An Individualized Teaching Program for Atherosclerotic Risk Factor Reduction in Patients with Myocardial Infarction

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This study was conducted to evaluate the effect of a teaching program on patients with myocardial infarction. Forty-five patients were randomly selected 22 were assigned to a teaching group and 23 to a control group. An individualized teaching program was delivered to the teaching group during the hospitalization period. It covered aspects such as: the characteristics of heart disease, the anatomy and physiology of the heart, risk factors of atherosclerosis, medication and diet and exercise therapy. When these subjects were discharged to their homes, they received regular supportive care via telephone or mail for 12 weeks. Atherosclerotic risk factors, including smoking, exercise, blood lipid profile and BMI were measured before and after the teaching program.

Post-testing revealed that the numbers of those who exercised and the number of non-smokers were significantly higher in the teaching group than in the control group. Increased HDL cholesterol (High-Density Lipoprotein cholesterol) was significantly greater in the teaching group than in the control group.

The above findings suggest that this individualized teaching program might be helpful at reducing the risk factors of atherosclerosis in myocardial infarction patients.

Key Words: Individualized teaching program, atherosclerotic risk factor, myocardial infarction

INTRODUCTION

Economic growth in Korea has brought about marked changes both in lifestyle and in patterns of health and disease. The lifestyle of Koreans has become more sedentary and the consumption of foods such as rice and green vegetable has decreased while the consumption of animal fats has increased. Regarding health status, morbidity and mortality from chronic degenerative diseases, particularly cardiovascular disease (CVD), have rapidly increased. Ischemic heart diseases (IHD), including myocardial infarction (MI), have now become one of the leading causes of death and their prevalence continues to rise with the extension of life span.¹ To prevent the onset and recurrence of myocardial infarction, the most important thing is to control the risk factors of atherosclerosis, the main cause of MI. Various lifestyle factors, such as, smoking, the lack of exercise and an inadequate diet are the risk factors of atherosclerosis. Physiological factors, such as, obesity, high serum lipid level (cholesterol, triglyceride, HDL-cholesterol and LDL-cholesterol) and high blood pressure are also known risk factors.²

Although risk factors have a significant impact on the lives of patients with cardiovascular diseases, considerable knowledge is needed to effect behavioral change. Interventions in patients with myocardial infarction will not have long-term effects unless lifestyle changes are made. Most patients, however, do not achieve satisfactory lifestyle modifications due to a lack of knowledge about the characteristics and management of the disease, and a lack of family support.³ Therefore, the more effective the teaching, the better the effect of education is expected to be.⁴
Group teaching is one of the most common methods of cardiac rehabilitation programs. Some studies of group teaching using programmed instruction have reported that knowledge about cardiac rehabilitation concepts in patients after MI was increased. Nevertheless, the group teaching cannot satisfy individual patients' diverse needs. Fletcher reported success in the form of individually planned consecutive teaching sessions, and achieved a reduction in anxiety and modification of identifiable risk factors, including smoking, obesity, diet, and exercise in patients with MI. No studies have been reported that examined the effectiveness of an individualized teaching program to reduce atherosclerotic risk factors, including blood lipid profiles, in patients with MI.

We conducted this study to find more effective ways of reducing the atherosclerotic risk factors of patients with MI, and examined the effectiveness of a teaching program.

MATERIALS AND METHODS

Research design

A randomized comparison group of pre- and post-test experimental design was used to assess the effectiveness of an individualized teaching program on the reduction of atherosclerotic risk factors in patients with MI. The independent variable was the individualized teaching program and the dependent variables were the atherosclerotic risk factors: smoking, exercise, blood lipid profile and BML.

Subjects

Subjects for this study were patients admitted to the cardiology unit of three Catholic University hospitals, which had the same treatment protocol for MI patient from November 1999 to December 2000. The selection criteria dictated that subjects should be patients with a first onset history of MI, be mentally alert, and able to communicate. Subjects were disqualified if they were receiving hormonal therapy (steroids or estrogen), or had a thyroid gland disorder or renal disease that might affect blood lipid profile. A total of 70 patients met the above criteria and agreed to participate. They were randomized by coin tossing to one of the two groups, teaching (n=35) and control (n=35) in each hospital. Forty-five subjects completed the entire study, 22 of teaching and 23 of control. Of the 25 subjects who did not complete the study, three received chest surgery, ten were transferred to other hospitals, and 12 dropped out before completing the post-test.

