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Diabetic Cheiroathropathy. A Musculoskeletal Complication of Diabetes Mellitus.
Chéiroathropathie diabétique. Une complication à long terme du diabète musculo-squelettique.

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ABSTRACT

Diabetic Cheiroarthropathy, DCA, is a recognized long-term musculoskeletal complication seen in people living with diabetes mellitus (DM). It is characterized by limitation of mobility in the small joints of the hands and feet with possible disability. Globally, approximately 33% of people living with DM have been observed to have DCA with evidence of association with microvascular complications. This association makes it pertinent to screen for microvascular complications in DCA patients. Modalities of treatment include controlling glycaemic control to target, aminoguanidine, (a promising compound that prevents advanced glycation end products (AGEP) formation, physiotherapy, and the intraarticular injection of steroids as the case may be. This paper is aimed at sensitizing clinicians on this almost forgotten clinical condition that may affect the quality of life as well as act as a physical marker of microangiopathy in DM patients.

ABSTRAIT

La chéiroarthropathie diabétique (DCA) est une complication musculo-squelettique à long terme reconnue mais négligée chez les personnes atteintes de diabète sucré (DM). Il se caractérise par une limitation de la mobilité des petites articulations des mains et des pieds avec un handicap possible. À l'échelle mondiale, environ 33 % des personnes atteintes de diabète sucré présentent un DCA, ce qui montre une association avec des complications microvasculaires. Cette association rend pertinent le dépistage des complications microvasculaires chez les patients atteints d'ACD. Les modalités de traitement comprennent ; l'atteinte de la cible de contrôle, l'aminoguanidine (un composé prometteur qui empêche la formation de produits finaux de glycation avancée (AGEP), la physiothérapie et l'injection intraarticulaire de stéroïdes selon le cas. Cet article vise à sensibiliser les cliniciens sur cette condition clinique presque oublieuse qui peut affecter la qualité de vie et agir comme un marqueur physique de la microangiopathie chez les patients atteints de diabète sucré.

INTRODUCTION

Diabetic cheiroarthropathy, DCA, is a recognized musculoskeletal complication of diabetes mellitus (DM) (1-5). Its characteristic limitation of mobility of the small joints of the hands and feet led to the nomenclature, limited joint mobility syndrome (6). This entity has been reported in about 33% of people living with DM and because of its established correlation with microvascular complications of DM, it may be considered a clinical marker of microvascular disease in DM patients (1,3,7,8).

DCA varies in severity to a spectrum that affects daily activities involving grips such as turning door handles, opening a door with a key, combing hair, brushing teeth, writing, and driving among others. Here, we provide some insight into epidemiology, pathogenesis, clinical perspective implications as well as management options of this almost forgotten clinical entity.

A study among children with type 1 DM, reported a frequency of 30.2% was found (9). By using either the prayer sign or an objective measurement with a goniometer, limited mobility of the small joints of the hands and feet was found in 33% (prayer sign) and up to 20% (goniometer) respectively in an adult Caucasian DM population (7). Akanji

et al reported a cheiroarthropathy frequency of 19% among Nigerians living with DM and was said to be as twice as common in type 1 DM (32%) as in type 2 DM patients (16%) (5). Genetic and racial factors are thought to play roles in the predictive value of diabetic cheiroarthropathy and related microvascular complications (5,9).

PATHOGENESIS

Even though the pathogenesis of DCA is not entirely clear, it is thought to be related to alteration in collagen metabolism (3). Recent studies have suggested the role of protein glycation or glycosylation in the pathogenesis of cheiroarthropathy (10). Protein molecules can bind non-enzymatically with glucose to form an initial unstable aldimine and ketamine that would eventually form more stable products (10). The degree to which this happens is proportional to the plasma concentration of glucose, as well as the duration of the exposure (10). This may explain why certain studies have suggested poor glycaemic control and duration of diabetes as risk factors for neuroarthropathy in persons with DM (2-4,8,9,11).

