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Case report

UNUSUAL RADIOGRAPHIC PRESENTATION OF TUBERCULOUS SPONDYLITIS : 3 CASES OF MIMIC SPINAL METASTASIS

Torphong Bunmaprasert, M.D.

Department of Orthopaedics, Faculty of Medicine, Chiang Mai University

Abstract

Background Spinal infection and tumor are common diseases that cause back pain with collapsed vertebrae. Radiographic findings of spinal tuberculosis are similar to those of spinal metastasis.

Objective To radiographically demonstrate that spinal tuberculosis is able to mimic spinal metastasis.

Patients and methods Three cases were collected during January to June 2008. All presented with nonmechanical back pain with or without neurological deficit. Plain radiographs, myelography, technetium bone scan, computed tomography (CT) scan and magnetic resonance (MR) imaging of the spine were done. All patients were treated surgically. Tissue specimens were sent for analysis.

Results and discussion Study subjects comprised 2 men and 1 woman, with an average age of 51 years. Plain radiographs of two cases showed destruction of the vertebral bodies, pedicles and posterior elements of the spine. Disc spaces and vertebral endplates were preserved. The other case had disc space and endplate destruction, but a CT scan strongly suggested spinal metastasis. All specimens showed chronic caseating granulomatous inflammation without malignancy. Generally, the radiographic findings suggested spinal metastasis destructive of the vertebral body, but they did not include the vertebral endplates or intervertebral discs. The earliest sign was pedicle erosion. Spinal tuberculosis destroyed the body. It might also spare the disc and the posterior neural arch in early phases. Finally, a biopsy should be done.

Conclusion Radiographic presentation of spinal tuberculosis is able to mimic spinal metastasis. Tissue diagnosis before treatment is mandatory. **Chiang Mai Medical Journal 2008;47(4):189-199.**

Keywords: spinal tuberculosis, spinal metastasis, radiographic presentation

Address requests for reprints: Torphong Bunmaprasert, M.D., Department of Orthopaedics, Faculty of Medicine, Chiang Mai University, Chiang Mai 50200, Thailand: E-mail:tbunmapr@mail.med.cmu.ac.th
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When approaching patients with back pain caused by collapsed vertebrae, there are three common strategies that the physician should realize: infectious spondylitis, spinal metastasis and fracture. Patients with vertebral fractures may or may not have a history of trauma, especially osteoporotic patients. Radiographic findings show a fracture line through the vertebra and frequently spare intervertebral discs. Patients who are suspected of having metastatic disease to the spine may have a history of primary cancer. Back pain is insidious at the onset, and it is usually progressive. If the metastatic tumor encroaches into the spinal canal, this may cause neural compression. Radiographs will reveal destruction of the vertebral bodies, pedicle erosion, and preserved discs with or without canal compromise. Back pain in tuberculous spondylitis is very similar to that in metastatic patients. Radiographic findings in spinal tuberculosis usually demonstrate destruction of vertebral bodies and endplates, endplate irregularity, disc space narrowing, cold abscesses and paravertebral calcification. The gold standard for providing a definite diagnosis of collapsed vertebrae is a tissue biopsy.

The huge limitation of our facility is time delay in recieving the results of a tissue biopsy. This study shows the examples of 3 cases in which we could not wait for the biopsy results before surgery, so we proceeded to perform an open biopsy. We suspected spinal metastasis, in which case we would decompress the spinal cord and nerve roots, then fix and fuse the spine. However, the tissue biopsy gave us definitive results of chronic, caseating granulomatous inflammation that was most likely tuberculous spondylitis.

Although this is certainly not the most accurate way to manage such cases, these particular ones led us to review the preoperative radiographic evidence and summarize the criteria for suspecting tuberculous spondylitis rather than spinal metastasis. The purpose of this study was to demonstrate that spinal tuberculosis is able to mimic spinal metastasis radiographically.

