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Effects of Fenofibrate on Albuminuria in Patients with Hypertriglyceridemia and/or Hyperuricemia: A Multicenter, Randomized, Double-Blind, Placebo-Controlled, Crossover Study

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ABSTRACT

Background: A slight increase in albuminuria (urinary albumin excretion [UAE] ≥30 mg/d) is associated with hypertension, type 2 diabetes mellitus, dyslipidemia (high triglyceride [TG] and low high-density lipoprotein cholesterol [HDL-C] concentrations), and hyperuricemia. Although antihypertensive and antidiabetic therapies have been reported to reduce UAE, an association between improvement in dyslipidemia and/or hyperuricemia and a reduction in UAE has not been reported.

Objective: The aim of this study was to investigate the efficacy and tolerability of fenofibrate on albuminuria in patients with hypertriglyceridemia and/or hyperuricemia.

Methods: Patients with hypertriglyceridemia and/or hyperuricemia were recruited from general clinics and lipid clinics in Japan; they received fenofibrate (300 mg once daily) in this randomized, double-blind, placebo-controlled, crossover study. Patients in group A received fenofibrate for 8 weeks followed by placebo for an additional 8 weeks, whereas those in group B received placebo for 8 weeks followed by fenofibrate for 8 additional weeks. UAE was measured at baseline and at the end of each 8-week period. Blood tests were performed at baseline and every 4 weeks until study end. Each physician who participated in the study was to record adverse events at each study visit.

Results: A total of 43 patients entered this study (38 men, 5 women; mean [SE] age, 57.1 [1.4] years; mean [SE] body mass index, 24.3 [0.4] kg/m^2). Twenty-one patients (18 men, 3 women) were randomly assigned to group A and 22

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(20 men, 2 women) to group B. In group A, serum TG ($P < 0.001$) and apolipoprotein (apo) C2, C3, and E (all $P < 0.01$) concentrations decreased significantly with fenofibrate, and HDL-C and apo A1 and A2 increased significantly (all $P < 0.001$). All of these parameters returned to near-baseline levels after placebo administration. In group B, serum TG, HDL-C, or apo A1, A2, B, C2, C3, and E concentrations did not change significantly with placebo, but TG ($P < 0.01$), apo C3 ($P < 0.05$), and apo E ($P < 0.05$) were significantly decreased with fenofibrate. In addition, HDL-C ($P < 0.05$), apo A1 ($P < 0.001$), and apo A2 ($P < 0.01$) were significantly increased with fenofibrate. Serum concentrations of TG (group A, $P < 0.001$; group B, $P < 0.001$); apo C2 (group A, $P < 0.01$), C3 (group A, $P < 0.01$; group B, $P < 0.05$), and E (group A, $P < 0.01$; group B, $P < 0.05$); and uric acid (group A, $P < 0.001$; group B, $P < 0.01$) were significantly decreased with fenofibrate compared with placebo. HDL-C and apo A1 and A2 were significantly increased with fenofibrate compared with placebo (all $P < 0.001$ in both groups). Fenofibrate treatment was associated with significant reductions in UAE (group A, $P < 0.05$; group B, $P < 0.01$). Spearman rank correlation analysis showed that changes in UAE were associated with changes in apo C2 ($\rho = 0.43$; $P = 0.02$) and apo C3 ($\rho = 0.49$; $P = 0.01$) concentrations. Multiple regression analysis revealed that a decrease in apo C3 concentration was independently and significantly associated with reductions in albuminuria ($\rho = 0.48$; $P = 0.01$). At the end of the study, neither drug-related nor clinical adverse events were evident in any of the patients, except for an increase in serum creatinine concentration above the upper limit of normal (1.40 mg/dL) in 3 patients (14.3%) in group A and 1 patient (4.5%) in group B.

