CONDITION

Volkmann contracture

Volkmann contracture is a lasting hand and wrist deformity caused by severe loss of blood flow to forearm muscles and nerves.

WHAT IT IS
Permanent hand deformity from forearm muscle damage

BODY SYSTEM
Muscles, nerves, and joints of the arm and hand

MAIN SYMPTOMS
Bent fingers, stiff wrist, weakness, numbness

WHAT CAUSES IT
Interrupted blood flow, usually during acute compartment syndrome

HOW IT IS DIAGNOSED
Physical examination, supported by imaging and nerve tests

MAIN TREATMENT
Hand therapy and reconstructive surgery

CAN IT BE CURED?
No - established muscle damage is permanent

IS IT AN EMERGENCY?
Sometimes - new severe pain and swelling after injury

LONG-TERM OUTLOOK
Function may improve, but lasting stiffness is common

Overview

Volkmann contracture, also called Volkmann ischemic contracture, is a lasting deformity of the hand, wrist, and sometimes the elbow. It develops after muscles and nerves in the forearm have been badly damaged by a lack of blood flow.

The usual starting point is acute compartment syndrome . Muscles are grouped inside firm layers of tissue called compartments. If bleeding or swelling raises the pressure inside a compartment, blood cannot reach the tissues properly. Without urgent treatment, muscle and nerve tissue may die.

As the damaged muscle heals, it is replaced by shortened, firm scar tissue. This pulls the wrist and fingers into a bent position and reduces strength and movement. The condition is named after Richard von Volkmann, who described this pattern of injury.

Volkmann contracture is not an active infection or an ongoing circulation disorder. It is the long-term result of an earlier injury to the tissues. An established contracture is usually not an emergency, but the acute compartment syndrome that can cause it is an emergency.

Symptoms

The appearance and loss of function depend on which forearm muscles and nerves were injured. One arm is usually affected.

Common features include:

In a milder contracture, the fingers may straighten more easily when the wrist is bent. When the wrist is brought back, the fingers tighten again. This happens because scarred finger-flexing muscles have become too short.

More extensive damage can affect most of the forearm muscles. The wrist and fingers may then be fixed in a strongly bent position. Injury to the median and ulnar nerves, which supply feeling and movement in much of the hand, can cause marked weakness and numbness.

Pain is not always present once the contracture is established. Some people have aching, nerve pain, tender scars, or pain from stiff joints. Reduced feeling can make it harder to notice pressure, cuts, burns, or skin irritation.

- Fingers that remain bent or are difficult to straighten
- A wrist held in a bent position
- Weak grip or difficulty releasing objects
- Numbness, tingling, or reduced feeling in the hand
- A thin or wasted-looking forearm
- Stiffness of the finger, wrist, or elbow joints

Causes and risk factors

Volkmann contracture is caused by severe and prolonged loss of blood flow to forearm muscles and nerves. Most cases follow acute compartment syndrome that was not relieved soon enough.

In children, compartment syndrome may occur after a fracture just above the elbow, known as a supracondylar humerus fracture. Forearm fractures can also cause it. In adults, possible causes include fractures, crush injuries, major bleeding, burns, or damage to an artery.

Pressure can also rise beneath a cast, splint, bandage, or dressing that has become too tight as the arm swells. Less commonly, medicines or fluids leaking from an intravenous line into nearby tissue can contribute to dangerous swelling.

A fracture does not mean that Volkmann contracture will develop. The risk is linked to the severity and duration of reduced blood flow, the amount of tissue involved, and how quickly compartment pressure is relieved.

Conditions that increase bleeding may raise the risk of compartment syndrome after an injury. However, Volkmann contracture itself is not inherited and cannot spread from one person to another.

Diagnosis

Volkmann contracture is mainly diagnosed through the history of the injury and a physical examination. A hand or orthopaedic specialist will look at the resting position of the wrist and fingers, scars, muscle bulk, joint movement, strength, feeling, and circulation.

The examination may compare finger movement with the wrist bent and straight. It also helps determine whether stiffness comes from shortened muscle, fixed joints, damaged tendons, nerve injury, or a combination of these problems.

Tests may be used to map the damage and plan treatment:

There is no blood test that confirms Volkmann contracture. Other causes of a bent or weak hand may need to be ruled out, especially when there is no clear history of trauma or compartment syndrome.

- X-rays can show old fractures, bone alignment, and joint changes
- MRI or ultrasound can show scarred or lost muscle tissue
- Nerve conduction studies and electromyography can assess nerve and muscle function
- Blood-flow tests may be used if there are concerns about circulation

Treatment and management

Treatment is different during the initial injury and after a contracture has formed.

Acute compartment syndrome needs emergency treatment. Tight casts or dressings may need to be removed, and an operation called a fasciotomy may be required. During this procedure, the surgeon opens the firm tissue around the muscles to relieve pressure.

Fractures, damaged arteries, and injured tissue are treated at the same time.

Once Volkmann contracture is established, dead muscle cannot be restored. Treatment instead aims to improve the position and useful function of the hand, protect feeling and skin, and reduce pain.

Hand therapy may include carefully planned stretching, movement exercises, strengthening, and splints. Therapy can help maintain joint flexibility and make the best use of muscles that still work. It cannot replace muscle that has been destroyed. Forceful stretching without professional guidance may injure stiff joints or numb skin.