Materials and methods

Three consecutive cases were collected during January to June 2008. All presented with nonmechanical back pain with or without neurological deficit. They were examined for spine and neurologic function. Laboratory investigation included complete blood count, urine analysis, serum electrolytes, liver and renal function tests, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), serum calcium and specific serum tumor markers. Plain radiographs, myelography, technetium (Tc-99m MDP) bone scan, computed tomography (CT) scan and magnetic resonance (MR) imaging of the spine were done. All patients were treated surgically. Operations included open biopsy, posterior or posterolateral decompression and instrumented fusion for 2 spinal levels above and below the lesions. Tissue specimens were sent to pathologists.

Results

Case 1

A 48-year-old man presented with lower back and radicular pain in the right lower extremity for 3 months. The pain worsened and was unresponsive to analgesic medications. He had no fever, weight loss or other systemic illness. Physical examination revealed tenderness and localized kyphosis

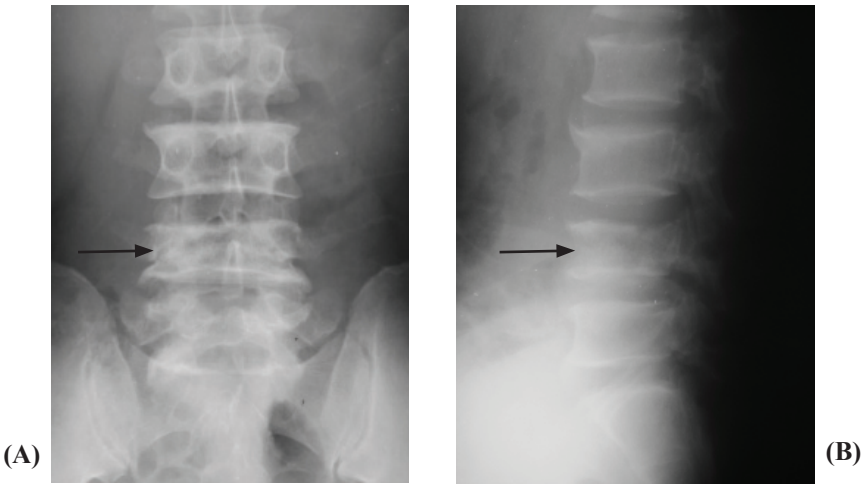


Figure 1. Plain radiographs of the lumbosacral spine (A) anteroposterior (AP) view (B) lateral view demonstrating destruction of the L4 vertebral body and pedicles (arrow), and preserved disc height.

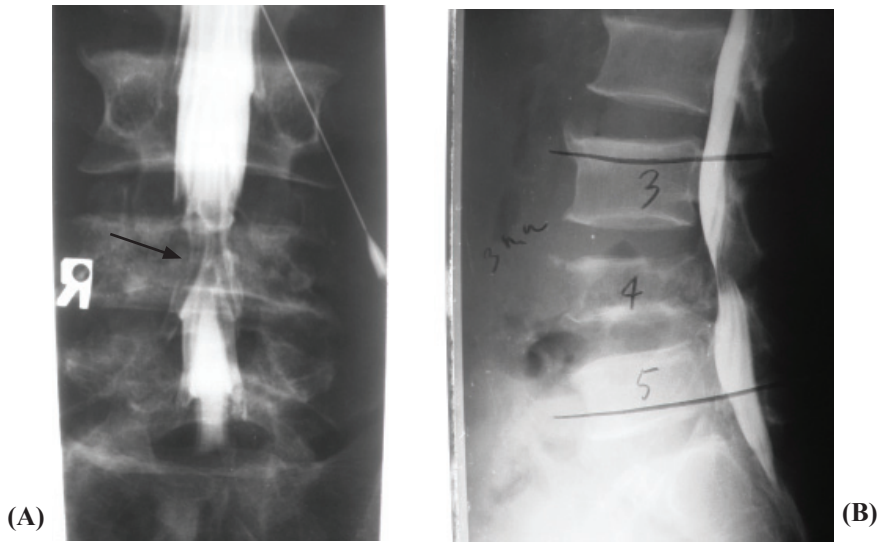


Figure 2. Myelography of the lumbar spine (A) AP view (B) lateral view showing anterior indentation of the thecal sac at the L4 level and "root cut-off" sign of L4, L5 nerve roots (arrow) that correlated with the clinical signs of right lower extremity weakness and positive sciatic tension signs.

