

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Musculoskeletal Manifestations in Diabetes Mellitus.

Surendra U Kamath^{1*}, and Shaila S Kamath².

¹Department of Orthopaedic Surgery, Kasturba Medical College, Mangalore, Manipal University, Manipal, Karnataka, India.

²Department of Anaesthesiology, Kasturba Medical College, Mangalore, Manipal University, Manipal, Karnataka, India.

ABSTRACT

Diabetes mellitus is a common metabolic disease; prevalent world wide can be associated with variety of musculoskeletal manifestations. They may be classified as articular, nonarticular and bony conditions. Among articular conditions, osteoarthritis is frequent and early in diabetes, in which also chondrocalcinosis and gout occur. Diabetic cheiroarthropathy, neuropathic arthritis, diabetic amyotrophy, diabetic muscle infarction are considered to be non-articular conditions. Among bone conditions, osteopenia and osteoporosis may occur early in type 1 diabetes. This article reviews clinical, diagnostic and therapeutic aspects of these conditions.

Keywords: rheumatological condition, diabetes mellitus, musculoskeletal structure.

**Corresponding author*

INTRODUCTION

Diabetes mellitus is a metabolic condition characterized by persistent hyperglycemia with resultant morbidity and mortality related primarily to its associated microvascular and macrovascular complications¹. Type 2 Diabetes mellitus is a highly prevalent disorder worldwide. India is popularly known as a “diabetes capital of the world”. Diabetes can affect the individuals by the disease per se as well as the complications that occur over the period of years. Important and common complications include neuropathy, nephropathy and retinopathy. Musculoskeletal complications related to diabetes are common and can lead to severe morbidity.

The pathophysiology of musculoskeletal disorders in diabetes is not clear. It could be associated with connective tissue disorders, such as the formation of abnormally glycosylated end products or the impaired degradation of by products. It could be indirectly related to vasculopathy and neuropathy commonly complicating the primary disease or finally it could be attributed to a combination of factors.

Consequences following diabetic complication are, muscle infarction, neuropathic arthropathy, Charcot joint². Metabolic derangements, can lead to diffuse idiopathic skeletal hyperostosis (DISH) and osteopenia. DISH is not only associated with Type 2 diabetes mellitus but also seen in patients with obesity, hyperuricaemia and dyslipidaemia. Syndromes due to microvascular disease are carpal tunnel syndrome, Dupuytren’s contracture, flexor synovitis, Adhesive capsulitis, and limited joint mobility. Other complication like Sclerodactyly, Calcific Tendinitis of shoulder, Periarthritis of shoulder, Reflex Sympathetic Dystrophy^{2,3}. Longer duration of diabetes, especially with poor glycemic control, increase the risk of developing many of the mentioned complications. Connective tissue disorders, neuropathy, vasculopathy and combinations may result in musculoskeletal complications in diabetic patients. The development of musculoskeletal problems depends on age and duration of diabetes. Early recognition and treatment will increase the quality of life in these patients.

Musculoskeletal manifestations

The musculoskeletal manifestations of diabetes mellitus can be broadly grouped into following 5 Types⁴ :

1. Syndromes of limited joint mobility: diabetic hand syndrome (diabetic cheiroarthropathy), adhesive capsulitis (frozen shoulder, periarthritis), trigger finger (flexor tenosynovitis) dupuytren’s contractures,
2. Osteoporosis
3. Diffuse idiopathic hyperostosis (DISH);
4. Neuropathies: neuropathic arthritis (Charcot joints, diabetic osteoarthropathy, Carpal tunnel syndrome, diabetic amyotrophy, reflex sympathetic dystrophy, various other neuropathies;
5. Diabetic muscle infarction.

I. Syndromes of limited joint mobility – mostly involve the upper limb and can be attributed to poor glycemic control, diabetic duration and presence of microvascular complications.

1. Diabetic cheiroarthropathy or "stiff-hand syndrome" is a condition characterized by painless limitation of movements of the small joints of the hands. The prevalence varies from 8% to 50% among patients with diabetes, compared with only 4% to 20% among individuals without diabetes⁵. Diabetic cheiroarthropathy is primarily a clinical diagnosis and the imaging findings are nonspecific. As a result of contractures and limitation of mobility patients are unable to put their hand flat on a surface. Flexion contractures of the fingers may develop at advanced stages.

Treatment includes glycaemic control, non-steroidal antiinflammatory drugs and physiotherapy.

2. Dupuytren’s contracture is characterized by focal flexion contracture with thickening and shortening of the palmar fascia, causing flexion deformity of the affected finger. In non-diabetic patients, the most affected fingers are the fourth and the fifth, but in individuals with diabetes contracture mainly affects third and fourth fingers and the hand involvement is frequently bilateral. The prevalence of Dupuytren’s contracture in

diabetes varies between 20% and 63%, higher than among subjects without diabetes, 13%⁴. It is associated with diabetes duration, long-term poor metabolic control and presence of microvascular complications⁶. Diabetic cheiroarthropathy and Dupuytren's contracture may coexist in the same patient².

