Effect of endurance training on Cell Adhesion Molecules (ICAM-1) in Healthy and Sedentary Middle-Age Women

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ABSTRACT

In accordance to all research and perspective of international and hygienic organizations along with development of scientific and industries show that cardiovascular lesions that affected dietary patterns, activity patterns, lifestyle can be variety and stressors as well as they are known as fundamental hygienic and social problem. Therefore, we investigated effect of endurance training on changes of cell adhesion molecules (ICAM-1) in healthy and sedentary middle-aged women. Results of the study showed that aerobic and resistance exercise improves endothelial activity and reduces ICAM-1 gene expression. Therefore, Regular exercise is a very important part in the prevention of diseases such as atherosclerosis and inflammatory diseases such as cancer. However, further investigation is needed to support these findings.

INTRODUCTION

Researchers show that traditional criteria of cardiovascular disease have not sufficient efficiency in identifying many of people who are facing with cardiovascular disease. Therefore, a recent assessment of indicators can help identify individuals predisposed to the disease's prevalence. Most researchers have reported in this cell adhesion molecules sICAM-1 and sVCAM-1 as novel prognostic indicators of cardiovascular disease. Cardiovascular disease, especially coronary heart problems as causes of death in the new century and the first cause of death in Iran due to using cars and intelligent tools rather than human activities leads to chronic inactivity among people. Furthermore, average age of patients with cardiovascular disease are declining and many young due to lack of exercise, consumption of foods containing fats and bad cholesterol, anxiety, stress, smoking and alcohol, obesity and diabetes are diagnosed. Now, all we need to identify ways to prevent and identify factors associated with the disease.

Based on all research and perspective of international and hygienic organizations along with development of scientific and industries show that cardiovascular lesions that affected dietary patterns, activity patterns, lifestyle can be variety and stressors as well as they are known as fundamental hygienic and social problems.

Literature review:

ICAM-1 is type of intercellular adhesion molecules in immune cells and described for the first time by Roselin in 1986. High level of intercellular adhesion molecules (ICAM-1) in blood can be seen in cardiovascular disease. In research of Demrath et al, investigated relationship between ICAM-1 and cardiovascular risk factors in healthy men and women conclude that concentrations of cell adhesion molecules ICAM-1, especially because the adhesion of monocytes, lymphocytes and neutrophils to create a reflection of cardiovascular risk factors in healthy men and women. In addition, contributing to cardiovascular disease has anti-inflammatory effects on the vascular endothelium.

We identify, control and reduce risk factors, educate the public on issues such as smoking, obesity, proper diet, physical activity and lifestyle programs of WHO in this regard research and large investments have been made. Identification of risk factors for cardiovascular disease has prompted researchers with extensive research on different species of animal and human and increase health and life of humans.
Despite the success of researchers and 17%, reduction in mortality from cardiovascular disease in the 1990s due to advances in diagnostic and surgical techniques and medication, but the actual number of deaths in this period is 2.5 per cent increase.

High blood pressure, high blood lipids and lipoproteins, smoking, alcohol, lack of exercise, diabetes, obesity, lipid profile has long been regarded as an indicator of cardiovascular disease. However, the increase in LDL-C and decreased HDL-C are key indicators and risk factors for cardiovascular disease. However, reports suggest that some individuals with normal LDL-C and HDL-C had been suffering from cardiovascular disease. Thus, researchers are constantly looking indicators with greater sensitivity to predict cardiovascular disease risk.

Development of cardiovascular disease and inflammation of the underlying inflammation plays a pivotal role in the development and progression of atherosclerosis.

Inflammation is physiological response to various stimuli such as infection, tissue injury and physical trauma. In general, an acute inflammatory response occurs and ends quickly. Acute inflammation is a common response to the acute phase response is characterized by changes in plasma protein.

ICAM-1 siRNA transfection with ultrasound-microbubble method could suppress neointimal formation. Before the in vivo study of ICAM-1 siRNA, we examined in vitro MLR to evaluate the silencing effect of several murine ICAM-1 siRNAs in the suppression of the immune reaction.

All sequences had suppressive effects compared to the proliferation without siRNA administration in the assay. Thus, we selected the most effective sequence (S1) among the sequences for in vivo analysis.

