

Sample Topic

Muscle Injury



The Medical Disability Advisor: Workplace Guidelines for Disability Duration

Fifth Edition

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Editor-in-Chief

The Most Widely-Used Duration Guidelines in the Industry
Adopted in the US and in 38 other Countries

The Comprehensive Evidence-Based Return-to-Work Reference
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Muscle Injury

Related Terms

- Avulsions
- Bruises
- Detached Injury
- Strains

Medical Codes

- **ICD-9-CM:** 724, 728.8, 728.83, 728.9, 840, 841, 842, 843, 843.0, 843.8, 844, 844.9, 845, 846, 847, 848, 848.8, 848.9, 905, 920, 922, 922.0, 922.1, 922.2, 922.3, 922.31, 922.32, 922.8, 923, 924
- **ICD-10:** S09.1, S16, S29.0, S39.0, S46, S46.1, S46.2, S46.3, S56, S66, S76, S76.0, S76.1, S76.3, S86, S86.2, S86.3, S86.7, S86.8, S86.9, S96, S96.1, S96.2, S96.7, S96.8, S96.9, T09.5, T14.6, T79.6, T92.5, T93.5

Definition

Any muscle in the body may be damaged or injured. The various types of muscle injuries are categorized as strains, bruises (contusions), detached injuries (avulsions), and exercise-induced injury or delayed-onset soreness. The thigh and the back muscles are the most commonly injured.

Individuals who are inflexible or fail to warm up sufficiently prior to engaging in physical activity have an increased risk for muscle strains. Muscle strains are classified as mild, moderate, or severe. Mild strains refer to slightly pulled muscle without tearing of muscle or tendon fibers. Moderate strains involve tearing of fibers that result in diminished strength, and severe strains are a rupture of a tendon-bone attachment with separation of muscle fibers. Severe strains may require surgical repair.

Muscle contusions are also classified as mild, moderate, or severe. Contusions refer to injuries that do not involve a break in the skin but cause damage to muscle fibers and other soft tissues. Blood seeps out of damaged small blood vessels into the surrounding tissue forming black-and-blue marks beneath the skin (ecchymosis). After injury, gravity may pull the blood downward so that the black-and-blue “bruise” may be far from the contusion site. Blood can form (hematoma) within the muscle. Muscle contusions frequently occur in athletes participating in contact sports like football, hockey, and boxing.

Tearing or ripping the muscle away from an attachment point (avulsions) is usually caused by an intense force or dynamic overload. Avulsion injuries most frequently occur in the groin and upper connections of the hamstring muscles. Individuals with rapid growth, stress fractures, overdeveloped muscles in combination with an immature skeletal system, or weakened bones (osteoporosis) are at risk for avulsion injuries.

Exercise-induced injuries and delayed-onset soreness occur when stress applied to a muscle exceeds the tolerance level of the muscle and muscle attachments. Viral infection, performance of

a new activity, or excessive away-from-center (eccentric) work can predispose an individual to this type of injury.

Sports- and work-related muscle injuries are common, often leading to time away from sports participation and/or work.

Risk: Athletes are at a particularly high-risk for muscle injuries caused by over stretching, sudden muscle contraction (weight lifting), or rapid changes in speed or direction (sprinting, tennis).

Diagnosis

History: Symptoms of a muscle strain include swelling, constant pain or pain with muscle use, and muscle weakness or loss of muscle function. Muscle contusion symptoms include pain, swelling, and local skin discoloration. A muscle avulsion usually causes severe pain, swelling, and loss of function in the affected limb. An exercise-induced injury may result in swelling, joint stiffness, pain, and usually a decrease or loss of muscle function 1 to 2 days after exercising. Delayed-onset soreness refers to muscle pain, weakness, and a decreased range of motion occurring 1 to 3 days following the performance of a new exercise. Headaches or dizziness (vertigo) may also be present if neck muscles are injured.

