
Acute Muscle Spasms of the Back

Summary

Acute muscle spasms of the back are sudden, sustained involuntary contractions of muscles or muscle groups localized within the spine. In most cases, the cause of acute muscle spasms is unknown, but they may result from acute partial muscle tears (ie, strains) or partial or complete ligament ruptures (ie, sprains). The intensity of acute muscle spasms can range from mild muscle twitching to severe, sharp pain. Episodes of spasms can range between seconds to several minutes and may be recurrent. Another symptom of acute muscle spasms is difficulty in movement due to stiffness and/or soreness of the affected area, often localized to the lumbosacral region. Such acute muscle spasms of the back are commonly associated with acute back pain. At-risk populations for acute muscle spasms of the back include patients who are older, lack regular exercise, improperly lift, and/or overexert during exercise. More severe symptoms of acute muscle spasms of the back can have significant functional impact on the patient's work-related and daily activities.

Introduction

Acute muscle spasms of the back, defined as sustained involuntary contractions^{1,2} of a muscle or muscle group^{3,4} that cannot relax,⁵ are localized within the spinal structure.^{6,7} In most cases, the specific cause of the contractions is unknown.^{3,4} In the small proportion of cases with a known cause, acute muscle spasms commonly result from an acute partial muscle tear (ie, strain) or partial or complete ligament rupture (ie, sprain).^{3,4} Acute muscle spasms can be extremely painful depending on the severity, and spasm episodes can last from seconds to several minutes.⁵ Acute muscle spasms are commonly associated with mechanical lower back pain,⁸ which is the fifth most common reason for all physician visits in the United States.^{9,10} Typically, episodes of acute muscle spasm are self-limiting and last from 2 to 4 weeks^{6,11,12}; however, persistence of low-grade symptoms¹³ and symptom recurrence is common.^{9,14} The prevalence of acute muscle spasms increases with age.¹⁵ Despite affecting a large proportion of US adults,^{12,16} there has been little research on the topic within the last few decades.

Neuromuscular System

In normal skeletal muscle contractions, an A α -motor neuron sends an impulse to the muscle fibers that it innervates.¹⁷ The resultant depolarization of the muscle fiber leads to calcium release from the sarcoplasmic reticulum into the myofiber cytoplasm,¹⁸ where calcium binds to troponin C.¹⁷ This exposes myosin-binding sites on actin filaments such that actin and myosin form a cross-link, leading to contraction of the skeletal muscle fiber.¹⁷ Relaxation of the muscle normally follows contractions in which adenosine triphosphate binds to the myosin head and, the cross-link between actin and myosin breaks.¹⁸ However, in acute muscle spasms the contractions are sustained.^{1,2} This may be a result of myosin's inability to detach from actin either due to a lack of adenosine triphosphate binding to the myosin head or excess calcium binding to troponin C.¹⁸ These prolonged contractions may result in symptoms seen in acute muscle spasms, such as muscle twitching, pain,⁵ and/or aches,¹⁹ that can range in severity and intensity.⁵ Figure 1 depicts the neuromuscular junction and the muscle fiber, where the spasm may occur.

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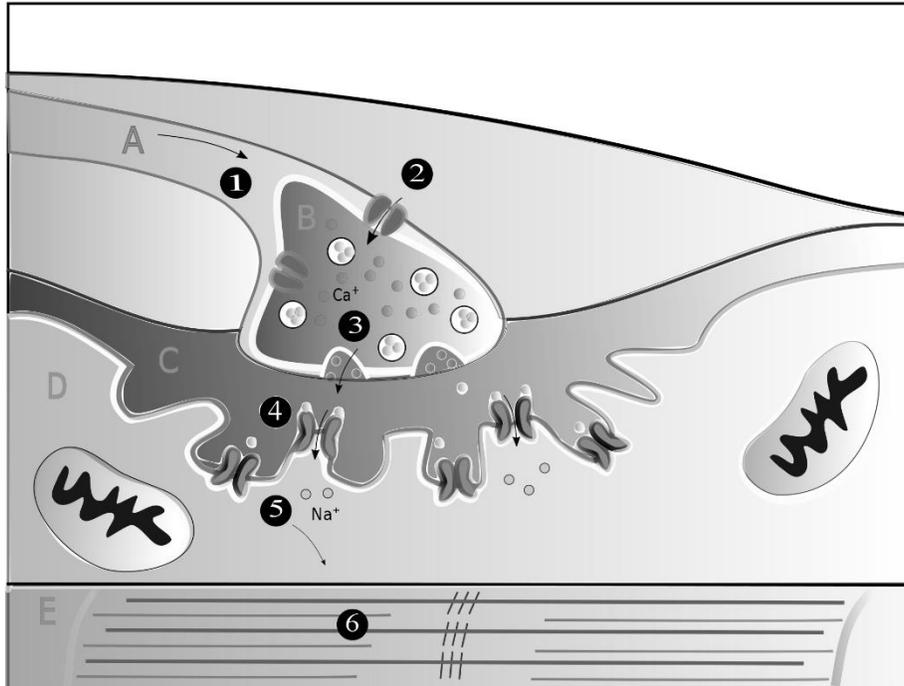


