



Hughston Health Alert

6262 Veterans Parkway, PO Box 9517, Columbus, GA 31908-9517 • www.hughston.com/hha

VOLUME 35, NUMBER 2 - SPRING 2023

35th Anniversary

HUGHSTON HEALTH ALERT

Inside...

- Rhabdomyolysis
- Brachial Plexus: Traumatic New Injuries
- **Hughston Health Alert**

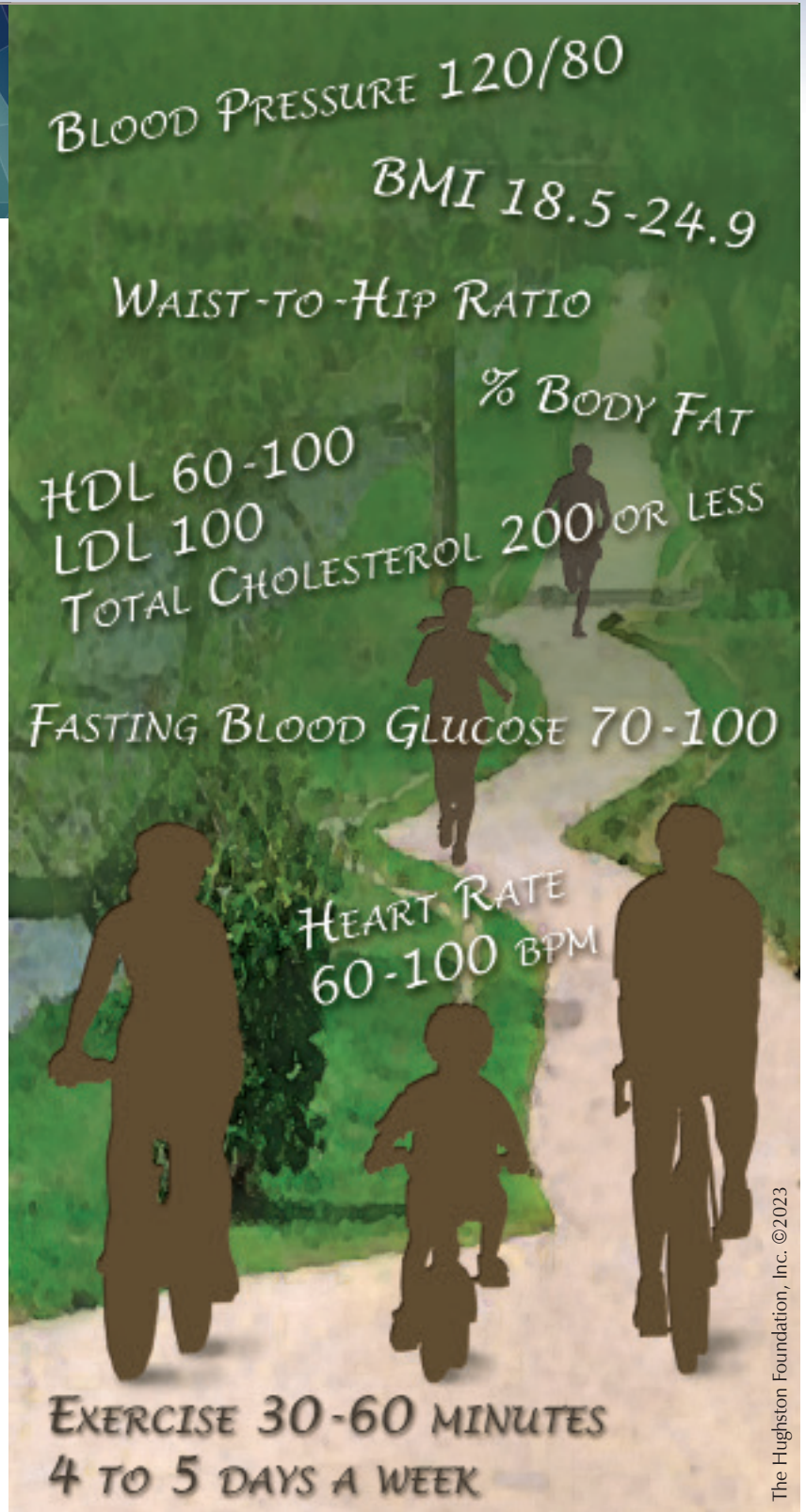
Wellness by the Numbers

Over the past 25 years, life expectancy has increased year after year for both men and women. Not only are people living longer, they are living healthy, active lives. People are staying healthy to a more advanced age partly because of improvements in the treatment of injury and illness and partly because researchers have focused on the prevention of disease.

