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The Relationship between Lipid Profile and Erectile Dysfunction

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ABSTRACT

Purpose: To evaluate the relationship between serum lipids including cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglyceride and erectile dysfunction (ED).

Materials and Methods: From January 2000 to June 2003, 100 patients with organic ED, who were referred to our center, were selected and their lipid profile (Cholesterol, Triglyceride, HDL, LDL) were assessed. The results were compared with those in 100 healthy individuals.

Results: Mean age of men in the study and control groups were 43.72 ± 9.76 and 43.59 ± 10.51 years, respectively. Mean plasma cholesterol and LDL levels in individuals suffering from erectile dysfunction were significantly higher than controls (P = 0.04 and P = 0.02, respectively). However, no difference in the mean plasma triglyceride and HDL levels was seen. Odds Ratios for high plasma cholesterol level (>240 mg/dl) and high plasma LDL level (>160 mg/dl) were 1.74 and 1.97, respectively (r^2 = 0.04 and r^2 = 0.04). Using linear regression analysis, the regression coefficient for cholesterol and LDL versus the International Index of Erectile Dysfunction Questionnaire (IIEF) score were -0.036 and -0.035, respectively (95% confidence interval: 0.98 - 2.5 for cholesterol and 1.13 - 2.81 for LDL).

Conclusion: The impact of total cholesterol and particularly LDL on men's erectile function underlines the role of hyperlipidemia treatment in prevention of ED and emerges a holistic management in ED patients.

KEY WORDS: erectile dysfunction, serum lipids, cholesterol, LDL

Introduction

In the First International Consultation on Erectile Dysfunction, which was held in Paris in July 1999, they defined ED as a consistent or recurrent inability to attain and/or maintain penile erection sufficient for sexual performance, for at least a 3-month period.[1]

The prevalence of complete ED in healthy men has tripled from 5% in 1940s to 15% in 1970s.[2] The incidence rate of erectile dysfunction is about 26 cases per 1,000 men annually, increasing with higher age, lower education, diabetes mellitus, heart diseases, and hypertension.[3] Commonly, patients are divided into two groups: psychogenic and organic. The ratio of organic to psychogenic male sexual dysfunction has been reported to be directly associated with age; 70 % of patients under 35 years of age have psychogenic ED and 85 % of patients over 50 years of age have organic ED.[4] It is well known that ED is frequently seen in patients with manifestations of atherosclerotic diseases and this may be a symptom of a

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systemic vascular problem related to risk factors such as smoking, hypertension, hyperlipidemia, and diabetes mellitus.[5] A marked increase in serum LDL and a decrease in serum HDL have been reported in patients with vasculogenic impotence, in comparison with those with non-vasculogenic erectile dysfunction.[6] Blood cholesterol can also affect the sex hormones, especially in older men.[7] However, no comprehensive published study has been done on the prevalence and characteristics of ED and its relationship with hyperlipidemia in Iran. In the present study we have compared the plasma lipid profile of patients suffering from organic ED with that in a healthy control group.

Materials and Methods

From January 2000 to June 2003, a total of 100 patients with organic erectile dysfunction, based on the International Index of Erectile Dysfunction Questionnaire (IIEF-5), were selected at Sina Hospital, to be enrolled in a case-control study. Intracavernous injection (ICI) and nocturnal penile tumescence monitoring by a Rigi-Scan (optional) was used to exclude patients with psychogenic (non-organic) ED. Exclusion criteria were diabetes mellitus, hypertension (blood pressure >140/90), renal failure, hypogonadism, Peyronie's disease, obesity (BMI >28 kg/m^2), pelvic or spinal cord injury, history of vascular surgery, multiple sclerosis, thyroid dysfunction, cardiac diseases, drugs/narcotics administration, and smoking.

For comparison, 100 healthy individuals, with no evidence of erectile dysfunction were selected. They were matched with the study group for age and the exclusion criteria. All the patients and controls were examined and assessed using the International Index of Erectile Dysfunction Questionnaire (IIEF-5). Mild, moderate, and severe ED were defined corresponding to the scores of 18 to 24, 11 to 17, and 10 or less. Scores between 25 and 30 were considered as potent (control group). Physical examination consisted of penile palpation for Peyronie's disease, assessment of penile and perianal sensation, anal sphincter tone, and response of the bulbo-cavernous reflex.

Plasma lipid profile including cholesterol, triglyceride, HDL, and LDL were measured in study and control groups with the same laboratory kits and technique (enzymatic spectrophotometery). Optimum and normal upper limit levels were considered 180 and 240 mg/dl for cholesterol, and 130 and 160 mg/dl for LDL.