of the lower back. Motor examination of the extremities was normal, with no numbness; however, positive sciatic tension signs were detected. Abnormal laboratory results were: WBC= 10,700/mm^3 (normal=5,000-10,000), and ESR=106 mm/hr (0-15); while other results were within normal limits. Bone marrow biopsy showed no evidence of multiple myeloma. Plain radiographs, myelography and the radionuclide bone scan are shown in Figures 1-3.

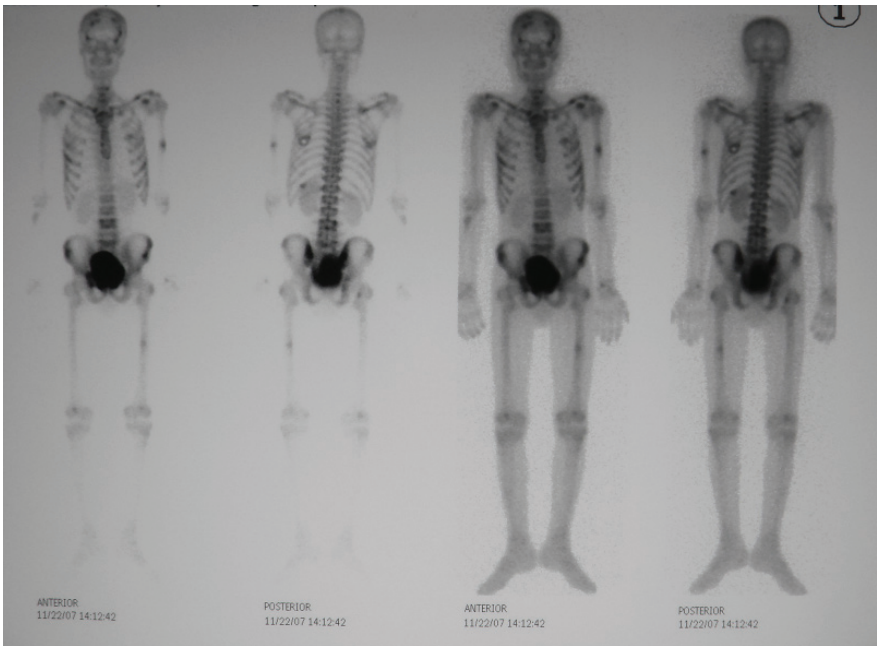


Figure 3. Technetium bone scan. The dynamic and blood pool image showing no significant increase in flow to the lumbar spine. The static imaging shows multifoci of increased tracer uptake at the skulls, bilateral clavicles and ribs, left humeral shaft, right scapular spine, pelvic bones and left femoral shaft. Flattening of L4 vertebra was observed. Impression was multiple metastasis.

Magnetic resonance image (MRI) results showed markedly collapsed L4 vertebra with T2 hyperintensity and marked enhancement, and retropulsion that severely compressed the thecal sac and bilateral traversing root sleeves. Preserved disc spaces were noted. The most likely diagnosis was suspected to be vertebral metastasis.

During admission, progressive motor weakness of both lower extremities was detected. Thus, decompressive laminectomy of L4-5 was performed with posterior instrumented fusion from L2-S1. Intraoperatively, the surgeon identified the destruction of bilateral L4 pedicles, laminar components, and some parts of the facet joints. An open biopsy was done and the specimen was sent to a pathologist.

The results from pathology showed chronic granulomatous inflammation of the L4 vertebra, without malignancy. The patient was treated by antituberculous medications for 12 months. Symptoms decreased markedly, the pain progressively subsided and the patient was able to walk unassisted with ambulatory aids.

