

Running head: VERTEBRAL COMPRESSION FRACTURES

Differential Diagnosis of Vertebral Compression Fractures

M. Michelle Piper, MSN, RN

Charles Robbins, BSN, RN

Submitted in Partial Fulfillment of the Requirements for

GNRS 5569 Adult/Women's Health

The University of Texas Medical Branch

School of Nursing

Spring 2013

Approximately 8 out of 10 Americans will experience back pain at some point in their life. Most of the time, back pain is acute and can be treated with basic therapies such as rest and nonsteroidal anti-inflammatory drugs (NSAIDs). Low back pain can range from mild, dull, and annoying pain, to persistent, severe, and disabling pain to the lower back. Lower back pain can restrict mobility and interfere with normal functioning. As aging progresses, probable causes of back pain change as comorbidities evolve, raising the chances of a more severe etiology. Discussed below is an example of an elderly patient who presented with low back pain, together with three differential diagnoses of vertebral compression fracture, herniated disc, and nephrolithiasis.

Subjective Data

Chief Complaint

The patient seeks care for pain in his lower back. The patient reports his own history and symptoms and appears reliable, despite advanced age.

History of Present Illness

Mr. W.F is a 75-year old Caucasian male with a medical history significant of herniated disc at the L4-L5 level in 2011. He presents today with complaint of pain in his lower back with 3 days duration, requiring care due to worsening of pain and extended effort required to get out of bed. The pain is located at the middle to lower back and is described as dull and aching. He denies radiation of pain to any other location and rates the pain as an 8, on a 0 to 10 scale at its worst. The pain is reported as being constant for the preceding three days. Mr. W.F. does not remember the onset of pain other than it began three days ago. He denies any traumatic activity or injury. Mr. W.F. reports stiffness at the present time, but denies erythema or radiation pain down the leg. He takes two

acetaminophen (Tylenol) 325 mg by mouth every four hours for pain, but reports that it is not effective for pain relief.

Past Medical History

Mr. W.F. has a past medical history including nephrolithiasis in 2003, right hip bursitis in 2006, hypertension, hypercholesterolemia, constipation, and benign prostatic hypertrophy. He reports hospitalization in 2008 for left lower lobe pneumonia and a surgery for herniated disc repair in 2011.

Medications

Mr. W.F. takes acetaminophen (Tylenol) 325 mg by mouth every four hours as needed for pain. He also takes chlorothiazide (Diuril) 1000 mg by mouth every morning for hypertension, atorvastatin (Lipitor) 20 mg by mouth every evening for hypercholesterolemia, and tadalafil (Cialis) 5 mg by mouth every morning for BPH and erectile dysfunction. He reports that he avoids drinking fluids in the evening to avoid needing to urinate at night. He reports no muscle aches or other adverse effects of his medications.

Allergies

Mr. W.F. reports no known drug allergies and no known environmental allergies.

Family History

Mr. W.F.'s father was diagnosed with osteoporosis around age 75. He has no family history of rheumatoid arthritis, gout, lupus, or joint problems.

Social History

Mr. W.F. is happily married and lives with his wife and their two dogs. They have two children together and maintain a close relationship with both children, although they both live out of state. He has an active social life with his wife and enjoys daily walks and weekly bingo games. He denies use of tobacco products and reports social drinking once per year at Christmas. He has health insurance through Medicare. He reports good nutrition habits, consuming three meals per day. He reports that his only exercise consists of walking around his cul-de-sac with his wife.

Review of systems

Mr. W.F. is a pleasant 75-year old Caucasian male. He is a retired employee of the railroad commission. He reports no symptoms of fatigue, malaise, fever, weight loss, or other constitutional symptoms. He denies any chest pain or palpitations. He denies any shortness of breath, difficulty breathing, or cough. He denies any pain on urination. He reports symptoms of urinary hesitancy and frequency, but does not believe it is different from his usual state. He endorses pain in middle to lower back, which is worsened by getting up out of a chair or by walking. He has noticed that his height has decreased by 1-2 inches. He reports a decreased activity level and decreased range of motion to his back as a result of pain.

