

RESPIRATORY FUNCTION EVOLUTION IN A DURATION OF FOUR YEARS IN PATIENTS WITH DIABETES MELLITUS

K. MASMOUDI and N. ZOUARI

*Service d'Explorations Fonctionnelles
CHU. H.Bourguiba ; 3029 ; Sfax ; TUNISIA*

SUMMARY:

Objective: To search the effect of diabetic duration on the evolution of respiratory function parameters.

Material and Methods: 19 subjects with diabetes mellitus aged $36, 79 \pm 2, 15$ years, 8 male and 11 female, 9 with type 2 diabetes mellitus and 10 with type 1. Patients were characterised by body mass index (BMI) of $25,79 \pm 0,75 \text{ kg/m}^2$, fasting glucose of $10,97 \pm 0,71 \text{ mmol/l}$, HbA1C of $9,09 \pm 0,49 \%$, and diabetic duration under 10 years in 10 subjects (G1) and upper or equal to 10 years in 9 subjects (G2). A measure of ventilatory flows, pulmonary volumes and alveolo-capillary diffusion capacity of CO (DLCO) was realised twice at an interval of four years.

Results: The initial exploration had shown a restrictive pulmonary tendency (total lung capacity TLC % th = $87, 47 \pm 2, 23$) without alteration of DLCO reported to alveolar volume (DLCO / VA % th = $113,53 \pm 5,65$). After four years, we had found a significant reduction of functional residual capacity in G2 (FRC % th : $106,44$ vs $86,11$; $p < 0,05$) with a slight decrease of residual volume (RV % th : $93,78$ vs $80,89$) without modification of the other parameters for both groups. The fasting glucose and HbA1C % values were also comparables.

Conclusion: This study found that pulmonary volumes impairment are more marked with diabetic duration especially after 10 years. An other measurement after some years will be necessary in order to evaluate the evolution kinetic of different parameters of respiratory function.

Key words: diabetes mellitus; lung; spirometry; diffusing capacity.

INTRODUCTION

The presence at the lung of numerous capillary vessels and an abundant connective tissue suggests the possibility of pulmonary degenerative lesions during the diabetes mellitus, which can have functional repercussions. It had been demonstrated that respiratory function at rest is altered in diabetes mellitus. There were a restrictive tendency and a reduction of alveolo-capillary diffusing capacity if compared with reference subjects [1-5]. The aim of this study is to evaluate the evolution of these parameters after duration of four years.

MATERIAL AND METHODS

Patients:

At a first study, 49 subjects with diabetes mellitus aged 36.67 ± 10.79 years, with extreme ages of 15 and 56 years, 29 female and 20 male, without known pulmonary pathologies (infectious, professional...), not obese (BMI $< 30 \text{ Kg/m}^2$) and no smoking were recruited. 27 Patients had type 1 and 22 had type 2 diabetes mellitus. Diabetes

mellitus mean duration was 9.41 ± 5.66 years. subjects with diabetes mellitus were compared to 31 reference subjects matched for age, sex ratio, and BMI.

After four years, we had the possibility to repeat the same exploration to 19 subjects with diabetes mellitus. Their characteristics are mentioned in table I.

Table I: subjects with diabetes mellitus: characteristics at the start

Number	19
Age (years)	36.79 ± 2.15
Sex	8M + 11F
Type of diabetes mellitus	10 type 1 + 9 type 2
Diabetes mellitus duration (years)	9.26 ± 1.42

Methods:

All patients had a large exploration in order to appreciate glycaemia control and to search degenerative complications at the start of the study and after four years for 19 subjects with diabetes mellitus. The evaluation included the measurement of weight, height and arterial pressure, an electrocardiogram, a fundoscopic examination and a neurological exploration. The evaluation included glycaemia, HbA1c, cholesterol, triglycerid, creatinemia, 24 h proteinuria and chest radiography.

