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A STUDY OF SMALL JOINT INVOLVEMENT IN DIABETES MELLITUS OF MORE THAN FIVE YEARS DURATION AND ITS CORRELATION WITH OTHER MICROVASCULAR COMPLICATIONS OF DIABETES

General Medicine

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ABSTRACT

Background: A wide range of musculoskeletal abnormalities are associated with diabetes, which are multifactorial in origin. The present study aims to study the X-ray changes in small joints of diabetic patients and their correlation with other microvascular complications of diabetes.

Methods: The present study is a cross sectional observational study including 50 patients which was completed over a period of 2 years. The included patients were subjected to joint examination and X-rays of both hand and feet. Patients were also investigated for presence of Nephropathy, Retinopathy and Clinically examined for neuropathy.

Results: Out of 50 patients only 6% had symptoms in hands and 8% in feet both examination and X-rays showed evidence of joint involvement.

Conclusion: Diabetic small joint involvement on X-rays was seen in 50% of our patients and correlated well with glycaemic control and proprioceptive neuropathy in feet.

KEYWORDS

Diabetes Mellitus, Musculoskeletal, Small Joint, Glycaemic Control

INTRODUCTION:

Musculoskeletal involvement is an important but overlooked complication of diabetes. Modern therapeutics has led to a major decrease in the morbidity and mortality of diabetes but has increased the rate of complications in diabetes. The musculoskeletal complications of diabetes are the most common endocrine arthropathies.[1] Several Epidemiologic studies have shown that "the prevalence of rheumatologic manifestations is increased in subjects with diabetes mellitus."[2]

A wide range of bone and joint abnormalities are associated with diabetes, which are multifactorial in origin.[3] Campbell et al [4] found that "a generalised reduction in joint mobility was present in diabetics of all ages two years after diagnosis."

Various small joint complications of diabetes include: [5,6]
Conditions affecting hands

- Diabetic cheiroarthropathy (stiff hand syndrome or limited joint mobility-LJM)
- Flexor tenosynovitis (trigger finger)
- Dupuytren's contracture
- Carpal tunnel syndrome

Conditions affecting feet

- Diabetic osteoarthropathy (Charcot's or neuropathic arthropathy
- Diffuse Idiopathic Skeletal Hyperostosis (DISH)

Pathophysiology and Definitions

Although the precise aetiology of Diabetes associated periarticular disorders remains uncertain, evidences suggest that, "abnormal collagen deposition in the periarticular connective tissues alters the structural matrix and the mechanical properties of these tissues.". There is little evidence available which suggests a genetic predisposition for musculoskeletal disorders among diabetic patients.[7]

Increased glycosylation of collagen in the skin and periarticular tissue, decreased collagen degradation, diabetic microangiopathy, and possibly diabetic neuropathy are thought to be some of the contributing factors.[6]

The joint tissue damage in diabetes is caused by an excess of advanced glycation end products (AGEs) that form at a slow but constant rate, accumulating over time in the normal body. Most extensive accumulation of AGEs occurs in tissues with low turnover, such as cartilage, bone, and tendon.[2]

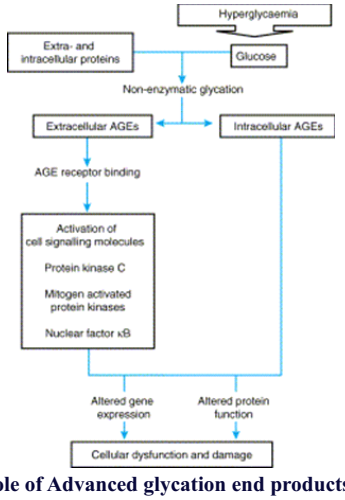

Figure 1: Role of Advanced glycation end products in joint involvement in diabetes.

