Examining Exercise Performance in Nonalcoholic Fatty Liver Disease (NAFLD), Hepatitis C (HCV), and non-Chronic Liver Disease (CLD) Populations

Authors: Zeba Ejaz1, Katherine Thomas2, Jillian K. Price1, Patrick Austin1, Carey Eschelk1

1Betty and Guy Beatty Center for Integrated Research, INOVA Health System, Falls Church, VA, US 2College of Science, George Mason University, Fairfax, VA, US

Introduction

- Nonalcoholic Fatty Liver Disease (NAFLD) is the accumulation of fat in the liver that is not caused by alcohol consumption. NAFLD is known to develop in patients who are obese, diabetic, hypertensive, have high cholesterol and triglyceride levels, or diagnosed with metabolic syndrome.

- In addition to preventing further weight gain, diet and exercise can lead to weight loss, mobilization of fat out of the liver, and resolution to NAFLD.

- Hepatitis C (HCV) is an acute or chronic infection that primarily causes inflammation of the liver.

- Previous studies have examined how exercise can benefit both NAFLD and HCV patients, but it is also important to understand how the disease itself can influence exercise performance.

Aim

- The purpose of the study was to determine if there is a significant difference in exercise performance between NAFLD patients, HCV patients, and non-CLD patients.

Methods

- Three groups of patients were examined: NAFLD, HCV, and non-CLD patients (Table 1).

- Patients were subjected to modified Bruce treadmill testing to volitional exhaustion that measured various parameters, such as VO2.

- Lab tests were also performed prior to treadmill testing.

- The treadmill and lab data were collected and assessed through statistical testing using SPSS.

- Simple descriptive analyses were performed to assess the three populations as a whole. T-Tests and ANOVAS were performed to analyze and compare the population means.

Table 1. Population Statistics

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>Non-CLD (N=4) Mean</th>
<th>NAFLD (N=14) Mean</th>
<th>HCV (N=8) Mean</th>
<th>(N=26) Mean (Std.)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age***</td>
<td>29.00</td>
<td>46.71</td>
<td>51.33</td>
<td>45.42 (11.15)</td>
</tr>
<tr>
<td>Weight (lbs)</td>
<td>168.20</td>
<td>205.19</td>
<td>185.39</td>
<td>193.40 (38.45)</td>
</tr>
<tr>
<td>Height (in)</td>
<td>64.38</td>
<td>66.71</td>
<td>68.50</td>
<td>66.90 (3.90)</td>
</tr>
<tr>
<td>BMI***</td>
<td>28.77</td>
<td>38.46</td>
<td>24.56</td>
<td>32.36 (10.24)</td>
</tr>
<tr>
<td>Pulse (bpm)</td>
<td>79.00</td>
<td>68.46</td>
<td>66.00</td>
<td>69.33 (14.24)</td>
</tr>
<tr>
<td>Systolic (mmHg)</td>
<td>121.25</td>
<td>123.14</td>
<td>123.50</td>
<td>122.96 (11.89)</td>
</tr>
<tr>
<td>Diastolic (mmHg)</td>
<td>75.00</td>
<td>76.00</td>
<td>76.75</td>
<td>76.08 (9.62)</td>
</tr>
<tr>
<td>AST (IU/L)</td>
<td>N/A</td>
<td>34.45</td>
<td>53.80</td>
<td>40.50</td>
</tr>
<tr>
<td>ALT (IU/L)</td>
<td>N/A</td>
<td>53.00</td>
<td>65.20</td>
<td>56.81</td>
</tr>
</tbody>
</table>

*Std. = Standard Deviation; ***significance found

Results

- There was a significant difference between NAFLD and non-CLD patients' rate of change of VO2 between the resting state and anaerobic threshold (AT1).
  • Rate of change of VO2 for NAFLD: 148.77 mL/min; std. = 30.44
  • Rate of change of VO2 for non-CLD: 107.15 mL/min; std. = 7.81
  • P value = 0.018

- ANOVA test showed that all three groups had significantly different amounts of fat accumulation
  • Mean of non-CLD fat accumulation: 28.77; std. = 7.81
  • Mean of NAFLD fat accumulation: 38.46; std. = 9.16
  • Mean of HCV fat accumulation: 24.56 ; std. = 6.46

Table 2. T-Test Significance found in the change of VO2 between NAFLD and non-CLD patients

<table>
<thead>
<tr>
<th>Rate of Change of VO2 (Baseline-AT1)</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean difference</th>
<th>Std. Error Difference</th>
<th>% Confidence Interval of the Difference</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variance assumed</td>
<td>-2.65</td>
<td>15</td>
<td>0.018</td>
<td>-41.62</td>
<td>15.69</td>
<td>-75.06 to -8.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal Variance Not assumed</td>
<td>-4.50</td>
<td>4.89</td>
<td>0.000</td>
<td>-41.62</td>
<td>9.24</td>
<td>-61.34 to -21.91</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. The rate of change of VO2 between the start of exercise and stage AT1 in NAFLD and non-CLD patients

Figure 2. Normal liver VS. Fatty liver

Source: http://www.doctortipster.com

Conclusion

- There were no significant differences between NAFLD and HCV exercise performance.

- The overall performance of both populations were not severely skewed in comparison to the non-CLD group, indicating that their exercise tolerance has not been greatly reduced with disease.

- The NAFLD population was able to withstand a longer duration of work with oxygen as their primary source compared to non-NAFLD.

- This result was not expected and could be due to the low N of the non-CLD Population or possible metabolic abnormalities in the Non-CLD population that went undetected.