Conclusions: In our study population of patients with hypertriglyceridemia and/or hyperuricemia, fenofibrate-induced ameliorations of impaired TG-rich lipoprotein metabolism were associated with reductions in albuminuria. (*Curr Ther Res Clin Exp.* 2003;64:434–446)

Key words: fenofibrate, apolipoprotein C3, low level of high-density lipoprotein cholesterol, hyperuricemia, albuminuria.

INTRODUCTION

Microalbuminuria (urinary albumin excretion [UAE] ≥30 mg/d) is a strong risk factor for cardiovascular disease in diabetic and hypertensive patients.[1–3] The exact mechanisms of albuminuria and subsequent organ damage are debatable. One hypothesis states that generalized endothelial dysfunction underlies microalbuminuria.[4] Strong support for this theory comes from studies in both diabetic and hypertensive patients showing that circulating levels of von Willebrand's factor are related to microalbuminuria.[5,6]

Microalbuminuria has been reported to be associated with hypertension, type 2 diabetes mellitus (DM), high serum triglyceride (TG) and uric acid concentrations, and low serum high-density lipoprotein-cholesterol (HDL-C)

concentration.[7–10] We recently found that patients with type 2 DM whose condition progressed from normoalbuminuria to microalbuminuria had increased serum TG and apolipoprotein (apo) B concentrations.[11] Although intervention studies revealed that antidiabetic and antihypertensive treatment reduced albuminuria,[12,13] studies in which low-density lipoprotein (LDL) cholesterol concentration was lowered showed conflicting results.[14,15] No other studies have examined the effect on albuminuria of correcting dyslipidemia (high TG and low HDL-C concentrations) or high uric acid concentration, both of which were improved with fenofibrate.[16]

The aim of this study was to investigate the efficacy and tolerability of fenofibrate treatment on albuminuria in patients with hypertriglyceridemia and/or hyperuricemia.

PATIENTS AND METHODS

Study Design

This was a multicenter, randomized, double-blind, placebo-controlled, crossover study. Male and female patients with hyperlipidemia (fasting serum concentrations of total cholesterol ≥220 mg/dL and/or TG ≥150 mg/dL[17]) and/or hyperuricemia (uric acid concentration ≥7.0 mg/dL) were randomly selected from 3 lipid clinics and 4 general clinics in Japan and were invited to participate in the study if they fulfilled the following criteria: age 17 to <70; no sign of primary renal, hepatic, or cardiac disease; and no sign of insufficiently treated DM (hemoglobin A_{1c} [HbA_{1c}] >9.0%) or hypertension (blood pressure [BP] ≥160/95 mm Hg). Female patients who were pregnant, possibly pregnant, or lactating were excluded.

After providing written informed consent, patients were asked to revisit the clinic 4 weeks later, for biochemical screening and initiation of the treatment. The study protocol was approved by the local ethics committee of each study site and was in accordance with the principles of the Declaration of Helsinki II.

The patients were instructed to maintain their dietary habits throughout the study. Diet and exercise were not assessed at study visits.

Patients

Patients were randomly assigned to 1 of 2 treatment groups. In group A, patients received fenofibrate (300 mg once daily) for 8 weeks, followed by placebo for an additional 8 weeks, whereas group B received placebo for 8 weeks, followed by fenofibrate (300 mg once daily) for an additional 8 weeks. All patients received placebo for 4 weeks before the study began.

UAE, creatinine clearance rate (CCR), uric acid excretion, uric acid clearance, and fractional excretion of uric acid (FEUA) in a 24-hour pooled urine sample were measured at baseline and at the end of both treatment periods.

Blood tests after an overnight fast and BP measurements were performed at baseline and every 4 weeks until study end.

