

Background

- Recently, non-alcoholic fatty liver disease (NAFLD) is revealed as a risk factor of coronary artery disease.
- Fatty liver is one of the most common abnormality found in subjects that had health checkup.

Objective

The aim of this study was to analyze the relationship between NAFLD and atherosclerotic risk factors detected by medical checkup to investigate the association with atherosclerosis.

Subjects

Consecutive healthy non-drinkers who had a health checkup with abdominal ultrasound at Tokyo Midtown Clinic Health Screening Center between April 1, 2011 and March 31, 2012.

3143 men, 3956 women

Mean age: 42.9 ± 8.6 years

Definition of non-drinker: less than 20g consumption of daily alcohol intake.

Exclusion: subjects with hepatitis B and hepatitis C infection.

Methods

1. Definition of NAFLD: non-drinker with hepatorenal echo contrast, liver brightness, deep attenuation, and vascular blurring by abdominal ultrasound.
2. Comparison of atherosclerotic risk factors between subjects with NAFLD and without NAFLD was analyzed.
3. The relationship between coronary artery calcification and NAFLD on 1866 subjects with chest CT scan (64-slice multidetected computed tomography) was analyzed.
Definition of coronary artery calcification:
calcification detected by visual check by radiologist.

Methods

4. The relationship between carotid artery atherosclerosis and NAFLD was analyzed for 258 subjects with carotid echography.

Definition of carotid artery atherosclerosis:

Thickness of carotid intima-media thickness or carotid plaque detected by ultrasound

5. The predictors of coronary calcification in age under 60 years were analyzed by multivariate logistic regression analysis using atherosclerotic risk factors and NAFLD.

Statistical Analysis

Continuous variables were reported as the mean \pm SD and analyzed by unpaired t-test.

Categorical variables were analyzed using Chi-square test.

The predictors of coronary calcification were analyzed by multivariate logistic regression analyses using the following parameters: gender, smoking habits, diabetes mellitus, hypertension, body mass index (BMI), HDL-cho, LDL-cho, TG, and NAFLD.

Table 1. Subject Characteristics

| | NAFLD (n=1680) | No NAFLD (n=5419) | p value |
|---|-------------------|----------------------|---------|
| Age (years) | 44.9 ± 8.8 | 42.3 ± 8.4 | <0.001 |
| Male (%) | 1309 (77.9) | 1834 (33.8) | <0.001 |
| BMI (kg/m ²) | 25.3 ±3.4 | 20.8 ±2.5 | <0.001 |
| Waist circumflex (cm) | 88.6±8.6 | 76.9±7.2 | <0.001 |
| Systolic blood pressure (mmHg) | 114.7 ± 14.2 | 104.8 ± 12.7 | <0.001 |
| Diastolic blood pressure (mmHg) | 72.8 ± 10.8 | 65.1 ± 10.1 | <0.001 |
| Smoking (%) | 301 (17.9) | 620 (11.4) | <0.001 |
| ALT (IU/L) | 36.8 ± 25.3 | 17.8 ± 9.9 | <0.001 |
| AST (IU/L) | 25.5 ± 10.7 | 19.7 ± 6.1 | <0.001 |
| γ-GTP (IU/L) | 44.2 ± 43.3 | 22.2 ± 21.6 | <0.001 |
| Fasting blood glucose (mg/dl) | 102.5 ± 18.1 | 94.3 ± 8.9 | <0.001 |
| HbA1c (%) | 5.3 ± 0.7 | 5.1 ± 0.4 | <0.001 |
| T-cho (mg/dl) | 214.9 ± 35.1 | 204.2 ± 33.1 | <0.001 |
| LDL-cho (mg/dl) | 136.1 ± 32.2 | 116.4 ± 29.2 | <0.001 |
| TG (mg/dl) | 140.1 ± 90.9 | 74.9 ± 41.0 | <0.001 |
| HDL-cho (mg/dl) | 51.0 ± 11.4 | 66.1 ± 14.9 | <0.001 |
| Distribution of visceral fat (cm ²) | 109.5 ± 57.7 | 51.0 ± 34.4 | <0.001 |

Data are reported as the mean (SD) or number

Table 2. NAFLD and Coronary Calcification

(n=1866)

| | NAFLD | Non-NAFLD | p value |
|----------------------------|----------|-----------|---------|
| | (n=455) | (n=1411) | |
| Coronary calcification (%) | 28 (6.2) | 34 (2.4) | <0.001 |

Table 3. Carotid Artery Atherosclerosis

(n=258)

| | NAFLD | Non-NAFLD | p value |
|------------------------------------|-----------|-----------|---------|
| | (n=70) | (n=188) | |
| Carotid artery atherosclerosis (%) | 49 (70.0) | 85 (45.2) | <0.001 |

Table 4. Predictors of Coronary Artery Calcification Based on Multivariate Logistic Regression Analysis in age under 60 years old

(n=1643)

| Variable | Odds ratio | p value |
|--------------|------------|---------|
| NAFLD | 3.32 | 0.02 |
| Hypertension | 2.92 | 0.04 |
| HDL-cho | 0.95* | 0.008 |
| Gender | | |

*Per 1-mg/dl increment.

Results

- 1) Subjects of NAFLD were significantly older, male, and had smoking habits. Had a higher BMI, waist circumflex, ALT, AST, γ -GTP, fasting blood glucose, HbA1c, T-cho, and LDL-cho, TG, systolic blood pressure, diastolic blood pressure, and distribution of visceral fat and HDL-cho levels were low.
- 2) Subjects of NAFLD had a high frequency of coronary artery calcification on the chest CT.
- 3) NAFLD had significant more carotid artery atherosclerosis.
- 4) The risk factors of coronary calcification in age under 60 years old with multivariate logistic regression analysis were hypertension, HDL-cho, gender and NAFLD.

Conclusions

NAFLD can be considered an independent risk factor for atherosclerosis.