The foundation of disease prevention includes being at a healthy weight, exercising regularly, eating a balanced diet, and having your health status evaluated during a physical examination. From your physical exam, there are some key numbers you can learn about yourself and your health. The numbers can reveal how well you are, and they can show in which areas you need improvement. Most importantly, the numbers can help you plan, set goals, and change habits to live a healthier, longer life.

Your weight

Excess weight can place you at a higher risk for certain diseases, such as heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and some cancers. For this reason, the first step toward a healthier life is to step on a scale. Once you know how much you weigh, you can determine if you are overweight, underweight, or at your ideal weight. Other basic numbers



The Hughston Foundation, Inc. ©2023

relevant to your weight include amount of body fat, body mass index, and waist-to-hip ratio.

Body fat

Determining the percentage of your body fat can help to determine your ideal weight. Some scales can calculate percentage of body fat, but you can get a truer number if you seek the advice of a fitness professional who can complete skinfold measurements and calculate it for you. **Table 1** shows the range of body fat percentages for men and women. The formula for calculating one's ideal weight is your percentage of body fat times your current weight, which equals your fat weight. Subtract your fat weight from your current weight to get your lean weight. For a female, divide .78 into your lean weight; for a male, divide .84 into your lean weight to get your ideal weight (**Fig. 1**).

Table 1. Body fat percentages		
Description	Men	Women
Essential fat	2-5%	10-13%
For athletes	6-13%	14-20%
For fitness	14-17%	21-24%
Acceptable	18-25%	25-31%
Obese	26%+	32% +

Fig. 1. How to Calculate Ideal Weight

Step 1

% of body fat
x current weight

= fat weight

Step 2

current weight
- fat weight

= lean weight

Step 3

lean weight
÷ .78 (females) or
.84 (males)

= ideal weight

Example for a female

26% body fat x 150 lbs = 39 lbs fat weight
150 lbs - 39 lbs fat weight = 111 lbs lean weight
111 lbs lean weight ÷ .78 = 142.3 lbs

Example for a male

22% body fat x 200 lbs = 44 lbs fat weight
200 lbs - 44 lbs fat weight = 156 lbs lean weight
156 lbs lean weight ÷ .84 = 185.7 lbs

Body mass index

If you don't have access to a fitness professional who can complete skinfold measurements for you, body mass index (BMI) is often used instead due to its simplicity. BMI uses only body weight and height and does not take into account overall body composition, including body fat; therefore, although it is widely used, it can be a poor indicator of obesity in some populations. The normal BMI range for men and women is between 18.5 and 24.9 (**Table 2**). Some home digital scales can calculate BMI or

Table 2. BMI categories	
Underweight	below 18.5
Normal weight	18.5 – 24.9
Overweight	25 – 29.3
Obesity	30.0 & above

you can go to the Internet and use an online calculator by keying in your height and weight. When stepping on the scale, keep in mind that you are weighing muscle, bones, and fat, that is why BMI can be misleading and not always a good way to determine healthy weight. BMI can be a poor measurement of body fat for athletes or people who have a muscular build, and it can be inaccurate in older people who have lost muscle mass.

Waist-to-hip ratio

Research has shown that people who have an “apple-shaped” body, or who have more weight around the waist, face higher health risks than those with a “pear-shaped” body, or who carry extra pounds around the hips. To determine if you have a healthy waist-to-hip ratio, use a measuring tape to measure the circumference of your hips at the widest part of your buttocks. Then measure your waist at the smaller circumference of your waist, just above your belly button. Divide your waist measurement by your hip measurement to determine the ratio. If the ratio is greater than .86 in women and .95 in men, the measurement can be associated with an increased risk for heart disease.

Weight loss

Weight loss can be accomplished by reducing the number of calories you consume or by increasing the number of calories you burn through exercise. In order to lose 1 pound a week, the formula is as follows:

Multiply 10 times your current body weight to get the calories you need to maintain your current weight. To lose 1 pound a week reduce your caloric intake by 500 calories a day. Females should not consume less than 1,200 calories a day and males should not consume less than 1,500 calories a day (**Fig. 2**).

Health screening numbers

During your physical exam, your doctor's office staff will conduct a number of health screenings, such as checking your blood pressure and drawing blood to send to a lab. Your doctor will then review your lab report and other test results and let you know if you have any areas of concern.

Blood pressure

One of the most dangerous aspects of high blood pressure, or hypertension, is that you may not know you have it. Ideal blood pressure is 120/80, or 120 systolic and 80 diastolic. Blood pressure that exceeds 139 systolic and 89 diastolic should be monitored by your physician.