Physical exam: The exam may reveal swelling, muscle tenderness, ecchymosis, and hard areas in the affected muscle. Specific “trigger points” of pain may be present. Movement may be decreased with the individual guarding the affected muscle.

Tests: Plain x-rays, CT, MRI, nerve conduction tests, or electromyography (EMG) may be done to determine the extent of the injury and rule out bone fractures.

Treatment

Mild strains, exercise-induced injuries, delayed-onset soreness, and most contusions are treated by resting the affected muscle, applying ice initially or heat later, compression, and the use of pain relievers (analgesics) or muscle relaxants. Open injuries are treated with surgical cleansing (débridement), repair, and antibiotic therapy. Muscle tears may also require surgery to realign (reapproximate) the torn edges. Avulsions require surgery to reattach the muscle to the tendon. Traction, a cervical collar, splints, crutches, or a cane may be prescribed. Corticosteroids, in rare circumstances, may be given to reduce inflammation especially in chronic conditions. When recovery is complete, gradual strengthening of the muscle is important.

Prognosis

Most contusions resolve completely without residual symptoms within a few weeks. Delayed-onset soreness resolves within a few days. Mild strains heal in 2 to 10 days, moderate strains in 10 days to 6 weeks, and severe strains in 6 to 10 weeks. Avulsions usually require 6 to 10 weeks to heal. A longer recovery period (6 to 10 weeks) is also necessary for any muscle injury requiring surgical repair.

Differential Diagnoses

- Bone fractures
- Compartment syndrome
- Muscle fatigue
- Muscular dystrophies

- Fibromyalgia
- Lumbar disc syndrome
- Muscle cramps
- Myasthenia gravis
- Rheumatoid arthritis

Specialists

- Orthopedic Surgeon
- Physiatrist
- Physical Therapist
- Sports Medicine Internist

Rehabilitation†

The various types of muscle injuries are categorized as strains, bruises (contusions), detached injuries (avulsions), and exercise-induced injury or delayed onset soreness.

Rehabilitation of a muscle injury depends on the type, location, and extent of the injury. For example, muscles can be strained by excessive stretching or forced contracture. They can also be torn and need surgical repair. Each muscle performs a different function and responds differently to injury as well as treatment. Consequently, the degree of the strain will determine the rate of rehabilitation.

Muscle injuries often result in the formation of a hematoma. The immediate goal of the rehabilitation of all muscle injuries is to decrease pain and swelling. The best way is to follow the PRICE principle (protection, rest, ice, compression, elevation) (Braddom). Physical activities should be terminated immediately after the injury to avoid further damage. Application of a compression bandage and ice can reduce the formation of a hematoma. Elevation of the injured extremity decreases blood flow to the injury site and increases venous return, thus further limiting the size of the hematoma. The immobilization should be kept as short as possible. It has been shown that short immobilization is beneficial in the early phase of muscle regeneration and prolonged immobilization results in the atrophy of healthy fibers around the injury. Usually 1 to 5 days after injury gentle exercise can be started, depending on the severity of the injury, with the intensity increased as tolerated. Early stretching exercises as tolerated help to minimize the negative effects of scar formation. Modalities such as local heat can be used for pain management once the edema is controlled.

If pain and functional limitations persist, the injury needs to be re-evaluated. Besides clinical evaluation, sonography or an MRI may help to detect the extent of the injury (Noonan). Depending on the severity of the muscle injury a surgical intervention might be necessary.

Additional information may provide insight into the rehabilitation needs of these individuals (Kirkendall).

FREQUENCY OF REHABILITATION VISITS

Nonsurgical and Surgical	
Specialist	Guidelines
Physical Therapist	Up to 4 visits within 3 weeks

The table above represents a range of the usual acceptable number of visits for uncomplicated cases. It provides a framework based on the duration of tissue healing time and standard clinical practice.

