

Musculoskeletal manifestations of upper limbs in diabetes

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Abstract

Introduction

Diabetes mellitus (DM), a worldwide high prevalence metabolic disease, is associated with a large variety of musculoskeletal disorders. These manifestations are most often due to chronic hyperglycaemia. In most cases, they are associated with pain and functional disability, affecting the quality of life of diabetic patient.

Several entities that affect the upper limbs can be distinguished: diabetic cheiroarthropathy, Dupuytren's disease, flexor tenosynovitis, De Quervain's tenosynovitis, carpal tunnel syndrome (CTS) and adhesive capsulitis of the shoulder. The treatment is especially based on physiotherapy, rehabilitation and a tight glycaemic control.

This article reviews some epidemiological, clinical, diagnostic and therapeutic aspects of these musculoskeletal manifestations of upper limbs during diabetes.

Conclusion

Musculoskeletal disorders are common and frequent in diabetic patients. Examination of articular and periarticular regions of the hands, shoulders and the others joints should be included in the evaluation of diabetic patients.

Introduction

Diabetes mellitus (DM) is a chronic metabolic condition characterized by persistent hyperglycaemia with a significant morbidity and mortality mainly related to its associated microvascular and macrovascular complications¹.

It can affect the connective tissues in many ways and causes alterations in the periarticular and the musculoskeletal systems.

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These manifestations are generally under-recognized and poorly treated, compared to the other complications, such as neuropathy, nephropathy and retinopathy. They are most often due to chronic hyperglycaemia and strongly associated to the duration of disease, the glucose levels, and the age of the patient². Common symptoms include pain, swelling, and stiffness.

They can limit the range of motion of the affected joint, leading to functional disability in daily living.

Several rheumatic manifestations of the upper limbs have been described in diabetic patients. They are dominated by diabetic cheiroarthropathy, Dupuytren's disease, flexor tenosynovitis, carpal tunnel syndrome (CTS), De Quervain's tenosynovitis and adhesive capsulitis of the shoulder³. Their treatment is largely based on physiotherapy, rehabilitation, corticosteroid infiltration and a tight glycaemic control.

This review provides a short description of diabetes-related joint diseases of upper limbs during diabetes and their management.

Discussion

Pathophysiology of connective tissue disorders in DM

The aetiology of DM-associated articular and periarticular disorders remains unclear. Several pathophysiologic mechanisms appear to be involved together in the development of diabetes-related rheumatic diseases. Experimental studies conducted with fibroblasts and extracellular matrix obtained from involved samples of diabetic patients have showed alterations in connective tissue metabolism, including increased intramolecular and intermolecular collagen cross-linkages which render collagen less

soluble and increase its resistance to collagenases⁴.

Prolonged hyperglycaemia provokes an excess of advanced glycosylation end-products (AGEs). A principal characteristic of reactive AGEs is the formation of covalent cross-links within collagen fibres, altering their structure and functionality and causing a stiffening of collagen fibres⁵. Ligand engagement by AGE-binding receptors activates several molecular pathways and stimulates many effects. These consist on pro-oxidant reactions via generation of reactive oxygen species and proinflammatory reactions via NFκβ signalling⁶. Inflammation plays a major role in rheumatic manifestations in diabetes especially in adhesive capsulitis of the shoulder and Dupuytren's disease.

It has demonstrated an increased level of inflammatory and fibrogenic cytokines in the synovium and subacromial bursa⁷. In addition excessive extracellular matrix deposition could be explained by an imbalance between matrix metalloproteinases (MMPs) and their inhibitors (TIMPs)⁸.

In obese diabetic patients, other factors can participate in the pathogenesis of rheumatic manifestations. Fatty tissue releases bioactive peptides including leptin, and adiponectin⁹. These adipokines are able to modulate cytokines such as tumour necrosis factor-α (TNFα) and prostanoids, and to increase the production of MMPs. These conditions together may act as a prolonged disruptor of tendon, synovium and fascias homeostasis⁹.

Diabetic cheiroarthropathy

It is characterized by tight and stiff skin of the fingers and palm with painless limitation of mobility of the small joints of the hands. This condition is most commonly seen in type 1 diabetes and

it is more prevalent in patients with diabetic neuropathy¹⁰. Its prevalence is 8% - 50% among patients with diabetes, while only 4% - 20% among individuals without DM^{11,12}.

There are two clinical signs to confirm the diagnosis of Diabetic cheiroarthropathy: the first is the prayer sign, in which, the patient is unable to approximate the palmar surface of the fingers when raising the hands as if in prayer and the second is the tabletop sign, in which, when the patient is asked to lay the palms flat on the tabletop, he is unable to touch the palmar surface of the fingers to the table.

The ultrasound findings of diabetic cheiroarthropathy are the thickening of the flexor tendon sheaths and subcutaneous tissues¹³ and MRI shows the thickening of the flexor tendon sheaths¹⁴. Treatment consists on optimizing the glycaemic control and an individualized hand therapy programme. Early recognition of cheiroarthropathy is important, because it represents a marker of other diabetic microvascular complications¹⁵.

Dupuytren's disease

Dupuytren's disease is a fibromatosis affecting the hand. It affects the hand and the fingers and may present with a contracture causing increasing disability of the hand. The prevalence of Dupuytren's disease in diabetic patients ranges from 20 to 63%^{16,17}.