Laboratory Tests

Serum cholesterol, TG, creatinine, free fatty acid (FFA), and uric acid concentrations were measured enzymatically using a Hitachi 7350® Autoanalyzer (Hitachi Ltd., Mito, Ibaraki, Japan). HbA_{1c} (reference interval, 4.5%–5.8%) and fasting plasma glucose (FPG) concentration were assayed by affinity chromatography and a glucose oxidase method, respectively. Insulin was measured using enzyme immunoassay. HDL-C and apo concentrations were measured by a precipitation method using phosphotungstate and manganese chloride[18] and an immunoturbidimetric assay,[19] respectively. UAE was measured using a commercially available latex immunoassay[20] kit (Eiken Alb-II®, Eiken Chemicals, Tokyo, Japan) with a detection limit of 0.4 mg/mL. Intra- and interassay coefficients of variation were $\leq$2.5% and $\leq$1.8%, respectively. Urinary creatinine concentration was determined by Jaffe's reaction using a Hitachi 7450® Autoanalyzer (Hitachi Ltd.). All blood and urine samples were analyzed at the SRL Laboratory (Tokyo, Japan).

Each physician who participated in the study was to record adverse events at each study visit.

Statistical Analysis

SAS statistical software (SAS Institute Inc., Cary, North Carolina) was used to perform statistical analyses. The results for continuous variables are presented as mean (SE). Wilcoxon signed rank test and the Mann-Whitney *U* test were used to assess the significance of differences within and between group means, respectively. The Fisher exact test was used to assess differences in proportions between groups. Associations of changes in UAE with those in other variables were assessed by Spearman rank correlation analysis and then multiple regression analysis. $P < 0.05$ was considered significant. To improve skew and kurtosis of the distribution, log-transformations were made when appropriate.

RESULTS

A total of 43 patients (38 men, 5 women; mean [SE] age, 57.1 [1.4] years; mean [SE] body mass index [BMI], 24.3 [0.4] kg/m^2) entered this study. Twenty-one patients (18 men, 3 women) were allocated to group A and 22 (20 men, 2 women) to group B. Of these, 9 (42.9%) and 11 (50.0%) patients in groups A and B, respectively, were selected from general clinics and 12 (57.1%) and 11 (50.0%) patients, respectively, were selected from lipid clinics.

Thirty patients (69.8%) had hypertension (BP >140/>90 mm Hg),[21] 8 (18.6%) had type 2 DM (FPG >126 mg/dL),[22] and 4 (9.3%) (2 each in groups A [9.5%] and B [9.1%]) had both conditions (Table I). The number of patients with clinical disorders at baseline were similar in the 2 groups. The number of patients using

Table I. Number (%) of patients with clinical disorders at baseline.*†

Disorder	Group A (n = 21)	Group B (n = 22)
Hypertriglyceridemia	16 (76.2)	18 (81.8)
Hyperuricemia	16 (76.2)	15 (68.2)
Hypertension†	15 (71.4)	15 (68.2)
Hypercholesterolemia	14 (66.7)	15 (68.2)
Microalbuminuria	3 (14.3)	8 (36.4)
Type 2 diabetes mellitus‡	2 (9.5)	6 (27.3)
Impaired fasting glycemia	1 (4.8)	3 (13.6)

*No significant differences were found between the 2 groups.
†Some patients had >1 disorder.
‡Two patients in each group (9.5% in group A, 9.1% in group B) had both hypertension and type 2 diabetes mellitus.

antihypertensives or angiotensin-converting enzyme (ACE) inhibitors also were similar in the 2 groups.

At the end of the study, neither drug-related nor clinical adverse events were evident in any of the patients, except for an increase in serum creatinine concentration above the upper limit of normal (1.40 mg/dL) in 3 patients (14.3%) in group A and 1 patient (4.5%) in group B. Although the mean CCR decreased significantly from baseline with active treatment in group B (from 115[17] mL/min to 89[14] mL/min; $P < 0.01$), this rate remained within the normal range. No significant changes were found in BMI, BP, FPG, HbA_{1c}, fasting serum insulin, or FFA concentrations in either group (Table II). In both groups, fenofibrate treatment was associated with a significant decrease in mean (SE) serum uric acid concentration (group A, $P < 0.001$; group B, $P < 0.01$). This treatment also was associated with a concomitant significant increase in the FEUA (both $P < 0.05$), demonstrating a uricosuric effect of fenofibrate.