Differential Diagnoses

Vertebral Compression Fracture. Most osteoporotic compression fractures to the thoracic or lumbar spine are found as incidental findings on chest or abdominal radiograph and are asymptomatic. However, when becoming symptomatic, the most common symptom reported is pain. These are usually not related to a traumatic event such as a fall or motor vehicle collision, but may be related to a minor trauma such as bending, lifting, or driving over a speed bump. Pain, when

present, follows the nerve roots and radiates from the spine around to the abdomen at the level of fracture. Pain radiation to the legs rarely occurs with compression fractures. Pain may be reported as either dull or sharp, and is aggravated by sitting or movement (Rosen, 2013). Osteoporosis is the most common cause of vertebral compression fractures. While men are at lower risk for osteoporosis, a man with low testosterone levels increases his risk of osteoporosis (Finkelstein, 2012). Mr. W.F. has erectile dysfunction, which may be a symptom of low testosterone.

Herniated Disc. Similar to a vertebral compression fracture, a herniated disc is a condition affecting the spine. Also like a vertebral fracture, osteoporosis can increase the likelihood of not only having a disc herniate, but also can increase the severity of the herniation. The spine can be affected due to trauma, lifting injuries, or idiopathic causes. However, the main difference between a herniated disc compared to a vertebral fracture, is a herniated disc has a different a pathology, one in which a tear in the outer fibrous ring of an intervertebral disc allows the soft, central portion to bulge out beyond the damaged outer rings. This tear in the disc ring may result in the release of inflammatory chemical mediators which may directly cause severe pain, even in the absence of nerve root compression. Disc herniations are normally a further development of a previously existing disc protrusion, a condition in which the outermost layers of the annulus fibrosis are still intact, but can bulge when the disc is under pressure. Symptoms of a herniated disc can vary depending on the location of the herniation and the types of soft tissue that become involved. They can range from little or no pain if the disc is the only tissue injured, to severe and unrelenting neck or low back pain that radiates into the regions served by affected nerve roots which are irritated or impinged by the herniated material. Pain may have an insidious onset, and when present, is usually described as continuous and will radiate down the buttocks to the legs and feet. Often, herniated discs are not diagnosed immediately, as the patients experience undefined pain in the thighs, knees,

or feet. Other symptoms may include sensory changes such as numbness, tingling, muscular weakness, paralysis, paresthesia, and affection of reflexes. Patients with a herniated disc at the L3 – L5 level may also experience erectile dysfunction due affected nerves (Dunphy 2011).

Nephrolithiasis. Renal stones are fairly common, and result in pain in the abdomen or back. Stones have multiple etiologies. Renal calculi are twice as likely in patients with hypertension and half of patients with a renal calculus will have recurrence within ten years (Curhan, Aronson, & Preminger, 2012). Stones can grow very large and can block the renal pelvis, ureter, or bladder. The greatest risk factors for kidney stones are poor fluid intake, and less than one liter of urine output per day. Similar to a disc herniation or vertebral fracture, the presenting symptom is pain. However the difference in the pain of nephrolithiasis from the other two possible diagnoses is that it begins suddenly and may be mild or excruciating. The presenting symptom is pain that begins suddenly and may be mild or excruciating. Pain typically is in waves associated with ureteral spasm. Pain is usually felt at the costovertebral angle, but may be felt in the abdominal area, side, or lower back, depending on location of the lodged stone. The pain may radiate to the groin or testicles. Associated symptoms include chills, fever, nausea, and vomiting (Dunphy 2011).

Objective

Physical Exam

Mr. W.F. is 5 foot 9 inches tall and weighs 151 pounds, with a calculated body mass index (BMI) of 22.3. His previous height was documented as 5 foot 10 inches. He has an oral temperature of 99.0° Fahrenheit. His blood pressure is 142/70; his heart rate is 62 per minute, and respiratory rate is 16 per minute.

The patient is a pleasant 75-year old male in no acute distress, who is sitting upright in the visitor chair in the exam room. He has a regular heart rate and rhythm. A normal S1 and S2 are auscultated, without any murmurs, rubs, or gallops. No edema is noted. Peripheral pulses are rated as 2+ in all extremities, with capillary refill occurring in less than three seconds. Mr. W.F.'s lungs are clear to auscultation bilaterally. No adventitious sounds, such as crackles or wheezes are noted. Tenderness to palpation is present over the T 11 – S1 region of the spine. Adam's forward bending test shows kyphosis over thoracolumbar region. Range of motion examination of the spine is limited by patient discomfort. Straight leg raise testing was unable to be performed due to patient discomfort. Full range of motion and adequate strength is present below the knees. Sensation is intact to bilateral lower extremities, with normal touch, proprioception, and vibration sense. The patient's skin is warm, dry and intact with no rash or signs of trauma visible. A Urinalysis revealed pH 6.0, specific gravity 1.005, glucose negative, bilirubin negative, ketone negative, blood negative, protein negative, urobilinogen normal, nitrite negative, leukocyte esterase negative.