Case 2

A 60-year-old man presented with progressive weakness of the lower extremities. He was unable to walk for 2 weeks and had no sensation below the umbilical level. He could still control the bowel and bladder functions. Physical examination found localized kyphosis and tenderness at the T7 spinous process, spastic paralysis of both

lower extremities, decreased pinprick sensation below the xyphoid region, and hyperreflexia of the knee and ankle reflexes. Laboratory results were normal, except for elevated ESR (=67 mm/hr), CRP (=26.6 mg/L, normal < 5). Plain radiographs and MRI of the thoracic spine are shown in Figure 4 and 5.

Chest radiography found right middle lobe mass. The physician provisionally suspected tuberculous spondylitis T5-6 with spinal cord compression, and prescribed a course of antituberculous medications.

However, the CT chest scan showed multiple pulmonary nodules scattered throughout both lungs. It also found multilobulated heterogenous rim enhancing hypodense lesions at the bilateral paravertebral region along the T3-T6, vertebrae with adjacent bony destruction and canal extension. These findings led to a suspicion of multiple pulmonary nodules (likely to be lung metastasis) and paravertebral mass at T3-T6 with bony destruction. Spinal metastasis was likely (Figure 6).

Posterior spinal decompression and open biopsy were performed. Tissue diagnosis from the T5-6 vertebral body showed caseating granulomatous inflammation with no signs of malignancy. The surgeon expected to go anteriorly to further decompress the spinal cord through thoracotomy and simultaneous spinal stabilization. Fortunately, the patient recovered from his paralysis quite well and was treated by antituberculous medications without a second operation.

Case 3

A 45-year-old woman had increasing back pain for 3 months. Walking aggravated the pain, and it was excruciating at night. She lost 6 kg of weight in 1 month. No weakness or numbness was detected. Physical examination found moderate tenderness at the lower thoracic spine. No spinal deformity or abnormal neurologic deficit was found. Laboratory results were all within normal

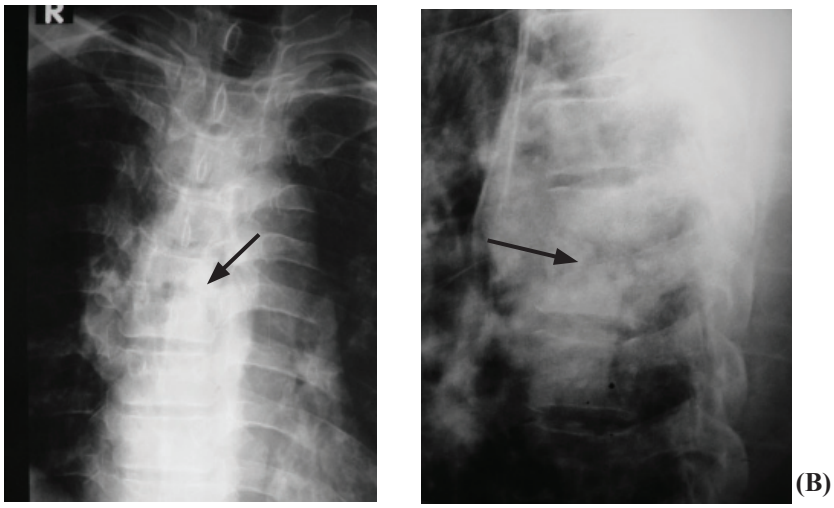
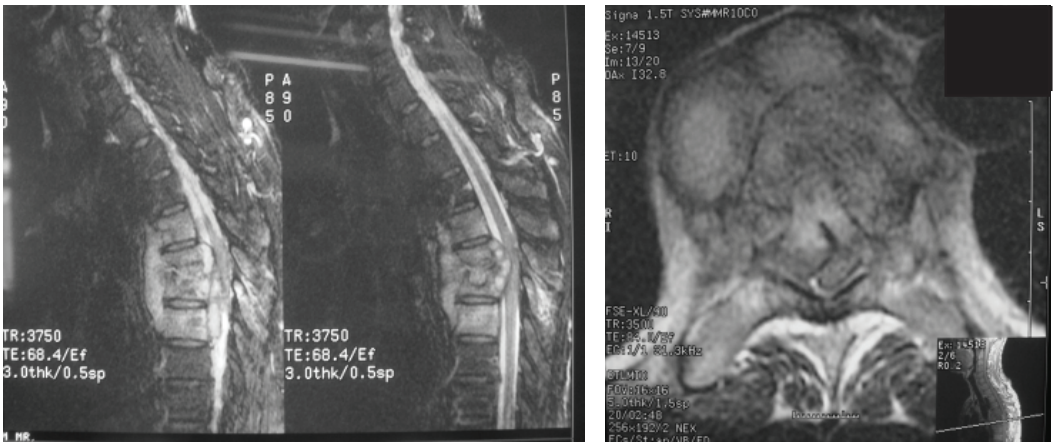


