



Joint, Muscle and Bone Problems Associated With Diabetes

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Introduction

- Joint and skeletal disorders, known as connective tissue disorders, have been recognised as complications of diabetes for some time.
- They tend to receive less attention than the other complications of diabetes and the progress of these conditions is often not monitored.
- They are not life-threatening but they can be distressing and painful conditions that may alter the lifestyles for many people.
- Osteoporosis is a common problem and in the UK, one in two women and one in 5 men over 50 will break a bone. Research has shown that there may be links between osteoporosis and Type 1 and Type 2 diabetes.

Connective tissue disorders

Connective tissue is the material between the cells of the body that gives tissues form and strength. It is also involved in delivering nutrients to the cells around the body. It is made up of dozens of proteins including collagens. These proteins vary in quantity to provide different structures with varying functions: bone, cartilage, tendons and ligaments as well as fatty and elastic tissues.

Many connective tissue disorders are caused by mutations (alterations) in genes for building tissues and these mutations may change the structure and development of skin, bones, joints, heart, blood vessels, lungs, eyes and ears. Some connective tissue disorders are not directly linked to these mutations but some people may be genetically predisposed to becoming affected. Inherited connective tissue disorders may not be evident at birth but may appear after a certain age or after exposure to a particular environmental stress.

Tests that your doctor may carry out

In connective tissue disorders there may be inflammation/infection present and/or there may be damage to muscles. There are two tests that the doctor may carry out:

- **ESR Test (erythrocyte sedimentation rate)** - this is the 'standard' blood test that GPs often carry out for many conditions to find out if there is any infection present in the body. A high result means that there is an infection and this can then be treated.
- **Creatine Kinase Test** - this is carried out to diagnose and monitor the progress of neuromuscular disorders. Creatine kinase (CK) is a protein found mainly in muscle and it is an enzyme that encourages a biochemical reaction to occur to provide a quick source of energy for the cells. If muscle is damaged, then during the muscle regeneration muscle cells break open and their contents go into the bloodstream. This means that the amount of CK in the blood will rise indicating that muscle damage has occurred and this can be caused by chronic disease or by acute muscle injury.

Myopathy

Myopathy is a general term used to describe any disease of muscles, such as the muscular dystrophies and myopathies associated with thyroid disease. It can be caused by endocrine disorders, including diabetes, metabolic disorders, infection or inflammation of the muscle, certain drugs and mutations in genes. In diabetes, myopathy is thought to be caused by neuropathy, a complication of diabetes. General symptoms of myopathies include muscle weakness of limbs sometimes occurring during exercise although in some cases the symptoms diminish as exercise increases. Depending on the type of myopathy, one muscle group may be more affected than others.

Treatment - this varies according to the type of myopathy but may include drug therapy such as immuno-suppressants, physiotherapy, bracing or surgery.

Chiroarthropathy (diabetic prayer)

This is often called limited joint mobility and in people with diabetes generally involves the small joints of the hands, although it can affect larger joints such as wrist, shoulder, knees and hips. It is usually painless but numbness and pain may be present if there is also neuropathy or angiopathy (blood vessel damage) of the hand. Most people do not report the problem until there is some deformity or loss of movement of the fingers. The affected fingers are swollen with a thick, tight and waxy skin and there is an inability to press both hands together hence the term, diabetic prayer.

Other disorders of the hand, such as carpal tunnel syndrome and Dupuytren's contracture, have different and distinct clinical features. Chiroarthropathy is linked with more serious microvascular complications of diabetes eg retinopathy, nephropathy and neuropathy, so diagnosis is important. The causes of chiroarthropathy are not really understood.

Treatment - because of the relationship with the microvascular complications of diabetes, improved diabetic control is advised but there is no well established treatment. Physiotherapy is important to maintain movement and prevent further deterioration. Surgery and corticosteroid injections may help in severe cases.

Prevalence:

- 4 -14% of the nondiabetic population
- 8.4 - 55% of people with Type 1 diabetes
- 4.2 -77% of people with Type 2 diabetes

Studies show a wide variation which could be due to genetic or racial factors or incorrect diagnosis. However, it does increase with the duration of diabetes

Frozen Shoulder (adhesive capsulitis)

An early sign of frozen shoulder is when it is difficult to lift the arm above the head, reach across the body or behind the back. This is followed by pain which is often worse at night. There are 3 different stages – freezing, frozen and thawing which last up to 24 months. The pain then reduces but the range of movement is more limited and may last from 5 to 24 months. In the final stage, the condition begins to resolve although surgery may be needed to restore movement. Despite this, some studies suggest it is a self-limiting condition and may last up to 3 years while others have shown that up to 40% of patients may have persistent symptoms and restriction of movement beyond 3 years.

