Limited joint mobility and other musculoskeletal problems in diabetes

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Article points

1. Limited joint mobility can occur in people with diabetes. It is difficult to treat, but good glycaemic control may prevent it.
2. Other hand abnormalities that can occur in people with diabetes include Dupuytren's contracture, flexor tenosynovitis and diabetic sclerodactyly. Common shoulder problems include adhesive capsulitis and rotator cuff tendonitis.
3. There is increasing interest in the effects of metabolic syndrome on the prevalence of gout and osteoarthritis in type 2 diabetes.

Key words

- Diabetes
- Gout
- Limited joint mobility
- Musculoskeletal problems
- Osteoarthritis

Authors

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While musculoskeletal conditions are common in the general population, people with diabetes are at greater risk than would be expected for their age. Identification and treatment of these problems are important to maintain quality of life. One specific problem of the diabetic hand, limited joint mobility, is difficult to treat, although better control of diabetes may reduce its prevalence in the future. Flexor tendon nodules, carpal tunnel syndrome and Dupuytren's contractures can also affect hand function and respond more readily to therapy. Painful shoulder problems are frequent in people with diabetes and require treatment. Obesity is a risk factor for type 2 diabetes, as well as for both osteoarthritis and gout, but there is increasing interest in the effects of the metabolic syndrome itself on the prevalence of gout and osteoarthritis in type 2 diabetes. It is important to recognise and treat both these common conditions in people with diabetes.

The care of people with diabetes involves far more than the control of blood glucose levels. It is accepted that screening and management of retinopathy, microalbuminuria, neuropathy and cardiovascular risk factors, along with excellent foot care, are all necessary. However, joint problems, although common and often painful, are relatively neglected. This article covers some of the joint conditions commonly linked to diabetes, aiming to raise awareness of these in the diabetic clinic and the potential for treatment that can improve the individual's quality of life.

Limited joint mobility

Limited joint mobility was first described in children with type 1 diabetes in 1974 by Rosenbloom and colleagues (Rosenbloom et al, 1974). It is characterised by a limitation of joint movement, most marked in the small joints of the hand, and often associated with thickening and waxiness of the skin. Unlike arthritis, the condition is painless, although flexion contractures of the proximal interphalangeal (PIP) and metocarpophalangeal (MCP) joints can occur. Symptoms include stiffness, decreased grip strength and difficulty with fine movements of the hands. The distal interphalangeal joints (DIP) and, less commonly, the wrists, elbows, shoulders, knees, neck and spine, may also be involved. Limited joint mobility in the feet may contribute to high foot pressures, which, along with other factors including neuropathy, peripheral vascular disease and trauma, can lead to foot ulceration. (Turner et al, 2007).

Diagnosis is made by clinical examination. Two simple tests are the "prayer sign", where the hands are flattened together as in prayer, and the "table top sign", where the hand is pressed flat, palm downwards, on the table top (*Figure 1*). Contractures of the PIP, DIP and

Figure 1. Table top sign

MCP joints can be readily detected by these quick and easy manoeuvres. Skin texture is also examined to detect changes of thickening and waxiness. It is important to exclude other diabetic hand conditions, which are described later in the article. These conditions can co-exist with limited joint mobility and respond more readily to treatment.

The cause of limited joint mobility is the deposition of abnormal collagen in the connective tissues around the joints. Enzymatic and non-enzymatic glycosylation of skin collagen and the production of advanced glycation end products, which lead to abnormal crosslinking and decreased turnover of collagen, are thought to be responsible (Brownlee et al, 1988; Kapoor et al, 1989; Rosenbloom, 2013).

Estimates of the prevalence of limited joint mobility are difficult, as these depend on the populations of people with diabetes studied, ranging from those with mild, diet-controlled type 2 diabetes managed in primary care, to those with type 1 diabetes attending a specialist clinic. Furthermore, estimating prevalence is further complicated by the definition of limited joint mobility used. The condition can occur in both type 1 and type 2 diabetes and is linked to both duration of diabetes and diabetic control as measured by HbA_{1c} values. The prevalence also increases with age and smoking (Eadington et al, 1991; Arkkila et al, 1994; Silverstein et al, 1998).

