CONDITION

Crush injury

A crush injury is damage caused when part of the body is squeezed by heavy or prolonged pressure.

WHAT IT IS
Pressure-related damage to muscles, nerves, blood vessels, or bones

BODY SYSTEM
Muscles, bones, nerves, kidneys, and circulation

MAIN SYMPTOMS
Pain, swelling, bruising, numbness or weakness

WHAT CAUSES IT
Heavy pressure, entrapment, or forceful compression

HOW IT IS DIAGNOSED
Examination, blood and urine tests, imaging, sometimes pressure measurement

MAIN TREATMENT
Emergency care, fluids, wound care, and sometimes surgery

CAN IT BE CURED?
Sometimes - mild injuries heal, but severe damage may persist

IS IT AN EMERGENCY?
Sometimes - severe pain, poor circulation, or whole-body effects

LONG-TERM OUTLOOK
Mild injuries heal; severe injuries may cause lasting disability

Overview

A crush injury happens when strong pressure squeezes part of the body. The pressure can damage skin, muscles, nerves, blood vessels, and bones. An injury may be limited to one area, such as a hand or foot, or may involve a large part of the body.

Crush injuries can range from bruising to major tissue damage. There does not have to be an open wound or broken bone. Damage may continue after the pressure is removed because swelling can reduce blood flow inside the affected area.

Severe or prolonged compression can cause muscle cells to break down. This is called rhabdomyolysis . Damaged muscle releases substances into the blood, including a protein called myoglobin and the mineral potassium. These can harm the kidneys or disturb the heart's rhythm.

When a crush injury causes serious effects throughout the body, it is called crush syndrome . This is an emergency, particularly after prolonged entrapment or damage to a large amount of muscle.

Symptoms

Symptoms depend on the force, the body area involved, and how long it was compressed. They may begin immediately or become more noticeable as swelling develops.

Possible symptoms include:

Severe pain that keeps increasing, especially with tight swelling, may suggest acute compartment syndrome . This happens when pressure builds inside a closed group of muscles. It can reduce blood flow and damage muscles and nerves. The skin may still look fairly normal, and a pulse may still be present.

Signs that the injury is affecting the whole body can include weakness, nausea, confusion, a fast or irregular heartbeat, reduced urine, or dark brown urine. Dark urine can occur when myoglobin from damaged muscle reaches the kidneys, although it can have other causes.

- Pain, tenderness, swelling, or bruising
- Cuts, blisters, or damaged skin
- Difficulty moving the affected part
- Numbness, tingling, or weakness
- A pale, cool, or unusually tense limb
- A visibly bent limb or other sign of a fracture

Causes and risk factors

Crush injuries are commonly associated with:

The chance of serious complications is greater when the pressure lasts a long time, a large muscle area is involved, or treatment is delayed. Injuries involving the thighs, pelvis, or several limbs can release more material from damaged muscle than a small, local injury.

Dehydration, blood loss, and low blood pressure can place additional strain on the kidneys. Existing kidney or heart problems may also make the effects of muscle breakdown harder for the body to manage.

- Road or railway collisions
- Industrial, farming, or construction incidents
- Building collapse or natural disasters
- A heavy object falling onto the body
- A limb becoming trapped in machinery
- Prolonged pressure on a body part when someone cannot move

Diagnosis

A healthcare team first checks breathing, circulation, major bleeding, and other injuries. They will ask how the injury happened, which areas were compressed, and how long the pressure lasted.

The affected area is examined for swelling, wounds, tenderness, movement, sensation, and blood flow. These checks may be repeated because swelling and circulation problems can develop over time.

X-rays can show fractures. CT scans or other imaging may be used when there could be deeper injuries, internal bleeding, or damage to several body areas. A normal X-ray does not rule out injury to muscles, nerves, or blood vessels.

Blood tests may measure:

Urine output and appearance may also be monitored. Urine testing can support a diagnosis of muscle breakdown, but no single urine result confirms or excludes it.

Acute compartment syndrome is often diagnosed from the symptoms and repeated examination. If the diagnosis is uncertain, a clinician may measure pressure inside the muscle compartment with a special device. Testing should not delay urgent treatment when the signs are clear.

- Creatine kinase, an enzyme released by damaged muscle
- Potassium and other minerals
- Kidney function
- Blood acidity and signs of blood loss

Treatment and management

A significant crush injury needs prompt medical assessment. If someone is trapped under a heavy object, call emergency services and follow the dispatcher's instructions. Do not put yourself in danger or attempt a difficult rescue without the right equipment. Releasing prolonged compression can lead to sudden changes in circulation, so coordinated rescue and medical care may be needed.

While waiting for help, major external bleeding can be managed with firm direct pressure. A tourniquet may be used for life-threatening bleeding from a limb when advised by an emergency dispatcher or when the person helping has been trained. Keep the injured person warm and as still as possible. Do not give food or drink because an operation or anaesthetic may be needed.

Hospital treatment is matched to the injuries found. It may include:

Acute compartment syndrome usually requires an emergency operation called a fasciotomy . The surgeon opens the firm tissue around the swollen muscles to release pressure and restore blood flow. The wound may need to remain open temporarily and be closed during another operation.

Some people need more than one procedure, skin grafting, or reconstructive surgery. If tissue has been damaged beyond recovery or infection threatens health, amputation may be necessary. This is not required for most minor crush injuries.

Severe kidney injury may require dialysis, which temporarily filters waste and excess minerals from the blood. Dialysis is not automatically needed whenever muscle breakdown occurs.