Treatment includes a good glycemic control, physiotherapy, topical steroid injection, and for the refractory cases surgery.

3. Trigger finger (stenosing flexor tenosynovitis) is due to the inflammation and subsequent narrowing of the A1 pulley of fibrous flexor sheath, which causes finger blocking in flexion with the active extension failure. The middle and index fingers are commonly involved. The classic presentation with popping and locking of a finger is usually enough for the diagnosis.

The prevalence of trigger finger varies between 5% and 36% patients with type 1 and 2 Diabetes as compared with 2% in the general population⁷. The incidence of these disorders in diabetic subjects is associated with actual duration of the disease, not with glycemic control⁸. Trigger finger treatment consists in the modification of the activities, non-steroidal anti-inflammatory drugs, physiotherapy, corticosteroid injection into the tendon sheath and surgical release⁹.

4. Adhesive capsulitis or frozen shoulder is a most disabling condition characterized by an insidious and progressive loss of active and passive mobility of glenohumeral joint, probably due to the capsular contraction. The estimated prevalence of this condition is of 11-30% in diabetic patients, and 2 to 10% in non-diabetics². The diagnosis of adhesive capsulitis is often one of exclusion. Adhesive capsulitis is associated with duration of diabetes and age. The treatment includes physical therapy, corticosteroid injection into the glenohumeral joint and subacromial bursa and manipulation under anaesthesia or arthroscopic release in resistant cases.

II. Osteoporosis can occur in the diabetic patient as a direct consequence of the disease, but it can be also a treatment manifestation. It was demonstrated that oral antidiabetic agents, the thiazolidinediones cause a bone mass decrease and increase risk of fracture.

III. Diffuse idiopathic skeletal hyperostosis (DISH) is associated with ligamentous ossification of the anterolateral aspect of the spinal column, sometimes leading to bony ankylosis. It was demonstrated that DISH is associated with diabetes mellitus particularly with non-insulin dependent diabetes. Several other metabolic disturbances and concomitant diseases have been suggested to be associated with DISH including obesity, increased waist circumference, hypertension, dyslipidemia, hyperuricaemia, metabolic syndrome^{10, 11}. Insulin has been proposed as a factor that promotes growth in DISH. Treatment is generally symptomatic including analgesics, NSAIDs, local applications and physiotherapy. Control of associated metabolic disorders, may reduce the morbidities associated with these disorders, may retard future cardiovascular disease and possibly slow down the progression of soft tissue ossification.

IV. Neuropathies

1. Neuropathic arthritis or Charcot joint is a condition characterized in its early stages by acute inflammation that leads to bone and joint fractures, dislocation, instability and gross deformities. Charcot joint is associated with a longstanding duration of diabetes and peripheral neuropathy. The prevalence estimated among diabetic patients varies from 0.08 to 13%¹². The condition passes through 4 stages. Stage 0, is characterized by erythema, edema and heat but there are no structural changes visible on plain X-Ray. Stage 1 is characterized by bone resorption, bone fragmentation, and joint dislocation. The swelling, warmth, and redness persist, but there are also radiographic changes such as evidence of debris formation at the articular margins, osseous fragmentation, and joint disruption. Stage 2 involves bony consolidation, osteosclerosis, and fusion after bony destruction. Absorption of small bone fragments, fusion of joints, and sclerosis of the bone are noticeable. Stage 3 - reconstruction of the damaged joints and bone Healing and new bone occur. Decrease sclerosis and bony remodeling signify that the deformity (subluxation, incongruity and dislocation) is permanent. The goal of the treatment for acute or quiescent Charcot joint

should be to maintain or achieve structural stability of the foot and ankle, to prevent skin ulceration, and to preserve the plantigrade shape of the foot so that prescription footwear can be used.

2. Carpal tunnel syndrome is a common the compressive neuropathy of the median nerve. It has been reported in up to 20 percent of diabetic patients, but the incidence rises to 75 percent in those with limited joint mobility. The clinical features include nocturnal paresthesia, spontaneous pain, characterized by proximal irradiation. Sometimes motor or sensory conduction velocity evaluated with the aid of electromyography may be needed for confirming the diagnosis. Treatment consists in conservative measures or surgical procedures. Surgical release is used in patients who fail to achieve an adequate relief with conservative measures and for those with moderate to severe symptoms¹³. It is noticed in diabetic patient the recuperation after the surgical intervention is slower and less important¹⁴.

3. Diabetic amyotrophy occurs in type I and II diabetes, with patients developing severe aching or burning and severe pain in the hip and thigh, followed by a weakness and wasting of the thigh muscle and significant weight loss. It is associated with poor glycemic control¹⁵. This condition is most likely caused by inflammatory, immune-mediated vascular radiculoplexopathy^{16,17}. The diagnosis is based on a clinical presentation, the presence of diabetes and neural studies. Good functional recovery is expected within 2-3 years. Medical therapy usually includes immunosuppressive agents, like cyclophosphamide and methylprednisolone.