Figure 1. Diagram of neuromuscular junction between a motor neuron and a muscle fiber. (1) The action potential reaches the axon terminal. (2) Voltage-dependent calcium gates open, allowing calcium to enter the axon terminal. (3) Neurotransmitter vesicles fuse with the presynaptic membrane and acetylcholine (ACh) is released into the synaptic cleft via exocytosis. (4) ACh binds to postsynaptic receptors on the sarcolemma. (5) This binding causes ion channels to open and allows sodium ions to flow across the membrane into the muscle cell. (6) The flow of sodium ions across the membrane into the muscle cell generates an action potential that travels into the myofibril and results in muscle contraction. A, Motor neuron axon; B, axon terminal; C, synaptic cleft; D, muscle cell. Image with no adaptation: "[File:The Muscle Contraction Process.png](#)" by [Elliejellybelly13](#) is licensed under [CC BY-SA 4.0](#).

Demographics

During a lifetime, approximately 84% of US adults (175 million) experience musculoskeletal spasms^{12,16} and approximately 90% of US adults (188 million) experience back pain.^{9,20} Age is the most common risk factor for back pain associated with acute muscle spasms.¹⁹ Symptom onset generally begins in individuals aged 30 to 55 years,^{6,19} and peak prevalence is between the ages of 55 to 64.^{19,21} Other risk factors include lack of exercise, excess weight, improper lifting,¹⁹ and overexertion during exercise.⁵

Due to its increased prevalence with age, back pain associated with acute muscle spasms is the fifth most common reason for all physician visits in the United States.^{9,10} As back pain associated with muscle spasms self-limits from 2 to 4 weeks,^{6,11,12} up to 90% of patients recover to full activity within 1 month^{22,24} and return to work within 3 months.^{9,14} Despite this, within 1 year²⁰ approximately 73% of patients experience both symptom recurrence and limited functionality.^{9,14} Each year, approximately 50% of working adults experience back pain^{2,22,25,26}; in adults aged <45 years, back pain is the most common cause of work-related disability.⁶ Of the patients who experience physical symptoms of

acute muscle spasms of the back, approximately 25% seek medical attention.^{22,27}

Clinical Presentation and Features

Patient-Reported Symptoms

The intensity of muscle spasms, from mild twitching to severe pain, can vary among patients.⁵ Depending on the severity of muscle spasms, patients may experience episodes that last from seconds to 15 minutes or longer, and episodes may return multiple times before going away.⁵ The patient may also experience sudden, sharp pain⁵ resulting from involuntary contractions of the muscle. Depending on the severity of the muscle spasm, the patient may also report shooting or stabbing pain that may worsen with bending, lifting, standing, or walking.¹⁹ The affected muscle may feel sore or stiff during or after the muscle spasm episode⁵; this is why acute muscle spasms are closely associated with back pain. With acute back pain, patients may complain about muscle aches¹⁹ localized to the lumbosacral region.¹³

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Evaluation by Clinician (Clinical Signs)

To a clinician evaluating a patient with acute muscle spasms, the affected area may feel firmer than normal to the touch.⁵ Visually, the affected area may seem distorted or there may be signs of twitching.⁵ Point tenderness over the spine with palpation or percussion may indicate fracture or an infection involving the spine.²⁸ In addition, palpating the paraspinous region may help delineate tender areas or muscle spasm.^{9,28} Figure 2 depicts a guide for muscle spasm assessment of the back. During a physical exam, the clinician may notice that the patient has difficulty sitting, standing, walking, and/or lifting their legs.¹⁹ During a straight leg raise test in which the patient is in the supine position, each leg is raised separately until pain occurs.²⁸ Pain occurring when the angle is between 30 and 60 degrees is a provocative sign of nerve root

irritation.²⁸ Bending the knee while maintaining hip flexion should relieve the pain and pressure in the popliteal region should cause it to worsen (popliteal compression test).²⁸ If placing the knee back in full extension during straight leg raising and dorsiflexing the ankle also increases the pain (Lasègue sign), nerve root irritation and sciatic nerve irritation are likely.²⁸ The clinician may also observe abnormalities in stance, posture, and gait.⁵ When examining the patient's forward flexion, extension, lateral flexion, and lateral rotation of the upper torso, the clinician may notice that the patient may have a painful response with forward flexion that indicates mechanical causes.²⁸ If pain is induced by back extension, spinal stenosis should be considered.²⁸ Unfortunately, the evaluation of spinal range of motion has limited diagnostic use, although it may be helpful in planning and monitoring treatment.²⁸

