Back pain is an early and sensitive indicator of metastatic spinal cord compression (MSCC). However, back pain is so common in the general population that its significance as a symptom of advanced, recurrent, or undiagnosed cancer may be overlooked. Any delay in evaluating and initiating treatment for MSCC can result in a true oncologic emergency.

Etiology of the Problem

MSCC usually is associated with advanced cancer but may be the first sign of the presence of malignant disease. MSCC develops most often when a tumor mass metastatic to vertebral bone or a local cancer expands into the epidural space and compresses the cord. Bone fractures from a collapsed vertebral body also may cause MSCC when they impinge on the spinal cord (Kaplan, 2006; Wilkes, 2004). It commonly is associated with solid tumors that preferentially metastasize to vertebral bone, particularly cancers of the breast, lung, and prostate, which together account for more than 60 of all cases of MSCC. The cancers are followed in incidence by renal cell carcinoma, non-Hodgkin lymphoma, and multiple myeloma, the most common primary tumor of bone.

The thoracic spine is the most common site of epidural compression; its 12 vertebrae contain the largest volume of bone and active bone marrow (which supports the growth of metastatic deposits) in the spinal column (Kaplan, 2006). Advanced breast and lung cancers typically involve the thoracic vertebrae but may be distributed more widely. The lumbosacral spine follows the thoracic spine in incidence of MSCC. Prostate, kidney, and colon cancers metastatic to bone are associated mostly with cord compression in the lower thoracic or lumbosacral regions. The cervical spine has the lowest incidence of MSCC and is associated with head and neck cancers, lung cancer, and lymphoma (Abrahm, 2004; Gabriel & Shiff, 2004; Weinstein, 2002).

The clinical manifestations of MSCC follow a similar pattern in all affected patients. The earliest symptom typically is pain, which if not recognized and treated promptly, will progress to muscle weakness, then to sensory loss, autonomic dysfunction (sphincter disturbance and loss of bladder and bowel control), and finally to irreversible paralysis (Loblaw, Perry, Chambers, &
Table 1. Etiology and Clinical Manifestations of Spinal Cord Compression by Spinal Level

<table>
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<tr>
<th>SPINAL LEVEL AND INCIDENCE</th>
<th>MALIGNANCY</th>
<th>PAIN CHARACTERISTICS</th>
<th>POTENTIAL CLINICAL MANIFESTATIONS</th>
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</table>
| Cervical spine (10%)      | Head and neck*, melanoma, lung (pancoast tumor), and lymphoma | Occipital headache; radicular pain in neck, shoulder, and arm; may be exacerbated by neck flexion; neck stiffness | • Lesion at or above C4, diaphragmatic weakness or paralysis (unilateral or bilateral), and respiratory insufficiency  
• Weakness, spasticity, and wasting of neck, shoulder, and arm muscles; in time progressing to opposite arm and leg(s)  
• Neurogenic shock: hypotension, bradycardia, or peripheral vasodilation  
• Quadriplegia  
• Paresthesias and sensory loss for position, vibration, and temperature in areas of weakness  
• Lhermitte’s sign: electric tingling sensation down the back and upper and lower extremities on neck flexion and extension  
• Horner syndrome: constricted pupil, upper eyelid droop, and loss of sweating on affected side of face (with C8 involvement)  
• Reflexes: hyperactive deep tendon reflexes, extensor plantar response (positive Babinski sign)  
• Autonomic effects: late onset, bladder, bowel, and sexual dysfunction  
• Risk of autonomic hyperreflexia: hypertension, bradycardia, pounding headache, profuse sweating; autoregulation mechanisms interrupted by spinal lesion |
| Thoracic spine (70%)      | Breast*, lung*, lymphoma, multiple myeloma, pancreatic, and esophageal | Pain is local, radicular, or both; in chest and back | • Weakness of abdominal muscles; arm muscles spared  
• Lower extremity weakness or paralysis (low T-spine)  
• Band-like paresthesias around waist  
• Decreased sensation below level of lesion, increased above  
• Reflexes: increased deep tendon reflexes distal to lesion, extensor plantar response, and Baeov sign  
• Autonomic effects: late onset; bladder, bowel, and sexual dysfunction  
• Risk of autonomic hyper-reflexia: lesion at or above T6 |
| Lower levels              | Prostate, colon, and renal | Pain is local, radicular, or both; in groin region or sciatic distribution in leg(s); pain on straight leg raising | • Weakness in pelvic muscles  
• Weakness to paralysis in lower extremities with muscle atrophy; ataxic gait  
• Numbness, paresthesias, and sensory loss in lower extremities  
• Reflexes: decreased to absent knee and ankle reflexes; extensor plantar response  
• Autonomic effects: bladder, bowel, and sexual dysfunction |
| Lumbosacral spine (20%)   | Prostate, renal cell, and ovarian | Pain is local, radicular, or both; in back and leg(s) | • Weakness in pelvic muscles  
• Weakness to paralysis in lower extremities with muscle atrophy; ataxic gait  
• Numbness, paresthesias, and sensory loss in lower extremities  
• Reflexes: decreased to absent knee and ankle reflexes; extensor plantar response  
• Autonomic effects: bladder, bowel, and sexual dysfunction |
| Lower levels              | Colon, uterine, and cervix | Pain is local, radicular, or referred; in back and leg(s) | Conus medullaris syndrome (with lower T-spine lesions):  
• Muscle weakness; fasciculations in lower extremities; spasticity possible  
• Saddle anesthesia: numbness in buttocks, thighs, perineum  
• Reflexes: knee jerk preserved; decreased to absent ankle, plantar reflex; bulbocavernosus and anal reflexes may be preserved  
• Autonomic effects: early onset, urinary retention and overflow incontinence, bowel incontinence, and impotence |
| Cauda equina              | Prostate, bladder, renal, colorectal, uterine, and cervix | Pain is local, radicular, or referred; in back and leg(s) | Cauda equina syndrome:  
• Muscle weakness, flaccidity (foot drop) or paralysis in lower extremities  
• Saddle anesthesia: numbness in buttocks, thighs, perineum  
• Reflexes: decreased to absent knee, ankle, plantar, bulbocavernousus, and anal reflexes  
• Autonomic effects: early onset; urinary retention, overflow incontinence, constipation, and impotence |