The respiratory functional exploration was realised with a body pléthysmograph «V6200 SensorMedics», permitting the measure of pulmonary flows, volumes and capacities, and the alveolo-capillary diffusion capacity to the CO with single breath method (DLCO). Tests were realised in the morning, between 10h and 13h, in conformity with the American Thoracic society recommendations [6,7] Predicted values were those established by Knudson RJ and coll. [8] for flows and volumes and Burrows B and coll. [9] for DLCO.

Statistical analysis:

Descriptive analyses were expressed by mean values \pm Standard error mean (SEM). Newman Kulls test-Student was used to compare anthropometric and spirometric parameters between 2 groups at the first study. One way variance analysis for repeated measures test had permitted to compare different parameters for the same patients at four years interval. Results were significant at the threshold of 5% ($p < 0.05$).

RESULTS

The first study had demonstrate that subjects with diabetes mellitus had a significant decrease of ventilatory flows, lung volumes and alveolo-capillary diffusing capacity if compared to reference subjects [5]. For the 19 subjects with diabetes mellitus who had completed the second examination, the evolution of metabolic parameters and degenerative complications is mentioned in table II. They had a slight overweight and an elevated values of glycaemia and HbA1c. But, after four years, these values were ameliorated. If considering diabetes mellitus duration lower or upper 10 years, subjects with diabetes

mellitus were reparted in two groups of 9 and 10 patients respectively. The functional respiratory parameters evolution is mentioned in table III. There was a significant decrease of FRC if diabetes mellitus duration is upper than 10 years and a slight decrease of RV, but no change in other spirometric parameters in both groups.

Table II : Metabolic and degenerative complications evolution after four years in subjects with diabetes mellitus

	<u>At the start</u>	<u>After four years</u>
BMI (kg/m ²)	25.79 \pm 0.75	25.65 \pm 0.70
Fasting glucose (mmol/l)	10.97 \pm 0.71	10.06 \pm 0.69
HbA1c (%)	9.09 \pm 0.49	8.62 \pm 0.55
Serum creatinine (μ mol/l)	71.37 \pm 3.90	88.93 \pm 4.09 *
Serum cholesterol (mmol/l)	5.22 \pm 0.28	4.89 \pm 0.27
Retinopathy (number)	4	7
Neuropathy (number)	7	9

*: $p < 0.05$

Table III: Pulmonary function evolution after four years

	<u>Diabetes duration <10years</u>		<u>Diabetes duration \geq10years</u>	
	<u>At the start</u>	<u>After 4 years</u>	<u>At the start</u>	<u>After 4 years</u>
FVC% th	80,7	87,8	88,33	92,11
FEV1% th	79,9	82,6	86,56	87,44
FEV1/FVC%	84,9	79,5	83,11	79,78
FEF25-75% th	78,5	71,3	81,78	81,67
PEF% th	60,7	72,9	69,11	72,56
TLC% th	85,4	86,4	89,78	87,44
RV% th	100,7	82	93,78	80,9
FRC % th	93,3	93,8	106,44	86,11*
DLCO% th	93,2	97,7	87,25	87,33
DLCO/VA % th	118,22	119,33	112,25	117,11

COMMENTS

The principal results of our study are: The lung can be damaged in diabetes mellitus. There is a restrictive pulmonary tendency and an alteration of diffusing capacity. After a duration of four years, there is a relative stability of most spirometric values in both groups. There is also a slight but not significant decrease in fasting glucose, HbA1c, cholesterol, triglycerid and BMI values which is in favour of a better metabolic control. We formulate the hypothesis that relative stable respiratory function may be explained by a better metabolic control. In fact, several previous studies had found a significant correlation between glycaemia control and pulmonary function [10-12].

Our results are different of those of Lange P et coll

[13] who found that the decrease of ventilatory capacity is more marked at the beginning of diabetes mellitus and Barret-Connor E et coll [14] who found that pulmonary function in older adults is altered only in male subjects with diabetes mellitus with diabetes mellitus duration upper than 10 years.

CONCLUSION

Pulmonary volumes impairments are slightly more marked with diabetes mellitus duration especially after 10 years. An other measurement after some years will be necessary in order to evaluate the respiratory function evolution kinetic in diabetes mellitus.

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