Fig. 2. The Keys to Weight Loss

Healthy Food Portions
(Consumed Calories) = **or** < **Physical Activity**
(Burned Calories)

10 x your weight (lbs) = calories needed to
maintain current weight

Weight Loss Example

Starting weight: 200 lbs **Ideal weight:** 150 lbs
 $10 \times 200 \text{ lbs}$ $10 \times 150 \text{ lbs}$
= 2,000 calories = 1,500 calories

Rate of weight loss: This is a difference of 50 lbs and 500 calories per day. Safely reducing your diet by 500 calories per day = 1 lb of weight loss per week. Therefore, it would take approximately 50 weeks to lose the weight.

To maintain a weight of 150 lbs

Consuming 1,500 calories = Burning 1,500 calories

Your healthcare provider should also check your heart rate. Your heart rate should be between 60 and 100 beats per minute. A low heart rate at rest implies that your heart is functioning effectively and that you have good cardiovascular fitness. Exercise and diet can help improve your resting heart rate and blood pressure.

Cholesterol

Know both your high-density lipoprotein (HDL) level, which is your good cholesterol, and your low-density lipoprotein (LDL) level, which is your bad cholesterol. The National Institutes of Health recommends that LDL numbers stay under 100 and HDL is kept above 40. The more HDL you have, the better your chances of not experiencing heart disease. Cholesterol/HDL ratio is the ratio of your total cholesterol to your good cholesterol. The ideal ratio is between 3.5 and 4 and the lower the ratio, the better. Research indicates that for every 1 unit increase in HDL the risk of heart disease drops by as much as 3%.

Triglycerides

Triglycerides are fats that come from the food you eat, as well as those produced by your body. Elevated triglycerides, in combination with high total cholesterol,

low HDL, and high LDL can cause an increased risk of developing heart disease. The fats can often be brought under control through a low fat diet and medication. Evidence shows that high cholesterol and triglyceride levels can be hereditary; therefore, it should be monitored regularly by your physician. Generally, no more than 10% to 20% of your diet should be fat.

Blood glucose

The American Diabetes Association has recently released new fasting blood glucose guidelines. Fasting blood glucose between 100 and 125 signals prediabetes and anything above 126 indicates a need for evaluation. Diet and exercise can help prevent or manage diabetes. If diabetes isn't managed, it can lead to disease and health complications, such as heart attack, stroke, amputation, blindness, kidney failure, and nerve damage.

Liver enzymes

Depending on your medical history and the medications you take, your doctor will check your liver enzymes. Elevation of the enzymes can be caused by alcohol, some over-the-counter drugs, prescription medications, and medical conditions, such as liver disease and heart disease. Acetaminophen (Tylenol), cholesterol reducing drugs, and blood pressure medications are common offenders.

Blood count

A complete blood count (CBC) provides information about your red blood cells, white blood cells, platelets, hemoglobin (the oxygen carrying capacity of the blood), and hematocrit (the percentage of red cells to the total volume of blood). The test results can help your physician determine why you are having specific symptoms.

Exercise

Last but not least, exercise is an essential part of a healthy lifestyle. Do some type of aerobic exercise, such as jogging, walking, swimming, cycling, or aerobic dance, 30 to 60 minutes a day, 4 to 5 times each week. Include some flexibility exercises in your program and some weight resistance exercise, as well. Find some type of activity or several activities you enjoy doing. Participating in something you enjoy doesn't seem like exercise, which means you are more likely to do it regularly.

Your overall fitness level and your health often determine your outlook on life. If you feel good, life is always brighter. A friend of mine once said "We live our lives between first and second base. You will never know what it is like to steal second if you don't give it a try. So put on your best shoes and your most comfortable britches and just do it." Consistency is the foundation of any diet and exercise program; it can determine your success or failure. Your goal should be to be healthy at any size.

William Etchison, MS
Columbus, Georgia

Table 3. Cholesterol and triglyceride levels

Test	Desirable	Borderline	Undesirable
HDL (Good)	60-100	50	39 or less
LDL (Bad)	100	130-159	over 160
Triglycerides	199 or less	200-400	over 400
Total cholesterol	200 or less	200-239	240 & higher

Brachial Plexus

TRAUMATIC NERVE INJURIES

The brachial plexus are nerves that conduct signals to the shoulder, elbow, and hand muscles and provide feeling in the arm. If these nerves become injured you can lose function, sensation, and experience pain. Some injuries to the brachial plexus are minor and brief, while others are severe and can cause permanent disability. These injuries often occur after a traumatic event, such as a sports injury, an automobile accident, or from complications at birth.

