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Masquerade: Nonspinal musculoskeletal disorders that mimic spinal conditions

■ ABSTRACT

Nonspinal musculoskeletal disorders frequently cause neck and back pain and thus can mimic conditions of the spine. Common mimics are rotator cuff tears, bursitis in the hip, peripheral nerve compression, and arthritis in the shoulder and hip. A thorough history and physical examination, imaging studies, and ancillary testing can usually help determine the source of pain.

■ KEY POINTS

Neck pain is commonly caused by shoulder problems such as rotator cuff disease, glenohumeral arthritis, and humeral head osteonecrosis.

Brachial neuritis involves acute, severe neck or shoulder pain, followed by weakness as pain resolves.

Low back pain can be caused by hip or spine arthritis, femoral head osteonecrosis, an occult or impending femoral neck fracture, hip dysplasia, piriformis syndrome, and bursitis.

Bony and soft tissue masses can be detected with imaging studies.

Peripheral nerve compression can mimic cervical or lumbar spine radiculopathy. Electromyography and eliciting symptoms by tapping over the compressed nerve aid in making a diagnosis.

Patients with human immunodeficiency virus infection, alcoholism, or corticosteroid use are at increased risk of developing osteonecrosis of the humeral or femoral head.

NOT ALL PAIN in the neck or back actually originates from the spine. Sometimes pain in the neck or back is caused by a problem in the shoulder or hip or from peripheral nerve compression in the arms or legs.

This article focuses on the diagnostic features of common—and uncommon—nonspinal musculoskeletal problems that can masquerade as disorders of the spine. A myriad of nonmusculoskeletal disorders can also cause neck or back pain, but they are beyond the scope of this article. Medical disorders that can present as possible spinal problems have been reviewed in the December 2007 issue of the *Cleveland Clinic Journal of Medicine*.

■ CAUSE OF NECK OR BACK PAIN IS NOT ALWAYS OBVIOUS

Pain in the neck or back is one of the most common reasons for visits to primary care physicians.

Usually the diagnosis is straightforward, but atypical pain patterns frequently make the cause of the problem difficult to decipher.¹ Axial neck or back pain is in many cases caused by problems in the joints, muscles, tendons, or ligaments of the arms or legs because the nerves in these structures arise from the spinal cord.² Because these structures can move relative to one another, pain often varies with position, further confusing the pic-

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TABLE 1

Features of common musculoskeletal causes of neck pain

CONDITION	FEATURES
Rotator cuff tear	Pain with overhead and reaching activities, night pain Weakness in external rotation MRI: discontinuity and retraction in rotator cuff tendon, edema
Glenohumeral arthritis	Pain with overhead activities Crepitus with shoulder movement, pain with motion Radiography: narrowing of glenohumeral joint space
Humeral head osteonecrosis	History of human immunodeficiency virus infection, alcoholism, corticosteroid use Radiography: sclerosis or collapse of subchondral bone of humeral bone MRI: edema and subchondral collapse; “double line” on MRI
Nerve compression	
Carpal tunnel syndrome	Numbness and tingling or weakness in radial or ulnar distribution Decreased sensation or motor weakness
Cubital tunnel syndrome	Radiating paresthesias in arm Decreased sensation or motor weakness, Tinel sign Electromyographic and nerve conduction study findings
Suprascapular nerve impingement	Shoulder or arm pain, or both Weakness of supraspinatus or infraspinatus muscles MRI: ganglion cyst Electromyographic findings
Brachial neuritis	Acute, intense pain in neck or shoulder, followed by weakness Progressive weakness despite improving pain
Bony mass	History of cancer Findings on radiography or CT
Soft tissue mass	MRI

MRI = magnetic resonance imaging, CT = computed tomography

Rotator cuff tears cause pain at night and with overhead activities

ture.² Despite these challenges, a correct diagnosis can usually be made on the basis of the history, physical examination, and ancillary testing.

NONSPINAL MUSCULOSKELETAL CAUSES OF NECK PAIN

Although neck pain is very common, in few studies were its anatomic boundaries specifically defined.^{3,4} Most patients say that they have pain in the neck if it occurs anywhere from the base of the occiput to the superomedial part of the scapula. Because many muscu-

loskeletal structures traverse or are contained in this area, several musculoskeletal conditions can present with “neck pain” (TABLE 1).