The disease most commonly begins as a nodule in the palm or finger. Then it progresses with pathologic cord form leading to progressive flexion deformity of the involved fingers, commonly of the metacarpophalangeal and proximal interphalangeal joints but also of the distal interphalangeal joint. Dupuytren's disease and cheiroarthropathy may coexist in the same patient¹⁸.

We can treat the symptoms with physiotherapy, and hand exercises and improve the disease with tight

glycaemic control. Nonsurgical treatment options, including corticosteroid injections, applications of vitamin A and E, radiotherapy, ultrasound therapy, and gamma interferon injections, have been unsatisfactory¹⁹.

The surgical treatment such as fasciotomy or limited percutaneous needle aponeurotomy can be proposed in case of severe affected function and contractures of 30 degrees or more¹⁹.

Recently, the use of collagenase injections from *Clostridium histolyticum* (1-3 intralesional injections) aimed at chemically disintegrating pathologic cords may emerge as an interesting treatment for Dupuytren's disease.

Flexor tenosynovitis

Flexor tenosynovitis (trigger finger or stenosing tenovaginitis) is caused by fibrous tissue proliferation in the tendon sheath inducing limitation of the normal movement of the tendon. The prevalence of flexor tenosynovitis is 5%-15% among subjects with diabetes versus 1%-2% in the general population²⁰. Middle and index fingers are most commonly involved and the insulin-dependent patients have more severe symptoms and multiple digit involvement²⁰.

Corticosteroid injections are recommended as first-line therapy. They have a high efficacy rate (50%-60%), and are more effective for the thumb than for the other fingers (92% versus 50%-57%, respectively)²¹. Corticosteroid injection should be performed under ultrasound control.

If symptoms relapse, a second infiltration can be tried. Surgical treatment becomes necessary when conservative therapy has failed.

Carpal tunnel syndrome (CTS)

Carpal tunnel syndrome is the commonest entrapment neuropathy and is due to combined compression and traction on the median nerve at the wrist. CTS is more frequent in

women than in men. The CTS may be due to the compression of the median nerve within the carpal tunnel because of fibrous tissue proliferation, or diabetic neuropathy, or a combination of both²².

Clinically, it is characterized by paraesthesia over the median nerve cutaneous distribution of the thumb, index, middle, and lateral half of the ring fingers, which is often worse at night. Electromyography is performed in cases of doubt diagnostic or before surgical treatment.

Treatment of CTS consists of the use of simple analgesics, splints, and possibly local steroid injections. Surgery is indicated in those patients who fail the above conservative measures.

De Quervain's disease

De Quervain's disease is due to thickening of the synovial sheath containing the extensor pollicis brevis (EPB) and abductor pollicis longus (APL) tendons, which leads to irritation of the muscles, causing pain and swelling over the radial side of the wrist in patients along with an increased difficulty in gripping objects²³.

Many series of physical examination manoeuvres, including the Finkelstein test, can help to confirm the diagnosis. This condition is frequent among diabetic patients. Conservative treatment including corticosteroids, nonsteroidal anti-inflammatory drugs, and splinting can be used to treat de Quervain's tenosynovitis. Surgery is reserved in case of nonsurgical treatment failure.

Shoulder capsulitis

Shoulder capsulitis, also called frozen shoulder, is also the most common musculoskeletal disorders in diabetic patients. The estimated prevalence of this condition is of 11-30% in diabetic patients, which is considerably greater than in non-diabetics²⁴.

Shoulder capsulitis occurs bilaterally more frequently in diabetic subjects than in controls. Clinically, it is characterized by progressive, painful

restriction of shoulder movement, especially in external rotation and abduction²⁴. Natural course of the disease can be divided into 3 phases: Pain, Stiffness and Recovery. X-ray examination is used to exclude other diagnoses, such as tumour or arthropathy. Sometimes it can show localized osteoporosis in the humeral head.

To treat the pain, anti inflammatory drugs and analgesics can be used. Corticosteroid injection into the glenohumeral joint and subacromial bursa followed by physical therapy and rehabilitation can be an efficient therapy²⁵.

Arthroscopic capsular release is used for refractory adhesive shoulder capsulitis and is preferred to open surgical release due to shorter length of postoperative recovery²⁶.

Reflex sympathetic dystrophy

Reflex sympathetic dystrophy is also known as chronic regional pain syndrome type 1. It is defined as unilateral, localized, or diffused pain associated with swelling or trophic changes and vasomotor disturbance with impaired mobility of the affected limb. Generally, this condition may occur after minimal trauma or surgery. Diabetes can be added in the list of several diseases which can be complicated with reflex sympathetic dystrophy especially shoulder hand syndrome.

A variety of treatments have been used with anecdotal success, including analgesics, physiotherapy, intravenous bisphosphonates, calcitonin, oral corticosteroids, and sympathetic ganglion blocks²⁷.

The outcome is usually good, although some patients develop chronic pain and contractures.

Conclusion

Musculoskeletal disorders are common and frequent in diabetic patients. They are probably related to the long-term glycaemic control of

diabetes. Examination of articular and periarticular regions of the hands, shoulders and the others joints should be included in the evaluation of diabetic patients.

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