Surgery may be considered when the contracture interferes with daily activities. The operation chosen depends on the amount of muscle and nerve damage, whether the joints remain flexible, and which muscles are still working.

Possible procedures include:

Severe cases may need more than one operation. Surgery often improves hand position or selected movements, but it may not restore normal strength, feeling, or dexterity. Rehabilitation afterward is an important part of treatment and may continue for months.

Pain management may include rehabilitation, medicines used for nerve pain, and practical ways to reduce strain. Treatment choices are made around the movements and daily tasks that matter most to you.

- Lengthening shortened tendons
- Releasing scarred tissue
- Sliding surviving muscle to give it more reach
- Transferring a working tendon to replace a lost movement
- Repairing or reconstructing damaged nerves
- Moving a functioning muscle from another part of the body
- Correcting a fixed joint or bone position

Complications

Volkmann contracture can cause permanent weakness, stiffness, and loss of fine hand control. Tasks such as dressing, writing, preparing food, using tools, or opening the hand around an object may be difficult.

Nerve damage may leave areas of reduced feeling. This increases the risk of unnoticed burns, cuts, pressure injuries, and skin infection. Fixed joints may become painful, and overusing the

opposite arm can cause additional discomfort.

In children, damage may affect the growth of bones and soft tissues. The difference between the arms or the degree of contracture may become more noticeable during growth.

Operations carry risks such as infection, scarring, stiffness, incomplete improvement, or further nerve and blood-vessel injury. A specialist can explain how these risks relate to the planned procedure.

Prevention

The accident or fracture that starts the process cannot always be prevented. Volkmann contracture can sometimes be prevented by recognising and treating acute compartment syndrome before permanent muscle damage occurs.

After an arm injury, cast, or operation, follow the instructions given for elevation, movement, and cast care. Do not place objects inside a cast or alter it yourself. Report a cast that feels increasingly tight, especially when pain or swelling is worsening.

Severe pain that continues to increase despite pain relief needs urgent assessment. A hand can still have a pulse during compartment syndrome, so a normal-feeling pulse does not rule it out.

Once muscle death and scarring have occurred, exercises cannot prevent the contracture from forming. Early specialist care may still limit joint stiffness and preserve remaining function.

Living with it and what to expect

An established Volkmann contracture does not usually disappear on its own. Scarred muscle generally remains shortened. Over time, joints can become stiffer if they are held in one position, although the original tissue injury is not normally continuing.

In children, growth can change the appearance and effect of the contracture. A hand that functioned reasonably well at one age may need reassessment as the bones lengthen and daily activities become more demanding.

Hand therapy, splints, adaptive equipment, and changes to how tasks are done can support independence. Protecting numb skin is important. Check it for redness, blisters, cuts, or burns, particularly after cooking, using tools, or wearing a splint.

After reconstructive surgery, improvement is usually gradual. Swelling, splinting, therapy, and

retraining transferred muscles can continue for months. Some people need staged procedures. The final result is influenced by the original damage, joint flexibility, nerve function, and the goals of treatment.

Many people develop practical ways to work, study, exercise, and manage personal care. Some continue to have limits in grip strength, sensation, or precise finger movement. Occupational therapy can help match equipment and task changes to your home, school, or workplace.

When to get medical help

Seek emergency care after an injury, operation, or cast placement if there is:

These can be signs of acute compartment syndrome or a serious circulation problem. Do not wait for every symptom to appear or for a pulse to disappear.

If you already have a long-standing contracture, arrange routine medical follow-up if movement is becoming more limited, pain is increasing, a splint no longer fits, or the condition is interfering more with daily activities.

Seek prompt assessment for a new wound, spreading redness, drainage, or swelling, particularly in an area with reduced feeling. Sudden new weakness, severe pain, or loss of circulation is not routine and needs urgent care.

- Severe or rapidly increasing pain, especially pain that seems greater than expected
- Marked pain when the fingers are gently moved or stretched
- Increasingly tense swelling or a cast that feels much tighter
- New numbness, tingling, weakness, or inability to move the fingers
- A hand that becomes unusually pale, cold, or blue

Common questions

Is Volkmann contracture the same as compartment syndrome?

No. Acute compartment syndrome is the pressure emergency that can damage muscles and nerves. Volkmann contracture is a possible long-term result after that damage has occurred.

Can my fingers be straightened?

It may be possible to improve their position. The result depends on whether the shortening is mainly in the muscles and tendons or whether the joints have also become fixed. Therapy, splints, or surgery may be used, but normal movement cannot be guaranteed.

Can physiotherapy cure Volkmann contracture?

Therapy cannot bring dead muscle back to life or remove established scar tissue. It can preserve joint movement, strengthen working muscles, support splint use, and improve recovery after surgery.

Does Volkmann contracture get worse with time?

The original muscle injury is usually not progressive. However, joints may become stiffer, and the imbalance can become more noticeable as a child grows. New pain, weakness, or rapid change should be assessed rather than assumed to be part of the condition.

Does surgery completely fix it?

Surgery may improve hand position, movement, grip, or the ability to perform selected tasks. Severe damage may require several procedures, and some weakness, numbness, or stiffness often remains.

Can Volkmann contracture affect children?

Yes. It is classically linked to serious fractures around the elbow in children, although it can occur at any age. Growth means children may need follow-up over several years.

Sources

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