Many shoulder problems present as neck pain

Shoulder problems frequently cause neck pain⁴ because the shoulder and neck are near the brachial plexus, which connects them. The shoulder joint is a complex of several structures; problems in any of them can present with specific features that can be distinguished from neck problems.⁵

In general, shoulder problems in older



FIGURE 1. Glenohumeral arthritis with decreased joint space and osteophytes

people are due to degenerative conditions, whereas younger people generally have problems arising from trauma, inflammation, or instability.¹

Rotator cuff disease is one of the most common shoulder problems that can present with neck pain. The rotator cuff consists of four muscles—the supraspinatus, infraspinatus, subscapularis, and teres minor—which form a common tendon that attaches to the proximal humeral tuberosities and allows rotation of the arm at the glenohumeral joint.¹ The rotator cuff probably undergoes both mechanical and biologic degeneration over time, making it prone to painful tears.

Rotator cuff tears can cause pain in the anterolateral or medial aspect of the shoulder or in the trapezius and neck area.^{1,6} Many older patients present with pain in the trapezius and paraspinal muscles.^{2,5,7} Many patients report pain when they raise the arms over their head or when they reach and hold the arm away from the body (eg, holding the steering wheel while driving), and at night while lying on the affected side.¹

On physical examination, weakness of the rotator cuff muscles can be detected by externally rotating the shoulder or applying a downward force to the arm with the shoulder abducted 90 degrees, forward flexed 30 degrees, and internally rotated with the

thumbs pointing to the ground.¹

Magnetic resonance imaging (MRI) can very accurately diagnose a rotator cuff tear: diagnostic findings include a discontinuity and retraction in the rotator cuff tendon and edema.

Not all rotator cuff tears are symptomatic.⁶ If a rotator cuff tear is evident on MRI but the patient does not have pain at night or during overhead activity, then neck pain is more likely due to spinal disease.

Glenohumeral arthritis is another common shoulder problem that can cause axial neck pain.¹ Most cases are idiopathic, although many patients have a history of rheumatoid arthritis, prior shoulder trauma, or glenohumeral instability for which they may have had surgery. Patients with shoulder arthritis usually also have arthritis in the cervical spine.

Patients report pain in the trapezius muscle and possibly a sensation of swelling around the shoulder joint, as well as difficulty with overhead activities such as combing hair or applying makeup.¹

The most significant clinical finding is eliciting the shoulder pain with motion. Patients may also have limited range of motion accompanied by pain and crepitation.¹

Shoulder radiographs are frequently diagnostic and show narrowing of the glenohumeral joint space (**FIGURE 1**).

Humeral head osteonecrosis is a less common intra-articular problem that can cause neck pain. It occurs most frequently with human immunodeficiency virus infection, alcoholism, or corticosteroid use.⁸ Radiography shows sclerosis or collapse of the subchondral bone of the humeral head. MRI is best for detecting early changes of osteonecrosis.

Peripheral nerve compression may mimic cervical radiculopathy

Peripheral nerve compression is common and may present with paresthesias mimicking a cervical radiculopathy.⁹

Carpal tunnel syndrome usually presents with hand numbness and tingling or decreased sensation in the median nerve distribution (the radial three digits). Thenar

TABLE 2

Features of common musculoskeletal causes of back pain

CONDITION	FEATURES
Hip arthritis	Groin, back, or buttock pain, pain with activity Groin pain with internal rotation, limp, pain during straight leg-raising test Radiography: decreased joint space, osteophytes, subchondral cysts
Femoral head osteonecrosis	Slowly worsening pain in buttock, thigh, and groin and increasingly limited hip rotation History of alcoholism, corticosteroid use, HIV Radiography: femoral head collapse MRI: edema, subchondral collapse, “double line” on T2
Occult femoral neck fracture	Groin pain in young patients and athletes Pain with weight-bearing MRI of pelvis and proximal femur: stress fracture
Hip dysplasia	Back, buttock, groin pain
Piriformis syndrome	“Sciatic” pain in athletes Pain replication with piriformis stretching maneuver
Trochanteric bursitis	Pain of lateral hip, upper thigh Localized tenderness over greater trochanter
Ischial bursitis	Back pain Localized tenderness over ischial tuberosity
Peripheral nerve compression	
Lateral femoral cutaneous nerve	Paresthesias in upper, anterolateral thigh, pain worsens wearing tight pants or belt Tinel sign Electromyography
Saphenous or peroneal nerve	Paresthesias in medial and lateral knee and leg Tinel sign Electromyography
Tibial nerve	Paresthesias in medial foot Tinel sign Electromyography