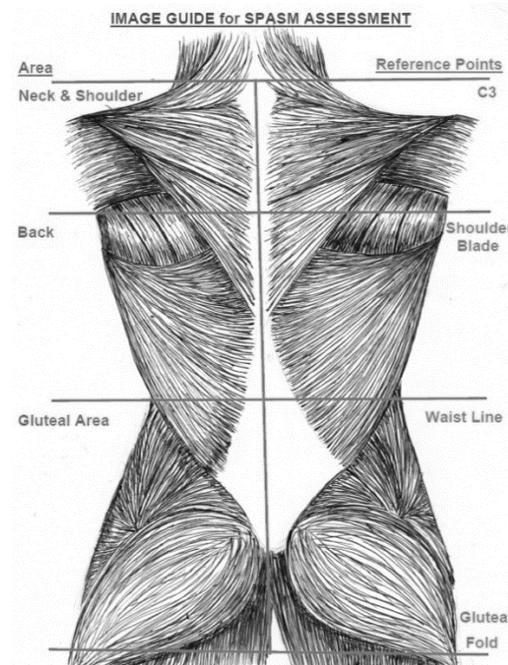


Figure 2. Image guide for spasm assessment of the back. Figure provided by Neurana Pharmaceuticals, Inc.

Possible Causes for Muscle Spasms

In most cases of acute muscle spasms of the back, the cause is unknown.^{3,4} Approximately 85% of patients seen in a primary care setting do not have a known cause for their acute low back pain.^{6,7,11} Only a small proportion of patients have an identifiable cause,⁹ which may include degenerative or inflammatory diseases of the musculoskeletal system^{1,2}; constant back strain^{6,19,29}; cumulative muscle fatigue^{5,6,29}; excessive physical activity, such as heavy lifting without prior adequate stretching^{5,19}; or localized tissue injury or sprain within the structure of the spine.^{3,6,7} Of the small

proportion of known causes, the most common are muscle strains and ligament sprains.^{3,4} Muscle strains are injuries to the muscle or tendon connecting the muscle to bones.³⁰ Minor strains are overstretching of the muscles or tendon, whereas severe strains are partial or complete tears.³⁰ Sprains are stretching or tearing of ligaments connecting two bones together.³⁰ Either muscle strains or ligament sprains may occur when muscles are overworked or injured from physical activity or labor.^{5,19} Although muscle strains and ligament sprains may be common causes of the small

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proportion of known causes to acute muscle spasms, most cases do not have a known cause.^{3,4}

Diagnosis

Due to a large differential diagnosis, the precise etiology is rarely identified, although musculoligamentous processes are usually suspected.¹³ For most patients, back symptoms are nonspecific, meaning that there is no evidence for radicular symptoms or underlying systemic disease.¹³ To determine whether the cause of a patient's acute back pain is specific or nonspecific, a thorough medical history review and complete physical examination are recommended by the joint practice guideline from the American College of Physicians and the American Pain Society.^{6,11} With acute back pain, very few patients need additional diagnostic testing and imaging, such as x-rays, magnetic resonance imaging, bone scans, and computed tomography scans, unless a medical history review and physical examination indicate a serious underlying condition or the patient presents with severe or progressive neurological deficits.^{6,11} For most patients, the medical history review and physical examination are sufficient to exclude serious disorders, such as cancer, compression fracture, or infection.¹³ However, if a tumor or infection is suspected, further laboratory investigation should be considered.²⁸

Typically, a clinician will examine the affected area of the back and assess the patient's standing spinal symmetry, posture, and flexibility.¹³ Palpation can assess spinal (ie, bone) versus paraspinal (ie, soft tissue) pain and its severity, although the presence and location of soft tissue tenderness are poorly reproducible from clinician to clinician.¹³ The patient may also be asked to rate their pain using a numerical rating scale or visual analog scale on a scale of zero to 10 and rate how they are functioning with their reported pain.¹⁹ It is also important to inquire about the specific

characteristics and severity of the pain and about the patient's history of trauma.⁹ These assessments help the clinician to determine from where the pain originates and whether the cause of the back pain can be linked to muscle spasms.¹⁹

In addition, nonorganic factors are sometimes important contributors to the symptoms of acute low back pain.²⁸ Psychosocial factors can be economic or social.²⁸ To determine whether psychosocial factors are relevant, the examiner can obtain "pain drawings" by asking the patient to mark the type and distribution of pain on a figure of the human body.²⁸ If the distribution is nonanatomic, a psychogenic cause is likely.²⁸ The Waddell tests, a set of five maneuvers easily performed during a routine physical examination, identify patients in whom nonorganic issues play an important role in the persistence of symptoms.²⁸ Nonorganic physical signs include a discrepancy between findings on sitting and supine straight leg raising tests and disproportionate facial expression, verbalization or tremor during examination. Thus, the clinician should also assess social factors, psychological factors, and the functional impact of the pain on the patient's work and activities of daily living.⁹

Summary

Acute muscle spasms of the back, defined as sustained involuntary contractions^{1,2} of a muscle or muscle group^{3,4} that cannot relax,⁵ are localized within the spinal structure.^{6,7} The intensity and duration of spasms may vary,⁵ and they are commonly associated with back pain.⁸ In most cases of acute muscle spasm, the specific cause is unknown.^{1,2} Despite the prevalence of acute muscle spasms of the lower back, there has been limited research on their management over the last few decades. Given that they affect a large proportion of US adults, more contemporary research is needed.

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