Figure 4. Plain radiographs of the thoracic spine (A) AP view (B) lateral view showing destruction of the vertebral bodies of T5 & T6 , including pedicles (arrows). The T5-6 intervertebral disc was also decreased in height, and the upper endplate of T6 was irregular.



(A) **(B)**

Figure 5. T2-weighted sagittal (A) and axial (B) MR-images of the thoracic spine showing kyphotic angulation of the thoracic spine, T5-6 vertebral body collapse, narrowing of the T5-6 disc space with increased T2 signal, irregularities of the opposing T5-6 vertebral endplates, and marrow edema of the T4-T7 vertebral bodies with heterogenous enhancement. There was moderate surrounding enhancing paravertebral soft tissue swelling, with abscess formation extending into the anterior epidural space along the T3-T7 vertebrae, resulting in marked spinal cord compression. The physician suspected infectious spondylitis of T5-T6 levels with spinal cord compression.

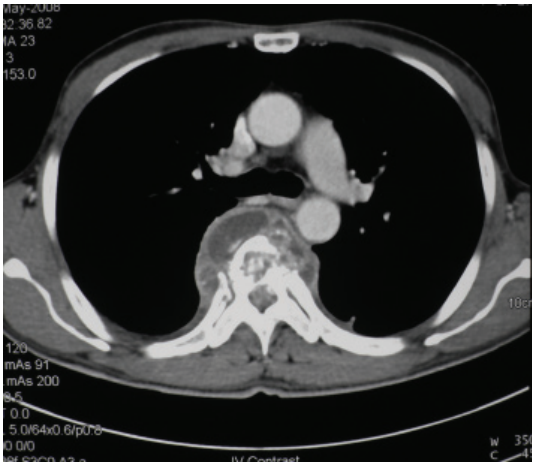


Figure 6. CT chest scan showing destruction of the vertebrae with paravertebral mass.

limits, except for mild anemia without clinical symptoms and increased CRP =39.4 mg/L. Serum tumor markers showed increased levels of CA125 =52.77 U/mL (0-35) and CA 19-9 =45.97 U/mL (0-37). Plain radiographs and MR-images of the thoracic spine are shown in Figure 7 and 8.

Decompressive laminectomy of T7-T9 was performed with posterior instrumented fusion of T6-T12. Intraoperatively, the T8 body and pedicles, including the T7 body, were destroyed causing severe spinal instability. The surgeon removed the tissue that compressed the spinal cord and nerve roots. T8 vertebra specimens were collected and sent to a pathologist. After surgery, the patients looked very well because the pain had markedly decreased. She started to walk by using a walking aid.

The pathologic results showed chronic granulomatous inflammation, without malignant cells. The patient was treated by antituberculous medications. After taking these medications, she got severe nausea, vomit-