Brachial plexus injuries involve the C5, C6, C7, C8, and T1 nerves that originate from the spinal cord in the neck. As these nerves leave the neck, they form the brachial plexus, which weave together then branch as they pass under the clavicle (collarbone) toward the shoulder (Fig. 1). Depending on the extent of the injury and which nerve

is damaged, brachial plexus injuries are sometimes called Erb's palsy, Klumpke palsy, Parsonage-Turner syndrome (brachial plexus neuritis), and burners and stingers. Most brachial plexus injuries are minor and you will recover within a few weeks with limited treatment; however, other injuries can require rehabilitation or surgery and take longer to heal.

Causes

Often, brachial plexus injuries occur during high-speed automobile accidents, blunt trauma from a fall, or from the violence of a stab or gunshot wound. Difficult births are a major cause of brachial plexus nerve injuries in newborns. The nerve injuries can also result from medical conditions such as inflammation, compression from a growth or tumor, and nerve disease.

The damage occurs when 1 or more nerves are pulled, stretched, compressed, or torn. The nerve injury can be an avulsion (pulled away from the spinal cord), a stretch

(pulled but not torn), or a rupture (stretched with a partial or complete tear). Often, the nerves closer to the neck are damaged when the shoulder is forced down and the nerves closer to the armpit are more likely damaged when your arm is forced upward or above your head. In addition, athletes in contact sports can sustain transient brachial plexus injuries known as "burners and stingers" after sustaining a blow to the neck and shoulder girdle region (Fig. 2). The injury occurs when the arm is forcibly pulled or stretched downward and the head is pushed to the opposite side. Interestingly, brachial plexus insult can also occur in an idiopathic (unknown cause) fashion after inflammation of the nerves.