As shown in Table III, serum concentrations of TG ($P < 0.001$) and apo C2, C3, and E (all $P < 0.01$) decreased significantly in group A after 8 weeks of fenofibrate therapy, and HDL-C and apo A1 and A2 significantly increased (all $P < 0.001$). All of these parameters returned to near-baseline levels after 8 weeks of placebo administration.

In group B, placebo administration for 8 weeks did not produce significant changes from baseline in any parameters. However, fenofibrate treatment for 8 weeks resulted in significant decreases in TG ($P < 0.01$), apo C3 ($P < 0.05$), and apo E ($P < 0.05$). In addition, HDL-C ($P < 0.05$), apo A1 ($P < 0.001$), and apo A2 ($P < 0.01$) were significantly increased by fenofibrate (Table III).

As shown in Table IV, serum concentrations of TG (group A, $P < 0.001$; group B, $P < 0.001$); apo C2 (group A, $P < 0.01$), C3 (group A, $P < 0.01$; group B, $P < 0.05$), and E (group A, $P < 0.01$; group B, $P < 0.05$); and uric acid (group A, $P < 0.001$; group B, $P < 0.01$) were significantly decreased with fenofibrate

Table II. Clinical and biochemical values in study patients. (Data are expressed as mean [SE].)*

Parameter	Normal Value	Baseline	8 Weeks	16 Weeks
BMI, kg/m^2	<25			
Group A		25.1 (0.9)	25.2 (1.0)	25.1 (1.1)
Group B		25.2 (1.0)	24.3 (0.6)	23.9 (0.6)
SBP, mm Hg	≤140			
Group A		137 (4)	136 (3)	134 (4)
Group B		138 (2)	135 (3)	140 (4)
DBP, mm Hg	≤90			
Group A		82 (3)	81 (3)	79 (2)
Group B		80 (1)	79 (1)	81 (2)
FPG, mg/dL	<126			
Group A		107 (10)	102 (7)	118 (15)
Group B		131 (12)	128 (11)	122 (13)
HbA_{1c}, %	4–7			
Group A		5.7 (0.2)	6.1 (0.4)	5.4 (0.3)
Group B		6.3 (0.5)	6.1 (0.4)	6.2 (0.5)
Fasting insulin, μU/mL	3.1–16.9			
Group A		11.2 (1.9)	11.3 (1.9)	13.5 (2.7)
Group B		10.8 (1.4)	11.1 (1.2)	11.2 (1.2)
FFA, mEq/L	0.14–0.85			
Group A		0.70 (0.11)	0.56 (0.16)	0.58 (0.13)
Group B		0.71 (0.11)	0.57 (0.04)	0.76 (0.29)
Serum uric acid, mg/dL	3.0–7.0			
Group A		7.8 (0.2)	5.9 (0.3)[†]	7.6 (0.2)
Group B		8.1 (0.2)	6.9 (0.5)[‡]	5.7 (0.3)[§‖]
FEUA, %	≤5			
Group A		6.6 (0.5)	9.5 (1.4)[¶]	6.5 (0.6)
Group B		5.4 (0.5)	7.8 (1.0)[¶]	10.6 (1.0)[¶#]
Serum creatinine, mg/dL	0.70–1.40			
Group A		1.09 (0.07)	1.26 (0.09)[†]	1.11 (0.08)
Group B		0.99 (0.04)	1.03 (0.05)[‡]	1.13 (0.05)[†]
CCR, mL/min	90–140			
Group A		82 (10)	68 (8)	79 (12)
Group B		115 (17)	124 (29)	89 (14)[§]

BMI = body mass index; SBP = systolic blood pressure; DBP = diastolic blood pressure; FPG = fasting plasma glucose; HbA_{1c} = hemoglobin A_{1c}; FFA = free fatty acid; FEUA = fractional excretion of uric acid; CCR = creatinine clearance rate.

