LIMITED JOINT MOBILITY IN SRI LANKAN PATIENTS WITH NON-INSULIN-DEPENDENT DIABETES

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SUMMARY

Two hundred and sixteen patients with non-insulin-dependent diabetes (NIDDM) and 216 age- and gender-matched controls were studied to assess the prevalence of limited joint mobility (LJM). Joint mobility was measured by goniometry at metacarpophalangeal and subtalar joints, and those in whom a prayer sign was elicited were said to have cheiroarthropathy. Forty diabetic patients and 10 controls had cheiroarthropathy. The mean range of motion was reduced at metacarpophalangeal joints in diabetic patients with cheiroarthropathy (36.8 ± 9.2°) and without cheiroarthropathy (45.7 ± 8.1°) when compared to controls (51.4 ± 9, P < 0.01). Mobility at subtalar joints was reduced in those with cheiroarthropathy (25 ± 5.3, P < 0.01) when compared to controls (32.4 ± 4.1) and diabetic patients without cheiroarthropathy (27.4 ± 4.6). No differences in subtalar mobility existed between diabetic patients without cheiroarthropathy and controls. Significant differences were observed in the presence of foot ulceration (35 vs 16%) in those with and without cheiroarthropathy. We conclude that cheiroarthropathy is seen in Sri Lankan patients with NIDDM and that significant limitation of joint mobility is present in patients with NIDDM who do not have overt cheiroarthropathy and that overt cheiroarthropathy may be a marker for a high risk of foot ulceration.

KEY WORDS: Limited joint mobility, Cheiroarthropathy, Non-insulin-dependent diabetes mellitus.

HAND abnormalities, such as thickened tight waxy skin and limitation of small joint mobility, referred to as cheiroarthropathy, are a common manifestation of diabetes [1, 2]. It is seen more frequently in diabetic patients than in the general population [3], occurring in as many as 30% of patients with insulin-dependent diabetes [1]. An association with microvascular complications of diabetes [4], indicating that it may be a marker for microvascular complications [5], has been reported. It is also associated with elevated plantar foot pressures [6] and an increased risk of foot ulceration [6, 7]. The term cheiroarthropathy implies that the condition is limited to the hand, but although in the fully developed form the hand abnormalities are most prominent, other joints may also be involved [7, 8]. The term limited joint mobility (LJM) is therefore the preferred term to describe this phenomenon.

Cheiroarthropathy, when severe, is easily detectable by the ‘prayer sign’ [1], while a more discrete ‘subclinical’ form of LJM in the hand and foot, which can be detected only by measurement of joint motion, may exist as an incomplete form of the syndrome. A generalized limitation of joint mobility has been demonstrated in patients with insulin-dependent diabetes [8], but data on its prevalence amongst patients of South Asian origin with non-insulin-dependent diabetes are scarce.

This study examines ranges of joint motion in patients with non-insulin-dependent diabetes (NIDDM) and control groups in order to assess the presence of generalized reduction in joint mobility in patients without overt cheiroarthropathy.

METHODS

Two hundred and sixteen patients with NIDDM attending a diabetes clinic, and 216 controls matched for age and gender taken from a community register of non-diabetic individuals in whom diabetes was excluded by a 75 g oral glucose tolerance test, were studied.

Patients with onset of diabetes at age 30 or over and who had been treated with tablets for over 2 yr and with no history of ketoacidosis were considered to have NIDDM. Details of retinopathy status and the presence or absence of albuminuria were obtained from a computerized clinic database.

Joint mobility was measured by goniometry at metacarpophalangeal joint and subtalar joints, and cheiroarthropathy was said to be present if the prayer sign was elicited [1]. Metacarpophalangeal joint mobility was measured by asking the patient to lift the palm of the hand as far as possible off the table while the fingers were held flat on the table by the examiner. The angle between the ulnar border and the surface of the table was measured [8].

Joint mobility was measured at the subtalar joint as follows [7]. With the patient supine and the subtalar joint in the neutral position, a vertical line was marked on the patient’s skin from heel to mid-calf and the maximum range of calcaneal inversion and eversion measured using a goniometer. The mean of three readings from both sides for each site was calculated and reported as the mean range of motion for that site.

The prayer sign was elicited as follows. The patient was requested to bring together the palmar surfaces of the hands as at prayer. If the approximation of the palmar surfaces is incomplete, the limitation of mobility is confirmed by passively extending the patient’s fingers. An inability to extend the proximal and distal interphalangeal joints to 180° indicates cheiroarthropathy.