Limping, groin pain, and limited, painful internal rotation of the hip strongly suggest hip arthritis as the cause of back pain

atrophy is present in advanced cases.^{1,9} Carpal tunnel syndrome may also present with non-specific hand pain or other symptoms. Chow et al⁹ found that 84% of patients with carpal tunnel syndrome had nocturnal hand paresthesias, 82% had paresthesias that were aggravated by hand activity, and 64% had hand pain. However, some patients with cervical spondylosis also had these symptoms: 10% had hand pain, 7% had nocturnal hand paresthesias, and 10% had paresthesias that were aggravated by hand activity.

Cubital tunnel syndrome can also present with radiating arm symptoms and is usually associated with pain at the elbow and a positive Tinel sign (ie, tapping over the cubital tunnel—at the elbow between the olecranon process and the medial epicondyle—elicits pain and tingling in the small and ring fingers).¹ Electromyography and a nerve conduction study can help determine the diagnosis.

Suprascapular nerve impingement is another peripheral nerve problem that can mimic a cervical spine problem.^{1,10} The



FIGURE 2. Hip arthritis with decreased joint space, subchondral sclerosis, and osteophytes

suprascapular nerve innervates the supraspinatus and infraspinatus muscles and can become entrapped by a ganglion cyst at the suprascapular notch of the scapula. The condition is more commonly seen in young, active patients who participate in overhead activities (eg, volleyball or tennis).

Chronic suprascapular nerve impingement can cause weakness and atrophy of the supraspinatus or infraspinatus muscles or both and can be detected on physical examination and confirmed by electromyography.^{1,10} Electromyography is best for diagnosing peripheral nerve compression: a decreased amplitude and increased latency indicates severe nerve compression. MRI can reveal a ganglion cyst if it is the source of nerve compression at the notch.

Brachial neuritis: Acute, severe neck or shoulder pain, followed by weakness

Brachial neuritis (Parsonage-Turner syndrome) presents with abrupt onset of intense pain in the neck or shoulder, mimicking a cervical spine radiculopathy. The pain typically improves over several days to weeks,¹¹ but may be followed by weakness of the arm muscles. The cause of this condition is unclear.

Brachial neuritis characteristically involves multiple nerve roots and the rapid onset of severe pain.¹¹ Cervical radiculopathy, on the other hand, usually starts insidiously and has a single dermatomal distribution. Another distinguishing feature is that neck movement typically exacerbates the symptoms of cervical radiculopathy but not of brachial neuritis.¹² Brachial neuritis should be suspected in patients who have these features and who do not respond to conventional therapy.¹¹

A mass can be detected with imaging studies

A mass in or around the shoulder can present as neck or arm pain by compressing or stretching nervous structures or connective tissues in the shoulder.¹³

Bony masses. Although most bony lesions in the shoulder are benign (osteochondroma or bone cysts), malignant osseous lesions such as metastatic disease and primary bone sarcomas also occur. Metastatic disease should be suspected in older patients with a history of malignancy, even if the presentation is atypical.¹³ Most bony lesions can be diagnosed by radiography or CT.

Soft tissue masses (eg, lipomas, elastofibromas, and sarcomas) can also cause a confusing pain pattern when they arise in the shoulder. They can be diagnosed with MRI.¹³

■ NONSPINAL MUSCULOSKELETAL CAUSES OF BACK PAIN

More than 80% of people experience significant low back pain at some time in their life.¹⁴ While most patients have no obvious pathology, physicians should be meticulous in evaluating for serious conditions (TABLE 2).

Sometimes nonspinal musculoskeletal problems cause signs and symptoms of lumbar radiculopathy such as mechanical low back pain, referred pain, radicular pain, paresthesias, weakness, neurogenic claudication, or changes in bowel or bladder function.^{10,12}

Hip and spine arthritis are commonly found together

Hip arthritis can be confused with back pain from a spinal cause if it causes pain in the back or buttocks rather than in the groin.¹⁵ The presentation can be further complicated because radiographic evidence of hip and spine arthritis is not necessarily proof that these are the source of the pain: both conditions frequently occur as people age (FIGURE 2).^{2-4,6,7}

Several studies found that if a patient has problems in both the spine and the hip, treating only one of the conditions may not relieve the pain.^{11,16,17} Birrell et al¹⁵ evaluated patients with concomitant hip and spinal disease and found that most patients who underwent total hip arthroplasty followed by spinal decompression had excellent results.