Comorbid Conditions

- Coagulation disorders
- Musculoskeletal disorders

Complications

Resumption of strenuous physical activity before the muscle has healed completely can lead to reinjury. A muscle may be so extensively damaged that it must be removed. Hematomas within the muscle prolong recovery time and delay return of function. Pressure on the muscle from swelling or bleeding can result in compartment syndrome, causing permanent muscle and nerve damage. Disintegration of muscle (rhabdomyolysis) can occur. In a condition known as myositis ossificans, damaged muscle converts into a bone-like substance (ossification) that causes disfigurement and impaired muscle function.

Factors Influencing Duration

Length of disability may be influenced by the location of injured muscle, type of muscle injury, severity of injury, type of treatment, response to treatment, and any coexisting injuries (laceration, fracture) or complications.

Length of Disability

Supportive treatment, groin strain.

DURATION IN DAYS			
Job Classification	Minimum	Optimum	Maximum
Sedentary	0	3	7
Light	0	3	7
Medium	3	7	14
Heavy	7	14	28
Very Heavy	7	14	28

Supportive treatment, quadriceps or hamstring strain or contusion.

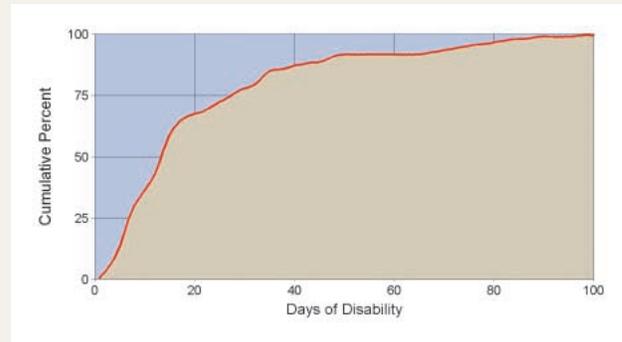
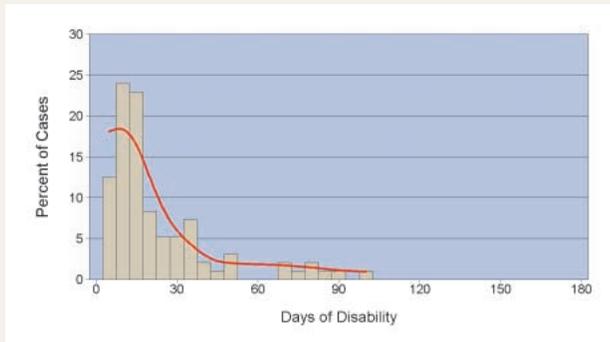
DURATION IN DAYS			
Job Classification	Minimum	Optimum	Maximum
Sedentary	1	3	7
Light	3	7	14
Medium	7	14	28
Heavy	14	28	56
Very Heavy	28	56	112

† Researched and authored by the OIOC of New York University Medical Center. To understand the underlying methodology, please refer to "The Rehabilitation Guidelines" at the beginning of this volume.

Reference Data

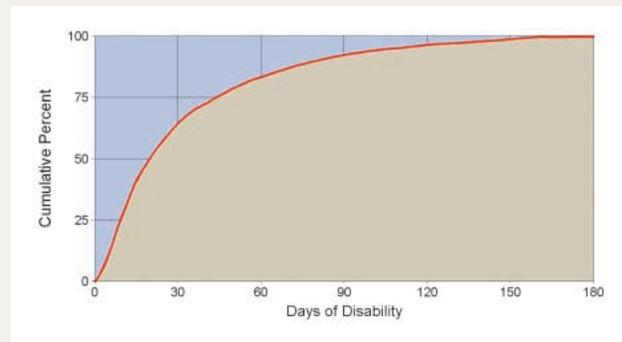
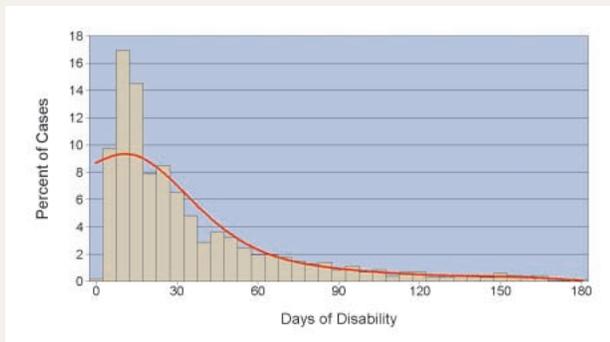
DURATION TRENDS - ICD-9-CM: 843.0