The correlation of limited joint mobility with the more serious microvascular complications of diabetes, such as retinopathy, nephropathy and neuropathy, has been controversial, with studies giving conflicting results. Again, differences in populations studied contribute to these conflicting results, as well as whether the study is a cross-sectional or a long-term prospective study. There are too many studies to list here, but two examples are given. In one prospective study, 44 individuals with and without limited joint mobility were followed for 10 years. These study participants did not have nephropathy and retinopathy at baseline. At 10 years, similar numbers in both groups developed retinopathy and microalbuminuria (McCance et al, 1993). A larger prospective study studied 479 children for a median of 10.9 years following diagnosis of type 1 diabetes and found that 35% developed limited joint mobility at a median age of 13 years and a duration of diabetes of 5.2 years. The risk of developing limited joint mobility was related to higher HbA_{1c} levels, as well as puberty. Children with limited joint mobility had an increased risk of microalbuminuria (Amin et al, 2005).

The association between limited joint mobility and diabetic control has been equally controversial in the past, due to differences in study populations. Perhaps more importantly, the assessment of diabetic control has been very variable in different studies. Comparing people with diabetes with and without limited joint mobility using longitudinal measurements of HbA_{1c} gives a better idea of long-term control in these groups, rather than a cross-sectional study of the same groups comparing HbA_{1c} measured at a single time point. Supportive evidence that better long-term glycaemic control reduces the frequency and severity of limited joint mobility comes from two cross-sectional studies of children at diabetes camps in the US some 20 years apart. The 1976–1978 cohort had a prevalence of limited joint mobility of 30%, while the 1998 cohort had a prevalence of limited joint mobility of 7% (Infante et al, 2001). A similar cross-sectional British study looking at adults with type 1 diabetes (mean age 27) found the prevalence of limited joint mobility fell from 43% in 1981–1982 to 23% in 2002 (Lindsay et al, 2005).

Limited joint mobility does not respond well

Page points

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3. The association between limited joint mobility and diabetic control has been equally difficult to determine due to differences in study populations.

Page points

1. Carpal tunnel syndrome is caused by the compression of the median nerve in the carpal tunnel at the wrist. It is associated with the duration of diabetes, but not metabolic control, nephropathy or retinopathy.
2. Dupuytren's contractures have been reported in 16–42 % of outpatients with diabetes, the prevalence increasing with age and duration of diabetes.
3. Diabetic sclerodactyly is characterised by thickening and waxiness of the skin most marked on the dorsum of the fingers. It is associated with limited joint mobility, but can occur separately from this condition.

to treatment. Ensuring good glycaemic control and stopping smoking is sensible, and may reduce progression, although this is uncertain. Both actions, however, have other health benefits to the person with diabetes and should be encouraged. Function can be improved by physiotherapy with palmar stretching and by occupational therapy.

Other hand abnormalities in diabetes

Carpal tunnel syndrome

Carpal tunnel syndrome is caused by the compression of the median nerve in the carpal tunnel at the wrist, and gives numbness and tingling, most commonly in the thumb, index, middle and ring fingers, which often disturbs sleep. If severe, wasting of the thenar eminence can occur. Carpal tunnel syndrome has been reported in up to 20% of people with diabetes and in up to 75% of those with limited joint mobility. Carpal tunnel syndrome is associated with the duration of diabetes, but not metabolic control, nephropathy or retinopathy (Chaudhuri et al, 1989; Gamstedt et al, 1993). Fortunately the results of carpal tunnel release are similar in people with and without diabetes (Thomsen et al, 2009).