*Patients in group A received fenofibrate for 8 weeks followed by placebo for 8 weeks, and group B received placebo followed by fenofibrate.

[†]$P < 0.001$ versus baseline.

[‡]$P < 0.05$ versus group A (Mann-Whitney U test).

[§]$P < 0.01$ versus baseline.

[‖]$P < 0.001$ versus group A (Mann-Whitney U test).

[¶]$P < 0.05$ versus baseline.

[#]$P < 0.01$ versus group A (Mann-Whitney U test).

Table III. Serum concentrations of lipids and apolipoproteins during treatment in study patients. (Data are expressed as mean [SE].)*

Component	Normal Value	Baseline	8 Weeks	16 Weeks
TC, mg/dL	<220			
Group A		238 (10)	225 (10)	232 (9)
Group B		245 (11)	231 (8)	220 (7)†
TG, mg/dL	<150			
Group A		352 (60)	205 (47)‡	339 (110)
Group B		342 (65)	262 (33)§	220 (36)†
HDL-C, mg/dL	<40			
Group A		40.0 (2.2)	49.5 (2.5)‡	43.1 (2.5)
Group B		49.4 (5.1)	47.4 (5.1)	54.5 (6.4)‖
Apo A1, mg/dL	119–155 (men) 126–165 (women)			
Group A		148.8 (5.3)	172.0 (4.7)‡	152.2 (6.6)
Group B		163.3 (6.5)	157.3 (8.4)¶	180.1 (7.3)‡§
Apo A2, mg/dL	25.9–35.7 (men) 24.6–33.3 (women)			
Group A		34.2 (1.0)	42.1 (1.1)‡	33.6 (1.3)
Group B		35.4 (1.4)	34.5 (1.6)#	43.0 (1.8)†#
Apo B, mg/dL	73–109 (men) 66–101 (women)			
Group A		140.8 (7.5)	129.1 (8.4)	130.5 (5.3)‖
Group B		138.7 (7.5)	137.1 (4.3)	122.8 (6.0)†
Apo C2, mg/dL	1.8–4.6 (men) 1.5–3.8 (women)			
Group A		7.5 (0.7)	6.2 (0.6)†	7.4 (1.1)
Group B		7.5 (0.8)	7.0 (0.8)	6.6 (0.7)
Apo C3, mg/dL	5.8–10.0 (men) 5.4–9.0 (women)			
Group A		17.9 (1.8)	14.0 (1.6)†	18.7 (3.4)
Group B		20.0 (2.5)	18.0 (2.0)	16.5 (2.1)‖
Apo E, mg/dL	2.7–4.3 (men) 2.8–4.6 (women)			
Group A		8.1 (0.8)	6.3 (0.8)†	9.1 (1.6)
Group B		8.6 (1.2)	7.2 (0.8)	7.1 (0.9)‖

TC = total cholesterol; TG = triglycerides; HDL-C = high-density lipoprotein cholesterol; apo = apolipoprotein.

*Patients in group A received fenofibrate for 8 weeks followed by placebo for 8 weeks, and group B received placebo followed by fenofibrate.

†$P < 0.01$ versus baseline.

‡$P < 0.001$ versus baseline.

§$P < 0.01$ versus group A.

‖$P < 0.05$ versus baseline.

¶$P < 0.05$ versus group A.

#$P < 0.001$ versus group A.