Based on these results, we made murine arterial injury models. The ICAM-1 siRNA plus microbubble mixture was incubated within the arterial lumen and then ultrasound irradiated. In the 3 groups of controls, injured arteries on day 28 showed significantly thickened intima, whereas the ICAM-1 siRNA with microbubble and ultrasound group showed suppressed neointimal formation.

There was significant difference between the treated group (ICAM-1 siRNA, microbubble and ultrasound) and the control groups. The VCAM-1 siRNA had a statistically and incubated with 5% normal goat serum to avoid nonspecific reaction. The samples were incubated with primary antibodies against ICAM-1 (YN1/1.7), VCAM-1 (MK/2), CD4 (GK1.5), CD8 (53-6.7), and CD11b (M1/70 [Pharmingen, San Diego, California]), CD31 (H-300[Santa Cruz, San Diego, California]), and proliferating cell nuclear antigen (PC10 [Sigma Aldrich, Tokyo, Japan]) for 12 h at 4°C. Biotin-conjugated antibodies were detected with an avidin-biotin-horseradish peroxidase complex (Nichirei, Tokyo, Japan) according to the manufacturer’s instructions. Enzyme activity was detected with diaminobenzidine (0.5 mg/ml) with 0.05% NiCl in 50 mM Tris Buffer, pH 7.5. We counted positive cell numbers per artery for CD4, CD8, CD11b, and proliferating cell nuclear antigen. Immunohistochemical analyses for ICAM-1, VCAM-1, and CD31 were performed by independent observers using qualitative scoring as previously reported (0, absent; 1, weak, focal; 2, weak, diffuse; 3, strong, focal; 4, strong, diffuse; and 5, very strong and diffuse). Scores uniformly fell within 1 grade of each other and were averaged (9).

Real-time polymerase chain reaction (RT-PCR). RT-PCR was used to determine the messenger ribonucleic acid(mRNA) expression of ICAM-1 (assay ID: 00516023_m1, Applied Biosystems). To account for differences in cDNA preparation and cDNA amplification efficiency, the mRNA expression of the target gene was normalized by 18s ribosomal RNA (assay ID: 4308329). Quantitative data were calculated using the comparative CT (_CT) method comparable effect to that of ICAM-1 siRNA in the prevention of neointimal formation.

**Objective of research:**
Impact of endurance training on changes in cell adhesion molecules (ICAM-1) in healthy and sedentary middle-aged women

**Hypothesis:**
**H1:** Significant relationship exists between 8 weeks of endurance and resistance training on Changes in cell adhesion molecules (ICAM-1) in healthy middle-age women

**Methodology:**
This study used a quasi-experimental. In this study, changes resulting from the implementation of three methods of endurance training, resistance and we investigate and Control protocol specific training, strength and resistance in a distinct group with a control group of middle-aged women on Intercellular adhesion molecules and inflammatory markers ICAM-1, VCAM-1.

A quasi-experimental period of eight consecutive weeks in three groups of sedentary obese women who are ages 30 to 50 years. People were included in each group were randomly assigned to a control group that did not have any training. In addition, experimental groups exposed to endurance and resistance training three times a week our schedule.
At the beginning and end of the study, all patients took blood tests to measure subcutaneous fat, weight and anthropometric measurements.

**Scope of research:**
1. Subjects who were female sex
2. Subjects aged 35 to 58 years old
3. Healthy and sedentary individuals: all healthy and had no history of diseases that affect the outcome of the investigation.
4. Run-time test and exercise program of 24 sessions, 3 times a week in the gym and it was morning.
5. Geographic location and living subjects

**Independent variable:**
- 8 weeks or 24 sessions of aerobic activity
- 8 or 24 weeks of resistance exercise using gym equipment

**Dependent variable:**
- Cellular adhesion molecules ICAM-1

### Table 1: Protocol exercise separately.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance</td>
<td>60 minutes of aerobics, 2 weeks, 50 to 70 percent of maximum heart rate after 2 weeks and 4 weeks Hrmax remaining 60-80 percent 70-85 percent Hrmax</td>
</tr>
<tr>
<td>Resistance group</td>
<td>10 move apart in two consecutive sessions includes a forward movement of the arm, back, arm, butterfly, breast, back, thigh, front thigh and then the bench press, sit-ups, publishing side, leg extension and leg flexion. Each movement includes 4 sets of 8-10 reps and resting 60 seconds among sets. Subjects were 60-80% of one repetition maximum daily amount</td>
</tr>
<tr>
<td>Control</td>
<td>The control group received no intervention during the study. Relative control their activity level during training exercises at the location of the observations performed</td>
</tr>
</tbody>
</table>

