Arab Journal of Gastroenterology xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Arab Journal of Gastroenterology

journal homepage: www.elsevier.com/locate/ajg

Original article

Erectile dysfunction in patients with nonalcoholic fatty liver disease

Ahmad Farooq Alsayed Hasanain [a,*], Reem Ezzat Mahdy [b], Ali Mohamed Abdel-Rahman Mahran [c], Ahmed Serag Mahmoud Safwat [d], Asmaa Omar Mohamed [e], Sherif Mohamed Abdel-Aal [f]

[a] Department of Tropical Medicine and Gastroenterology, Faculty of Medicine, Assiut University, Egypt
[b] Department of Internal Medicine (Gastroenterology Unit), Faculty of Medicine, Assiut University, Egypt
[c] Department of Dermatology and Andrology (Andrology Unit), Faculty of Medicine, Assiut University, Egypt
[d] Department of Urology, Faculty of Medicine, Assiut University, Egypt
[e] Department of Clinical Pathology, Faculty of Medicine, Assiut University, Egypt
[f] Department of Diagnostic Radiology, Faculty of Medicine, Assiut University, Egypt

ARTICLE INFO

Article history:
Received 13 November 2015
Accepted 20 December 2016
Available online xxxx

Keywords:
Erectile dysfunction
Fatty liver
Insulin resistance
Testosterone

ABSTRACT

Background and study aims: There is a lack of studies on erectile dysfunction (ED) in patients diagnosed with nonalcoholic fatty liver disease (NAFLD). The present study aimed to estimate the prevalence of ED in patients with NAFLD and to determine the independent predictors of ED in these patients.

Patients and methods: We conducted a prospective, hospital-based study of 192 consecutive male patients with NAFLD. All patients underwent clinical evaluation; abdominal ultrasonography; test for viral hepatitis markers; and estimation of liver chemistry panel, complete blood count, prothrombin time, serum lipids panel, serum testosterone, and fasting serum levels of glucose, insulin, and C-peptide.

Results: The mean age of the study population was 42.4 ± 7.7 years (79.1% ≥ 40 years). Of the 192 patients with NAFLD, 88 (45.8%) had ED, 28 (14.6%) had metabolic syndrome, 25 (13%) had type-2 diabetes mellitus (DM), and 131 (68.2%) had insulin resistance (IR). The mean level of serum testosterone was 3.17 ± 2.94 ng/mL, while the mean insulin resistance index was 2.9 ± 1.7. Mild ED (38.6%) was the most frequent grade of ED. Age ≥ 40 years (odds ratio [OR] 6.4; 95% confidence interval [CI] 1.7–24.1; p- 0.006), IR (OR 5.9; 95% CI 1.7–20.6; p- 0.005), and low serum testosterone (OR 5.1; 95% CI 1.5–17.1; p- 0.009) were the predictors of ED.

Conclusions: ED is a common disorder in male patients with NAFLD; both IR and low serum testosterone contribute to its development. Treatment of IR may carry a dual benefit of improving erectile function and decreasing the grade of hepatic steatosis.

Introduction

Nonalcoholic fatty liver disease (NAFLD) is a global disorder. It is considered as the most common liver disease in the Western world with a prevalence of 20–30% in the general population, with a higher percentage in patients with type-2 diabetes mellitus (DM) (70%) and morbid obesity (90%) [1]. Obesity is a major risk factor for the development of NAFLD; it may lead to insulin resistance (IR) and metabolic syndrome (MS). IR may also lead to the development of NAFLD even in lean individuals [2]. Imaging studies may reveal abnormalities suggestive of fatty liver. In clinical practice, abdominal ultrasound is most widely used as an initial imaging modality because of its availability, low cost, and lack of radiation exposure [3].