Certain long-lived macromolecules such as collagen and DNA are also glycosylated to form amadori products that are transformed to the irreversible complex called advanced glycation end products, (AGES) (10). Due to their long life, AGES tend to accumulate faster in DM patients (10). Accumulation of AGES, in the blood vessel walls plays a role in the mechanisms thought to be responsible for long-term diabetes complications including vascular diseases (11). High AGES formed from glycated collagen in the joints causes excessive cross-linking of the protein matrix. Local ischemia and fibrosis due to microvascular AGES effects exacerbate this process resulting in tendon sheath sclerosis. Thus, the affected joints become increasingly stiff due to their thickness resulting in cheiroarthopathy.

DCA was suspected in a 52-year-old lady, who was seen at the Endocrine out patients services of the Nile University of Nigeria Teaching Hospital, Abuja. She has been living with type 2 diabetes for 20 year standing. Part of her complaints was; stiffness in both hands of six months duration and getting worse lately. Stiffness was not limited to the early hours of the morning. Not a known hypertensive patient. No history of hand trauma, isolated joint pain, or swelling. No history suggestive of autoimmunity or photosensitivity. She suffered an right hemispheric ischaemic stroke three years previously, with minimal neurologic deficit. She was on insulin and oral hypoglycaemic agents, OHA combo with good glycaemia control at the time of this visit. Insulin was added when her control was poor (HbA1c 10%) while previously on OHAs only. Examination of her hands shows fixed flexion deformity at the distal interphalangeal joints, with no skin tightening. There was peripheral neuropathy of gloves and stocking distribution. DCA was diagnosed clinically based on history and positive prayer sign (Figure).

Furthermore, there were no evidence of other underlying autoimmune diseases such as scleroderma, (no Raynauds phenomenon). No hand osteoarthritis with the absence of Heberden's or Bouchard's nodes. Flexor tenosynovitis was ruled out with the absence of palpable crepitus. Fundoscopy was not remarkable as well as with examination of other systems.

Investigations showed a negative rheumatoid factor (RF) and antinuclear antibodies (ANA). Erythrocyte sedimentation rate, ESR was 34 mm/hr. The liver function test, electrolyte urea, and creatinine as well as her full blood count were not remarkable. There was, however, microalbuminuria.

Figure. Positive Prayer Sign.

CLINICAL ASSESSMENT AND COURSE OF DCA

It is vital to take a good history to find out possible risks such as age, duration of DM, and drug compliance (as a guide to glycaemic control). Clinical examinations would include fundoscopy or retinal photography for retinopathy and a check for Peripheral Neuropathy. Examination of the joints to exclude other possibilities and to determine the range of movement. The prayer sign should be elicited by asking the patients to put their hands together in a prayer position with their fingers fanned out (7).

Apart from cheiroarthropathy, other hand abnormalities that may be seen in persons with DM include Dupuytren's contracture, carpal tunnel syndrome, and flexor tenosynovitis (4). Others are stiff-hand syndrome and shoulder-hand syndrome (reflex dystrophy) (1). Stiff hand syndrome and cheiroarthropathy are seen almost exclusively in persons with DM, having distinct clinical characteristics in diabetic subjects compared to the presentation seen in persons without DM (1).

In children with cheiroarthropathy, a peculiar involvement of the interphalangeal joints with palmer flexion is observed (12). The clinical course involves the onset of painless deformity of the fingers with progressive stiffness and impaired extension starting on average four to ten years after diagnosis of DM (12). Cheiroarthropathy is thought to begin typically in the fifth finger and move radially with affectation of the interphalangeal and metacarpo-phalanged joints (13).

Although it could be painless and cause little or no disability, studies have reported the affectation of patients' activity and a decrease in quality of life (4,13). This may have been corroborated by Sanseng et al (7) who demonstrated objectively, using goniometer measurements, that the range of movement of the small joints of the hands was significantly impaired.

In children with diabetes in whom cheiroarthropathy was found, growth failure and delayed puberty have been reported to be more frequent (12,13). Though this association is yet to be fully understood, it is possible that growth impairment found in children with DM may be secondary to microvascular complications such as nephropathy. Suffice it to mention that Cheiroarthropathy is of particular interest because it is common in young patients and correlates well with an increased risk for microvascular long-term DM complications (8).