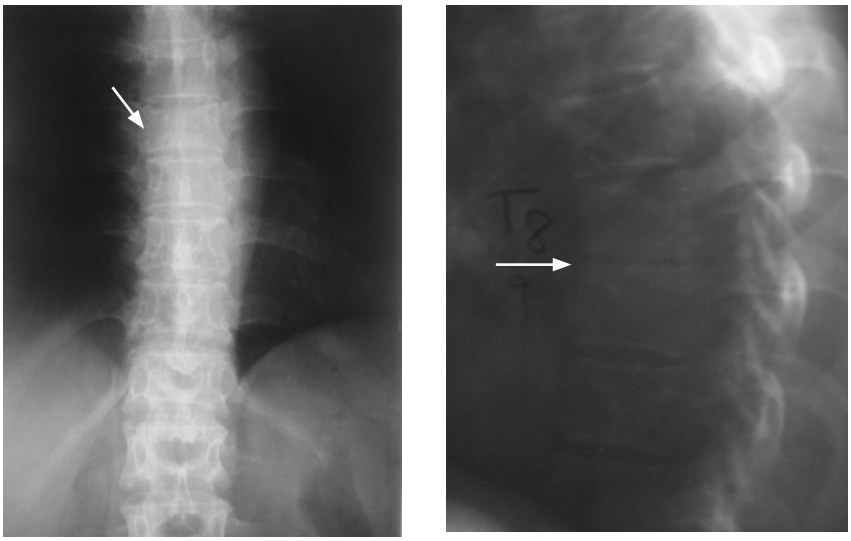


Figure 7. Plain radiographs of the thoracic spine (A) AP view (B) lateral view showing mild loss of vertebral body height of T8 , but significant destruction of T8 pedicles. No irregularity of the vertebral endplate or disc height loss were found.

Figure 8. T1-weighted sagittal (A) T2-weighted sagittal (B) and axial (C) MR-images of the thoracic spine showing possible vertebral metastasis of C7-T2 and T8.

ing and jaundice. Tests showed that the liver function tests should be raised, so the antituberculous formula was changed.

Discussion

Both spinal metastasis and infection should be suspected in patients who present with chronic, non-mechanical back pain and systemic illness. Laboratory investigations, including serum tumor markers, may narrow the diagnosis. Clinical evaluation needs multimodal diagnostic imaging to detect lesions, assess the extension and localization, and guide the biopsy. Imaging studies are usually necessary to distinguish infectious spondylitis from spinal metastasis. Finally, tissue diagnosis from a spinal biopsy is the gold standard of diagnosis.

Plain radiographs of the affected vertebrae are helpful, but usually non-specific. Both of these entities destroy the vertebral bodies, causing vertebral height loss (collapsed vertebrae). Early stages of vertebral osteomyelitis from tuberculous infection and spinal metastasis may also preserve the adjacent intervertebral discs. Central body involvement of tuberculosis may resemble tumor, with central rarefaction and bone destruction followed by collapse. Later stages of tuberculous spondylitis erode the vertebral endplates and intervertebral discs, thus the disc space will be narrow and the body may fuse together. Low virulence and chronicity of tuberculous infection may cause paravertebral abscess and calcification, multilevel subligamentous spreading, and contiguous vertebral involvement. On the other hand, radiolucency of the vertebral bodies may obviate detection of lytic metastasis and delay diagnosis. The earliest radiographic sign of vertebral metastasis is destruction of the pedicles.[1] Screening for metastasis in patients with local symptoms or pain is best accomplished by a combination of plain radiographs and MR-imaging.[2]

Bone scan is a very sensitive, but also a nonspecific imaging modality in diagnosing both diseases. Infected and metastatic vertebrae produce areas of increased bone turnover rate, and will thus show an increased uptake on a bone scan. A bone scan will reveal the primary foci and distant organ involvement of bone tumor and infection. One Swedish study mentioned that a bone scan was still the first choice in routine screening of asymptomatic patients with metastatic bone disease.[2]

Computed tomography (CT) scan of the spine offers improved specificity in the detection of spinal infection and metastasis. It also gives excellent details of vertebral involvement, extent of diseases, and paravertebral soft-tissue and canal encroachment. However, the CT scan is not capable of differentiating an abscess from granulation tissue in spinal tuberculosis, including vertebral metastasis.