Erectile dysfunction (ED) represents a heavy burden upon public health [5]. Approximately 50% of the male population aged between 40 and 70 years will suffer from ED at some stage of their lives, with 10% experiencing a severe disease [6]. The prevalence of ED is 2–9% in the ages from 40 to 49 years and 20–40% for men aged <69 years, while reaching a higher prevalence in men in their 70 s and 80s [7]. Causes of ED may be organic (e.g., vascular, neurogenic, hormonal, anatomic, or drug-induced), psychological, or a combination of both [8,9]. In young men, obesity can lead to ED because of lower testosterone levels [10]. One of the mechanisms by which obesity contributes to decline in testosterone levels is the adipose-tissue–dependent aromatisation of testosterone to estradiol [11]. The prevalence of ED in patients with MS is almost two times more than in those without MS; about 40% of patients with ED have MS. An important mechanism linking MS and ED is

* Corresponding author at: Department of Tropical Medicine and Gastroenterology (6th Floor), Assiut University Hospital, Assiut, Egypt.
E-mail address: a.fh@outlook.com (A.F.A. Hasanain).

http://dx.doi.org/10.1016/j.ajg.2017.02.002
1687-1979/

hypogonadism [12]. History and physical examination are sufficient for making an accurate diagnosis of ED in most cases. The initial evaluation of ED includes a complete medical, sexual, and psychosocial history [13].

There is a lack of studies on ED in patients with NAFLD. This study aimed to estimate the prevalence of ED in patients with NAFLD and to determine the independent predictors of ED in this group of patients.

Patients and methods

We conducted a prospective, hospital-based study at the Assiut University Hospital, Egypt, during the period of April 2013 through February 2015. The study included 192 consecutive male patients with NAFLD admitted at the departments of Tropical Medicine and Gastroenterology, and Internal Medicine (Gastroenterology Unit). Diagnosis of NAFLD was based on the following criteria: (1) ultrasonographic findings (hyperechogenecity of the liver parenchyma, i.e., bright liver relative to the spleen and right kidney, hepatomegaly, and blurring of vascular margins) [3]; (2) no history of alcohol consumption; (3) no exposure to steatogenic medications; and (4) no evidence of viral hepatitis B or C [11]. Abdominal ultrasonography was performed by a single, experienced radiologist using *Siemens*, *Sonoline Siena* set (Germany). An Arabic validated version of the five-item International Index of Erectile Function (IIEF-5) was used to detect the presence of ED and to determine its severity [14,15].

All patients underwent clinical evaluation; abdominal ultrasonography; test for viral hepatitis markers (hepatitis B surface antigen and antibody to hepatitis C virus [HCV]); and estimation of liver chemistry panel, complete blood count, prothrombin time, serum lipids panel, serum testosterone, and fasting serum levels of glucose, insulin, and C-peptide. Body mass index (BMI) was estimated according to the following equation: BMI = weight (in kilograms)/height (in metres)^2. Overweight was defined as a BMI of 25 kg/m^2 to <30 kg/m^2. Obesity was defined as a BMI of ≥30 kg/m^2. Waist circumference was measured at the midpoint between the lower costal margin and the iliac crest. Patients with clinical, laboratory or ultrasonographic evidence of liver cirrhosis were excluded from the study.

Venous blood samples were collected after a minimum 14-h overnight fast. All laboratory investigations were conducted in the same laboratory with the standard methods. Elevated alanine aminotransferase (ALT) level was defined as ALT more than 41 IU/L. Glucose intolerance was defined as fasting serum level of glucose more than 6.1 to <7 mmol/L. Diabetes mellitus was defined as serum level of glucose of 7 mmol/L or more. Dyslipidemia was defined as one or more of the following: cholesterol serum level more than 200 mg/dL, low-density lipoprotein–cholesterol (LDL-C) serum level more than 130 mg/dL, high-density lipoprotein–cholesterol (HDL-C) serum level less than 27 mg/dL or triglyceride serum level of 165 mg/dL or more.

