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LIMITED JOINT MOBILITY IN PATIENTS WITH TYPE 1 DIABETES MELLITUS

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Life expectancy of those developing Type 1 Diabetes Mellitus under the age of 20 years is reduced by 30% and 50% of all such patients will no longer be alive after 30 years of Type 1 Diabetes.[1] Many, if not all, of the long term complications of Diabetes such as nephropathy, retinopathy as well as the macrovascular complications that contribute to the increased mortality and morbidity in these patients are considered related to ambient and chronic elevation of blood glucose levels. Prevailing evidence suggests that glycosylation of tissue proteins associated with chronic hyperglycaemia may be responsible for many of these complications.[2]

Limited Joint Mobility (LJM) is an example of tissue glycosylation in patients with Diabetes. It has been called flexion contractures and joint contractures. Although first described by Lundbaek[3] in 1957, it was overlooked until Jung[4] redescribed as "Diabetic Hand Syndrome" in 1971. It was also described as Cheiroarthopathy[5] and could be identified by the presence of a "prayer sign" (Fig 1) that is charaterised by the inability of the affected patients to oppose the palmar surfaces of the digits. Other workers have shown that the joints in the foot can also be affected[6]. Hence the term LJM may be more appropriate.

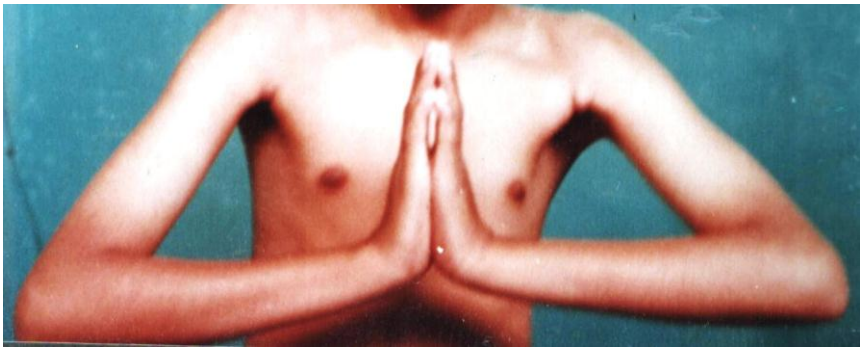

Fig: 1 " Prayer Sign" of limited joint mobility

Alan L. Rosenbloom[7]., et al described in 1974, 3 adolescents with long standing Diabetes who had restricted mobility of small and large joints, thick, tight, waxy skin, both impairment and maturation delay under the title "Diabetes Mellitus, short stature and stiffness – a new syndrome". In a subsequent study, they observed that the development of LJM was a function of the duration of Diabetes and that there was a positive correlation between its development and the development of microvascular complications. Construction of life table analysis indicated 83% risk for microvascular complications after 16 years of Diabetes, if LJM was present, but only 25% risk if LJM was absent. Consequently it was their opinion that LJM identifies a population exceptionally at risk for the early development of complications, permitting the attention of health care professionals to be focused on such high risk individuals.

The real clinical importance of LJM may lie in its known association with nephropathy, retinopathy and neuropathy. The accumulation of the pigmented collagen products, melanoidins as reflected by increased fluorescence and absorbance in biopsy specimens has been shown to correlate with the presence and severity of retinopathy and nephropathy.

It was, therefore, the purpose of study to determine the prevalence of LJM in patients with Type 1 Diabetes in South Indian population and to determine the risk factors for its development as well as to look for correlation, if any, between its occurrence and the development of long term complications of Diabetes.

MATERIALS AND METHODS

Seventy five randomly selected patients with Type 1 Diabetes of both sexes with variable duration of Diabetes formed the material for the study. Each patient was subjected to detailed clinical examination for the presence of long term complications of Diabetes. Optic fundi were examined after full Pupillary dilatation. Urine was examined for proteinuria. Each patient was examined for the presence of LJM following the recommendations of Brink-Starkaman[8] as modified by Rosenbloom[7] (Table 1).

Table 1. Definition of LJM: recommendations of Brink – Starkman as modified by Rosenblom[1]

Observe and shake both hands of subject

Ask subject to place his / her hands in the "Clapping" or "Prayer" position with forearm parallel to the floor.

Evaluate stiffness of the skin and inability to oppose joints of fingers.

Observe incomplete flexion and extension of Wrist and elbows, lateral bending of neck, and limited mobility of spine.

Staging of LJM was carried out as per Brink-Starkman[8] staging criteria (Table 2)

Table 2: Brink-Starkman LJM staging criteria

Stage 0: No stiffness, no joint abnormalities

Stage 1: Stiffness of skin only

Stage 2: Flexion contractures of opposing 5th fingers bilaterally.

Stage 3: Bilateral contractures of more than 5th fingers

Stage 4: Bilateral involvement of the wrists

Stage 5: Involvement of other joints.

It was then analysed to see whether there was any correlation between the development of LJM on the one hand and age, gender, age at diagnosis, duration of Diabetes and degree of metabolic control on the other. Further, it was analysed to see if presence of LJM correlated with the development of specific diabetic microvascular complications such as retinopathy and nephropathy so that LJM could serve as an external marker of internal microvascular complications of Diabetes.