Dupuytren's contracture

Dupuytren's contracture (shown in *Figure 2*) is the result of fibrosis in and around the palmar fascia, with nodule formation and contracture of the palmar fascia, leading to flexion contractures of the fingers, commonly the ring and little fingers. It is often painless. Dupuytren's contractures have been reported in 16–42% of outpatients with diabetes, the prevalence increasing with age and duration of diabetes (Gamstedt et al, 1984). Other associations of Dupuytren's contracture include racial and genetic factors, and chronic liver disease. Dupuytren's contracture is often asymptomatic, but severe cases may require surgery.

Flexor tenosynovitis

Flexor tenosynovitis, sometimes known as trigger finger, is characterised by a palpable nodule formation and thickening localised

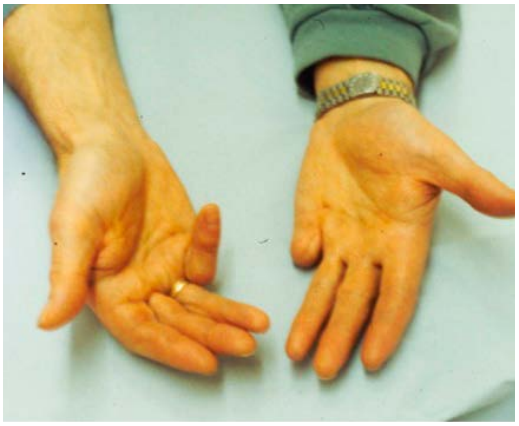

Figure 2. Dupuytren's contracture

to the flexor tendon sheath. When the patient flexes the finger it may lock in a bent position and straightening the finger can be painful. The ring, middle fingers and thumb are most often affected, and the condition may be bilateral (Yosipovitch et al, 1990). The prevalence ranges from 1.5–20% in people with diabetes, depending on the population studied and can occur in 0.7% of people without diabetes, although those with diabetes are more likely to have multiple digit involvement (Vance et al, 2012). Collagen abnormalities induced by diabetes are thought to be responsible.

Local corticosteroid injection can be successful (Kapoor et al, 1989) but some people require repeated surgery (Yosipovitch et al, 1990). Flexor tenosynovitis is more common in those with limited joint mobility (Kameyama et al, 2009) and it is important to distinguish between the two conditions as flexor tenosynovitis responds to treatment.

Diabetic sclerodactyly

Diabetic sclerodactyly is characterised by thickening and waxiness of the skin, most marked on the dorsum of the fingers. It is associated with limited joint mobility, but can occur separately from this condition. In most cases, the frequency of diabetic sclerodactyly increases with the duration of diabetes. It can be distinguished from scleroderma, which it resembles, by the absence of Raynaud's phenomenon, digital ulceration and calcinosis, and autoantibodies are negative. Improving

diabetic control is the only option for treatment and has limited benefit.

Shoulder problems

Adhesive capsulitis

Adhesive capsulitis, commonly known as frozen shoulder, is characterised by painful restriction of glenohumeral movement in all planes of motion, in the absence of joint degeneration sufficient to explain the condition. Both active and passive movements are restricted. The aetiology is unknown. While the prevalence is approximately 5% in those without diabetes, it increases to 19–29% in people with diabetes, depending on the diagnostic criteria used and the population studied. In people with diabetes, the condition is more likely to be bilateral (Pal et al, 1986; Balci et al, 1999).

Adhesive capsulitis in those with diabetes is associated with increased age, longer duration of diabetes, the presence of limited joint mobility and Dupuytren's contractures. Some studies have shown associations with retinopathy and neuropathy, as well as poorer glycaemic control. For both those with and without diabetes, treatment is with analgesia, intra-articular steroids and physiotherapy. Arthroscopic release may help in resistant cases, but people with diabetes are slightly less likely to respond than those without diabetes (71% versus 90%; Mehta et al, 2014). Adhesive capsulitis commonly resolves slowly over 1–3 years, but a significant minority of patients in both groups (7–15%) are left with residual functional disability.

