



Research Article

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Musculoskeletal disorders of the hand in type 2 diabetics: is it important?

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Abstract

Aim: Diabetes mellitus(DM) is a chronic metabolic condition characterised by persistent hyperglycaemia and may affect the musculoskeletal system. In this study our aim was to investigate the prevalence of the most frequently occurring hand complications in type 2 diabetes mellitus patients. **Material and methods:** 250 Type 2 DM patients and 120 healthy control were included in this study. The presence of cheiroarthropathy, dupuytren's contracture, tinel's sign and trigger finger were assessed. All patients were evaluated also by the Rheumatology Division. **Results:** The mean diabetic duration was 7.60 ± 6.25 years. Dupuytren's contracture was present in 13.2 %, cheiroarthropathy in 12 %, tinel's sign in 18.8% and trigger finger in 5.2% in diabetic patients. Retinopathy was present in 14.8 %, nephropathy in 15.6%. There was positive correlation between diabetic duration and diabetic retinopathy and diabetic nephropathy ($p=0.000$, $r=274$; $p=0.049$, $r=125$, respectively). There was positive correlation between diabetic nephropathy and cheiroarthropathy, dupuytren's contracture ($p=0.001$, $r=214$; $p=0.002$, $r=191$, respectively). Also there was positive correlation between diabetic retinopathy and dupuytren's contracture ($p=0.007$, $r=0.170$). **Conclusions:** Some musculoskeletal disorders are more prevalent in type 2 DM patients. The hand abnormalities are associated with the diabetic complications. Long-term prospective randomised controlled trials on preventing musculoskeletal complications and disability in diabetics are needed.

Key Words: diabetes, complications, hand.

Introduction

Diabetes mellitus (DM) is a chronic metabolic disease characterized by persistent hyperglycaemia with resultant morbidity and mortality related primarily to its associated microvascular and macrovascular complications (1).

Diabetes mellitus may affect the musculoskeletal system. Some changes in the connective tissue

occur in diabetes including glycosylation of proteins; collagen accumulation in periarticular structures and skin; and microvascular abnormalities with damage to blood vessels and nerves (2). Diabetes mellitus has been associated with a number of musculoskeletal manifestations. The rheumatologic manifestations of DM include diabetic cheiroarthropathy, dupuytren's contractures, carpal tunnel syndrome, trigger

finger, adhesive capsulitis, diabetic osteoarthropathy, diffuse idiopathic skeletal hyperostosis, diabetic amyotrophy and reflex sympathetic dystrophy (3,4).

Diabetic cheiroarthropathy, also known as limited joint mobility (LJM), is characterized by tight, thick, waxy skin, mainly on the dorsal aspect of the hands, with flexion deformities of the interphalangeal and metacarpophalangeal joints (5). Dupuytren contracture (DC) is characterized by the thickening and shorting of the palmar fascia, causing a contracture in flexion of the affected finger. In nondiabetic patients, the most affected fingers are the fourth and the fifth, but in individuals with DM, DC mainly affects third and fourth fingers and the hand involvement is frequently bilateral (6). The presence of carpal tunnel syndrome was defined as pain and paresthesias of the first, second, and third fingers, plus a positive Tinel's or Phalen's sign (7). Trigger finger (TF) is due to a stenosing tenosynovitis of the digital flexors. The diagnosis is made by palpating a thickened flexor tendon or nodule with a locking phenomenon during extension or flexion of any finger (8).

Musculoskeletal complications of DM have been generally under-recognized and poorly treated compared with other complications, such as neuropathy, retinopathy, and nephropathy (9). In this study our aim was to investigate the prevalence of the most frequently occurring but often neglected hand complications in type 2 diabetes mellitus patients, and to examine their relationship with patients' age, sex, diabetes duration, diabetic complications and glycaemic control.

Materials and Methods

Study Protocol

This single point cross-sectional case control study was conducted at the Endocrinology and Metabolism Clinic between January 2013 and January 2014. It was approved by the local ethics committee and written informed consent was obtained from all subjects. 250 type 2 Diabetes Mellitus patients and 120 age- and sex-matched normal healthy volunteers were recruited for the study. Patients with a history of neurological

diseases, chronic renal failure, inflammatory arthritis of the wrist, chronic alcoholism, previous Colle's fracture or hand injury were excluded from the study.