For the quantitative measurement of insulin and C-peptide, fasting serum levels of insulin and C-peptide were estimated using *IMMULITE 2000* immunoassay system (*Siemens Healthcare Global, USA*). Fasting level of insulin was used to estimate insulin resistance index (IRI) according to the equation of homeostasis model: IRI = Insulin in μIU/mL × Glucose in mmol/L/22.5. Insulin resistance was defined as IRI >2.5 [16]. C-peptide is formed during conversion of proinsulin to insulin. The causes of decreased C-peptide level are exogenous administration of insulin and type-1 DM [17]. Thus, C-peptide fasting level was estimated to differentiate type-2 DM (high or normal C-peptide level) from type-1 DM (low C-peptide level) and to differentiate between high fasting insulin level due to IR (high or normal C-peptide level) from that due to exogenous insulin administration (low C-peptide level).

Serum testosterone level was estimated using ab108666-Testosterone ELISA Kit (Abcam, USA). Sensitivity (the lowest detectable concentration of testosterone that can be distinguished from the zero standard) was 0.07 ng/mL at the 95% confidence limit. Human serum testosterone reference value in male was 1.8–9 ng/mL. Serum testosterone was considered low if less than 1.8 ng/mL.

MS was defined by presence of three or more of the following criteria: (1) abdominal obesity (waist circumference >102 cm in men or >88 cm in women); (2) high blood pressure (≥130/85 mmHg) or treatment for systemic hypertension; (3) high fasting serum level of glucose (≥110 mg/dL) or treatment for hyperglycaemia (glucose intolerance or type-2 DM); (4) high fasting serum level of triglycerides (≥150 mg/dL) or treatment for hypertriglyceridemia; (5) low fasting serum level of HDL-C (<40 mg/dL in men or <50 mg/dL in women) or treatment for low HDL-C level [18].

Ethical considerations

The study was approved by the Assiut Faculty of Medicine Clinical Research Ethical Committee, and was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). Before enrolment in the study, all the participants signed a consent certificate. Prior to signing the consent certificate, the participants discussed in detail with the investigator about the subject of the certificate and the study aim. The participants were clearly informed that refusing to participate in the study will not affect their having full benefit of the available medical service and treatment. Data were collected by personal interview with the participants, taking care to ensure data confidentiality.

Statistical analysis

The data were entered into and analysed using the SPSS (statistical package for social sciences; version 22) software for Windows (SPSS Inc., Chicago, IL, USA). Results are expressed as mean ± standard deviation or frequency (percentage) as appropriate. Independent predictors of ED in the study population with NAFLD were identified using univariate analysis (Yates' corrected chi-square test), followed by multivariate analysis (stepwise binary logistic regression) to assess the specific effect of each predictor. Multivariate analysis included factors with significant level ($p < 0.05$) in univariate analysis.

Results

The characteristics of the study population with NAFLD are shown in Table 1. Their mean age was 42.4 ± 7.7 years (79.1% were 40 years old or more). Of the 192 patients with NAFLD, 88 (45.8%) had ED, 28 (14.6%) had MS, 25 (13%) had type-2 DM, and 131 (68.2%) had IR. All patients with MS and DM had IR. The mean serum level of laboratory measures was as follows: ALT, 71.9 ± 12.5 IU/L; glucose, 5.9 ± 2.4 mmol/L; insulin, 15.6 ± 18.3 mlU/mL; C-peptide, 0.9 ± 1.1 ng/mL; cholesterol, 153.6 ± 31.5 mg/dL; LDL-C, 87.9 ± 27 mg/dL; HDL-C, 39.9 ± 7.6 mg/dL; and triglycerides, 135.4 ± 61.3 mg/dL. The mean level of serum testosterone was 3.17 ± 1.94 ng/mL, while the mean IRI was 2.9 ± 1.7.

With regard to the relative frequency of the different grades of ED in the NAFLD patients with ED (88 patients), mild grade was the most frequent (38.6%), while severe grade was the least frequent (9.1%) (Fig. 1).

Please cite this article in press as: Hasanain AFA et al. Erectile dysfunction in patients with nonalcoholic fatty liver disease. Arab J Gastroenterol (2017), http://dx.doi.org/10.1016/j.ajg.2017.02.002