Relationship between esophageal motility disorders and autonomic nervous system in diabetic patients: Pilot North African study

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INTRODUCTION

Diabetes mellitus (DM) affects different systems of which the gastrointestinal (GI) tract. Although little attention has been given to esophageal disorders in DM, the prevalence of esophageal symptoms is estimated to be between 25% and 87% [1, 2]. Moreover, esophageal manometry (EM) revealed frequencies up to 65% of esophageal motility disorders (EMD) in diabetic patients [1- 3]. Pathophysiology of EMD in patients with DM seems to be multifactorial and still unclear. Main mechanisms described include hyperglycemia as well as autonomic neuropathy (AN). In fact, several studies have shown that poor glycemic control is associated with a higher frequency of EMD [3, 4]. Moreover, esophageal dysfunctions occur frequently in patients with diabetic autonomic neuropathy (DAN) [5-6].

AIMS

1. To evaluate the prevalence of EMD in patients with type 2 diabetes mellitus
2. To determine the relationship between EMD and autonomic neuropathy as assessed by heart rate variability (HRV)

MATERIELS ET METHODES

All the patients completed a questionnaire about diabetes characteristics and gastrointestinal symptoms. Conventional esophageal manometry was performed in all patients by a water perfusion catheter (MMS probe E4-5-5-5) connected to external transducers perfusion pump. The EMD was diagnosed if patients fulfilled one or more of the following five criteria [7]: 1/ resting pressure in LES < 10 or > 45 mmHg 2/ relaxation pressure in LES > 8 mmHg 3/ speed of the peristaltic wave < 2 or > 8 cm/s in the distal esophagus 4/ mean peristaltic contraction amplitude < 30 or > 180 mmHg in the esophagus 5 / Percentage of simultaneous, non-propulsive peristaltic waves in the esophagus > 10%. HRV was recorded for 7 minutes in three successive positions (supine, standing and supine) using Polar S810i watch (Polar Electro Oy, Finland, 1000 Hz). HRV data analysis was carried out using the Kubios HRV software (University of Eastern Finland, Kuopio, Finland). The temporal and frequency domains parameters were considered for analysis. A p-value of 0.05 was accepted as significance level.

RESULTS

EM was done in 38 patients (22 females) suffering from T2DM. The prevalence of EMD in our patients was 60.5%. Table 1 detailed the different EMD in our study.

The main characteristics of our patients were detailed in table 2. Low score physical activity was significantly more frequent in patients with EMD (p = 0.03).

Table 1. Esophageal manometric abnormalities in patients

EMD	Prevalence (%)
Abnormal resting pressure in the LES	50
Defect of relaxation LES	39.5
Slow speed of the peristaltic wave	5.3
Abnormal mean peristaltic contraction amplitude	7.9
Simultaneous contractions > 10%	7.9

EMD: Esophageal motility disorder; LES: Lower esophageal sphincter

Table 2. Characteristics of patients with normal and abnormal esophageal motility

Parameters	Normal esophageal motility(n =15)	Abnormal esophageal motility(n =23)	p
Gender (m/f)	7/8	9/14	ns
Age (yr)	56.9±9.8	61.6±11	ns
Low physical activity (n)	5 (33.3%)	17 (73.9%)	0.03
Diabetes duration (yr)	7.1± 6	6.8 ± 6.3	ns
BMI (kg/m^2)	28.4 ± 2.9	29.9 ± 5	ns
HbA1c (%)	7.8±1.7	7.7±1.7	ns
Fasting glucose (mmol/L)	10±3	9,2±3.1	ns
Peripheral Neuropathy (n)	4 (30.8%)	9 (69.2%)	ns
Retinopathy (n)	1 (12.5%)	7 (87.5%)	ns
Microalbuminuria (mg/L)	0.05±0.08	3.6±15.3	ns

BMI: body mass index; N : number ; HbA1c: glycosylated hemoglobin; ns: not significantly.

The levels of temporal domain indices (rMSSD, pNN50 and SDNN) were comparable between the two groups of patients with and without EMD during the three positions.

Considering frequency domain, There was an increase in sympathetic activity represented by the LF parameter (p=0.027) in the presence of EMD. Whereas parasympathetic modulation of heart rate represented by the HF parameter (p=0.027) was declined in patients with EMD compared to those without. The LF/HF ratio was significantly higher (p=0.002) in patients with EMD. The non linear HRV indices (SD1, SD2 and SD1/SD2) were no different between the two groups in the three positions.

CONCLUSION

The major findings of our study was a relatively high prevalence of EMD in population of T2DM. We also demonstrated that patients with EMD had an autonomic nervous system dysfunction, predominantly on the parasympathetic component.

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