The SPSS software package, version 9.00, was used for statistical analysis, and *t* test was used for groups comparison and P value less than 0.05 was considered statistically significant.

Results

Mean ages of the patients and controls were 43.59 ± 10.51 (range 20 to 60) years and 43.72 ± 9.76 (range 20 to 60) years, respectively. Among 100 patients in the study group, 2 had mild, 41 had moderate, and 57 had severe ED. Delay in seeking treatment was less than 1 year in 48 patients, 1 to 2 years in 27, and more than 3 years in 35. Sleep disorder was found in 38 patients.

In order to find out the influence of age, we divided the patients into two groups of <40 and ≥40 years old. Mean plasma cholesterol level in study and control groups were 235.58 ± 76.56 mg/dL and 209.15 ± 47.63 mg/dL, respectively (P = 0.004). Among the patients 40 years of age or older, the difference between the two groups in cholesterol and LDL was also significant (P = 0.02 and P = 0.004, respectively), but not in patients younger than 40 years (table 1). Forty-eight per cent of patients (study group) and 17% of the controls had a plasma cholesterol level of 240 mg/dL or higher (P = 0.02). Such significant difference was also found in individuals over 40 years old (38% vs. 15%, respectively, P = 0.03), but

TABLE 1. *Number and percent of individuals in subgroups according to total plasma cholesterol level and age*

		Age				Total	
		<40		≥40			
		Controls (%)	Cases (%)	Controls (%)	Cases (%)	Controls	Cases
Cholesterol (mg/dL)	≤200	18 (47.3)	10 (31.2)	14 (22.5)	13 (19.1)	32	23
	201-240	18 (47.3)	12 (37.5)	33 (53.2)	17 (25.0)	51	29
	>240	2 (5.3)	10 (31.2)	15 (24.2)	38 (55.8)	17	48
Total		**38**	**32**	**62**	**68**	**100**	**100**

TABLE 2. *Number and percent of individuals in subgroups according to serum LDL level and age*

		Age				Total	
		<40		≥40			
		Controls (%)	Cases (%)	Controls (%)	Cases (%)	Controls	Cases
LDL (mg/dL)	≤130	19 (50.0)	15 (46.9)	29 (46.8)	16 (23.5)	48	31
	131-159	15 (39.5)	6 (18.7)	20 (32.2)	10 (14.7)	35	16
	>160	4 (10.5)	11 (34.4)	13 (21.0)	42 (61.8)	17	53
Total		**38**	**32**	**62**	**68**	**100**	**100**

not in those under 40.

Mean plasma LDL level in study and control groups were 163.68 ± 75 mg/dL and 136.79 ± 42.16 mg/dL, respectively (P = 0.002). In the patients younger than 40 years old, such a significant difference was not found. However, in those with an age of 40 or more, the difference was significant (P = 0.004). The results in subgroups according to serum LDL level and age is shown in table 2. Overall, 53% of patients in the study group and 17% of the controls had high plasma LDL (≥160 mg/dL, P = 0.02). This difference was also seen in individuals over 40 years old (42% vs.13%, P = 0.04). Nevertheless, it was not significant in individuals under 40.

Mean plasma triglyceride observed in the study and control groups were 257.53 ± 53.80 mg/dL and 251.28 ± 100.00 mg/dL, respectively (P = 0.58), the result of which was not significantly affected by age.

Mean plasma HDL level in the study and control groups were 39.82 ± 22.01 mg/dL and 42.42 ± 11.62 mg/dL, respectively (P = 0.29), and it was not affected by age.

Using the linear regression test, the regression coefficient for cholesterol versus the patients' score, obtained by IIEF-5, was -0.036, i.e. regardless of changes in other parameters, by each 1 mg/dL increase in cholesterol level we will note 0.036 decrease in the patient's score. The coefficient for LDL was -0.035. R square for LDL and cholesterol was calculated separately (0.04 for both of them), which means that 4 percent of ED is accounted for by cholesterol or LDL levels.

Odds Ratios for high plasma cholesterol level (>240 mg/dl) and high plasma LDL level (>160 mg/dl) were 1.74 and 1.97, respectively (r^2 = 0.04 and r^2 = 0.04).