The cause is unknown but thought to involve an underlying inflammatory problem. The capsule around the shoulder joint thickens and contracts leaving less space for the upper arm bone to move around. It can also occur after long periods of immobilisation eg after injury or surgery.

Treatment - drugs such as aspirin or ibuprofen to reduce the inflammation and pain, muscle relaxants, physiotherapy, exercises, heat or ice therapies, corticosteroid injections. Surgery is only carried out if there is no improvement after several months. Some people have reported a positive response from acupuncture.

Prevalence:

Frozen shoulder affects more women than men, usually starts between ages 40 and 65 and affects 10-20% of people with diabetes.

Trigger finger

This is a common condition which results in a bent finger, as if pulling a trigger on a gun. The finger may be swollen, stiff and painful and there may be a bump over the joint in the palm of the hand. It involves the tendons and pulleys in the hand that bend the finger. The tendons connect the muscles to the forearm with the bones of the finger and each tendon is covered by a sheath. As the fingers are bent, the tendons glide backwards and forwards guided by a restraining pulley. If the tendon sheath becomes inflamed it swells and may develop a nodule or thickening of the tendon. The nodule passes through the pulley as the finger bends but gets stuck as the finger straightens which causes further irritation and swelling until eventually the finger locks in this bent position. The exact cause is unknown.

Treatment - aims to reduce the swelling and cycle of irritation so initially treatment is rest, splinting of the finger and taking aspirin or ibuprofen to reduce the swelling and pain. If the problem persists a steroid injection in the tendon sheath can relieve the pain and locking for several months. People with diabetes may require surgery to release the tendon and this can restore movement immediately.

Prevalence:

It affects people over 40 and people with a history of diabetes or rheumatoid arthritis are particularly at risk of developing it.

Dupuytren's Contracture

This is a fairly common condition in the palm of the hand that can cause the fingers to contract. It occurs when the connective tissue under the skin in the palm of the hand begins to thicken and shorten and as the tissue tightens it may pull the fingers down towards the palm of the hand. The first sign is a nodule near the base of the little finger and the ring finger.

Gradually other nodules may appear across the first joint of the fingers, the skin puckers and the finger is pulled towards the palm. It usually affects the ring finger first followed by the little, the long and the index fingers, although there is evidence that in diabetes different fingers are affected.

The problem is not pain but the restriction of movement. Although again the cause is unknown, there is a genetic link because it affects people of northern European descent.

Treatment - the only treatment is surgery but this is usually only if the contracture has developed into a deformity. The outcome is usually good.

Prevalence:

It is seven times more common in men than women and usually does not show up until after 40 years of age. People with diabetes, alcoholics and those taking anticonvulsant drugs have a higher risk of Dupuytren's contracture.

Carpel Tunnel Syndrome

The carpal tunnel is a narrow, rigid passage of ligament and bones at the base of the hand that contains the median nerve (this runs from the forearm to the hand) and tendons. If there is thickening of irritated tendons or other swelling the tunnel narrows and the median nerve is compressed. The symptoms often start gradually at night during sleep with burning, tingling or itching in the palm of the hand and fingers, especially the thumb and first two fingers. This can progress to daytime pain, weakness or numbness in the hand and wrist that may extend up the arm.

It is thought to be a combination of factors that put pressure on the nerve and tendons, rather than a problem with the median nerve itself. The most likely cause is congenital with some people just having a narrower tunnel but other common factors are injury to the wrist that causes swelling, overactivity of the pituitary gland, rheumatoid arthritis, and fluid retention.

The cause may be genetic rather than repetitive hand use. However, research suggests that genetics do not provide the whole answer with age, genetics, obesity, diabetes, thyroid, various types of hormonal conditions, even pregnancy being predisposing factors. There are also external factors that will bring on the symptoms. In other words, people who use their hands continuously and laboriously don't get carpal tunnel more frequently.

Treatment - obviously underlying causes such as diabetes or arthritis should be looked at first but treatment generally is resting the affected hand for two weeks, avoidance of anything that may worsen the symptoms and if necessary applying a splint to immobilise the wrist. In more severe cases drugs, physiotherapy and/or surgery may be needed.

Prevalence:

Carpal tunnel problems affect three times as many women as men. People with diabetes or other metabolic disorders that can directly affect nerves are more susceptible to compression and have a higher risk of developing carpal tunnel problems.

