. [3] The thoracic and lumbar spine are the regions most commonly affected. Pain is the most common presenting symptom. Neurological function is usually normal at this early stage. However, the clinical challenge is to detect and treat the spinal disease before the onset of neurological compromise.

Compression of the spinal cord or its nerve roots is said to occur in up to 5% of all patients with metastatic cancer at biopsy. [3] The incidence is expected to increase due to improved survival of cancer patients. Early diagnosis is critical since the onset of spinal cord injury may be sudden, often progressing to irreversible paralysis over a period of hours, as in this presented case.

Patients with metastatic compression of the spinal cord and cauda equina may experience a variety of symptoms and signs such as pain along the spine, radicular pain, motor weakness, sensory deficit, extensor plantar response, bowel or urinary incontinence and vertebral tenderness. [4] However, these symptoms and signs may also be due to other etiologies such as herniated intervertebral disc, osteoporotic vertebral fracture, radiation myelopathy or intraspinal abscess. In this elderly patient, the discovery of a vertebral compression deformity without obvious radiologic evidence of malignancy may present a difficult diagnostic problem. In other words, evaluating a compression fracture is often difficult based on radiographic information when there is a question of benign or malignant etiology. Rupp et al. reported the following MRI characteristics to differentiate compression spine fractures caused by osteoporosis or tumor: 1) Decreased signals on T1-weighted images and increased signals on T2-weighted images are sensitive but not specific for tumor involvement. 2) Normal marrow preservation of the compressed vertebral body or lesion on T1-weighted images almost completely rules out a tumor fracture or lesion. 3) Pedicle involvement, an associated soft tissue mass or epidural infiltration are

Table 1. Suggested clinical evaluation of patients with metastatic cancer of unknown primary site

<table>
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<tr>
<th>Evaluation</th>
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<tr>
<td>History</td>
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<td>Smoking history, abdominal pain, hemoptysis, nipple discharge, etc.</td>
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<tr>
<td>Physical examination</td>
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<tr>
<td>Lymph node, thyroid, skin</td>
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<td>Men: prostate</td>
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<td>Women: breast, pelvic examination</td>
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<td>Laboratory evaluation</td>
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<tr>
<td>Stool for occult blood, urinalysis, CBC, liver function test, serum PSA, Bili, AFP, CEA, CA-125 (women), chest x-ray, CT of abdomen, mammography</td>
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<td>Pathologic evaluation</td>
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<td>Tissue biopsy</td>
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fairly specific for a tumor compression fracture or lesion. In this patient, we reviewed the initial plain films and
Figure 2. Prostate carcinoma metastases. A: X-ray plain film shows osteoblast lesion in the T9 vertebral body. Post-lateral instrument fixation noted in the thoracolumbar junction regions. B: T1-weighted (600/20) sagittal MR image reveals multiple foci of hypointensity within the vertebral bodies (T5, T8, T9) (arrows), consistent with prostatic metastatic disease. C: T2-weighted (3500/105) sagittal MR image demonstrates heterogenous intensity of the vertebral body metastases. Extension of tumor at T9 to the epidural space with spinal cord edema (arrow) is also appreciated.
MRI films retrospectively to exclude possibly missed tumor. The relative preservation of bone marrow without bone destruction, pedicle involvement or associated soft tissue mass in the first MRI films suggested that the compression fracture be most likely benign origin. In addition, initial digital rectal examination showed no abnormality and the serum alkaline phosphatase level was not elevated, suggesting that the spinal metastasis was not likely during the first admission.

Metastatic bone cancer is usually diagnosed by radiographic examinations. Plain radiography often delays the detection of metastatic lesion because it requires at least 50% cortical bone loss before abnormalities are seen. They are highly sensitive, but have a high incidence of false positivity and do not define the anatomic extent of destruction. Computed tomography is particularly useful in the detection and evaluation of cortical bone involvement and the presence of a soft tissue mass. However, some subtle areas of marrow replacement by malignant tissue may be overlooked. MRI has several well-recognized advantages over the other imaging modalities, including noninvasive, superior soft tissue contrast, direct coronal or sagittal imaging and lack of exposure to ionizing radiation. Besides, MRI is the most sensitive procedure for the early detect of bone marrow metastasis and spinal-epidural disease. The sensitivity and specificity in detecting metastatic spinal cord compression is reported to be 93% and 97%.  