- Intravenous fluids to support circulation and protect kidney function
- Heart monitoring and repeated blood tests
- Treatment for dangerous potassium or acid levels
- Pain relief and support for injured limbs
- Cleaning and removal of badly damaged tissue
- Treatment of fractures, wounds, or damaged blood vessels
- Tetanus protection and, for some open or contaminated wounds, antibiotics like amoxicillin or doxycycline

Complications

Complications may affect the injured area or the whole body. They include:

Serious injuries and rescue events can also affect emotional health. Sleep problems, anxiety,

low mood, or distressing memories may occur. Psychological support can be included in rehabilitation.

- Acute compartment syndrome
- Rhabdomyolysis and crush syndrome
- Kidney injury
- High blood potassium and abnormal heart rhythms
- Infection, especially with open or contaminated wounds
- Permanent muscle weakness or nerve damage
- Poor fracture or wound healing
- Scarring, stiffness, and long-term pain

Prevention

Not every crush injury can be prevented, especially during collisions, disasters, or sudden equipment failures.

Workplace risks can be reduced through machinery guards, lockout procedures, stable lifting systems, protective equipment, and training for heavy loads. Vehicles, jacks, and raised equipment should be properly supported before anyone works beneath them.

At home, secure heavy furniture and appliances where tipping is possible. Keep children away from moving machinery and heavy doors. During emergencies, follow evacuation and rescue instructions rather than entering an unstable building or moving heavy debris without support.

Living with it and what to expect

Recovery is shaped by the depth of tissue damage, the body area involved, and whether nerves, blood vessels, bones, or kidneys were affected.

A mild soft-tissue injury may improve over days to weeks. More severe injuries can require months of wound care, surgery, and rehabilitation. Swelling, stiffness, weakness, altered sensation, and fatigue may continue after the initial injury has healed.

Physiotherapy can help restore movement, strength, and balance. Occupational therapy may help with daily tasks, work, equipment, or changes to the home. If a limb was amputated, rehabilitation may include care of the remaining limb, mobility training, and assessment for a prosthesis.

Nerves recover slowly and do not always recover fully. Some people are left with numbness, weakness, chronic pain, or reduced movement. Others return to most or all of their previous activities. It may take time to know the final level of recovery.

Kidney function often improves when the cause is treated promptly, but severe injury can require follow-up blood tests or specialist kidney care. Planned appointments may also check wounds, circulation, bone healing, movement, and pain.

Return to driving, work, sport, and heavy lifting should be gradual and based on healing and function rather than time alone.

When to get medical help

Call emergency services after major compression, prolonged entrapment, a building or machinery incident, or a high-force collision.

Emergency help is also needed for:

Do not wait for all these signs to appear. Compartment syndrome and crush syndrome can develop while the skin still looks relatively normal.

Seek prompt same-day advice for spreading redness, increasing warmth, pus, fever, worsening swelling, or pain that begins to increase after improving. These may indicate infection or another complication.

Routine follow-up is important for wound checks, dressing changes, fracture care, rehabilitation, and monitoring of kidney function or sensation. Bring forward a planned review if recovery stalls or movement, swelling, numbness, or pain is getting worse.

- Heavy bleeding that does not stop with firm pressure
- Severe or rapidly increasing pain
- A tense, rapidly swelling limb
- New numbness, weakness, or inability to move
- Pale, blue, or cold skin below the injury
- Trouble breathing, fainting, confusion, or collapse
- A fast or irregular heartbeat after a significant crush injury
- Dark brown urine or very little urine after major muscle injury

Common questions

Can I have a crush injury without breaking a bone?

Yes. Strong pressure can injure muscles, nerves, and blood vessels without causing a fracture. Significant pain, swelling, weakness, or numbness still needs assessment.

What is the difference between a crush injury and crush syndrome?

A crush injury is the local damage caused by pressure. Crush syndrome is a severe whole-body response to muscle breakdown. It can affect the kidneys, heart rhythm, and circulation.

Why can urine turn dark after a crush injury?

Damaged muscle can release myoglobin, which may make urine look red-brown or tea-coloured and can harm the kidneys. Blood, dehydration, and other conditions can also darken urine. After a significant crush injury, dark urine needs urgent assessment.

Can I walk on a crushed leg or foot?

Do not put weight on a significantly injured limb until it has been assessed. Walking could worsen a fracture or tissue injury. A healthcare team can advise when weight-bearing is safe.

Will I need an operation?

Many minor injuries do not need surgery. Surgery may be needed for compartment syndrome, open wounds, fractures, damaged blood vessels, dead tissue, or injuries requiring reconstruction.

How long does recovery take?

Bruising and minor muscle injury may settle within weeks. Deep tissue damage, fractures, nerve injuries, or surgery can extend recovery over many months. Some severe injuries cause lasting changes in strength, sensation, or movement.

Sources

- National Institute for Health and Care Excellence. Major trauma: assessment and initial management . NICE guideline NG39, 2016
- National Institute for Health and Care Excellence. Fractures (complex): assessment and management . NICE guideline NG37, 2016
- Sever MS, Vanholder R. Recommendations for the management of crush victims in mass disasters . Nephrology Dialysis Transplantation, 2012;27 Supplement 1:i1-i67



- Bosch X, Poch E, Grau JM. Rhabdomyolysis and acute kidney injury . New England Journal of Medicine, 2009;361:62-72
- Via AG, Oliva F, Spoliti M, Maffulli N. Acute compartment syndrome . Muscles, Ligaments and Tendons Journal, 2015;5(1):18-22
- World Health Organization and International Committee of the Red Cross. Management of limb injuries during disasters and conflicts . 2016