* May be distributed throughout spine


Lapierrere, 2005). Table 1 describes the etiology and clinical manifestations of MSCC associated with the level of spinal involvement.

**Associated Pain**

Back pain is the hallmark of MSCC. It presents as the first symptom in approximately 95% of cases and its location is clinically relevant. Pain in the lower back or neck, a common complaint among adults, usually is associated with benign conditions such as osteoarthritis, muscle spasm, or herniated disc and often is alleviated by lying down. However, pain in the middle or upper back is less common and is considered an independent predictive risk factor for MSCC in patients with a cancer history (Kaplan, 2006). Back pain associated with MSCC is experienced when the expanding vertebral mass puts pressure on the periosteum or erodes or fractures the vertebral body or when spinal nerve roots are compressed. The pain is not relieved by reclining, has
Local Pain
Definition: pain perceived within one to two spinal segments of the cord compression
Location: back pain is localized near the midline near the site of the cord compression
Quality: constant dull ache; may be worse in the morning; increases in intensity over time
Exacerbating factors: reclining position; actions that increase intradural and intrathoracic pressures (e.g., coughing sneezing, straining at stool, Valsalva maneuver)
Relieving factors: sitting or standing positions; sleeping upright

Radicular Pain
Definition: radiating pain triggered by compression of spinal nerve roots or the cauda equina
Location: pain radiates in a band-like pattern from back to front across the chest or abdomen, or down an extremity along dermatomes supplied by the affected nerve roots
Quality: varies; may be constant dull ache that is difficult to localize or an easy to localize sharp shooting pain provoked by movement of the spine
Exacerbating factors: movement; coughing sneezing, Valsalva maneuver; reclining position
Relieving factors: sitting or standing positions

Referred Pain
Definition: pain that is perceived in an area distant from the site of spinal cord compression.
Location: pain is poorly localized due to involvement of multiple dermatomes
Examples: Compression at first lumbar vertebra: pain may be experienced in the iliac crests, hips, or sacroiliac region. Compression at seventh cervical vertebra: pain may be referred to the area between the scapulae

Figure 1. Types of Pain Associated With Spinal Cord Compression
Note. Based on information from Kaplan, 2006.