### Table 2: Demographic indexes.

<table>
<thead>
<tr>
<th>Statistical Indicators</th>
<th>Age</th>
<th>Height</th>
<th>BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>Mean 41.08</td>
<td>158.08</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>SD 5.23</td>
<td>9.42</td>
<td>2.73</td>
</tr>
<tr>
<td>Endurance Training</td>
<td>Mean 44.83</td>
<td>162</td>
<td>28.67</td>
</tr>
<tr>
<td></td>
<td>SD 6.87</td>
<td>6</td>
<td>2.15</td>
</tr>
<tr>
<td>Control</td>
<td>Mean 44.33</td>
<td>158.42</td>
<td>30.08</td>
</tr>
<tr>
<td></td>
<td>SD 5.19</td>
<td>7.15</td>
<td>3.68</td>
</tr>
</tbody>
</table>

### Table 3: The mean levels of cell adhesion molecules.

<table>
<thead>
<tr>
<th>ICAM-1</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resistance</td>
<td>298.33</td>
<td>50.73</td>
<td>200</td>
<td>385.03</td>
</tr>
<tr>
<td></td>
<td>Endurance Training</td>
<td>288.64</td>
<td>31.57</td>
<td>232.6</td>
<td>332.69</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>271.55</td>
<td>63.57</td>
<td>171.19</td>
<td>370</td>
</tr>
</tbody>
</table>

### Table 4: Tukey’s post-test results.

<table>
<thead>
<tr>
<th>Cell adhesion molecule</th>
<th>First group</th>
<th>Second Group</th>
<th>Mean</th>
<th>SD</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAM-1</td>
<td>Controlling</td>
<td>Resistance</td>
<td>67.1</td>
<td>27.89</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>Controlling</td>
<td>Endurance</td>
<td>77.04</td>
<td>27.89</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>Endurance</td>
<td>Resistance</td>
<td>9.94</td>
<td>27.89</td>
<td>0.933</td>
</tr>
</tbody>
</table>

**Test of first hypothesis:**

Significant relationship exists between 8 weeks of endurance and resistance training on Changes in cell adhesion molecules (ICAM-1) in healthy middle-age women. We used t-test in order to test hypothesis:

### Table 5: Effects of endurance training on changes in cell adhesion molecules.

<table>
<thead>
<tr>
<th>Cell adhesion molecule</th>
<th>Average Pre-test</th>
<th>Average Post-test</th>
<th>DF</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAM-1</td>
<td>288.64±31.57</td>
<td>210.12±43.27</td>
<td>11</td>
<td>7.061</td>
<td>0.000</td>
</tr>
</tbody>
</table>

In table above mentioned, P-value is less than 0.005, therefore, Pre-test and post-test rejects the hypothesis of equality at the molecular level or it can be aid that significant relationship exists between 8 weeks of endurance and resistance training on Changes in cell adhesion molecules (ICAM-1) in healthy middle-age women.
Conclusion and Discussion:
Evidence suggests that aerobic exercise is to look for consistency high physiologic muscular endurance and resistance can develop cardiovascular. Now we can say that endurance training may have some mechanics, have protective effects against cardiovascular disease. Regular endurance training increases blood volume and plasma, decreased blood viscosity, increase in stroke volume and an increase in VO2max directly affect the cardiovascular system.

Endurance exercise regularly to reduce sympathetic stimulation and increased anti-inflammatory cytokine (IL-10) release of inflammatory mediators IL-1β and TNF-α from adipose tissue inhibits cell adhesion molecule, followed by concentration (ICAM-1) is reduced.

The overall results of the study showed that aerobic and resistance exercise improves endothelial activity and reduces ICAM-1 gene expression. Therefore, Regular exercise is a very important part in the prevention of diseases such as atherosclerosis and inflammatory diseases such as cancer. However, further investigation is needed to support these findings.

Limitation of research:
- Lack of food and drug on control subjects
- Lack of emotional control, mental health problems, family characteristics and motivation of the participants, especially when measurements.

REFERENCES