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The presence of Dupuytren's contracture can lead to overestimation of both the severity and prevalence of cheiroarthropathy. To eliminate this source of bias, patients with Dupuytren’s contracture were excluded from the study. Hard manual labour is associated with limitations of hand mobility. We classified the occupation of subjects as manual or white collar. However, those classified as white collar on the basis of non-manual labour in the course of their occupation, but who practised regular carpentry, weight lifting or gardening (more than 2 h, three times a week), were classified in the manual labour group.

Patients with shoulder pain for at least 1 month, inability to lie on the affected shoulder and restriction of both active and passive movements in all planes were considered to have adhesive capsulitis or ‘frozen shoulder’ if all other contributory causes to frozen shoulder, such as trauma, stroke and myocardial infarction, were excluded [9, 10].

The clinical examinations were performed by the same observer, and when assessed before commencement of the study, the results obtained were shown to be reliable and reproducible. In our hands, the inter-observer correlation coefficient was 0.89 and the intra-observer correlation coefficient was 0.74. We used the method of evaluation used by Elveru et al. [12] and Diamond et al. [13], and obtained similar results for the reliability of methods.

The study received institutional review board approval. Statistical analysis by the $\chi^2$ test, odds ratios (OR) and 95% confidence intervals (CI) were calculated using the EPIINFO 6 statistical package.

### RESULTS

Three groups were identified: diabetic patients with cheiroarthropathy, diabetic patients without overt cheiroarthropathy and non-diabetic controls. Ten (4.5%) control subjects had a positive prayer sign. All were those who were engaged in hard manual labour.

The range of motion was reduced in diabetic patients with cheiroarthropathy when compared to diabetic patients without cheiroarthropathy at subtalar and metacarpophalangeal joints (Table I). The range of motion in both groups of diabetic patients was significantly reduced when compared with controls ($P < 0.01$). Mobility at subtalar joints was reduced in those with cheiroarthropathy ($P < 0.01$) when compared to controls. No differences in subtalar mobility existed between diabetic patients without cheiroarthropathy and controls.

Patients with cheiroarthropathy were older than those without cheiroarthropathy and had a longer duration of diabetes from diagnosis ($P < 0.05$) (Table I).

We did not detect significant differences in the prevalence of ‘soft tissue rheumatism’, such as frozen shoulder, between patients with cheiroarthropathy and those without. However, a ‘frozen shoulder’ was more common amongst all diabetic patients compared to controls. Plantar foot ulceration (OR 3.25, 95% CI 1.4–7.5, $P = 0.002$) and neuropathy (OR 2.59, 95% CI 1.08–6.16, $P = 0.01$) were more common amongst patients with cheiroarthropathy. Cheiroarthropathy was not associated with a significantly higher risk of retinopathy (OR 1.69, 95% CI 0.69–4.10, $P = 0.2$) or nephropathy (OR 1.65, 95% CI 0.54–4.89, $P = 0.3$).

### DISCUSSION

We have demonstrated a significant decrease in joint mobility in hands and feet in diabetic patients with cheiroarthropathy, as assessed by the prayer sign, compared to controls. This may indicate the presence of a ‘subclinical’ form of LJM which can be quantitatively assessed by goniometry, as suggested by Slama and co-workers [13]. This subclinical limitation may be an early form of a generalized disorder of connective tissues, of which cheiroarthropathy may be a marker. Manual labour, smoking and Dupuytren’s contracture are associated with cheiroarthropathy. There were no significant differences in these risk factors in the diabetic and non-diabetic populations studied.

The exact pathogenesis of LJM is unclear. It is thought to be a manifestation of the diffuse collagen abnormalities found in diabetic patients [14]. The occurrence of similar changes in other collagen-
containing tissues, such as frozen shoulder [15] and restrictive lung disease [16], supports this hypothesis.

A simple screening test for cheiroarthropathy is to ask the patient to press the palms of the hands together, as if in prayer, and to abduct and extend the fingers. Patients with cheiroarthropathy are unable to appose the palmar surfaces together. However, abnormalities can be detected in many normal individuals with overenthusiastic use of this sign [4]. In this study, 10 (4.5%) control subjects had a positive prayer sign. All were those who were engaged in hard manual labour. Larkin and Frier [4] found as many as 26% of their controls to have a positive prayer sign. We did not detect any association between cheiroarthropathy and hypertension and manual labour.

Rosenbloom et al. [1] described an association between microvascular complications and cheiroarthropathy in patients with insulin-dependent diabetes. This study did not show a similar association with retinopathy in patients with NIDDM.

Foot ulceration was more common amongst patients with cheiroarthropathy. This is not entirely unexpected as LJM in the foot has been shown to increase plantar foot pressures and contribute to foot ulceration [17]. LJM is associated with patients with IDDM [1] and NIDDM [18]. The results of our study suggest that LJM is found in South Asian patients with NIDDM and that limitation of joint mobility can be demonstrated in diabetic patients who do not have classical cheiroarthropathy.

References