Differential Diagnoses

Vertebral Compression Fracture

Vertebral fractures result in tenderness to palpation over the injured spinous process. Associated symptoms with this type of fracture include height loss of six centimeters or more. Loss of height forces the abdominal contents into a smaller vertical space, leading to increased abdominal girth. Vertebral compression fractures can be detected using plain film radiographs of the thoracic and lumbar spine, as opposed to MRI as the test of choice for herniated disc or helical CT as the test of choice for nephrolithiasis. Anteroposterior and lateral views are the preferred films (Rosen 2013).

Herniated Disc

The straight leg test involves examining a supine patient by lifting the patient's extended leg ankle with dorsiflexed ankle. The straight leg test is acceptable to do in a physical exam in which the diagnosis is suspected of a herniated disc. However, in contrast to a vertebral compression fracture, the straight leg test can actually cause more trauma. Sciatic pain on lifting the leg is sensitive, but not specific for a herniated disc. Testing of the lower extremity neurological function will indicate deficits in the patient with herniated disc. Numbness, weakness, and diminished or absent ankle reflexes are signs of dysfunction to the L5-S1 nerve roots. Disc herniation is not visible with plain film x-rays, unlike vertebral fractures, but requires magnetic resonance imaging (MRI). Use of gadolinium contrast with MRI can aid in identifying scar tissue from previous back surgeries versus new spinal injuries. An MRI, however, is less sensitive in assessing bony structures. Markers of inflammation, including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) are elevated in patients with herniated disc, but are also elevated in many other inflammatory processes (Wheeler, Wipf, Staiger, & Deyo, 2012).

Nephrolithiasis

Microscopic or gross hematuria occurs in most patients with a renal calculus (Dunphy 2011). However, up to 30 percent of patients with a documented stone may not have detectable blood in the urine. An abdominal plain film x-ray would detect a sufficiently large radio-opaque stone. A spinal x-ray series of the thoracic and lumbar region would include the area of concern for possible renal calculus in this patient. The gold standard for diagnosis of nephrolithiasis is a non-contrast helical computed tomography (CT) scan, however. MRI is rarely used for nephrolithiasis, except in pregnant patients, because it is not as sensitive for renal stones (Curhan et al., 2012).

Assessment

Comparison of Differential Diagnoses

Vertebral Compression Fracture. The most likely diagnosis for Mr. W.F. is vertebral compression fractures. With his advanced age, he is at greater risk of osteoporosis which would lead to compression fractures. He has severe back pain without radiation and no history or signs of trauma. He has a documented loss of height of one inch. He has tenderness to palpation over the bony spinous processes.

Herniated Disc. Another likely diagnosis is herniated disc. Mr. W.F. has had a previous herniated disc, showing that he has previous spinal degeneration. He reports that the pain is increased on sitting or walking, which corroborates the possibility of a herniated disc. While radiation of pain was not reported, the straight leg raise test to determine radiculopathy was not assessed due to severe pain when the patient layed on the exam table. Of note, erectile dysfunction is a symptom of herniated disc at the L3-L5 level, and Mr. W.F. has previously been diagnosed with erectile dysfunction.

Nephrolithiasis. Nephrolithiasis should also be considered in this patient. He reports a decreased fluid intake during the day to avoid nocturnal awakening, and poor fluid intake is a major risk factor for kidney stones. He also has a history of a previous renal calculus. While he has no blood in his urinalysis, up to 30 percent of patients do not have hematuria. However, a renal calculus does not explain his loss of height. Also, his pattern of constant pain is dissimilar to waves of pain that are usually associated with kidney stones.

Plan

Diagnostic

Initial diagnostic studies for this patient include an x-ray series of the lower spine, x-ray series of the thoracic spine, urinalysis, complete blood count (CBC), comprehensive metabolic panel (CMP), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP).