Rotator cuff tendonitis

Rotator cuff tendonitis gives an aching discomfort in the shoulder, with pain both at night and on movement. Pain is felt in the deltoid area of the upper arm and is aggravated by abduction, with a painful arc of movement between 70–120 degrees. Calcific tendonitis is three times more common in those with diabetes compared to those without, although only one third have symptoms (Mavrikakis et al, 1991). Of 60 people with diabetes with shoulder pain, 58% had adhesive capsulitis and 28% tendonitis (Moren-Hybbinette et al, 1987). Treatment is by steroid injection and physiotherapy, although surgery may be required in persistent cases.

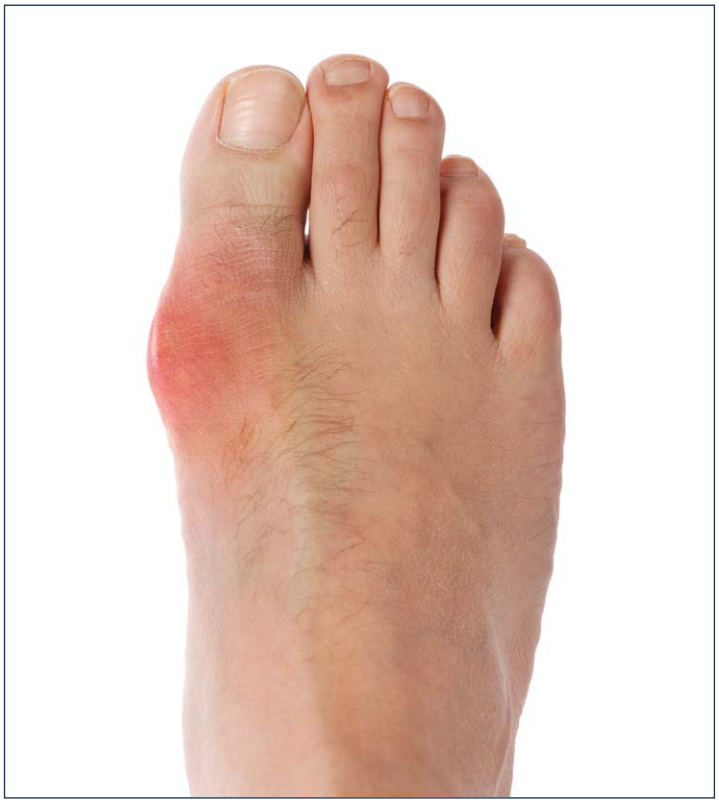

Figure 3. Both women and men with gout have a higher risk of diabetes.

Osteoarthritis and gout

Obesity is a risk factor for gout and also for osteoarthritis, particularly of the knee, as well as for type 2 diabetes. There is increasing interest in whether diabetes itself, independent of the mechanical and metabolic effects of obesity, is a risk factor for these two conditions. Two studies, both of which adjusted for age and body mass index, have linked osteoarthritis to diabetes. A cross-sectional study of people with diabetes in Puerto Rico showed a two-fold increased risk of hand and knee osteoarthritis, with the risk lower in those who only used insulin for their diabetes (Nieves-Plaza et al 2013). A longitudinal cohort study showed that type 2 diabetes was an independent risk factor for severe osteoarthritis leading to hip and knee replacement (Schett et al, 2013).

Men with gout (*Figure 3*) appear to have a higher risk of type 2 diabetes independent of other risk factors such as age, body mass

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index and family history of diabetes (Choi et al, 2008). In a large insurance database study, the risk of diabetes was found to be higher in people with gout, compared with that in people with osteoarthritis, even when adjusted for comorbidities, such as obesity. Women with gout appeared to be at higher risk of diabetes than men with gout in this study (Kim et al, 2015).

Conclusion

While treatment of many of the musculoskeletal problems associated with diabetes is outside the scope of the diabetic clinic, their prompt recognition can ensure the individual is referred along the correct pathway for help. Good blood glucose control and weight management may play a part in the reducing the prevalence of some of these musculoskeletal conditions, as well as other diabetic complications. ■

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