Prognostic Factors for Functional Recovery and Survival

Functional outcome and survival following MSCC are dependent on early recognition, diagnosis, and treatment. Once neurologic symptoms progress beyond back pain, the progression to complete paralysis of the lower extremities (paraplegia) can occur rapidly. The patient’s ambulatory status at the time of presentation of MSCC is the most important prognostic factor for functional outcome. Most patients who are ambulatory at diagnosis will maintain ambulation following treatment; very few who are paraplegic on presentation will ever walk again despite treatment (Abraham, 2004; Gabriel & Schiff, 2004; Weinstein, 2002). Figure 2 lists favorable and poor prognostic factors for functional recovery and survival.

Clinical Management

P.K. had an emergency magnetic resonance imaging of the entire spine that day, which revealed a tumor mass compressing the spinal cord at the level of the eighth thoracic vertebra. He was admitted to the hospital where he received symptomatic treatment individualized to the severity of his cord compression. Corticosteroid therapy immediately was initiated to reduce cord edema and diminish pain in the short-term while waiting for definitive treatment with radiation therapy to begin. He received a loading dose of 16 mg IV dexamethasone by slow push followed by 6 mg given four times daily for three days then tapered by a third every three days during radiotherapy. Radiation therapy began following day at a planned dose of 3,000 cGy in 10 fractions. Radiation therapy is effective in reducing pain but usually not before several fractions have been delivered, and full pain relief may not be achieved for up to two weeks following treatment completion (Bucholtz, 1999). Pain management was a priority for P.K. and began immediately upon diagnosis of MSCC adhering to the principles of the analgesic “ladder” developed by the World Health Organization (2009) (see Figure 3). Because naproxen was not providing pain relief for P.K., he was switched to hydrocodone 5 mg, one to two tablets taken orally every four to six hours around the clock. Because of the coincidence of a scheduled clinic visit, P.K.’s cord compression was diagnosed and treated early before his symptoms progressed beyond pain. After three days of hospitalization and three radiotherapy fractions, P.K. reported a consistent pain score of 2 and was discharged home to complete planned radiation on an outpatient basis. He was prescribed oral dexamethasone on a gradual taper from his initial IV dose and hydrocodone 5 mg tablets every four to six hours as needed for moderate pain and one to two tablets of acetaminophen 500 mg three or four times per day (not to exceed eight tablets in a 24-hour period) for mild pain. Before discharge, the nurse sat with P.K. and his wife and gave them verbal and written instructions about the signs and symptoms of

Favorable Prognostic Factors
• Early recognition and diagnosis of metastatic spinal cord compression (MSCC)
• Prompt initiation of therapy
• Able to ambulate at presentation
• Slow onset of motor weakness
• Radioresistant tumors (myeloma, lymphoma, breast, and prostate)
• Good performance status
• Responsive to steroid treatment
• Female gender
• Long interval between diagnosis of primary tumor and appearance of MSCC

Poor Prognostic Factors
• Paraplegia prior to treatment
• Urinary retention
• Sphincter incontinence
• Rapidly deteriorating neurologic function (in less than 72 hours)
• Radioresistant tumors (lung, renal, gastrointestinal, sarcoma, and bladder)
• Extensive disease
• Poor performance status

Figure 2. Prognostic Factors for Functional Recovery and Survival Following Metastatic Spinal Cord Compression

MSCC, emphasizing the importance of promptly reporting all back pain.

Conclusion

Time is of the essence in identifying and treating spinal cord compression if permanent functional loss and paralysis is to be prevented. The hallmark symptom of spinal cord compression is back pain typically related to metastatic disease invading the spine. However, pain in the back is a common problem that often is managed conservatively with rest and non-narcotic analgesics. Delays in initiating treatment diminish the patient’s chances for maintaining functional independence. The natural course of untreated MSCC is one of progressive neurologic injury and permanent loss of function. A sequence of increasing pain, motor weakness, sensory loss, and sphincter dysfunction ultimately leads to irreversible paralysis. As more patients survive cancer for long periods of time, particularly with bone metastases, the risk of developing MSCC increases, and with it the importance of early recognition and prompt intervention. Nurses must be able to recognize which patients are at increased risk for MSCC and raise their level of suspicion at the appearance of such nonspecific symptoms of MSCC as back pain.

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The author takes full responsibility for the content of the article. The author did not receive honoraria for this work. No financial relationships relevant to the content of this article have been disclosed by the author or editorial staff.

References


**Figure 3. World Health Organization Pain Relief Ladder**