Table IV. Mean (SE) changes in serum lipids, apolipoproteins, and uric acid concentrations.*

Component	8 Weeks	16 Weeks
TC, mg/dL		
Group A	−13 (11)	+14 (10)
Group B	−14 (8)	−12 (9)
TG, mg/dL		
Group A	−146 (55)†	+203 (75)
Group B	−80 (47)	−35 (27)†
HDL-C, mg/dL		
Group A	+9.5 (1.5)†	−6.6 (1.8)
Group B	−2.0 (1.7)	+7.8 (2.1)†
Apo A1, mg/dL		
Group A	+23.2 (4.7)†	−18.7 (5.6)
Group B	−5.9 (4.8)	+23.6 (5.8)†
Apo A2, mg/dL		
Group A	+7.9 (1.1)†	−8.2 (1.6)
Group B	−0.9 (0.8)	+9.1 (1.9)†
Apo B, mg/dL		
Group A	−11.7 (6.3)	+7.0 (5.2)
Group B	−1.6 (3.6)	−14.5 (6.2)§
Apo C2, mg/dL		
Group A	−1.2 (0.6)‡	+1.2 (0.8)
Group B	−0.8 (0.5)	−0.3 (0.6)
Apo C3, mg/dL		
Group A	−3.9 (1.8)‡	+5.2 (2.1)
Group B	−1.9 (1.4)	−1.4 (1.6)
Apo E, mg/dL		
Group A	−1.8 (0.7)‡	+2.8 (1.2)
Group B	−1.3 (0.8)	−0.3 (0.8)§
Uric acid, mg/dL		
Group A	−2.0 (0.3)†	+1.7 (0.4)
Group B	−0.6 (1.4)	−1.6 (0.5)‡

TC = total cholesterol; TG = triglycerides; HDL-C = high-density lipoprotein cholesterol; apo = apolipoprotein.
*Patients in group A received fenofibrate for 8 weeks followed by placebo for 8 weeks, and group B received placebo followed by fenofibrate.
†$P < 0.001$ versus placebo.
‡$P < 0.01$ versus placebo.
§$P < 0.05$ versus placebo.

compared with placebo. HDL-C and apo A1 and A2 were significantly increased with fenofibrate compared with placebo (all $P < 0.001$ in both groups).

As shown in the figure, fenofibrate treatment in group A was associated with a significant reduction in UAE ($P < 0.05$ vs baseline), which remained after 8 weeks of placebo administration ($P < 0.05$). In group B, UAE was not changed significantly after placebo administration, but it was significantly decreased after

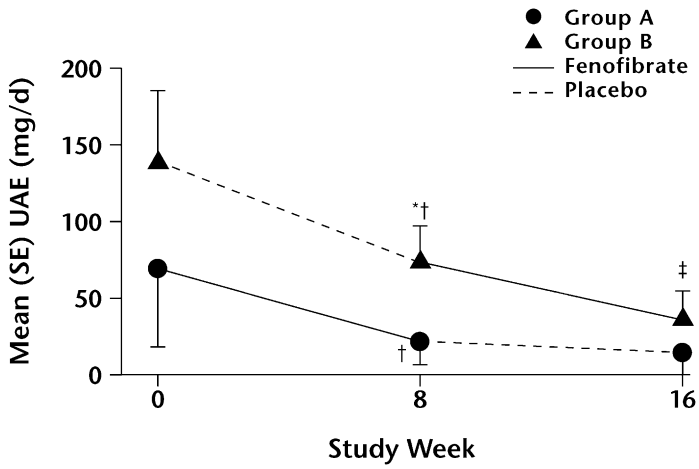

Figure. Mean (SE) urinary albumin excretion (UAE) with fenofibrate and placebo. *$P < 0.05$ versus group A. †$P < 0.05$ versus baseline. ‡$P < 0.01$ versus baseline.

fenofibrate therapy ($P < 0.01$ vs baseline). Baseline UAE was similar in both groups; however, after 8 weeks, the difference in UAE was statistically significant between the 2 groups ($P < 0.05$).