MRI of the spine is the imaging of choice for diagnosing spinal tumors and infection. Changing marrow signals,[1] disc destruction, and paravertebral soft-tissue density and neural compression are useful diagnostic clues revealed by MR-images. Kim *et al*.[3] stated that MR-images demonstrate excellent images of bone destruction and soft tissue mass, and provide information in multiple planes, thereby delineating the extent of involvement in tuberculous spondylitis. The MR-imaging is helpful in planning a surgical approach to tuberculous spondylitis. Contrast enhancement after injecting intravenous Gadolinium solution may identify a paravertebral abscess formation.

In a study conducted by Al-Mulhim *et al*.[4] of 28 vertebrae in 12 patients with tuberculous spondylitis, who were studied by using post-contrast MR-images, partial vertebral involvement and paraspinal and epidural extension were delineated. They concluded that post-contrast enhancement added more certainty to the diagnosis of tuberculous spondylitis. Narlawar et al.[5] evaluated 33 patients with proven tuberculosis of the posterior elements of the spine and concluded that isolated involvement of posterior elements, due to tuberculosis, was not uncommon. Gupta et al.[6] demonstrated that the presence of an abscess helped in differentiating tuberculosis from neoplasm in 22 of 41 patients with spinal tuberculosis, as the abscess was absent in all patients with neoplasms. The presence of bone fragments in 16 patients was found to be specific for tuberculosis. In the absence of an abscess or bone fragments, they recommended image-guided biopsy to establish the diagnosis. Despite the presence of high resolution for distinguishing the diseases, MR-imaging is still unable to give a definitive diagnosis.

Spinal biopsy, regardless of closed or open techniques, is the gold standard for diagnosing spinal infections and tumors.[2] The presence of chronic, caseating granulomatous inflammation is most likely to be tuberculous spondylitis. The diagnostic clues for spinal metastasis are malignant cells, their aggressiveness, and matrix.

This study showed 3 cases in which spinal tuberculosis may mimic metastasis radiographically. Presenting with destruction of the pedicles and vertebral body, while preserving the intervertebral disc, may persuade the physician to diagnose vertebral metastasis in the first patient. For the second case, plain radiographs and MR-images resembled tuberculous involvement, but the CT chest scan revealed multi-lobulated lung mass extending to the spine, which correlated with the nature of metastasis. Finally, pedicle destruction and multilevel vertebral involvement without disc narrowing in the third case may mimic spinal metastasis. In circumstances where the diagnosis is ambiguous, spinal biopsy is the procedure for achieving the final diagnosis. Without an accurate diagnosis (Table 1), the surgeon may make a mistake in treatment.

Conclusion

Pedicle erosion, destruction of the posterior elements of the spine, preserved endplate and intervertebral discs, and absence of paravertebral abscess or calcification do not

Table 1. Summary of radiographic findings in spinal metastasis and tuberculosis

Radiographic issue	Metastasis	Tuberculosis
Vertebral body destruction	Present	Present
Vertebral endplates	Normal	Irregular
Intervertebral discs	Preserved	Destroyed in later stages
Posterior elements	Pedicle destruction (as an early sign)	Uncommon
Abscess, Calcification	Absent	Present

exclude tuberculous spondylitis. Radiographic presentation of spinal tuberculosis is able to mimic spinal metastasis. Tissue diagnosis before treatment is mandatory.

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ภาพรังสีของโรควัณโรคกระดูกสันหลังที่คล้ายกับโรคมะเร็งกระจายมาที่กระดูกสันหลังรายงานผู้ป่วย 3 ราย

ต่อพงษ์ บุญมาประเสริฐ, พ.บ.

ภาควิชาออร์โทปิดิกส์ คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

บทคัดย่อ

ความเป็นมา โรคปวดหลังที่ทำให้เกิดการยุบของปล้องกระดูกสันหลังเกิดได้จากหลายสาเหตุ โรคที่พบบ่อย ได้แก่ โรควัณโรคกระดูกสันหลัง และเนื้องอกของกระดูกสันหลัง การวินิจฉัยแยกโรคอาศัยประวัติ การตรวจร่างกาย การตรวจทางห้องปฏิบัติการ และการตรวจภาพรังสี ลักษณะทางภาพรังสีของทั้งสองโรคมีความคล้ายคลึงกันในหลายประการจนยากที่จะแยกโรคจากกันได้โดยอาศัยภาพรังสีเพียงลำพัง