Fig. 1. Normal anatomy and injury of the neck nerves

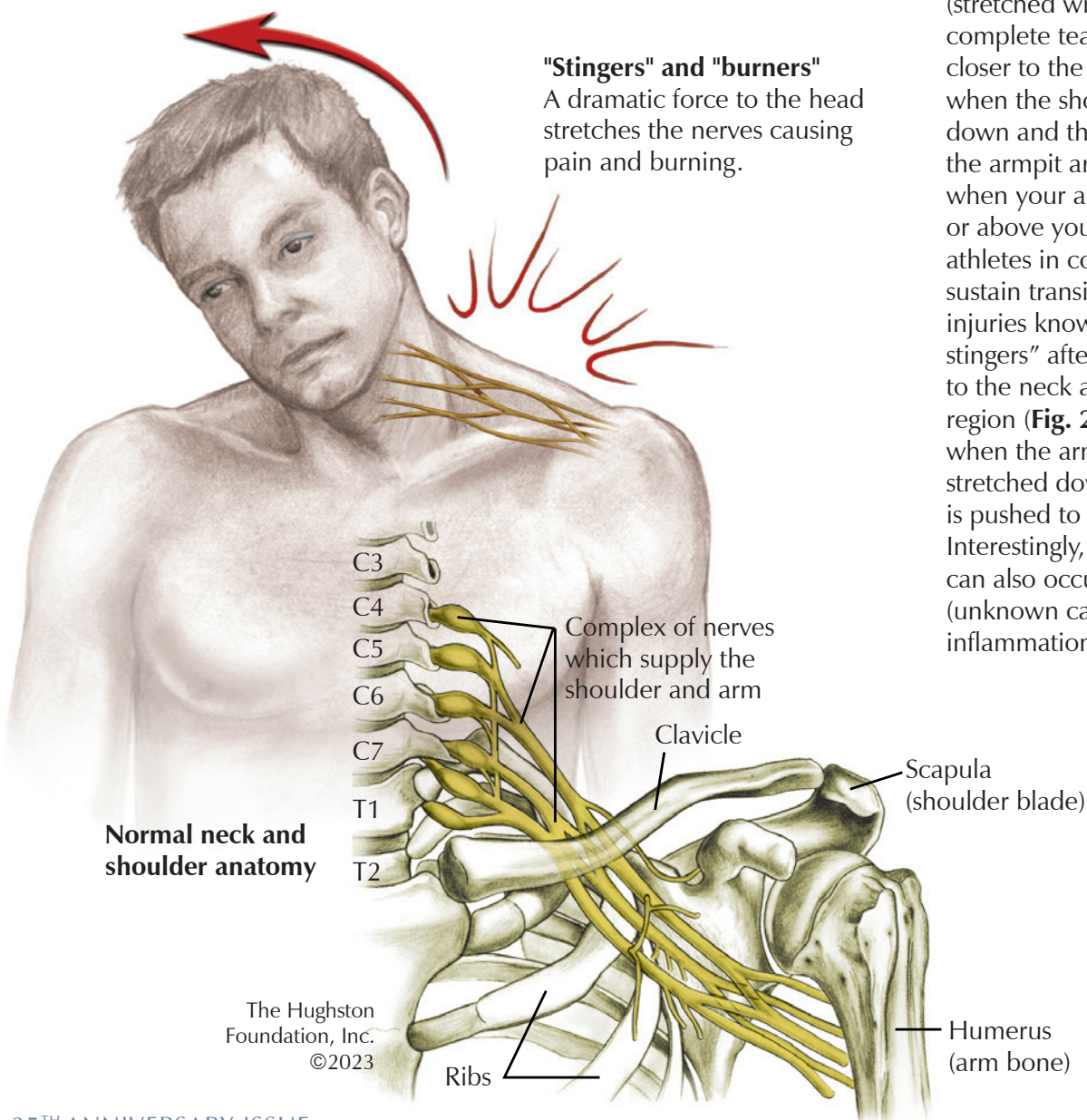


Fig. 2. Tackle that could result in a nerve injury



Symptoms

For most brachial plexus injuries, only one side is usually affected and depending on the severity and location, the signs and symptoms vary. For example, the minor damage caused by a burner or stinger can produce an electric shock or burning sensation shooting down the arm and numbness and weakness in the limb. The symptoms can last a few seconds or they can last for days. Traumatic brachial plexus injuries can present with partial or complete motor and sensory paralysis of the arm, shooting pains in the affected arm, and an inability to use all or selected muscles on the affected side. These injuries can be transient and slowly resolve over time or can persist for longer periods leading to permanent damage. If you experience a serious injury, such as an avulsion, you may become unable to use certain muscles in your shoulder, arm, or hand. You may experience severe pain or lose feeling and the ability to move the limb. Acute injuries to the brachial plexus often warrant close follow-up with a medical professional.

You should seek medical advice and treatment if a brachial plexus injury is suspected, especially when symptoms persist without improvement. Additionally, you should see a doctor if you have recurrent burners and stingers, weakness in your hand or arm, or experience neck pain.

Screening and diagnosis

A thorough health history and physical exam are of paramount importance in screening patients for potential brachial plexus injuries. Your physician may first order

chest, spine, or shoulder x-rays to rule out a fracture or dislocation that can cause entrapment (compression of the nerve) of the brachial plexus. Performing a computerized tomography with myelography (a CT scan using dye) a few weeks after the initial injury is the current gold standard to identify the nerve injury level. Other imaging modalities that can be useful include magnetic resonance imaging (MRI), electromyography (EMG), nerve conduction velocity (NCV), and other nerve studies based on the discretion of the healthcare provider. If your physician suspects an infectious cause, he or she will include laboratory work in the screening process.

Treatment

The mainstay treatment for brachial plexus injuries remains nonsurgical management with close observation for symptom resolution. The physician conducts frequent and thorough exams over the first 3 to 6 months and performs additional testing as needed to evaluate the recovery. Partial brachial plexus injuries with a halt in neurologic resolution can require surgery. If your physician suspects an inflammatory process, a course of pain control, physical therapy, and oral corticosteroids may be necessary.

Patients with open injuries, progressive neurologic deficits, and penetrating injuries such as gunshot wounds, often require immediate surgical treatment. For patients with a total plexus injury, surgery will likely take place around 4 to 6 weeks after the initial injury.

New advances in nerve surgery are helping to restore movement and function in the shoulder, elbow, and hand, which once was impossible. There are many surgical techniques available depending on the specific injury encountered. Some of these include direct nerve repair, nerve grafting, nerve transfers, muscle or tendon (tissue connecting muscle to bone) transfers, osteotomies (bone surgery), and arthrodesis (fusion of a joint). Reconstruction procedures can take up to 3 years before full recovery occurs, especially since nerve regeneration occurs at a slow rate of approximately 1 mm/day. When comparing injuries of the upper (C5, C6) and lower (C8, T1) brachial plexus, the upper plexus tend to have better outcomes as hand function remains preserved.

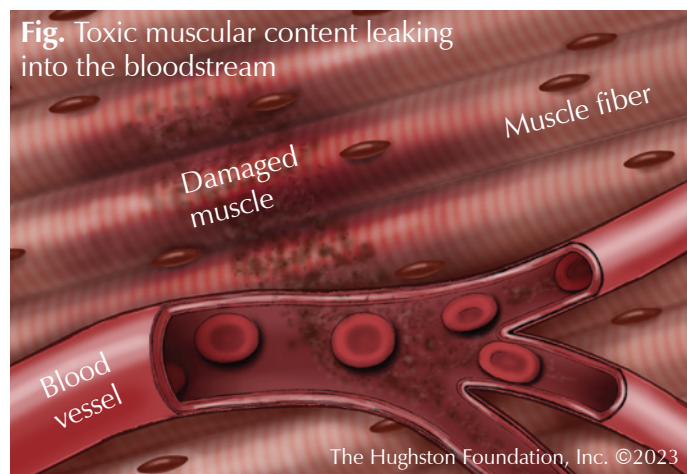
Be patient

Nerves heal and regenerate slowly, so you must be patient. Your doctor may prescribe a rehabilitation program to follow to keep your muscles strong and healthy while the nerve heals. Outcomes after sustaining brachial plexus injuries are dependent on the extent and level of your injury. However, given enough time, many brachial plexus injuries heal without lasting damage.