Stiff Man's Syndrome (SMS) or Stiff Person's Syndrome

This is a rare slow progressive neurological disorder and the symptoms are painful contractions and spasms of voluntary muscles, particularly those of the back and upper legs. The spasms can be spontaneous or because of a trigger such as: loud noises, being touched, cold temperature or stress. Sleep usually suppresses the frequency of the contractions.

It is thought to be an autoimmune condition. Because SPS is rare and its symptoms overlap with more common conditions such as Parkinson's disease, patients can be misdiagnosed for years before finding their true diagnosis.

Treatment - the drug diazepam, a muscle relaxant, provides improvement in most cases, as do some other drugs. Physiotherapy may also be helpful in some people.

Prevalence:

This is difficult to estimate because doctors often think that the symptoms are psychological or due to depression. 50% of people with SMS also have Type 1 diabetes although the link between the two conditions has not been proved scientifically.

Diffuse idiopathic skeletal hyperostosis (DISH)

This is where there is calcification of the spinal ligaments and the most common part to be affected is the thoracic (chest) spine. It may also be accompanied by general calcification of other ligaments and tendons. The symptoms are stiffness of the neck and back with decreased movement but pain is not the most marked symptom. The cause is not known.

Treatment - there is no evidence that good diabetic control delays the onset or improves the condition. Treatment is physiotherapy, aspirin or ibuprofen.

Prevalence:

DISH is higher in people with diabetes than the general population, especially in people with Type 2 diabetes who are obese.

- Women who have early menopause, hysterectomy or oestrogen deficiency, especially at an early age.
- Men with low levels of testosterone.
- Older age.
- People who have broken a bone after only minor injury.
- Medical conditions which make people immobile for a long time.
- Use of corticosteroids or immunosuppressive drugs (for asthma, arthritis, cancer, or transplant surgery).
- A variety of other medical conditions including endocrine disorders, stroke, kidney failure, organ transplantation and chronic intestinal disorders such as Crohn's disease, coeliac disease or ulcerative colitis.
- Medical conditions that affect the absorption of food.
- Low calcium or vitamin D intake, especially lifelong.
- Smoking.
- High alcohol intake (more than two drinks per day).
- Lack of exercise.
- Some medicines for thyroid conditions.
- Women who are underweight or have an eating disorder.
- The quantity and quality of dietary carbohydrates may also have an impact on bone health. Diets that are rich in refined or processed carbohydrates with added sugar are proinflammatory and increase oxidative stress, which may lead to increased bone loss, low bone density, and increased fracture risk.

Symptoms

There are no symptoms of osteoporosis in the early stages. In the late stages the symptoms include:

- Fractures of the vertebrae, wrists or hips.
- Low back pain.
- Neck Pain
- Bone pain or tenderness
- Loss of height over time.
- Stooped posture.

If you think you are at risk of osteoporosis

You should discuss this with your GP. You may need a special scan called a dual energy x-ray absorptiometry (DXA), which measures bone density. It is a simple and painless procedure that is recommended for people at high risk. Osteoporosis diagnosed on a bone density scan does not always mean you are at high risk of bone fractures as other factors such as age, have to be taken into account.

Diabetes and Osteoporosis

Osteoporosis is the most common type of bone disorder, with over 3 million people in the UK estimated to have osteoporosis and another estimated 500,000 fragility-related fractures that occur each year.

It is a chronic condition characterised by reduced bone strength, low bone mass, and a higher risk of bone fracture, especially of the hip, spine, and wrist. If you are over the age of 50, there is a 55% chance that you are at increased risk for osteoporosis or have it already. Although, the risk of osteoporosis increases with age, it is not limited to older individuals.

What is osteoporosis?

It literally means 'porous bones'. Our bones are made up of a thick outer shell and a stronger inner mesh of tiny struts of bones and in osteoporosis some of these struts become thin or break. This makes the bone more delicate and likely to break. The most common fractures in people with osteoporosis are wrists, hips and spinal bones. Osteoporosis often goes undetected until a fracture occurs.

Causes of osteoporosis

There are two types of cells in bones that are constantly working – one group of cells builds up new bone and the other breaks down old bone.

Calcium and phosphate are essential for normal bone formation and up to the mid-20s uses these minerals to enable the bone-building cells work harder to build strength into the skeleton. If calcium and phosphate intake is insufficient or if the body does not absorb enough calcium from the diet, then bone production and tissue may suffer. As part of the natural aging process, from 40 years onwards the cells that break down bones overtake and bones gradually lose their density.