Limited Joint Mobility [8]

Also known as Diabetic cheiroarthropathy or diabetic stiff hand syndrome. LJM is seen in around 30% to 40% of Diabetic Patients
LJM is Characterized by thick, tight, waxy skin, limited joint range of motion, Flexion contractures of the fingers may develop at advanced stages.[6]

In LJM, asymptomatic contractures initially involve the distal interphalangeal and proximal interphalangeal (PIP) joints and later spread to involve the metacarpophalangeal (MCP) joints. In the early stages, most patients are usually asymptomatic. As time passes, handgrip and ability to perform fine movements reduces, and at this stage patients complain of stiffness, weakness and clumsiness.

Simple clinical tests used to detect LJM are: the prayer sign and the table top sign. In the prayer sign, the patient puts his palms together in a praying position. [9] In the table-top test the patient is asked to place his hands with palms facing down on a table-top with the fingers spread. Both tests are positive if the palmar surfaces fail to make complete contact.

Diabetic Charcot Foot:

Charcot neuropathic arthropathy, also called the Charcot joint disease (CJD), "is a progressive, degenerative arthropathy associated with various types of neuropathic diseases; however, diabetes mellitus is the leading cause of CJD today." CJD affects the joints of the foot and causes a structural deformity. Unfortunately, early signs of CJD are subtle, thus often go unnoticed until structural deformities set in.Charcot foot is a particularly dreaded complication of diabetes as it is associated with chronic nonhealing ulcers, poor quality of life in view of restricted mobility & increased risk of limb amputation & mortality.

Charcot foot or neuroarthropathy is estimated to affect between 1-2.5% of people with diabetes. The duration of diabetes is usually greater than 12 years.[10,11,12] Usually it is unilateral but it may be bilateral in upto 25% of patients.[13]

Usual presentation of acute Charcot foot is a hot, swollen, erythematous foot which may be several degrees warmer than the contralateral foot and crepitus may be noted on manipulation of the foot.

Radiological Investigations in Joint Involvement in Diabetes

On Hand X-ray, early changes are periosteal osteopenia, and fine erosions of joint articular surface. In the advanced stage, X-rays show subchondral sclerosis, osteophytosis, subluxation and soft-tissue swelling. In the foot the earliest finding of neuropathic osteoarthropathy in X-ray is focal demineralization. The flattening of the metatarsal head is often the first sign of diabetic neuroarthropathy. In the absence of soft tissue involvement, subchondral or periarticular changes in the midfoot with polyarticular distribution strongly indicate diabetic neuroarthropathy [106,107]. Subtle changes associated with neuroarthropathy such as occult fractures and bone marrow edema are not detected by X-ray[14,15,16]

Sanders and Frykberg:[17]

Pattern 1 involves the phalanges, interphalangeal and the metatarsophalangeal joints. Pattern 2 the tarsometatarsal. Pattern 3 the cuneonavicular, talonavicular, and calcaneocuboid articulations. Pattern 4 the talocrural joint. Pattern 5 involves the posterior calcaneus. Studies have shown that patterns 2 and 3 are the most common, with approximately 45% of cases are pattern 2 and 35% are pattern 3. [7]

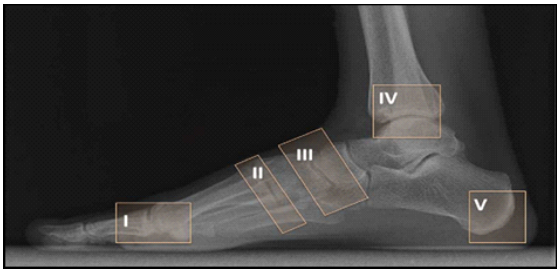

Figure 2: Sanders and Frykberg's classification of charcot foot

According to reviews by Morrison W B and Ledermann H P, (16) compared to X-rays of hands and feet, MRI is the preferred investigation. MRI detects early changes in Feet and may help prevent severe stages of Charcot Neuroarthropathy. Studies suggest that role of musculoskeletal USG and CT scan is limited in diabetes associated joint diseases. [18]

AIMS AND OBJECTIVES:

- To study the small joints of hands and feet in patients of diabetes mellitus of more than five years duration by clinical features and X-rays of Hands and feet.
- To correlate involvement of small joints of hands and feet with other target organ effects of diabetes.