Suspect metastatic disease in patients with a history of cancer and new symptoms

Other studies suggested that it is better to treat spinal stenosis first, because neurologic sequelae could result if it is left untreated.¹⁶ On the other hand, several other studies found that patients with symptoms and spinal stenosis seen by radiography can function for years without neurologic compromise.^{14,15,18} Conflicting data such as these make it difficult to determine whether hip disease or spinal disease should be treated first in patients with both conditions. Generally, the more symptomatic condition is treated first, unless a neurologic problem is progressing.

Recent studies examined clinical features that help distinguish symptomatic hip disease from spine disease in patients with concomitant radiographic hip and spine arthritis.^{15,18} Limping, groin pain, and limited and painful internal rotation of the hip strongly implicate the hip as the source of pain. Brown et al¹⁸ found that patients with a limp were seven times more likely to have pain from the hip alone or from the spine and hip combined than from the spine alone. Patients with groin pain or painful and limited internal rotation of the hip were 14 times more likely to have either the hip or the hip and spine as the source of pain. A positive straight-leg-raising sign or a contralateral straight-leg-raising sign strongly suggests the spine as the source of pain.¹² (Straight-leg tests are performed with the patient lying on a table and the examiner lifting the leg while the knee is straight. The test is positive if pain is elicited between 30 and 70 degrees.)

Femoral necrosis or fractures are detectable by imaging

Femoral head osteonecrosis is another intra-articular hip process that can cause back pain.¹³ As is also true of osteonecrosis of the shoulder, patients who abuse alcohol or take corticosteroids are at increased risk. Recently, human immunodeficiency virus has also been associated with this condition.

Femoral head osteonecrosis typically presents with insidiously worsening reduction of hip rotation and pain in the buttock, thigh, and groin. The pain is not in a dermatomal pattern and is usually unilateral but can be bilateral.¹⁸

Radiographs can be diagnostic for femoral head collapse in late disease. MRI is best for

diagnosing early disease before collapse occurs.

Occult or impending femoral neck fracture (ie, in metastatic or metabolic bone disease) usually presents with groin pain, similar to hip osteoarthritis and osteonecrosis,¹³ but it can also present with vague back pain with or without groin pain. The pain is produced by weight-bearing on the affected leg. Young patients with femoral neck stress fractures or primary benign bone lesions of the hip can also present with buttock pain that can be misinterpreted as coming from the back.

MRI of the pelvis and proximal femur is best for diagnosing a stress fracture and some bone lesions, because they are often not visible on radiographs.

Because the rate of osteonecrosis is very high in displaced femoral neck fractures, it is important that an impending fracture be detected and treated before a complete fracture occurs.

Hip dysplasia requires early treatment

Hip dysplasia, in which the hip joint does not develop normally, can present as back, buttock, and groin pain in young patients. Back pain may be caused by asymmetric spinal loading and abnormal muscular tension in the lumbar spine.¹³ Early diagnosis is important so that it can be surgically treated (with osteotomies of the proximal femur or pelvis, or both) to preserve hip function.

Piriformis syndrome occurs in athletic patients

Piriformis syndrome, which mimics sciatica from a spinal cause, is controversial because the diagnosis must be based on history and clinical findings without any objective imaging or electrodiagnostic testing. The condition is thought to be caused by sciatic nerve entrapment and compression under the piriformis muscle, which externally rotates the hip and may become swollen and inflamed in active, athletic people.^{13,16}

The diagnosis is confirmed on physical examination if the pain is replicated when the piriformis muscle is stretched by externally rotating the hip (ie, with the patient supine, flexing the affected hip and knee and pulling the ipsilateral knee toward the contralateral shoulder).^{13,16}

For concomitant hip and spinal arthritis, the more symptomatic condition is generally treated first

Imaging studies of the spine or hip are not diagnostic but should be done to look for other possible causes of the pain.

Some patients with this condition are helped by exercises to stretch the hip muscles, particularly the external rotators.

Bursitis causes localized tenderness

Trochanteric bursitis is a fairly common soft-tissue problem that can cause pain along the lateral aspect of the hip and proximal thigh. Unlike radiculopathy, the condition causes localized tenderness over the greater trochanter.

Ischial bursitis can cause back pain and can be differentiated from spinal pathology by localized tenderness over the ischial tuberosity.