*Devin W. Collins, DO
Columbus, Georgia*

Rhabdomyolysis

Physicians first described rhabdomyolysis in the medical literature during ancient times; however, in our modern era, a notable number of cases were reported during World War I and II in soldiers who sustained crush injuries from bombings and trench collapses. Rhabdomyolysis is a condition that results when damaged muscles release toxic muscular contents (fluids) into the bloodstream. In healthy skeletal muscle, each muscle fiber is enclosed in a thin membrane that controls a number of pumps that regulate and maintain the electrolyte concentration inside and outside the cell. Electrolytes are minerals—the 4 basic are magnesium, calcium, sodium, and potassium—in your blood and other body fluids that carry an electric charge. The proper balance of electrolytes and other nutrients provided by normal blood flow allow muscles to contract and relax in response to nerve stimulation. Any direct or indirect injury to the membrane can cause damage and the breakdown of muscle cells, resulting in toxic muscular contents to leak into the body's circulation (**Fig**).



What causes rhabdomyolysis to occur?

You can develop rhabdomyolysis from muscle damage in a number of ways, but the most common causes are trauma that leads to muscle compression and crush-type injuries, muscle overexertion from excessive exercise, and the abuse or overuse of drugs, alcohol, and certain medications (**Table**). Regardless of the cause, the results of a muscle injury can cause a cascade of events that leads to the release of toxic muscle byproducts into the bloodstream that not only affects your muscles, but also your organs and the rest of the body. In a crush injury—for example when a patient is trapped in a car or collapsed building—muscle dies when the blood flow is cutoff. When the compression is relieved, fluids from the damaged muscle are released into the bloodstream.

Additionally, excessive or intense exercise beyond the extent of a person's physical limits can cause exercise-induced rhabdomyolysis. The primary factors that tend to worsen this condition include the level of physical fitness, the intensity, and types of exercise. Exercise-induced rhabdomyolysis tends to occur in individuals who are poorly conditioned, during long durations of exercise, in high humidity and temperatures, and during excessive exercise while

Table. Causes of Rhabdomyolysis

Physical Factors

- Trauma
- Exertional
 - Overexertion in untrained athletes
 - People with sickle cell disease
- Muscle compression
 - Crush injuries
 - Tight dressings, splints, and casts
 - Tourniquets
- Third degree burns
- Immobilization
- Electrocutions
- Ischemic limb

Drugs

- Alcohol
- Recreational drugs
 - Cocaine
 - Amphetamines
 - CNS depressants
 - Ecstasy
 - LSD
- Anesthetics
- Medications
 - Statins
 - Cyclosporine
 - Itraconazole
 - Erythromycin
 - Colchicine
 - Zidovudine
 - Corticosteroids