Glycaemic control was assessed based on (a) the mean fasting plasma glucose level over the previous 3 clinic visits and (b) glycated haemoglobin. Degree of metabolic control was stratified as good, fair and poor based on these results as shown in Table 3.

Table 3: Criteria for the assessment of Glycaemic control

Mean Fasting Plasma Glucose	HbA1c(%)	Quality (mg%) of metabolic control
<100	<7	Good
100 – 140	7 – 10	Fair
>140	>10	Poor

RESULTS

Of the 75 patients studied 55 (73.33%) were males while the remaining 20 (26.67%) were females. Their age ranged from 10 to 54 years (mean 28.09± 6.86 years) Their age at diagnosis of Diabetes ranged from 9 to 30 years (mean 22.38 ± 5.35 years). Their duration of Diabetes ranged from 1 month to 24 years (mean 5.85 ± 4.41 years).

LJM was seen in 37 (49.33%) of the 75 patients studied, of whom 28 (75.67%) were males and 9 (24.33%) were females.

Staging of LJM revealed that 10.67%, 37.33%, and 1.33% of patients had stage I, II, and III LJM respectively. None had stage IV and V LJM.

Diabetic Retinopathy and Diabetic Nephropathy were present in 20 (26.66%) and 5 (6.67%) of the study subjects respectively. Of those with Retinopathy 17 (85%) had background retinopathy while the remaining 3 (15%) had proliferative retinopathy.

Correlation between the presence of LJM and various variables studied:
The mean age of Type 1 diabetics with LJM (30.65 $\pm$ 7.35 years) was significantly higher ($0.0027 > p > 0.001$) than those without LJM (25.53 $\pm$ 6.28 years)
The mean age at diagnosis of Diabetes in those with and without LJM of 22.51 $\pm$ 5.24 years and 22.16 $\pm$ 5.45 years, respectively was not statistically significant.
Type 1 diabetics with LJM had a significantly ($p<0.001$) longer duration of diabetes (8.14 $\pm$ 5.55 years) compared to those without LJM (3.55 $\pm$ 3.20 years).
While 9 (45%) of female diabetics had LJM, 28 (50.90%) of male diabetics had LJM. This difference was not statistically significant.

Mean fasting plasma glucose in those with LJM (205.43 $\pm$ 37.7mg%) was significantly higher ($0.05 > p > 0.046$) than in those without LJM (188 $\pm$38.61mg%). Similarly mean HbA1c in those with LJM (9.10 $\pm$ 1.16%) was also significantly higher ($0.046>p>0.01$) than in those without LJM (8.95 $\pm$1.01%)

Correlation between the presence of LJM and the development of microangiopathic complications of diabetes in patients with Type 1 Diabetes:

Retinopathy was present in a significantly ($p<0.001$) higher percentage of diabetics with LJM (45.95%) than in those without LJM (7.89%). Interestingly, proliferative retinopathy was not seen in any one without LJM.

Diabetic nephropathy was present in 10.81% of those with LJM and 2.63% of those without LJM, a difference that was not statistically significant.

DISCUSSION

Seventy five randomly selected patients with Type 1 Diabetes of both sexes were studied to determine the prevalence of limited joint mobility, factors associated with its development and correlation, if any, between LJM and long term microangiopathic complications of Diabetes.

LJM was present in 45.95% of patients. Its prevalence was 50.9% in males and 45% in females. Larkin, et al[9], reported a prevalence of 30% among 80 diabetic men and 43% among 88 diabetic women. Rosenbloom,[1] et al, detected LJM in 30% of 309 patients with Diabetes aged 1 to 28 years.

Type 1 diabetics with LJM were significantly older compared to those without LJM, though the age at diagnosis of Diabetes was not different between the two subgroups. Again, the duration of Diabetes was significantly longer in diabetics with LJM. In other words, LJM appears to be a duration – related complication of Diabetes.

Studies in some centres[10] describe increased prevalence in men that is not replicated in all studies. In the present study also the prevalence of LJM in 50.9% of men and 45% of women does not assume statistical significance indicating that gender does not probably influence the development of LJM in Type 1 diabetics. A curious finding in most reports has been the almost complete absence of LJM before puberty. It is as if some process related to awakening of the neuro-hypophyseal –adrenal-gonal axis was a co-factor required for the development of LJM.

In the present study fasting plasma glucose as well as HbA1c were significantly higher in diabetics with LJM than those without LJM. In most studies, however, there seems to be no apparent correlation with acute measures of glycaemia, though a positive correlation with HbA1c has been reported. For instance, Brink et al,[8] in a 5 year study of 805 patients followed prospectively found that there was a significant difference in HbA1c levels between those with and without LJM, though considerable overlap did occur. Pirart[11] found that in a group of 4400 Type 1 diabetics with onset by age 20, 50% had LJM after 16 years, if control of Diabetes was poor and only 35% if control was good.

SUMMARY AND CONCLUSIONS

Limited Joint Mobility is fairly common in patients with Type 1 Diabetes, being present in 50.90% of males and 45% of females. It tends to occur with longer duration of Diabetes, increasing age of the patients and poorer metabolic control and correlates best with the presence of Diabetic Retinopathy, thus serving as an important external marker of microangiopathy in patients with Type 1 Diabetes.

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