4. Reflex sympathetic dystrophy is a component of complex regional pain syndrome a neuropathic pain disorder with significant autonomic features. It typically develops after a minor tissue trauma or bone fracture and is associated with a predisposing condition. Diabetes mellitus and other endocrine and metabolic disease are predisposing conditions. The treatment includes medical therapy, invasive procedures (sympathetic blocks) and paramedical therapy.

V. Diabetic muscle infarction (DMI) is an uncommon complication of diabetes with acute onset characterized by muscle pain and swelling. Thigh muscles are most frequently involved, however, calf muscle, simultaneous thigh and calf muscle and upper extremity muscle involvement have also been described. The diagnosis consists in the presence of long standing diabetes, clinical aspects and imaging tests. MRI is the diagnostic test of choice. MRI gives a typical picture on T2-weighted images, with marked muscle oedema extending into the perifascicular and subcutaneous tissues.

CONCLUSION

In this article, musculoskeletal manifestations in diabetic patients are discussed. Late complications of diabetes mellitus (neuropathic arthropathy and diabetic muscle infarction), consequences of metabolic derangement inherent to diabetes (diffuse idiopathic skeletal hyperostosis, osteopenia, and osteoporosis), syndromes that may share etiologic mechanisms with changes of collagen and microvascular disease (limited joint mobility syndrome (cheiroarthropathy), palmar flexor tenosynovitis (trigger finger), Dupuytren's disease, adhesive capsulitis of the shoulder, and reflex sympathetic dystrophy) are described.

The development of musculoskeletal manifestations mostly depends on age and duration of diabetes. Early recognition and treatment will increase the quality of life in these patients.

ACKNOWLEDGEMENTS

Authors would acknowledge the support of Manipal University and Kasturba Medical College, Mangalore in writing this article.

REFERENCES

- [1] Diabetes and musculoskeletal manifestations (Editorial) J Indian Rheumatol Assoc 2003 Nov 23:11:13
- [2] SmithLL , Burnet SP and McNeil JD, Musculoskeletal manifestations of diabetes mellitus, Br J Sports Med 2003:37: 30-35
- [3] Fauci AS, Braunwald E, Isselbacher KJ, Wilson JD, Martin JB, Kasper DL, Harrison's Principal of Internal Medicine, 17th edition McGraw Hills, Health Professional Division; 2008.

- [4] Merkel PA. Less Common Endocrinopathies B. Rheumatic diseases and Endocrinopathies in Klippel J. H. Primer in the Rheumatic Diseases, 2008, New York, Springer, 479-483.
- [5] Pal B, Anderson J, Dick WC, Griffiths ID. Limitation of joint mobility and shoulder capsulitis in insulin and non-insulin-dependent diabetes mellitus. *Br J Rheumatol.*1986; 25(2):147-151.
- [6] Arkkila PE, Gautier JF. Musculoskeletal disorders in diabetes mellitus: An update. *Best Practice and Research Clinical Rheumatology.*2003; 17:945-970.
- [7] Cagliero E, Apruzzese W, Perlmutter GS, Nathan DM. Skeletal disorders of the hand and shoulder in patients with diabetes mellitus. *Am J Med.*2002; 112(6):487-490
- [8] Chammas M, Bousquet P, Renard E, Poirier J, Jaffiol C, Allieu Y. Dupuytren's disease, carpal tunnel syndrome, trigger finger, and diabetes mellitus. *J Hand Surg Am.*1995;20:109–114.
- [9] Ryzewicz M, Wolf JM. Trigger digits: principle management, and complications. *J Hand Surg Am.*2006;31(1):135-146.
- [10] Kiss C, Szilagyi M, Paksy A, Poor G. Risk factors for diffuse idiopathic skeletal hyperostosis: a case control study. *Rheumatology Oxford.*2002; 41:27-30.
- [11] Sarzi-Puttini P, Atzeni F. New developments in our understanding of DISH (diffuse idiopathic skeletal hyperostosis). *Curr Opin Rheumatol.*2004; 16:287-292.
- [12] Frykberg RG, Belczyk R. Epidemiology of the charcot foot. *Clin Podiatr Med Surg.* 2008; 25: 17–28.
- [13] Bland JD. Carpal tunnel syndrome. *BMJ.* 2007; 335(7615):343 –346.
- [14] Ozkul Y, Sabuncu T, Kocabey Y, Nazligul Y. Outcomes of carpal tunnel release in diabetic and nondiabetic patients. *Acta Neurol Scand.*2002;106: 168–172.
- [15] Russell JW, Berent-Spillson A, Vincent AM, Freimann CL, Sullivan KA, Feldman EL. Oxidative injury and neuropathy in diabetes and impaired glucose tolerance. *Neurobiol Dis.*2008;30 (3):420-4299.
- [16] Dyck PJ, Norell JE, Dyck PJ Microvasculitis and ischemia in diabetic lumbosacral radiculoplexus neuropathy. *Neurology.*1999;53(9):21:13-21.
- [17] Kawamura N, Dyck PJ, Schmeichel AM, Engelstad JK, Low PA, Dyck PJ. Inflammatory mediators in diabetic and nondiabetic lumbosacral radiculoplexus neuropathy. *Acta Neuropathol.*2008;115(2):231-9.