The demographic characteristics of the subjects are shown in Table 1. They ranged in age from 30 to 69, with a mean of 53.33, and 17.8% were female and 82.2% male. There was no significant difference between the control and teaching groups for any of the demographic characteristics (Table 1).

Methods

Only routine care (verbal instruction) was given to the control group, while an individualized teaching program was given to the teaching group on the 3rd to 5th days of hospitalization, when it was judged that their medical condition had stabilized. Information was given verbally in a structured way using a booklet developed by the researchers. It contained five major areas that are routinely addressed in cardiac rehabilitation program: Nature of Disease; Risk Factors and their Modifications; Diet; Medication; and Exercise (Table 2). To promote interest and enthusiasm in the learning process, the text was constructed with illustrations of the heart, coronary circulation and the process of atherosclerotic change within the coronary arteries, and charts of diet and exercise. The booklet was under 50 pages in length and was offered without cost to the patients of the teaching group. Each patient was instructed for 3 sessions 20-25 minute by a researcher at the patient's bedside. When subjects were discharged to their homes, they received regular supportive care to help compliance with the teaching program by telephone for 12 weeks.

Instruments

Smoking and exercise

A non-smoker was defined as a subject who does not smoke. Exercise was defined as a subject
Table 1. Characteristics of Subjects Between the Teaching and Control Groups

<table>
<thead>
<tr>
<th>Age</th>
<th>Teaching N(%)</th>
<th>Control N(%)</th>
<th>Total N(%)</th>
<th>X²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 60</td>
<td>8 (36.4)</td>
<td>8 (34.8)</td>
<td>16 (35.5)</td>
<td>0.01</td>
<td>0.912</td>
</tr>
<tr>
<td>Below 60</td>
<td>14 (63.6)</td>
<td>15 (65.2)</td>
<td>29 (64.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Gender*     |               |              |            |    |     |
| Male        | 18 (81.8)     | 19 (82.6)    | 37 (82.2)  | 1  |     |
| Female      | 4 (18.2)      | 4 (17.4)     | 8 (17.8)   |    |     |

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Teaching N(%)</th>
<th>Control N(%)</th>
<th>Total N(%)</th>
<th>X²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under Middle School</td>
<td>12 (54.5)</td>
<td>13 (56.5)</td>
<td>25 (55.6)</td>
<td>0.01</td>
<td>0.894</td>
</tr>
<tr>
<td>Above Middle School</td>
<td>10 (45.5)</td>
<td>10 (43.5)</td>
<td>20 (44.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Spouse*         |                |              |            |    |     |
| Yes              | 21 (95.4)      | 21 (91.3)    | 42 (93.3)  | 1  |     |
| No               | 1 (4.6)        | 2 (8.7)      | 3 (6.5)    |    |     |

| Family history |               |              |            |    |     |
| Yes            | 4 (18.2)       | 2 (8.7)      | 6 (13.3)   | 0.414 |     |
| No             | 18 (81.2)      | 21 (91.3)    | 39 (86.7)  |     |     |

| Hypertension |                |              |            |    |     |
| Yes          | 12 (54.5)      | 11 (47.8)    | 23 (51.1)  | 0.2 | 0.652 |
| No           | 10 (45.4)      | 12 (52.2)    | 22 (48.9)  |     |     |

| Diabetes Mellitus |              |              |            |    |     |
| Yes              | 7 (31.8)      | 9 (39.1)     | 16 (35.6)  | 0.26 | 0.608 |
| No               | 15 (68.2)     | 14 (60.9)    | 29 (64.4)  |     |     |
| Total           | 22 (100.0)    | 23 (100.0)   | 45 (100.0) |     |     |

Fisher's exact test: Gender, Spouse, Family history

who participates in aerobic exercise for 20-45 minutes per session more than 3 times a week over the previous 10 weeks.

Blood lipid profile

LDL cholesterol was calculated using the Friedewald equation, i.e., Total cholesterol - (HDL cholesterol + Triglyceride/5).