Infections

- Viral, bacterial, or fungal

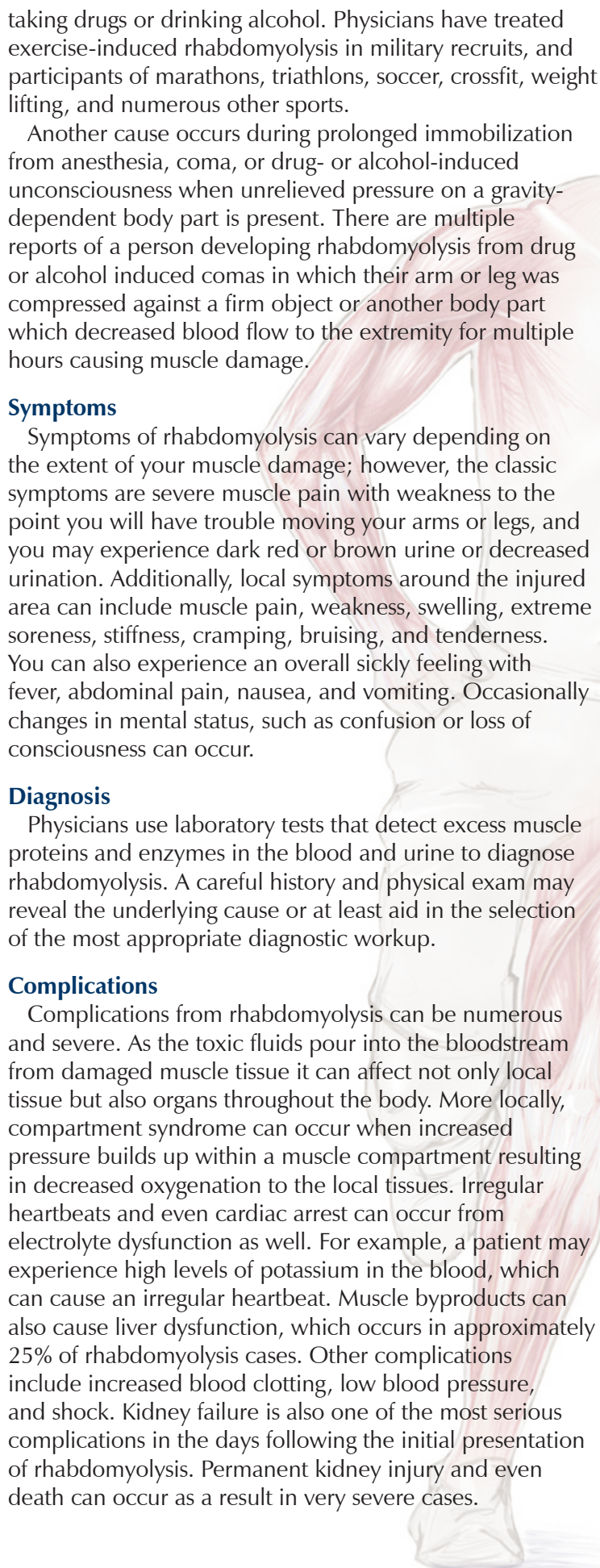
Metabolic and Endocrine Causes

- Diabetic ketoacidosis
- Electrolyte abnormalities
- Hypothyroidism
- Thyrotoxicosis

Other

- Neuroleptic malignant syndrome
- Malignant hyperthermia
- Polymyositis
- Dermatomyositis
- Hypothermia
- Snake bites
- Heatstroke
- Multiple genetic causes

The Hughston Foundation, Inc. ©2023



taking drugs or drinking alcohol. Physicians have treated exercise-induced rhabdomyolysis in military recruits, and participants of marathons, triathlons, soccer, crossfit, weight lifting, and numerous other sports.

Another cause occurs during prolonged immobilization from anesthesia, coma, or drug- or alcohol-induced unconsciousness when unrelieved pressure on a gravity-dependent body part is present. There are multiple reports of a person developing rhabdomyolysis from drug or alcohol induced comas in which their arm or leg was compressed against a firm object or another body part which decreased blood flow to the extremity for multiple hours causing muscle damage.

Symptoms

Symptoms of rhabdomyolysis can vary depending on the extent of your muscle damage; however, the classic symptoms are severe muscle pain with weakness to the point you will have trouble moving your arms or legs, and you may experience dark red or brown urine or decreased urination. Additionally, local symptoms around the injured area can include muscle pain, weakness, swelling, extreme soreness, stiffness, cramping, bruising, and tenderness. You can also experience an overall sickly feeling with fever, abdominal pain, nausea, and vomiting. Occasionally changes in mental status, such as confusion or loss of consciousness can occur.

Diagnosis

Physicians use laboratory tests that detect excess muscle proteins and enzymes in the blood and urine to diagnose rhabdomyolysis. A careful history and physical exam may reveal the underlying cause or at least aid in the selection of the most appropriate diagnostic workup.

Complications

Complications from rhabdomyolysis can be numerous and severe. As the toxic fluids pour into the bloodstream from damaged muscle tissue it can affect not only local tissue but also organs throughout the body. More locally, compartment syndrome can occur when increased pressure builds up within a muscle compartment resulting in decreased oxygenation to the local tissues. Irregular heartbeats and even cardiac arrest can occur from electrolyte dysfunction as well. For example, a patient may experience high levels of potassium in the blood, which can cause an irregular heartbeat. Muscle byproducts can also cause liver dysfunction, which occurs in approximately 25% of rhabdomyolysis cases. Other complications include increased blood clotting, low blood pressure, and shock. Kidney failure is also one of the most serious complications in the days following the initial presentation of rhabdomyolysis. Permanent kidney injury and even death can occur as a result in very severe cases.