Diabetic retinopathy was assessed by direct ophthalmoscopy. Urinary albumin excretion was determined in at least two 24 hour urine samples.

The musculoskeletal physical examination focused on the upper extremity. The presence of cheiroarthropathy, Dupuytren's contracture, tinel's sign and trigger finger was assessed. All patients were evaluated also by the Rheumatology Division.

Laboratory parameters

Blood samples for biochemical parameters were taken after an overnight fasting from an antecubital vein between 08:00 a.m and 09:00 a.m. Glucose was analysed with glucose hexokinase method, HbA1c were analysed with turbidymetric method (Siemens Dimension, Clinical Chemistry System, Newark, DE, USA) using appropriate commercial kits. Patients' renal status was assessed by the urinary albumin excretion rate in at least two out of three timed 24-h or overnight urine collections. Diabetic nephropathy was defined as macroalbuminuria (> 300 mg/24 h).

Musculoskeletal Examination

For 'Prayer sign', patients were asked to bring the palmar surfaces of the fingers together in a praying position with the fingers fanned and the wrist maximally flexed. Failure of metacarpophalangeal or proximal interphalangeal joints to make contact was classified as a positive prayer sign (10). The diagnosis of dupuytren's contracture was made based on the observation of one or more of the following four features on examination: a palmar or digital nodule, tethering of the palmar or digital skin, a pretendinous band and a digital flexion contracture (10). Flexor tenosynovitis was diagnosed by palpating a nodule or thickened flexor tendon with locking phenomenon during extension or flexion of any fingers (10).

Statistical analysis

Statistical evaluations were performed by running the SPSS 13.0 package program (SPSS, Inc., Chicago, IL, USA). While defining the data, number, percentage, mean, and standard deviation (SD) values were used. The normality of distribution of continuous variables was evaluated using the Kolmogorov-Smirnov test. For between-group comparisons Student's t test is used. For comparisons of discrete variables, the chi-square and Fisher's exact test were used between independent groups. Pearson's correlation test was performed for correlation analysis. The level of significance was set at 0.05.

Results

The demographic and clinical characteristics of the patients with and without DM are shown in Table 1. Demographic features, including age and sex, were not statistically different in either group. Mean duration of DM was 7.60±6.25 years. The prevalence and the distribution of the hand problems in the diabetic and non-diabetic control groups are summarised in Table 2. Dupuytren's contracture was present in 13.2 %, cheiroarthropathy in 12 %, tinel's sign in 18.8% and trigger finger in 5.2% in diabetic patients;

retinopathy was present in 14.8 %, nephropathy in 15.6%. Mean HbA1c was 8.60 ± 2.04%. Mean fasting glucose was 176.46 ± 71.32 mg/dl. The mean urinary albumin excretion was 82.69±14.81 mg/day. The relationship between these complications and patients' age, sex, duration of diabetes and glycaemic control was also analysed. There was positive correlation between age and cheiroarthropathy and dupuytren's contracture (p=0.001, r= +0.175 and p=0.000, r=+0.237, respectively). There was positive correlation between diabetic duration and diabetic retinopathy and diabetic nephropathy (p=0.000, r=+0.274; p=0.049, r=+0.125, respectively). There was positive correlation between diabetic nephropathy and cheiroarthropathy, dupuytren's contracture (p=0.001, r=+0.214; p=0.002, r=+0.191, respectively). There was positive correlation between diabetic retinopathy and dupuytren's contracture (p=0.007, r=+0.170). There was no significant correlation between HbA1C and dupuytren's contracture, cheiroarthropathy, tinel's sign and trigger finger. Also there was no significant correlation between fasting glucose and dupuytren's contracture, cheiroarthropathy, tinel's sign and trigger finger (Table 3)

Table 1. Demographic and anthropometric characteristics of the patients with type 2 diabetes mellitus and control group

	Type 2 DM (n=250)	Control group (n=120)	P value
Age (years)	51.98±8.86	50.67±4.16	0.125
Female/Male (%)	65.2/8	66.7/33.3	0.816
Height (cm)	161.52±8.62	162.77±5.63	0.111
Weight (kg)	84.46±15.22	86.21±11.93	0.270
BMI (kg/m ²)	32.521±5.88	32.88±6.63	0.588
Fat%	34.02±10.43	35.46±7.98	0.183
Fat (kg)	29.39±12.01	31.31±11.47	0.143