Discussion

The association between hyperlipidemia and ED is originally attributed to atherosclerosis in the hypogastric-cavernosal arterial bed, with a subsequent insufficiency in penile arterial inflow.[8] More recently, the importance of cavernosal relaxation in the erectile process has been shown. Impairment of endothelium-dependent relaxation in numerous vascular beds in men with hypercholesterolemia has been firmly established.[9,10,11] These impairments have also been shown to be reversible, using lipid-lowering therapies.[12] In animal models of hypercholesterolemia, studies show both deficient endothelium- and neurogenic-dependent cavernosal relaxations.[13,14] These changes are also reversible by normalizing total plasma cholesterol levels through dietary changes. Ultrastructural assessments in these studies have shown atherosclerotic-like processes in focal areas of the cavernosal sinusoids.[14] These changes are not thought to be the primary cause of ED, but more likely, precursors to later, more complex atherosclerotic lesions.

Although erectile dysfunction is frequently seen in patients with manifestations of arteriosclerotic diseases, the independent contribution of total plasma cholesterol in predicting erectile dysfunction is unclear. In the study done by Wei et al,[15] every mmol/L increase in total cholesterol was associated with a 1.32-fold increase in the risk of erectile dysfunction (95% confidence interval: 1.04 - 1.68), while every mmol/L increase in high density lipoprotein cholesterol was associated with a 0.38-fold increase in the risk (95% confidence interval: 0.18 - 0.80). Men with a HDL cholesterol measurement over 1.55 mmol/L (60 mg/dL) had 0.30 times the risk (95% confidence interval: 0.09 - 1.03) as did men with less than 0.78 mmol/L (30 mg/dL). Men with total cholesterol over 6.21 mmol/L (240 mg/dL) had 1.83 times the risk (95% confidence interval: 1.00 - 3.37) as did men with less than 4.65 mmol/L (180 mg/dL). Those differences remained essentially unchanged after adjustment for other potential confounders. The authors concluded that a high level of total cholesterol

and a low level of high density lipoprotein cholesterol are important risk factors for erectile dysfunction.

Sanchez-Cruz and colleagues[16] assessed the health-related quality of life factors associated with ED. The prevalence of ED based on IIEF was 18.9%. Odds Ratio was calculated for diabetes (4), hypertension (1.58), high cholesterol (1.63), peripheral vascular disease (2.37) and allergy (3.08).

In the study done by Pinnock et al,[17] high cholesterol level was an independent predictor of impotence. ED was strongly correlated with age in all seven domains of sexual function. High triglyceride levels, blood pressure medication, and non-cancer surgery for prostate disease were independent predictors of poor sexual function at older ages. High cholesterol level was an independent predictor of impotence. They concluded that cardiovascular risk factors were predictors of ED in these older men, suggesting that prevention may benefit sexual function.

In a study by Feldman et al,[18] after adjustment for age, a higher probability of impotence was directly correlated with heart disease, hypertension, diabetes, associated medications, and indices of anger and depression, and it was inversely correlated with serum dehydroepiandrosterone, high density lipoprotein cholesterol, and an index of dominant personality.

Manning et al[19] found a correlation between high LDL and organic erectile dysfunction (68.6% vs. 32.4% in the psychogenic impotence group) and a clear positive correlation between high LDL and caverno-venous insufficiency was determined.

In the study conducted by Kim,[20] the incidence of abnormally high level of LDL was significantly higher in the patients than in the control men, but there was no significant difference in the incidence of abnormally high blood level of total cholesterol or triglyceride and abnormally low blood level of HDL between the two groups.

In a study by Atahan et al,[21] lipoprotein A and triglyceride levels were higher in both peripheral and cavernosal samples of vasculogenic ED group than in non-vasculogenic ED group, with no differences between peripheral and cavernosal blood levels within the same groups. There was no significant change in TG and HDL levels in neither of the groups.

Our finding suggest that there is a significant correlation between total cholesterol and LDL with ED, probably indicating the etiologic role of these lipids in organic ED. According to our findings, every mg/dL increase in plasma cholesterol and LDL levels decreases IIEF-5 scores by 0.036 and 0.035, respectively. We have shown that this correlation was not significant in men aged under 40 years; thus, it can confirm the theory that organic factors play a role, especially in the elderly.

Conclusion

We recommend that men's lipid profile be tested regularly, especially in aged individuals. The individuals at risk for hyperlipidemia are also at increased risk for ED, but they can prevent ED and other associated complications by modifying their lifestyle, more physical activity, and changing diet.

ED is a symptom rather than a disease and we can almost always find a factor that causes ED. However, while visiting a patient, holistic management should not be neglected since several etiologic factors, including hyperlipidemia, can affect the whole body of patients.

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