X-Plain
Muscles
Reference Summary

Introduction

Muscles are very important elements of the human body. They account for about half of a person's weight. Understanding how muscles work and how they can be injured is necessary for preventing muscle injuries and recognizing symptoms of muscle disease. This reference summary reviews the types of muscles, how they function, and the various injuries and diseases that can harm them.

Muscles

There are 3 types of muscles in the body.

- voluntary muscles of the skeletal system
- involuntary smooth muscles
- involuntary cardiac muscles

Muscles

This summary will help you understand the voluntary skeletal muscles. The involuntary muscles handle unconscious functions such as pushing the food along in the digestive system, focusing the eyes, and controlling the width of arteries.

Cardiac muscles are involuntary too, but they have a special structure and function and are only in the heart.

All muscles:

- can be excited by a nerve or a stimulus
- contract when stimulated
- relax after contraction

Skeletal Muscles

About 605 skeletal muscles make up almost half the weight of the body. Muscles work together with the skeletal system and the nervous system. A typical skeletal muscle stretches from one bone to another, crossing a joint.

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Muscles are attached to bones with tendons. Tendons are special tissues of connective fibers. Ligaments also connect bones. Ligaments are made of tough connective tissue. The brain sends messages to the muscles, telling them to move, through the spinal cord and the spinal nerves, finally reaching the muscle.

A muscle contracts when the electrical impulse of a nerve reaches it. Each muscle has thousands of specialized fibers, which start sliding along each other when stimulated, causing a contraction. As a muscle contracts, it moves one bone relative to another. Many muscles are attached to more than 2 bones. Muscles are arranged opposite of each other. For instance, the movement of the triceps reverses the movement of the biceps. This way, the biceps allows us to bend our elbow and the triceps allows us to extend it.

Anatomy

The skeletal muscles vary in shape and strength. The muscles that surround the spine are the most powerful muscles. They give us posture. Shoulder muscles help move our arms. For example, the deltoid muscle allows us to move our arm away from our body. The muscles of the front forearm allow us to make a fist and bend our fingers. The muscles on the back of the forearm do the opposite: they allow us to open our hand and extend our fingers.

The quadriceps muscle, the big, bulky muscle on the front of the thigh, allows us to straighten our knee. The hamstring muscle on the back of the thigh allows us to bend our knee. The muscles in the shin of the leg allow us to bend our ankle upward, while the calf muscle allows us to bend our ankle downward. The combination of all the skeletal muscles allows us to walk, run, write, and play!

The muscles in the face allow us to open and close our eyes and mouth. They also allow us to make facial expressions, such as smiling and frowning. The tongue and cheek muscles allow us to chew and eat. The throat muscles allow us to swallow and breathe.

Other muscles are very important but we do not notice them all the time. These include our neck, back, chest and abdomen muscles. They help us maintain a good posture and move the spine. They also protect the organs in our chest and belly.

Regular exercise helps to keep our muscles in good shape.

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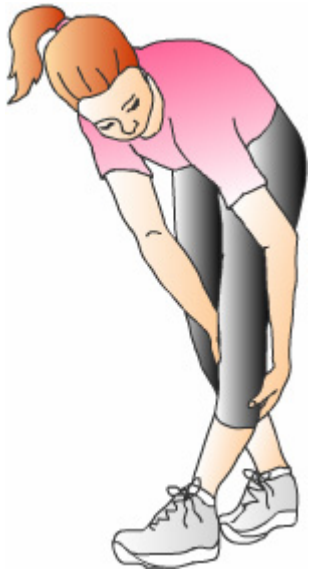
Muscle Injuries

Muscle injuries are more frequent than muscle diseases. When injured, muscles are capable of repairing themselves. Injuries to muscles and tendons are usually the result of overexertion or a sudden pull or twist.

Muscle strain is when the muscle fibers are damaged. Some bleeding inside the muscle causes tenderness and swelling. Pain and visible bruising accompany strain. Muscle strains can occur due to constant repetition of a certain movement, mainly if performed incorrectly. Strains are usually treated with short-term immobilization, physical therapy and anti-inflammatory drugs.