DM: Diabetes Mellitus, BMI: Body Mass Index

Table 2. The prevalence of the upper extremity musculoskeletal disorders in patients with type 2 diabetes mellitus and control group

	Type 2DM (n=250) [n(%)]	Control Group (n=120) [n(%)]	P value
Diabetic cheiroarthropathy	30(12.0)	0(0.0)	<0.001
Dupuytren contracture	33(13.2)	3(2.5)	0.001
Tinel's sign	47(18.8)	4(3.3)	<0.001
Trigger finger	13(5.2)	0(0.0)	0.012

DM: Diabetes Mellitus

Discussion

DM is a common disease and associated with various rheumatic conditions. Recognition of these conditions is important as they affect the patient's life quality. Hand and shoulder disorders occur more frequently than other rheumatic manifestations of DM (11,12). The hand in particular is an important target for diabetic complications. Hand involvement, diabetic cheiroarthropathy, Dupuytren's contracture and trigger finger probably have the same pathogenesis and are caused by excessive glycosylation of collagen in the skin and periarticular structures, and by decreased removal of degenerated collagen, resulting in thick, inelastic tissues (13).

Diabetic cheiroarthropathy, is characterised by skin thickening over the dorsum of the hands and restricted mobility of multiple joints. LJM is usually painless and not disabling (14). The underlying pathology of LJM is most likely multifactorial. Increased glycosylation of collagen in the skin and periarticular tissues, increased collagen degradation, diabetic microangiopathy have been implicated as contributing factors (15). It is a common complication of type 1 and type 2 diabetes mellitus. The prevalence of LJM ranges between 30 and 58 % among patients with type 1 DM and between 8 and 76 % among those with type 2 DM. The prevalence in the general population is 0–26% (1,5,16-21). In our study the prevalence of LJM was 12% in diabetic patients and 0% in control group.

Several studies have suggested that LJM is predictive of renal, retinal and other diabetic complications (13,14,22) and related to the duration of the diabetic condition (15,19,23). In our study, there was no correlation between LJM and diabetes duration. Some studies found relation between LJM and microvasculopathy (7, 24-27). In a study by Rosenbloom et al. the prevalence of proteinuria and retinopathy was of 11% in diabetic patients without diabetic cheiroarthropathy versus 50% in diabetic patients with diabetic cheiroarthropathy ([25]). Also in our study there was positive correlation between diabetic nephropathy and cheiroarthropathy ($p=0.001$, $r=0.214$).

No association between metabolic control and LJM has been proved (7,24) although Aydeniz et al (19) reported higher HbA1c levels in DM2 patients with LJM. We didn't find higher HbA1c levels in type 2 diabetic patients with LJM.

Dupuytren's contracture is characterized by spontaneously occurring chronic and idiopathic thickening of the palmar aponeurosis, leading to various degrees of flexion deformity of the fingers, palmar or digital thickening, tethering, pretendinous bands, and flexion contractures of the fingers. In patients with diabetes, both genders are equally affected, and the ring and middle finger are more commonly involved (7,11,17). Diabetes, smoking, and genetic susceptibility are accepted predisposing factors. Although the exact pathogenesis of DC remains unclear (29).

DC is associated with diabetes duration, long-term poor metabolic control and presence of microvascular complications (5). According to Arkkila et al duration of diabetes is the most important factor predicting the development of DC in type 1 diabetic patients after 5 years follow-up (30). In our study we didn't find any correlation between diabetic duration and DC. In several studies a correlation between DC and microvascular complications such as neuropathy, retinopathy and nephropathy has been reported (28,31,32). We also found correlation between DC and microvascular complications in our cross-sectional study. There was positive correlation between diabetic nephropathy and Dupuytren's contracture ($p=0.002$, $r=0.191$). Also there was positive correlation between diabetic retinopathy and Dupuytren's contracture ($p=0.007$, $r=0.170$).

The prevalence of DC has been reported as 5–63% in patients with DM compared to 3–13% in the general population (1,5,15,17). In our study, the prevalence of DC was 13.2%. In an epidemiological study, Zerajic and Finsen reported a far higher prevalence of DC in diabetic patients than in the general population (OR 2.75, 95% CI 1.83–4.11) [33]. On the contrary, Loos et al carried out a large retrospective study and did not find any significant correlation between DM and DC (34).