Breast, prostate, thyroid, lung and kidney carcinomas are the most common primary tumors to metastasize to the spine. However, up to 10% of cancer patients may not yield definitive identification of the site of origin of the neoplasm. A thorough history and physical examination should be carried out to elicit easily obtainable clues regarding the primary site. Symptomas referable to a given location should prompt an aggressive, yet specific, diagnostic approach. A summary of a reasonable diagnostic approach with spinal metastasis of unknown primary site is listed in table 1.

The treatment plan for metastatic bone cancer must be carefully decided. Since curative treatment for metastatic bone cancer is impossible in most cases, it is important to decide the purpose of the treatment before treatment is started. The aims are elongation of the life, decrease of pain, recovery from paralysis, attainment of stability, treatment and prophylaxis of the pathological fracture and improvement of quality of life.  

There are conservative treatments such as chemotherapy, radiotherapy, hormone therapy, immune therapy and operative treatment. Pain resistant to conservative treatment, vertebral compression fracture and segmental instability together with progressive neurologic deficits and para-or tetraplegia, all make operative intervention mandatory. Segmental stability and life-time prognosis of the patient are important factors to decide on the best surgical procedure. As a rule, operative treatment is indicated for the patients with the life expectancy of 6 months or more. But recently, with the progress of operative technique and implant material, more aggressive operation is proposed to improve the quality of life of these patients.

The recovery of function is closely related to the extent of neurologic deficit present at the time of diagnosis. In one study, only 7% of patients who were paraplegic at the time of diagnosis became ambulatory after treatment, whereas 60% of ambulatory patients remained so. Sorensen et al reviewed 345 patients with metastatic spinal cord compression and found that 79% of the patients who were able to walk before the treatment remained ambulatory, whereas only 21% of the nonambulatory paraplegic patients and 6% of the paralytic patients regained walking ability. They concluded that treatment result as to walking ability depends on the pretreatment ambulation status. In this presented case, the patient became paralyzed in 2 days and he still remained unable to walk after radiotherapy. It emerges that spinal compression by epidural metastasis still constitutes one of the important neurologic emergencies and that immediate treatment is crucial because it is easier to preserve function than to restore neurologic deficits.

In conclusion, spinal cord compression by metastatic epidural tumor is nearly always preceded by back pain which is typically weeks to months in duration. Bony destruction is frequently associated. Early diagnosis is based primarily on careful clinical examinations to detect the earliest possible signs of myelopathy and plain films of the spines should include thoracic and lumbar spines to detect possible bone destruction. MRI is recommended for patients with back pain and bone
destruction to facilitate an early diagnosis in most patients before the onset of neurologic deficits.

REFERENCES

轉移性攝護腺癌合併腰椎壓迫性骨折及脊柱狹窄
：病例報告暨文獻回顧

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一位七十二歲男性，一年前曾發生第一腰椎壓迫性骨折。病人因近期跌倒造成第一腰椎爆裂性骨折合併馬尾症候群而接受手術，術後可使用助行器走路，但仍主訴持續背痛。術後二個月，病人不幸於兩天內下肢癱瘓，神經檢查發現下肢肌力零到壹分，胸椎第十皮節以下感覺障礙及兩側出現巴班司基氏反射(Babinski response)。X-光檢查發現第九胸椎體有成骨性病變，磁共振影檢查顯示胸椎有多處等強度至低強度病兆並壓迫第九胸椎附近之神經，經證實為攝護腺癌合併骨轉移。

本例提醒臨床醫師，背痛病人需小心檢查肌力強度、感覺、深部肌腱反射及可能出現之神經症候群；即使在已有壓迫性骨折及脊柱狹窄之老人，若有復發生背痛，仍要考慮轉移性癌症之可能性。對背痛及骨頭破壞之病人早期詳細之脊椎 X 光攝影及磁共振影檢查有助早發現背痛病變，以避免嚴重不可逆之傷害。（中華復健醫誌 2001; 29(4): 213-219）

關鍵詞：癌症(cancer)，脊髓壓迫(spinal cord compression)，磁共振影(MRI)