Fatty Liver Is Associated with Greater Incidence of Cardiovascular Risk Factors

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Phoenix, AZ
Disclosure

• None
Obesity is a crucial CVD risk factor

Prevalence of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2014

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
Ectopic Fat Depots and CVD Risk

Despres JP. Circulation 2012
Ectopic Fat Depots and CVD Risk

Visceral adiposity → Liver fat → Epi/pericardial and myocardial fat → Muscle fat → Renal sinus fat → Pancreatic fat

Insulin resistance/inflammation

Increased cardiometabolic risk

High risk of type 2 diabetes

INCREASED RISK OF CARDIOVASCULAR DISEASE

Despres JP. Physiol Rev 2013
Non-alcoholic Fatty Liver Disease

- NAFLD is an important risk factor of cardiometabolic diseases
  - Liver manifestation of metabolic syndrome
  - NAFLD is associated with T2D and CVD

Little is known about the relationship b/w NAFLD and incident CVD risk factors in the American adult population

Targher G. NEJM 2010; Lonardo A. Dig Liver Dis. 2015; Mavrogiannaki AN. IJE 2013
Objective

• To determine if liver fat predicts the adverse progression of CVD risk factors above and beyond what is accounted for by generalized adiposity or visceral adiposity
Study Population

• Framingham Heart Study

1948: Original Cohort
n=5,209
living in Framingham, Massachusetts

1971: Offspring Cohort
n=5,124
offspring of the original cohort and their spouses

2002: Generation 3 Cohort
n=4,095
at least one parent in the Offspring Cohort
N=2,066
Study Population

• Exclusion criteria
  – Heavy alcohol use (n=134)
    • >21 servings/week for men
    • >14 servings/week for women
  – Myocardial infarction and stroke (n=14)
  – Cancer (n=39)
  – Bariatric surgery (n=4)
  – Missing covariates
  – Baseline prevalent cases

• Sample size: 1,641
  – Median follow-up duration was 6.2 years
Liver Fat Assessment

- Liver fat content (multi-detector CT)
  - liver-phantom ratio (LPR)
    - Higher ratio → lower liver fat
    - Lower ratio → higher liver fat
  - Fatty liver disease: LPR ≤0.33

Speliotes EK. J Gastroenterol Hepat 2008
## Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Fatty Liver (LPR ≤ 0.33)</th>
<th>No Fatty liver (LPR &gt; 0.33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatty liver</td>
<td>271 (16.5%)</td>
<td>1,370</td>
</tr>
<tr>
<td>Age, years</td>
<td>45.5±6.4</td>
<td>44.8±5.9</td>
</tr>
<tr>
<td>Women, %(n)</td>
<td>34.7 (94)</td>
<td>48.2 (660)</td>
</tr>
<tr>
<td>Body mass index, kg/m²</td>
<td>31.6±5.7</td>
<td>26.6±4.8</td>
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<tr>
<td>Alcohol, servings/week</td>
<td>4.3±5.4</td>
<td>4.3±4.9</td>
</tr>
<tr>
<td>Current smoking, %(n)</td>
<td>14.0 (38)</td>
<td>13.5 (185)</td>
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<tr>
<td>Physical activity score</td>
<td>36.8±7.8</td>
<td>37.4±7.7</td>
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Liver Fat Content and Incident CVD Risk Factors

CVD risk factors

- Metabolic syndrome
- Hypertriglyceridemia
- Low HDL
- Hypertension
- Impaired fasting glucose
- Type 2 diabetes

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- Model was adjusted for age, sex, smoking, physical activity, alcohol, BMI, & continuous CVD risk factors at baseline
- OR was calculated for per standard deviation increase of liver fat content
Fatty Liver Disease and Incident CVD Risk Factors

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OR (95%CI) of incident CVD risk factors

- Model was adjusted for age, sex, smoking, physical activity, alcohol, BMI, & continuous CVD risk factors at baseline
- OR was calculated using no-fatty liver disease as reference
Summary

• The present study demonstrates that higher level of liver fat is associated with increased incident hypertension and type 2 diabetes over 6 years
Acknowledgment

- Caroline S. Fox
- Shih-Jen Hwang
  - NHLBI’s Population Sciences Brach
- Michelle T. Long
  - Boston University School of Medicine
- Udo Hoffmann
  - Harvard Medical School
  - Massachusetts General Hospital