An abnormal blood lipid level, in this study, was one with over 200 mg/dl of cholesterol, over 200 mg/dl of triglyceride, below 35 mg/dl of high density lipoprotein cholesterol, or over 130 mg/dl of low density lipoprotein cholesterol.8

Body mass index

A person was classified as obese when the patient’s BMI was over 25 kg/m². BMI was calculated using the following formula:

\[ \text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2} \]

Procedures and data collection

The study, was approved by the Medical Research Ethics Committee of each University Hospital.

A patient data sheet was developed for recording demographic and clinical data from the subject's medical record.

All MI patients in the Cardiology Unit who met the study criteria were contacted as early as possible after their admission to the unit. The patients received information from the investigator about the purpose and procedure, and were told that participation was optional and that if they chose to participate they could withdraw at any time and that anonymity and confidentiality were assured. Verbal consent was then obtained. Outcome measurements that were to be used were explained. Patients were randomly assigned to two groups, teaching and control.

Before teaching program intervention, pre-test data upon, smoking and exercise were obtained by interview using a questionnaire when their medical conditions had stabilized. Demographic features of the subjects, body weight and height for BMI, blood lipid profiles, and medical history
Table 2. Contents of the Teaching Program Session

<table>
<thead>
<tr>
<th>Session</th>
<th>Contents</th>
</tr>
</thead>
</table>
| First   | Characteristics of disease  
          | - anatomy and physiology of heart  
          | - etiology  
          | - signs and symptoms  
          | - diagnostic procedures  
          | - care and care  
          | Risk factors and modification  
          | - risk factors  
          | - lifestyle modifications |
| Second  | Medication  
          | - pharmacological effects and side effects  
          | - cautions  
          | Diet  
          | - general tips  
          | - diet and ideal body weight  
          | - cholesterol and animal fat  
          | - lowering blood cholesterol  
          | - high-natrium containing food  
          | - effects of diet  
| Third   | Exercise  
          | - exercise and heart  
          | - proper exercise mode  
          | - intensity and frequency  
          | - safe limit of exercise  
          | (when to stop exercise) |

that could affect blood lipid profile were obtained from the subject’s medical record.

Teaching was provided to the teaching group during the admission period by one of the researchers. When they were discharged to their homes, these subjects received regular supportive care to help compliance with the teaching program via telephone for 12 weeks.

The data recorded at the pre-test were re-recorded in the outpatient clinic 12 weeks following discharge as post-test data.

Statistical analysis

Data were analyzed using the SAS program. Descriptive statistics, chi-square and Fisher’s exact tests were performed to compare demographic characteristics and differences in the number of subjects with atherosclerotic risk factors for the teaching and control groups. The McNemar test was used to identify changes in the numbers of subjects with atherosclerotic risk factors. Paired and unpaired t-tests were used to test changes in the subjects' blood lipid profiles within and between the teaching and control groups.

RESULTS

Smoking and exercise

Initially there was no significant difference in the number of non-smokers in the teaching and control groups, or in the number of subjects who exercised.

After teaching, post-testing revealed that the number of non-smokers had significantly increased, both in the teaching and control groups, from 36.4% to 90.9% ($\chi^2=12.00, p=0.001$), and from 30.4% to 60.9% ($\chi^2=6.00, p=0.014$), respectively. However, the number of non-smokers were significantly higher in the teaching group at 90.9%, compared to control group at 60.9% ($\chi^2=5.49, p=0.019$). Subjects who exercised were significantly increased after teaching, from 18.2% to 72.3% in teaching group ($\chi^2=12.00, p=0.001$), while no significant changes were shown by the control group, from 17.4% to 21.7% ($\chi^2=1.00, p=0.317$) (Table 3).

Blood lipid profile

In the pre-test data, no significant differences were found in the number of subjects with hypercholesterolemia, hypertriglyceridemia, Low HDL cholesterolemia and high LDL cholesterolemia in the teaching and control groups.

After teaching, no significant changes were shown in the number of subjects with hypercholesterolemia (Table 3), nor in the level of serum cholesterol of subjects, in the teaching or in the control group (Fig. 1).

No significant changes were observed in the number of subjects with hypertriglyceridemia (Table 3), or in the level of cholesterol in the teaching and in the control groups after teaching (Fig. 2).