A muscle tear is when a large number of muscle fibers are torn. Muscle tears cause severe pain and swelling. Severe bleeding may results in the formation of a blood clot. Surgery may be necessary to repair a muscle tear. Inflammation of a tendon, called tendonitis, can happen when stretching or repeated movement causes swelling of a tendon. Activities like running and kicking can cause inflammation of tendons in the foot. This may cause pain, swelling, and restricted movement. When a tendon tears, damage to the tendon is so severe it separates it from the bone. Lifting too much weight can result in tendon tears. Minor tendon tears are treated with immobilization and physical therapy. However, more serious tendon tears sometimes require surgery.

Muscle Diseases

Many diseases that affect muscles are actually diseases of the nerves that are connected to the muscles. The result is weakness and wasting away of the muscle, called *atrophy*. As the muscles weaken, they may start twitching. This muscle twitching is called *fasciculation*.

Here are some of the diseases that affect muscles by affecting their nerves.

- Spinal cord injuries
- Pinched nerves in the neck or back
- Polio
- Charcot-Marie-Tooth disease.
- Lou Gehrig's disease

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Most muscle cramps are caused by nerves malfunctioning. During a cramp, the muscle contracts by itself due to abnormal nerve signals. Muscle cramps can be very painful. They may occur particularly after exercise or at night. Stretching the muscle can relieve cramp pain.

Diseases that affect the muscles directly, rather than their nerve supply, include:

- Muscular dystrophy
- Myopathy
- Myositis

Muscle diseases can be inherited, the result of infections, or side effects of medications taken for other conditions. The affected muscles usually become weak and sometimes painful. Other diseases of the body affect the muscles, such as lupus, thyroid problems, and vitamin deficiencies.

Diagnosis

To diagnose muscle diseases, a very detailed personal and family history must be taken. A physical exam is very important in assessing the extent of weakness. It also checks for atrophy and fasciculations. Blood and urine tests may also be needed to diagnose muscle disease. MRIs of the affected spine or brain area, as well as the affected muscles, may be necessary.

Needle tests called EMG for ElectroMyoGram and NCV for Nerve Conduction Velocity may be done to determine whether the disease is primarily in the muscles or whether it is due to nerve damage. A small piece of muscle may need to be taken and studied by a pathologist under a microscope. This is called a muscle biopsy. The muscle sample is taken using either a needle or a scalpel.

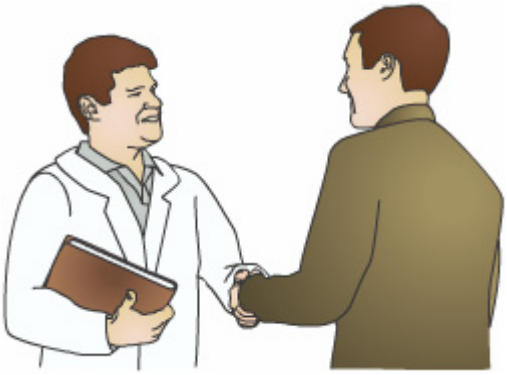
Treatment

Muscle and tendon strains are usually treated with immobilization and physical therapy. Muscle and tendon tears are treated the same way, although surgery may be needed to fix a tear.

The treatment of muscle diseases depends on what causes the disease. If the disease is caused by lack of vitamins, a simple vitamin supplement may fix the problem. Weakness due to low hormone levels may be treated with hormone replacement.

Some types of muscular dystrophy have no effective treatments. Most treatment for serious muscle disease requires physical therapy to strengthen the muscles.

Occupational therapy is sometimes needed if muscle weakness persists. The patient has to learn “tricks” in order to do daily activities. For example, the patient may use a reacher to put clothes on.



Summary

Muscles make up a large portion of the body’s weight and help us to walk, run, talk, and eat. Keeping muscles healthy and strong is important for a healthy lifestyle. Learning how to exercise safely and avoiding repetitive motion that can cause strain is essential to healthy living.

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