Therapeutic

A goal of therapy is to control pain in order to facilitate activity, as fractures may take up three months for healing. First step analgesia can be accomplished with acetaminophen (Tylenol) 650 mg by mouth every six hours. NSAIDs may be effective as well, but some studies have implicated diminished bone healing with NSAIDs (Rosen, 2013). Hydrocodone (Norco) 5/325 mg to be taken by mouth every four to six hours as needed for pain can be highly effective in relieving pain. A quantity of thirty limits the duration that the medication can be taken. Mr. W.F. should be cautioned to take the medication only as needed for breakthrough pain and to use caution to avoid falls. A frequent side effect of opioid analgesics is constipation. Since Mr. W.F. has a history of constipation, docusate (Colace) 100 mg by mouth twice per day should also be used. (Lehne 2007).

Mr. W.F. should be encouraged to maintain physical activity within his pain tolerance to prevent further osteoporosis and maintain pulmonary toilet. Sleeping in a reclining chair can also be encouraged, as it is more comfortable and puts less pressure on the spine than a traditional bed.

Vertebral compression fractures typically heal without additional intervention within 12 weeks. Due to his age, Mr. W.F. may be referred to an orthopedic surgeon who specializes in treating spinal injuries, pending confirmatory x-rays of compression fractures. Kyphoplasty and

vertebroplasty are two surgical procedures which may be helpful in treatment of vertebral compression fractures (Rosen, 2013).

Follow up

This patient should seek follow-up care if his pain increases, new symptoms appear, or if the character of his pain changes. Any abnormalities in his diagnostic testing would require further investigation and intervention. He should be encouraged to return for a routine appointment in two to weeks to address his levels of pain and activity, referral for physical therapy as pain subsides, as well as screening for osteoporosis using dual energy x-ray absorptiometry (DEXA) and laboratory assessment of serum calcium, phosphorus, 25-hydroxyvitamin D3, and testosterone.

Conclusion

Osteoporotic vertebral compression fractures are common in the elderly. Diagnosed by two-view spinal x-rays, compression fractures present with non-radiating pain at the level of injury, loss of height, and no evidence or history of trauma. Current management recommendations include pain management, activity to prevent further debilitation, referral to orthopedics, and subsequent assessment and treatment of osteoporosis.

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Table 1

Comparison of Features for Vertebral Compression Fractures, Herniated Disc, and Nephrolithiasis

	Vertebral Compression Fracture	Herniated Disc	Nephrolithiasis
Subjective	<p>Pain</p> <ul style="list-style-type: none"> Usually described as dull or sharp in nature. Non-radiating pain Walking and sitting exacerbate the pain <p>No history of trauma</p>	<p>Pain</p> <ul style="list-style-type: none"> Severe Exacerbated with activities or sitting Radiation of pain down to the buttock to the posterior or posterolateral leg to the ankle or foot. <p>Radiculopathy</p> <ul style="list-style-type: none"> Numbness Tingling. Insidious onset 	<p>Pain</p> <ul style="list-style-type: none"> Sudden Dull Aching Located over the costovertebral angle, or back. Radiation or referral of pain from flank across the abdomen down to the groin, perineal area or inner thigh. <p>Chills Nausea/vomiting Dysuria</p>
Objective	<p><i>Inspection –</i> Height loss</p> <ul style="list-style-type: none"> May be greater than 6cm. <p>Adam’s Bend Forward Test showing abnormality Increased abdominal girth</p> <p><i>Palpation –</i> Tenderness upon palpation over spinous process</p>	<p><i>Inspection –</i> Ipsilateral calf wasting Weak ankle dorsiflexion</p> <p><i>Palpation –</i> Special Techniques – Pain on straight leg raise indicates radiculopathy and disc herniation</p>	<p><i>Inspection –</i> Abdominal distention,</p> <p><i>Palpation –</i> Rigidity or guarding may be present patient showing</p> <p><i>Percussion –</i> Flank tenderness may be present.</p>
Laboratory/ Diagnostic Data	<p>X-ray series of the lumbar spine</p> <p>X-ray series of the thoracic spine</p> <p>Complete Metabolic Panel including serum calcium and phosphorus</p> <p>25-hydroxy vitamin D3 levels.</p> <p>Dual Energy X-ray Absorptometry (DEXA)</p>	<p>MRI of spine</p> <p>X-ray series of lumbar spine may have limited use</p> <p>ESR CRP.</p>	<p>Non-contrast helical Computed Tomography (CT) of abdomen</p> <p>Abdominal Ultrasound (US)</p> <p>MRI may have imited use</p> <p>Abdominal x-ray of abdomen may have limited use</p> <p>Urinalysis (UA)</p> <p>Complete Metabolic Panel</p>