The commonest microvascular DM complication that correlates with cheiroarthropathy is retinopathy which has been shown to be as high as 66% in a Caucasian study population (1,5,11,14). Another long-term microvascular complication of DM, peripheral neuropathy, is also reported to be common in Caucasian studies (11,14), however, no significant difference in the frequency of peripheral neuropathy has been reported between persons with DM with cheiroarthropathy and those without cheiroarthropathy in black subjects (5).

Rosenbloom (1) reported significant increases in the frequency of nephropathy among DM patients with cheiroarthropathy in a Caucasian study population, whereas Fisher et al (12) and Starkman et al (13) did not find any difference in the frequency of nephropathy between DM patients with or without cheiroarthropathy. Akanji et al (5) in a study involving adult blacks with DM, reported a higher frequency of nephropathy in DM patients without limited joint motility implying some racial differences.

ASSOCIATIONS AND CLINICAL SIGNIFICANCE

The duration of Diabetes Mellitus is a potential risk factor for development of cheiroarthropathy as suggested by studies that have reported higher prevalence with increasing duration of DM (2-4,8,11). This may be related to the pathogenesis of cheiroarthropathy in persons with DM. Although advancing age is reported as a risk factor in some studies (4,8), this was not the case with the finding by Shiavon et al (2). Increasing age may allow enough time for the cheiroarthropathy changes to take their toll. No sex predilection has been found for cheiroarthropathy in DM patients (2,3). Even though poor glycaemic control is an added risk for cheiroathopathy (4,9), the place of the type of Diabetes Mellitus remains controversial. Starkman et al (13) reported a higher frequency of cheiroarthropathy in type 2 than in type 1 patients. However, in a black population, the reverse was the case (5). These differences may have been due to the sample size and racial variation. While the study by Starkman et al (13) examined 238 types 1 patients and 41 types 2 Caucasian patients, Akanji et al examined 50 types 1 and 206 types 2 black patients (5).

Studies that may consider racial differences, the role of insulin resistance, and the use of insulin or oral hypoglycemic agents in cheiroarthropathy are recommended. Clinical significance of DCA include; possible affectation of functions of the hands resulting in disabilities of varied severity enough to affect patients' daily activities involving grip. These include turning door handles, opening a door with a key, combing the hair, brushing the teeth, writing, driving, handling of a syringe to withdraw and inject insulin as well as manipulation of the glucometer for self-monitoring of blood glucose.

DCA may be a pointer to the presence of microvascular DM complications. Thus may act as a non-invasive marker of microvascular complications, especially retinopathy. Affectation of the small joints of the feet may lead to foot deformity with an increased risk for diabetic foot ulcerations.

INVESTIGATIONS

A Goniometer examination could be done to give an objective assessment of joint mobility (7). A radiographic examination of the hands could be done. Ultrasonography examines for thickness of the flexor tendon sheath. Flexor tendon sheath thickness is an integral part of the pathology of DCA (15). Metabolic control should be assessed using glycated hemoglobin, fructosamine, or blood glucose at least. Renal function tests may be necessary since there exists a strong correlation between DCA and nephropathy.

MANAGEMENT

Potentially useful treatment modalities are considered. Control of Diabetes Mellitus to attain recommended targets should be ensured. Aminoguanidine has been shown to prevent excess AGES formation in in people living with Diabetes Mellitus (16). Thus, it is promising in the care of cheiroarthropathy or its prevention. Intraarticular corticosteroid injection may be useful in cases where hand deformities are causing disability (8).

The place of physiotherapy is sure, especially in cases where there is stiffness and/or disability. It may be recommended as a preventive measure with advancing duration of DM.

CONCLUSION

DCA is an important complication of diabetes mellitus, with a potential to impacting on the quality of life of people living with diabetes mellitus. Attention given to affected patients should include; ensuring good glycaemic control, the use of new treatment modalities as aminotuanidine, well as steroids and physiotherapy as needed.

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