Who is at risk of osteoporosis?

It is a common problem and in the UK one in two women and one in five men over 50 will break a bone. It is extremely rare in children, young people and pregnant women.

Bone health is largely hereditary but there are factors that can increase the risk of osteoporosis:

Treatment

Treatments focus on slowing down or stopping bone loss, preventing bone fractures by reducing the risks of falls and controlling pains associated with having the condition. There is a range of drug treatments to reduce the risk of breaking bones which your doctor will discuss.

Lifestyle changes can also help

- **Regular exercise** that requires muscles to pull on bones help the bones to retain or even gain density eg walking, jogging, yoga, resistance exercises. (Not exercises that increase the risk of falling.)
- **Diet** should include adequate amounts of calcium, vitamin D and protein. High calcium foods include low-fat milk, yogurt, ice cream and cheese, salmon and sardines (with the bones), and leafy green vegetables.
- **Give up unhealthy habits** such as smoking and limit alcohol intake.
- **Prevent falls** by making sure vision is as good as possible, remove hazards around the house, wear good fitting shoes, avoid walking on icy roads alone.

Why are people with Type 2 diabetes at higher risk?

The reasons for this are unclear and different studies have pointed to different factors which may work in isolation or combination:

- Low levels of insulin, as can occur in the progression of Type 2 diabetes, may cause a reduction in BMD.
- High blood sugar levels are known to interact with several proteins leading to a reduction in bone strength.
- High blood sugar levels also lead to frequent urination (glycosuria), which in turn can lead to decreased levels of calcium and poor bone quality.
- Type 2 diabetes is associated with low levels of vitamin D which, in turn, is associated with poor bone quality.
- Microvascular complications of the condition may lead to reduced blood flow to bone and may contribute to bone loss and fragility.

More research on diabetic complications is needed to better understand their impact on BMD and fracture risk.

Pioglitazone (Actos)

Use of pioglitazone (Actos), may be associated with an increased risk of fracture in women. Women taking pioglitazone should be warned of this potential adverse effect. It is unclear whether the risk of fracture can be mitigated by use of other agents (such as, bisphosphonates, calcium or vitamin D), and further research is needed to allow clinicians to pinpoint women who may be at increased risk. Talk with your doctor about whether Actos is safe for you to take.

Prevention and Treatment

Osteoporosis can be prevented or slowed down and once damage to the bone has taken place, it can be difficult to reverse. Several steps can be taken to prevent or treat low BMD. These include:

- Eating calcium-rich foods, such as low-fat milk, yoghurt, cheese, lean meat, fish and leafy green vegetables.
- Taking calcium supplements. If you need a calcium supplement to meet your calcium requirements, choose one that contains calcium citrate, calcium lactate, or calcium carbonate.
- Not smoking
- Not consuming alcohol in excess
- Exercising regularly (especially weight-bearing activities such as walking, jogging, stair climbing, and weight training).
- If you already have osteoporosis, you may want to discuss the variety of drug treatment options available with your doctor.

Fall Prevention

If you are diagnosed with osteoporosis, it is important to take steps to prevent fractures. However, not all people with low BMD will break a bone, and some people with high BMD will break one.

No official recommendation currently exists for fracture prevention that is specific to people with diabetes, since further research is needed to more fully understand how diabetes and fractures are related. However, adults with diabetes may want to observe general fall-prevention measures, which include:

- Wearing rubber-soled shoes both indoors and outdoors to prevent slipping.
- Keeping walkways clear of tripping hazards.
- Maintaining adequate lighting in and around the house.
- Having a grab bar installed in your shower or bath, and placing a rubber mat in the shower or bath.
- Having your vision and hearing checked regularly, and correcting any problems (with glasses or a hearing aid, if necessary), can also help prevent falls.

Some medicines could make a fall more likely. These include some sedatives and sleeping pills, antidepressants, anticonvulsants, muscle relaxants, blood-pressure-lowering drugs, and medicines for heart conditions. Interestingly and for unknown reasons, taking four or more prescription medicines, regardless of what they are, has also been shown to increase the risk of falls. If the medicines you take fit into any of these categories or if you take four or more medicines, you should go over all of your medicines with your doctor and discuss whether there are other treatment options that are less likely to increase your risk of falling.

General information about osteoporosis can be obtained from:

Royal Osteoporosis Society,
Helpline: 0808 800 0035
Website: www.theros.org.uk

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