MATERIALS & METHODS:

The present study is a cross sectional observational study comprising of 50 patients which was conducted over a period of 2 years (2016-2018) in the Department of Medicine of a tertiary care hospital in semi-urban western Maharashtra after taking clearance from the institutional ethical committee.

Inclusion Criteria: Diabetic Patients (type 1 and 2) in the age group of 12- 80 years having diabetes for more than five years.

Exclusion Criteria: Patients with other known joint diseases, Patients presenting with complaints of congenital skeletomuscular deformities, and trauma.

History and examination findings were recorded, Specific Investigation included X-ray of hands and feet and were reported by Radiologist. Data generated as per the proforma and patient records. Statistical analysis done Epi-info and SPSS software.

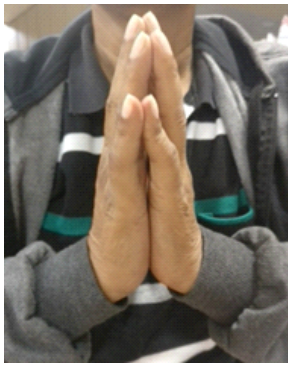

Figure 3: Prayer Sign

Figure 4: X-Rays of our patients showing positive findings

OBSERVATIONS & RESULTS:

The present study included 50 patients with diabetes mellitus of more than 5 years duration out of which,18 were males (36%) and 32 were females (64%), maximum patients were above 50 years of age (66%) and the mean age was found to be 5252±13.19 years.46 patients had type 2 DM and only 4 had type 1 DM.

The duration of diabetes was between 5-10 years in maximum patients (74%) rest had diabetes for more than 10 years, with mean duration being 9.58±4.20 years.

According to the glycaemic control (based on HbA1c) 20% had fair control, 42% had poor control and 38% were grossly uncontrolled.

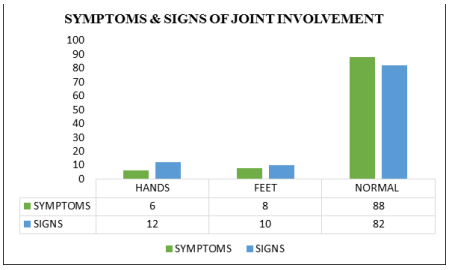

Table 1: distribution of patients based on presence and absence of signs and symptoms of joint involvement

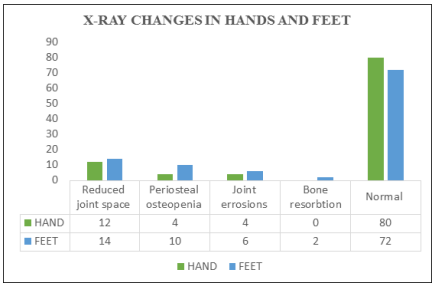

Table 2: distribution of patients based on x-ray changes in hand and feet.

Clinical evidence of neuropathy, in the form of loss of proprioception, was seen in 32% patients and was found to be more in feet than hands. A high incidence of NPDR 48% was seen in our study group. Features of early nephropathy based on USG findings were seen in 36% patients and 18% patients had abnormal RFT's, 16% patients had abnormal RFTs and USG evidence of early nephropathy.

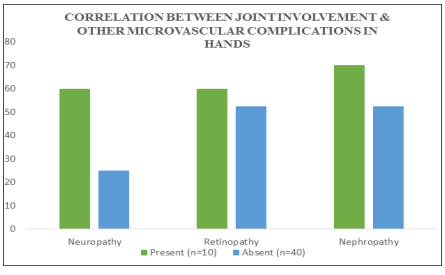

Table 3: correlation between joint involvement in hands and other microvascular complications

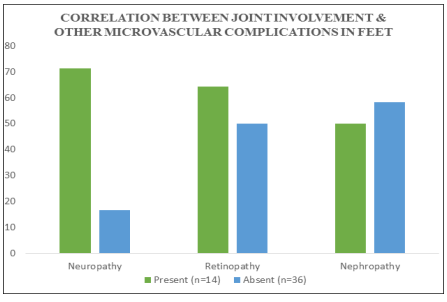

Table 4: correlation between joint involvement in feet and other microvascular complications

DISCUSSION

On associating the HbA1c levels with joint changes we found that, out of the 10 patients who had involvement of joints in hands 8 had uncontrolled diabetes, whereas 12 out of 14 had uncontrolled sugars in association with joint involvement in feet.