Using Spearman rank correlation analysis, changes in UAE were associated with significant changes in apo C2 ($\rho = 0.43$; $P = 0.02$) and apo C3 ($\rho = 0.49$; $P = 0.01$). However, no significant correlation was found in changes in serum levels of TG; HDL-C; apo A1, A2, or E; or uric acid.

Using multiple regression analysis, changes in serum TG, apo A1 and C3, and uric acid concentrations emerged as determinants of changes in UAE. These changes explained 49% of UAE reductions. Of these variables, the only association that was statistically significant was apo C3 ($P = 0.01$).

DISCUSSION

In this study, in patients with hypertriglyceridemia and/or hyperuricemia, fenofibrate decreased mean serum concentrations of TG by 30% and uric acid by 27% and increased HDL-C by 20%. Fenofibrate-induced improvements in hypertriglyceridemia and hyperuricemia were associated with reductions in albuminuria (as assessed by UAE), despite no change in blood pressure or glycemia (as assessed by HbA_{1c}). Multiple regression analysis showed that reductions in UAE were independently and significantly associated with decreases in serum apo C3 concentration. Although instructed not to do so, some patients may have changed their diet or exercise during the study, which may have contributed to the nonsignificant reduction in UAE during placebo administration. Apo C3 has been shown to inhibit the activity of lipoprotein lipase and the rate of uptake

of very-low-density lipoprotein remnants by the liver,[23] both of which result in prolonged residence time of TG-rich lipoproteins in the circulation. Hence, we suggest that fenofibrate-induced improvements in impaired metabolism of TG-rich lipoproteins may be associated with reductions in albuminuria in patients with hypertriglyceridemia and/or hyperuricemia.

Several possible explanations exist for these findings, and these explanations are not necessarily mutually exclusive. First, fenofibrate-induced reduction in albuminuria, which reflects widespread endothelial dysfunction,[4] may represent an improvement in impaired endothelial function, as was recently demonstrated in chronic but not in acute hypertriglyceridemia.[24–26] De Man et al[26] reported that patients with chronic hypertriglyceridemia had impaired endothelium-dependent vasodilation mediated by the nitric oxide pathway, which was reversed with lipid-lowering therapy using atorvastatin. They suggested that lipids did not interfere directly with nitric oxide availability because they did not find changes in endothelial vasodilation in acute hypertriglyceridemia. However, other investigators[27,28] have found small LDL particles to be associated with impaired in vivo endothelial function independent of TG concentration. As fenofibrate has been shown to increase small LDL size,[29] fenofibrate-induced albuminuria reduction found in the present study may be associated with an increase in small LDL size, although we did not measure LDL size. In this context, it should be noted that ciprofibrate therapy improved endothelial function and reduced postprandial lipidemia in type 2 DM.[30]

Second, reductions in albuminuria found in fenofibrate-treated patients with hypertriglyceridemia and/or hyperuricemia may be associated with improved insulin resistance, because fenofibrate has been shown to reduce insulin resistance.[31] Indeed, in the present study, fenofibrate treatment improved not only hypertriglyceridemia and low HDL-C but also hyperuricemia and microalbuminuria, all of which are features of the insulin resistance syndrome.[32] Although no change in fasting serum insulin concentrations was found in the present study, fasting serum insulin concentration may not be an accurate estimate of insulin sensitivity.

Several limitations of this study deserve mention. The sample size was very small. Also, many patients were diabetic and hypertensive; consequently, they received other drugs in addition to fenofibrate or placebo.

The results of the present study show that fenofibrate-induced improvements in impaired TG-rich lipoprotein metabolism were associated with reductions in albuminuria. Long-term studies are needed to confirm our observations and to investigate putative mechanisms involved in reductions in albuminuria.

CONCLUSIONS

In our study population of patients with hypertriglyceridemia and/or hyperuricemia, fenofibrate-induced ameliorations of impaired TG-rich lipoprotein metabolism were associated with reductions in albuminuria. Further studies of patients who are not receiving ACE inhibitors should be performed.

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