Cases	Mean	Min	Max	No Lost Time	Over 6 Months	Percentile:	5th	25th	Median	75th	95th
96	21	1	97	0%	0%	Days:	3	7	14	28	74



DURATION TRENDS - ICD-9-CM: 843.8, 844.9

Cases	Mean	Min	Max	No Lost Time	Over 6 Months	Percentile:	5th	25th	Median	75th	95th
2215	33	0	178	0.2%	0%	Days:	3	10	21	44	109



Note: Differences may exist between the duration tables and the reference graphs. Duration tables provide expected recovery periods based on the type of work performed by the individual. The reference graphs reflect the actual experience of many individuals across the spectrum of physical conditions, in a variety of industries, and with varying levels of case management. Selected graphs combine multiple codes based on similar means and medians.

Return to Work

Repetitive motion, strenuous activities, or movement of the affected limb may be restricted. For leg injuries, crutches or a cane may be required or a brace may need to be worn over the affected muscle or limb. Muscle injuries in a lower limb may affect the individual's ability to walk, stand, or sit for extended periods of time. The individual with upper limb muscle injury may be temporarily unable to lift and carry heavy or bulky objects, operate equipment, or perform other tasks requiring the use of both hands. Muscle injury in the dominant arm or hand may affect fine motor skills such as those needed to write legibly, type well, or work in a laboratory. Depending on work duties, the individual may need to be temporarily reassigned. Training on proper lifting and movement is helpful.

Failure to Recover

Regarding diagnosis:

- Has muscle injury been confirmed?
- Has type of injury been identified?
- Did individual experience any complications such as reinjury; damage so extensive that muscle must be removed; compartment syndrome causing permanent muscle and nerve damage; disintegration (rhabdomyolysis) of muscle; and a condition known as myositis ossificans in which damaged muscle converts into a bone-like substance (ossification) causes disfigurement and impaired muscle function?
- Does individual have an underlying condition that may impact recovery?

Regarding treatment:

- Has individual overused the injured muscle?
- Is individual following the plan of treatment?
- Was surgery required to repair a muscle tear?
- Was individual treated with corticosteroids?

Regarding prognosis:

- How severe are the persisting symptoms? Are they incapacitating?
- Can individual perform normal activities of daily life?
- Would individual benefit from muscle conditioning or additional physical therapy?
- Has individual injured this same muscle before?
- Did the individual resume strenuous physical activity before the muscle was completely healed?

- Have X-rays, MRI, or other scans been used to detect muscle tears, avulsions, fractures, or complicating conditions?

Cited References

Braddom, Randolph L. *Physical Medicine and Rehabilitation*. 2nd ed. Philadelphia: W.B. Saunders, 2000.

Kirkendall, Donald, and W. E. Garrett. "Clinical Perspectives Regarding Eccentric Muscle Injury." *Clinical Orthopedics and Related Research* 403 Suppl (2002): S81-S89. *National Center for Biotechnology Information*. National Library of Medicine. 12 Nov. 2004 <PMID: 12394456>.

Noonan, T.J., and W. E. Garrett. "Muscle Strain Injury: Diagnosis and Treatment." *Journal of the American Academy of Orthopedic Surgeons* 7 4 (2002): 262-269. *National Center for Biotechnology Information*. National Library of Medicine. 12 Nov. 2004 <PMID: 10434080>.