วัตถุประสงค์ เพื่อแสดงให้เห็นว่าโรควัณโรคกระดูกสันหลัง (tuberculous spondylitis) อาจแสดงลักษณะทางภาพรังสีที่คล้ายคลึงกับโรคมะเร็งกระจายมาที่กระดูกสันหลังได้ (spinal metastasis)

วิธีการศึกษา ได้รวบรวมผู้ป่วย 3 ราย ตั้งแต่เดือนมกราคมถึงมิถุนายน 2551 ที่มาด้วยอาการปวดหลัง และเกิดความผิดปกติของระบบประสาทร่วมด้วยหรือไม่ก็ได้ ผู้ป่วยทุกรายได้รับการตรวจร่างกาย การตรวจทางห้องปฏิบัติการพื้นฐานและ serum tumor markers ร่วมกับได้รับการวินิจฉัยทางรังสีวิทยา โดยใช้ plain radiograph, myelograhy, bone scan, CT scan และ MRI ของกระดูกสันหลัง ทุกรายได้รับการผ่าตัดและส่งตรวจชิ้นเนื้อทางพยาธิวิทยาในคราวเดียวกัน

ผลการศึกษา ผู้ป่วยเพศชาย 2 ราย เพศหญิง 1 ราย อายุเฉลี่ย 51 ปี (45-60 ปี) ภาพรังสีของผู้ป่วย 2 ราย แสดงให้เห็นการทำลายส่วน vertebral body, pedicle และ posterior elements of spine โดยที่ vertebral endplates และ intervertebral disc ยังคงสภาพที่ดีอยู่ ในขณะที่ผู้ป่วยอีก 1 ราย พบการทำลายของ vertebral endplates และ intervertebral disc ร่วมด้วย โดยการตรวจ CT scan ยืนยันการวินิจฉัยโรคมะเร็งกระจายมาที่กระดูกสันหลัง ผลการตรวจทางพยาธิวิทยาของทั้ง 3 ราย พบลักษณะการอักเสบแบบ chronic caseating granulomatous inflammation โดยไม่ตรวจพบเซลล์มะเร็ง

บทวิเคราะห์ โดยทั่วไป การตรวจทางภาพรังสีที่เข้าได้กับโรคมะเร็งกระจายมาที่กระดูกสันหลังมักพบการทำลาย vertebral body และส่วนอื่นๆ แต่มักจะไม่รวมถึง vertebral endplate และ intervertebral disc การเปลี่ยนแปลงระยะแรกที่มักพบคือ การทำลายกระดูกส่วน pedicle ในขณะที่โรควัณโรคกระดูกสันหลังจะพบการทำลาย vertebral body และอาจยังไม่ทำลาย vertebral endplate และ intervertebral disc เช่นกันในระยะแรก ในระยะที่เป็นมากแล้ว วัณโรคก็ยังสามารถทำลาย pedicle ได้ ทำให้อาจเกิดความสับสนระหว่าง 2 โรคนี้ ในกรณีที่ภาพรังสีไม่สามารถระบุได้ ควรทำการตรวจเก็บชิ้นเนื้อส่งตรวจทางพยาธิวิทยาก่อนการรักษาเสมอ

สรุป ภาพรังสีของโรควัณโรคกระดูกสันหลังและโรคมะเร็งกระจายมาที่กระดูกสันหลังมีความคล้ายคลึงกันไม่สามารถแยกกันได้ชัดเจน ผู้ป่วยต้องได้รับการตรวจชิ้นเนื้อก่อนให้การรักษาเพื่อแยกโรคระหว่างทั้ง 2 โรคนี้ **เชียงใหม่เวชสาร 2551;47(4):189-199.**

คำสำคัญ: วัณโรคกระดูกสันหลัง มะเร็งกระจายมาที่กระดูกสันหลัง ภาพรังสีวิทยา