Trigger finger is due to a stenosing tenosynovitis of the digital flexors. It is more often related to type 1 DM, where the prevalence has been reported to be about 20%. By contrast, it is present in 3-22% of patients with type 2 DM and in 0–2% of controls (7,35,36). The prevalence of DM in patients with trigger finger is about 10% (5). Aydeniz et al reported prevalence in type 2 DM of 5.9% compared to 2% in a group control (19). Mathew et al did not find a statistical difference in the prevalence of TF in diabetics compared to a control group (21). In our study, the prevalence of TF was 5% and 0% in the control group.

Musculoskeletal disorders are relatively common in type 2 DM patients. The hand abnormalities are associated with diabetic complications. There is a positive correlation between diabetic nephropathy and cheiroarthropathy and dupuytren's contracture. Also there is positive correlation between age and cheiroarthropathy and dupuytren's contracture. These musculoskeletal manifestations can effect the patients' quality of life. Therefore, both diabetologists and rheumatologists need to be aware of them. Long-term prospective randomised controlled trials on preventing musculoskeletal complications and disability in diabetics are needed.

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References

- 1- Smith LL, Burnet SP, McNeil JD. (2003) Musculoskeletal manifestations of diabetes mellitus. *Br J Sports Med.* 37(1):30-35
- 2- Kim RP, Edelman SV, Kim DD. (2001) Musculoskeletal Complications of Diabetes Mellitus. *Clinical Diabetes.*19(3): 132-135
- 3- Serban AL, Udrea GF. (2012) Rheumatic manifestations in diabetic patients. *J Med Life.* 5(3):252-257

- 4- Silva MB, Skare T. (2012) Musculoskeletal disorders in diabetes mellitus. *Rev Bras Reumatol.* 52(4):601-609
- 5- Arkkila PE, Gautier JF. (2003) Musculoskeletal disorders in diabetes mellitus: an update. *Best Pract Res Clin Rheumatol.*17(6):945–970
- 6- Childs SG. (2005) Dupuytren's disease. *Orthopaedic Nursing.* 24(2):160-164
- 7- Cagliero E, Apruzzese W, Perlmutter GS, Nathan DM. (2002) Musculoskeletal disorders of the hand and shoulder in patients with diabetes mellitus. *Am J Med.* 112(6):487–490
- 8- S Bañón, DA Isenberg. (2013) Rheumatological manifestations occurring in patients with diabetes mellitus. *Scand J Rheumatol.* 42(1):1–10.
- 9- Attar SM. Musculoskeletal manifestations in diabetic patients at a tertiary center. *Libyan J Med;*7. doi: 10.3402/ljm.v7i0.19162. Epub 2012 Oct 29.
- 10- Crispin JC, Alcocer-Varela J. Rheumatologic manifestations of diabetes mellitus. (2003) *Am J Med.* 114(9):753–757
- 11- Ibrahim A. Al-Homood. (2013) Rheumatic conditions in patients with diabetes mellitus. *Clin Rheumatol.* 32(5):527–533
- 12- Ardic F, Soyupek F, Kahraman Y, Yorgancıoglu R. (2003) The musculoskeletal complications seen in type II diabetics: predominance of hand involvement. *Clin Rheumatol.* 22(3): 229–233
- 13- Rosenbloom AL, Silverstein JH. (1996) Connective tissue and joint disease in diabetes mellitus. *Endocrinol Metab Clin North Am.* 25(2): 473–483
- 14- Renard E, Jacques D, Chammar M. (1994) Increased prevalence of soft tissue hand lesions in type 1 and type 2 diabetes mellitus: various entities and associated significance. *Diabetes Metab.* 20(6): 413–521
- 15- Crispin JC, Alcocer-Varela J. (2003) Rheumatic manifestations of diabetes mellitus. *Am J Med.* 114(9):753–757
- 16- Pal B, Anderson J, Dick WC, Griffiths ID. (1986) Limitation of joint mobility and shoulder capsulitis in insulin and non-insulin-dependent diabetes mellitus. *Br J. Rheumatol* 25(2):147-151
- 17- Chammas M, Bousquet P, Renard E, Poirier JL, Jaffiol C, Allieu Y. (1995) Dupuytren's disease, carpal tunnel syndrome, trigger finger, and diabetes mellitus. *J. Hand Surg Am.* 20(1): 109–115