No significant changes were observed in the
Teaching Program for Atherosclerotic Risk Factor Reduction

![Graph 1](image1.png)

**Fig 1.** Change in level of Cholesterol.

![Graph 2](image2.png)

**Fig 2.** Change in level of Triglyceride.

![Graph 3](image3.png)

**Fig 3.** Change in level of HDL-C. *p*=0.017.

![Graph 4](image4.png)

**Fig 4.** Change in level of LDL-C.

The number of subjects with low HDL cholesterol in the teaching or in the control group after teaching intervention (Table 3). But, the level of HDL cholesterol was significantly increased from 37.22 mg/dL to 41.52 mg/dL in teaching group (*t*=2.58, *p*=0.017), while it decreased from 42.91 mg/dL to 40.70 mg/dL in the control group (*t*=1.52, *p*=0.446) (Fig. 3).

After the teaching program, no change was shown in the number of subjects with high LDL cholesterol in the teaching group, while a significant reduction was observed in the control group, from 47.8% to 26.1% (*χ²*=5.00, *p*=0.025). However, no significant difference was observed in the number of subjects with high LDL cholesterol in the teaching and control groups (31.8% vs. 26.1%). No significant changes were shown in the level of LDL cholesterol in the teaching or in the control group after teaching (Fig. 4).

**Body mass index**

No significant differences were observed in the number of subjects with obesity in the teaching or control group, before or after teaching (Table 3).

**DISCUSSION**

Patient education is an essential component of patient care after an MI and it has been found to be cost-effective in terms of its potential to reduce recidivism and the length of hospitalization. As patients learn by a variety of methods, it is most efficacious to match an individual’s learning style with an appropriate teaching technique. Group didactic classes foster a passive type of learning experience and require that the patient be ready to learn at a specific time. Individualized teaching requires that a patient be more active during the learning process and that the individual be able to choose his or her learning time. In this study...
Table 3. Risk Factors for Atherosclerosis Between the Teaching and Control Group

<table>
<thead>
<tr>
<th></th>
<th>Teaching group N (%)</th>
<th>Control group N (%)</th>
<th>( \chi^2 )</th>
<th>( P )</th>
<th>( \chi^2 )</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Tx.</td>
<td>Post Tx.</td>
<td>Pre Tx.</td>
<td>Post Tx.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yes</td>
<td>14 (63.6)</td>
<td>2 (9.1)</td>
<td>0.001</td>
<td>16 (69.6)</td>
<td>9 (39.1)</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>8 (36.4)</td>
<td>20 (90.9)</td>
<td>0.001</td>
<td>7 (30.4)</td>
<td>14 (60.9)</td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (18.2)</td>
<td>16 (72.3)</td>
<td>0.001</td>
<td>4 (17.4)</td>
<td>5 (21.7)</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>18 (81.2)</td>
<td>6 (27.3)</td>
<td>0.001</td>
<td>19 (82.6)</td>
<td>18 (78.3)</td>
<td></td>
</tr>
<tr>
<td>Cholesterol (mg/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>=&gt;200</td>
<td>7 (31.8)</td>
<td>10 (45.5)</td>
<td>0.083</td>
<td>10 (43.5)</td>
<td>9 (39.1)</td>
<td>1</td>
</tr>
<tr>
<td>&lt;200</td>
<td>15 (68.2)</td>
<td>12 (54.5)</td>
<td></td>
<td>13 (56.5)</td>
<td>14 (60.9)</td>
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<tr>
<td>Triglyceride(mg/dL)</td>
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<tr>
<td>=&gt;200</td>
<td>8 (36.4)</td>
<td>9 (36.4)</td>
<td>0.317</td>
<td>5 (21.7)</td>
<td>6 (26.1)</td>
<td>1</td>
</tr>
<tr>
<td>&lt;200</td>
<td>14 (63.6)</td>
<td>13 (59.1)</td>
<td></td>
<td>18 (78.3)</td>
<td>17 (73.9)</td>
<td></td>
</tr>
<tr>
<td>HDLC(mg/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;= 35</td>
<td>8 (36.4)</td>
<td>8 (36.4)</td>
<td>3</td>
<td>3 (13.0)</td>
<td>8 (34.8)</td>
<td>3</td>
</tr>
<tr>
<td>&gt;35</td>
<td>14 (63.6)</td>
<td>14 (63.6)</td>
<td></td>
<td>20 (87.0)</td>
<td>15 (65.2)</td>
<td></td>
</tr>
<tr>
<td>LDLC(mg/dL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;=130</td>
<td>9 (40.9)</td>
<td>7 (31.8)</td>
<td>0.157</td>
<td>11 (47.8)</td>
<td>6 (26.1)</td>
<td>5</td>
</tr>
<tr>
<td>&lt;130</td>
<td>13 (59.1)</td>
<td>15 (68.2)</td>
<td></td>
<td>12 (52.2)</td>
<td>17 (73.9)</td>
<td></td>
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<tr>
<td>BMI(kg/m(^2))</td>
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<td></td>
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</tr>
<tr>
<td>Over 25</td>
<td>13 (59.1)</td>
<td>13 (59.1)</td>
<td></td>
<td>13 (56.5)</td>
<td>14 (60.9)</td>
<td>1</td>
</tr>
<tr>
<td>Below 25</td>
<td>9 (40.9)</td>
<td>9 (40.9)</td>
<td></td>
<td>10 (43.5)</td>
<td>9 (39.1)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22(100.0)</td>
<td>22(100.0)</td>
<td></td>
<td>23(100.0)</td>
<td>23(100.0)</td>
<td></td>
</tr>
</tbody>
</table>