Treatment

After muscle damage has occurred, the main treatment of rhabdomyolysis includes aggressive fluid resuscitation (IV fluids) to avoid kidney injuries. Once in a hospital setting, aggressive fluid resuscitation will continue along with a careful history and physical exam to identify and manage any complications. Management of complications can include cardiac monitoring, medications to correct electrolyte imbalances and irregular heartbeats, surgery to alleviate elevated pressures in an extremity, physical therapy, close monitoring of kidney function, and use of dialysis in severe cases of kidney injury.

Recovery

Recovery from rhabdomyolysis varies and depends on the degree of muscle damage and the specific complications that occurred. If the condition is recognized and treated early, you can avoid most major complications and expect a full recovery. Recovery from exercise-induced rhabdomyolysis, with no major complications, can take several weeks to months for the patient to return to exercise without recurrence of symptoms. More severe complications, such as those often seen in compartment syndrome, can result in multiple operations, months of rehabilitation, and permanent disability. Additionally, the kidney dysfunction that results from rhabdomyolysis often resolves, however, if you experience severe kidney injury it can result in permanent damage and a need for long-term treatments, perhaps even dialysis.

Prevention

Prevention is geared toward avoiding what causes rhabdomyolysis; but you can only avoid what you have control over. You cannot always prevent an accident or injury; however, you do have control over exercise-induced rhabdomyolysis. Exercise-induced rhabdomyolysis can be prevented by initiating a gradual training program with sufficient recovery time included, avoiding extreme exercises, preserving fluid balance, and not exercising in high heat and humidity.

A rare condition

Luckily, rhabdomyolysis is a rare condition, especially since it can have serious and long-lasting complications. While you cannot always avoid an injury, patients can steer clear of the complications by minimizing the risk factors that they can control. If a crush injury occurs or if you experience the symptoms of rhabdomyolysis, the best results will come if a physician promptly identifies and treats the condition.

*David Barnes, DO
Columbus, Georgia*



Hughston Health Alert

The Hughston Foundation, Inc.
6262 Veterans Parkway P.O. Box 9517
Columbus, Georgia 31908-9517



NONPROFIT ORG
US POSTAGE
PAID
COLUMBUS GA
PERMIT NO 99

Did you benefit from this Free Hughston Health Alert? Your gift makes a difference to support this Award-Winning Patient Education Newsletter

Please send in your tax-deductible donation to
The Hughston Foundation, P.O. Box 9517, Columbus, GA 31908
or visit: <https://hughston.com/hughston-foundation/>

YOUR CONTRIBUTION SUPPORTS

- Hughston Foundation's mission of providing reliable medical information in digital and print versions of *The Hughston Health Alert*.
- Strengthening our community by supplying issues to the YMCA, fitness centers, the Girls Club, and Girls Inc.
- Providing training materials at meetings for healthcare professionals, such as occupational health nurses, and future healthcare providers.
- Materials distributed at sporting events, such as the Georgia High School Soccer Association Championship, and Safe Kids programs to educate the public about safety concerns for our youth.

The *Hughston Health Alert* is a quarterly publication of the Hughston Foundation, Inc. The Foundation's mission is to help people of all ages attain the highest possible levels of musculoskeletal health, fitness, and athletic prowess. The content of the *Hughston Health Alert*, including text, graphics, images, and all other material considered "content," is published for educational purposes only. It is not intended to be a substitute for professional medical advice, diagnosis, or treatment. Always consult your physician or other qualified healthcare provider about any questions or concerns you may have regarding a medical condition. You should never delay seeking professional medical advice, disregard medical advice, or change or discontinue medical treatment based on information found in the *Hughston Health Alert* or on the Hughston website. Moreover, the *Hughston Health Alert* does not recommend or endorse any specific physicians, products, tests, procedures, or opinions mentioned therein. Reliance on any information published in the newsletter or appearing on the website is solely at your own risk.

Special written permission is required to reproduce, by any manner, in whole or in part, the material herein contained.

Send inquiries to Medical Writing, The Hughston Foundation, Inc.,
P.O. Box 9517, 6262 Veterans Parkway, Columbus GA 31908-9517 USA.

Copyright 2023, The Hughston Foundation, Inc.

ISSN# 1070-7778

Editor - Garland K. Gudger, Jr., MD

Managing Editor - Dennise Brogdon

Associate Editors - Benjamin Catoe, DO

Art Director - Belinda J. Klein, MA

Editorial Board

Mark A. Baker, PT, CEO
William C. Etchison, MS
Andy J. Grubbs, Jr., MEd, ATC
Rob Hopkins, PT, SCS
William Kuerzi, PT; Cert. DN
Cholly P. Minton



4401 River Chase Drive
Phenix City, AL 36867
Phone: 334-732-3000
Fax: 334-732-3020



6262 Veterans Parkway
PO Box 9517
Columbus GA 31908-9517

Appointments:
706-324-6661
1-800-331-2910