- 18- Savas S, Köro lu BK, Koyuncuo lu HR, Uzar E, Celik H, Tamer NM. (2007) The effects of the diabetes related soft tissue hand lesions and the reduced hand strength on functional disability of hand in type 2 diabetic patients. *Diabetes Res Clin Pract.* 77(1):77–83
- 19- Aydeniz A, Gursoy S, Guney E. (2008) Which musculoskeletal complications are most frequently seen in type 2 diabetes mellitus? *J Int Med Res.* 36(3):505–511
- 20- Lebiedz-Odrobina D, Kay J. (2010) Rheumatic manifestation of diabetes mellitus. *Rheum Dis Clin N Am* 36(4):681–699
- 21- Mathew AJ, Nair JB, Pillai SS. (2011) Rheumatic-musculoskeletal manifestations in type 2 diabetes mellitus patients in south India. *Int J Rheum Dis* 14(1):55–60
- 22- Fitzcharles MA, DUBY S, Waddell RW. (1984) Limitation of joint mobility (cheiroarthropathy) in adult non-insulin-dependent diabetic patients. *Ann Rheum Dis* 43(2): 251–257
- 23- Al-Matubsi HY, Hamdan F, Alhanbali OA, Oriquat GA, Salim M. (2011) Diabetic hand syndromes as a clinical and diagnostic tool for diabetes mellitus patients. *Diabetes Res Clin Pract.* 94(2):225–229
- 24- Garg SK, Chase HP, Marshall G, Jackson WE, Holmes D, Hoops S, et al. (1992) Limited joint mobility in subjects with insulin dependent diabetes mellitus: relationship with eye and kidney complications. *Arch Dis Child.* 67(1):96–99
- 25- Rosenbloom AL, Silverstein JH, Lezotte DC, Richardson K, McCallum M. (1981) Limited joint mobility in childhood diabetes mellitus indicates increased risk for microvascular disease. *N Engl J Med.* 305(4):191–194
- 26- Arkkila PE, Kantola IM, Viikari JS. (1994) Limited joint mobility in type 1 diabetic patients: Correlation to other diabetic complications. *J Intern Med.* 236(2):215–223
- 27- Frost D, Beischer W. (2001) Limited joint mobility in type 1 diabetic patients: associations with microangiopathy and subclinical macroangiopathy are different in men and women. *Diabetes Care.* 24(1):95–99.
- 28- Gamstedt A, Hom-Glad J, Ohlson CG. (1993) Hand abnormalities are strongly associated with the duration of diabetes mellitus. *J Intern Med* 234(2): 189–197
- 29- Loos B, Puschkin V, Horch RE. (2007) 50 years experience with Dupuytren’s contracture in the Erlangen University Hospital – a retrospective analysis of 2919 operated hands from 1956 to 2006. *BMC Musculoskelet Disord.* 4(8):60.
- 30- Arkkila PE, Kantola IM, Viikari JSA, Rönnemaa T, Vahatalo MA. (1996) Dupuytren’s disease in type-1 diabetic patients: a five-year prospective study. *Clin Exp Rheumatol.* 14(1):59–65
- 31- Jennings AM, Milner PC, Ward JD. (1989) Hand abnormalities are associated with the complications of type II diabetes mellitus. *Diabetic Med.* 6(1): 43–47
- 32- Burner TW, Rosenthal AK. Diabetes and rheumatic diseases. (2009) *Cur Opin Rheumatol.* 21(1):50–54
- 33- Zerajic D, Finsen V. (2004) Dupuytren’s disease in Bosnia and Herzegovina. An epidemiological study. *BMC Musculoskelet Disord.* 29(5):10
- 34- Loos B, Puschkin V, Horch RE. (2007) 50 years experience with Dupuytren’s contracture in the Erlangen University Hospital – a retrospective analysis of 2919 operated hands from 1956 to 2006. *BMC Musculoskelet Disord.* 8:60
- 35- Griggs SM, Weiss AP, Lane LB, Schwenker C, Akelman E, Sachar K. (1995) Treatment of trigger finger in patients with diabetes mellitus. *J Hand Surg.* 20A:787–789
- 36- Saar JD, Grothaus PC. (2000) Dupuytren’s disease: an overview. *Plast Reconst Surg.* 106(1):125–136

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