Peripheral nerve compression can cause radicular pain

Peripheral nerve compression in and around the leg can cause radicular pain that mimics lumbar spine pathology.

The lateral femoral cutaneous nerve, if

compressed and irritated as it exits the pelvis, can cause meralgia paresthetica, which is characterized by pain, numbness, and tingling in the anterolateral proximal thigh, mimicking an L1 or L2 radiculopathy. Many patients report that the pain worsens when they wear a belt or tight pants and improves when they remove or loosen them.

The saphenous and peroneal nerves can be compressed around the knee, causing paresthesias in the medial and lateral aspect of the knee and leg, respectively, mimicking a radiculopathy of the nerve roots at L3-L4 (saphenous nerve) and L5 (peroneal nerve).

The tibial nerve can be compressed in the tarsal tunnel on the medial aspect of the ankle, causing distal paresthesias in the medial aspect of the foot, mimicking radiculopathy at L4-L5.

Stimulating the area of nerve compression by external compression or tapping with the examiner's fingers generally causes paresthesias and aggravates the symptoms. Electromyography can also help with diagnosis. ■

REFERENCES

1. **McFarland EG.** Examination of the Shoulder: The Complete Guide. New York: Thieme; 2006.
2. **Macnab I, McCulloch J.** Neck Ache and Shoulder Pain. Baltimore: Williams & Wilkins; 1994.
3. **Tong HC, Haig AJ, Yamakawa K.** The Spurling test and cervical radiculopathy. *Spine* 2002; 27:156-159.
4. **Gorski JM, Schwartz LH.** Shoulder impingement presenting as neck pain. *J Bone Joint Surg Am* 2003; 85-A:635-638.
5. **Borenstein DG, Wiesel SW, Boden SD.** Neck Pain: Medical Diagnosis and Comprehensive Management. Philadelphia: WB Saunders; 1996.
6. **Spindler KP, Dovan TT, McCarty EC.** Assessment and management of the painful shoulder. *Clin Cornerstone* 2001; 3:26-37.
7. **Margoles MS.** The pain chart: spatial properties of pain. In: Melzack R, editor. Pain Measurement and Assessment. New York: Raven Press; 1983:215-225.
8. **Pateder DB, Park HB, Chronopoulos E, Fayad LM, McFarland EG.** Humeral head osteonecrosis after anterior shoulder stabilization in an adolescent. A case report. *J Bone Joint Surg Am* 2004; 86-A:2290-2293.
9. **Chow CS, Hung LK, Chiu CP, et al.** Is symptomatology useful in distinguishing between carpal tunnel syndrome and cervical spondylosis? *Hand Surg* 2005; 10:1-5.
10. **Johnson TR.** Shoulder. In: Snider RK, editor. Essentials of Musculoskeletal Care. 1st ed. Rosemont, Ill.: American Academy of Orthopaedic Surgeons; 1997.
11. **Mamula CJ, Erhard RE, Piva SR.** Cervical radiculopathy or Parsonage-Turner syndrome: differential diagnosis of a patient with neck and upper extremity symptoms. *J Orthop Sports Phys Ther* 2005; 35:659-664.
12. **Hoppenfeld S.** Physical Examination of the Spine and Extremities. New York: Appleton-Century-Crofts; 1976.
13. **McCarthy EF, Frassica FJ.** Pathology of Bone and Joint Disorders: With Clinical and Radiographic Correlation. Philadelphia: WB Saunders; 1998.
14. **Borenstein D.** Does osteoarthritis of the lumbar spine cause chronic low back pain? *Curr Pain Headache Rep* 2004; 8:512-517.
15. **Birrell F, Lunt M, Macfarlane G, Silman A.** Association between pain in the hip region and radiographic changes of osteoarthritis: results from a population-based study. *Rheumatology (Oxford)* 2005; 44:337-341. Erratum in: *Rheumatology (Oxford)* 2005; 44:569.
16. **Papadopoulos EC, Khan SN.** Piriformis syndrome and low back pain: a new classification and review of the literature. *Orthop Clin North Am* 2004; 35:65-71.
17. **Offierski CM, MacNab I.** Hip-spine syndrome. *Spine* 1983; 8:316-321.
18. **Brown MD, Gomez-Marin O, Brookfield KF, Li PS.** Differential diagnosis of hip disease versus spine disease. *Clin Orthop Relat Res* 2004; 419:280-284.

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