Out of total 50 patients, 3 (6%) had symptoms of joint disease in hands in the form of pain and 4 (8%) had symptoms in feet. On examination, reduced joint motility (ROM) was observed in 6 patients (12%) in hands and 5 patients (10%) in feet.

Comparing our study to a study done by:
Ardic F, Soyupek F et al in Ankara, Turkey(1) studied 78 patients of which 55 were males and 23 were females, with the mean age being 57.8±11.9 years. With predominance of hand involvement S.S. Kidwai and Lubna Wahidin, Pakistan(11) had a total sample size of 210 patients, 34.3% were males and 65.7% were females, with a mean age of 50.7±10.2 years. Besides 114 (54.28) had positive GALS screening (Gait, arms, leg, spine) which when further examined 28 (13.3%) had positive REMS (Regional examination for musculoskeletal system) in hands, with a statistically significant case and control comparison (p value < 0.001)

Bhat, Dhar et al, from Kashmir, India(12) found that out of 403 patients 342 (85.1%) patients had uncontrolled sugars with a mean HbA1c of 8.1.

In our study patients were subjected to X-ray of both hands and feet. There was more joint and bone involvement of feet, than hands Clinical evidence of proprioceptive neuropathy was seen in 32% of our patients, more in feet than hands, and these correlated well with X-ray findings of joint involvement.

54% patients had diabetic retinopathy, NPDR (48%). However, it did not correlate well with either hand or Feet involvement on X-ray.

16% patients had abnormal renal functions and early nephropathy on USG evident by decreased cortical thickness. Its correlation with joint involvement was not found to be statistically insignificant.

Way back in 1981, a study by Rosenbloom A L, Silverstein J H et al in New England Journal of Medicine(19) reported a correlation between LJM (limited joint mobility) and increased incidence of microvascular complications in Childhood Diabetics .

Vishwanathan V, Kumpatla S and Rao V in 2014 (1) studied radiological abnormalities in the feet of Diabetic patients with Neuropathy and foot ulceration and found significant correlation.

Fatma B Ergen, Saziye Eser Sanverdi et al (20) in their update on Imaging in Charcot Foot in Diabetes stated that MRI is far superior than plain X-rays and picks up changes in early stage.

Similarly, Rajbhandari S M and Jenkins R C (14) have classified and simplified the diagnosis of Charcot neuroarthropathy.
Our patients had early changes of neuro-arthropathy.

CONCLUSION:

Diabetic Early small joint involvement on X-rays was seen in 40% of our patients and correlated well with glycaemic control and proprioceptive neuropathy in feet. No correlation was seen with duration of diabetes and presence of retinopathy or Nephropathy

LIMITATIONS:

1) The study included only 50 patients, a larger study will be needed for better results.
2) MRI could not be done in our patients due to financial constraints.

CLINICAL IMPLICATIONS:

Small joint involvement occurs in diabetes and can lead to serious debilitating conditions like Limited Joint Mobility and Charcot Neuroarthropathy. These cause loss of function of Hand and Foot, loss of jobs and an increased economic burden on patients and society. Thus, joint examination should be included in the routine follow up of diabetic patients to pick up early involvement and be subjected to investigations like X-rays and MRI. Tight glycaemic control is also beneficial in preventing and postponing Diabetic small joint involvement.

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Conflicts of interest: None declared
Ethical Approval: The study was approved by the Institutional Ethical Committee

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