HDLC, High Density Lipoprotein Cholesterol; LDLC, Low Density Lipoprotein Cholesterol; BMI, Body Mass Index.

we adopted individualized teaching in order to assist patients to understand the pathophysiology of MI, identify risk factors present in their lifestyle and suggest possible modifications or the removal of risk factors identified. We provided information in a structured, easily understood way, to encourage patients to adopt behavior that will result in improved health status.

The factors associated with development and progression of atherosclerosis, are complex and multifactorial. Various lifestyle factors such as smoking, lack of exercise and inadequate diet are risk factors of atherosclerosis. Physiological factors such as obesity, high serum lipid level (cholesterol, triglyceride, HDL-cholesterol and LDL-cholesterol) and high blood pressure are also known risk factors. These risk factors, which contribute to subsequent morbidity and mortality, remain highly prevalent after acute MI. Among known risk factors, we excluded dietary habits and hypertension from his study, because hypertensive patients were receiving antihypertensive drug therapy, and thus it would have been difficult to gain valid and objective data on dietary habits.

Our results demonstrate favorable trends in several important areas, specifically, a dramatic increase in non-smokers, exercise compliance and increase HDL cholesterol.

The number of non-smokers after the program was significantly higher in the teaching group. This finding coincides with the result that intervention in the form of individually planned consecutive teaching sessions achieved a reduction in cigarette consumption. However, this conflicts with the findings of a previous study,
which reported that there were no significant differences in smoking cessation between, an experimental and a control group. We believe this discrepancy is due to differences in the teaching methods, and suggests that an individualized teaching program has a greater effect on the smoking cessation of post MI patients compared to a group teaching program. Having established the methods effectiveness upon quitting smoking, the next task is long-term maintenance through reinforcement and supportive care, as many patients complain of withdrawal symptoms and resume smoking.

Since most patients included in this study had a fear of chest pain and heart attack, they didn't want to actively exercise, and had no specific knowledge regarding exercise. We taught each patient the mode, duration, frequency, intensity and precautions of taking exercise as well as of dangerous signs during exercise. We recommended walking exercise at an intensity of 40-60% of the maximal heart rate and taught each patient how to measure radial pulse to assess the intensity of exercise so that they could exercise with confidence. Subjects exercising regularly were significantly increased after the program in teaching group. Almost the same results were reported in several previous studies. These results were desirable in MI patients, because exercise is not only effective in increasing cardiac function but also good at preventing atherosclerosis through the reduction of triglycerides and LDL cholesterol, as well as by increasing HDL cholesterol.

We were unable to detect any differences in the number of subjects with hypercholesterolemia, hypertriglyceridemia, low HDL cholesterolemia or high LDL cholesterolemia, nor observe significant changes in the levels of cholesterol, triglycerides, or LDL cholesterol in the teaching and control groups after the program. However, the level of HDL cholesterol increased significantly after the program in the teaching group. The factors related with blood lipid levels are complex: age, sex, smoking, drinking, medication and the intake of carbohydrates as well as the intake of animal fat and cholesterol and exercise, and the presence of thyroid gland disease and diabetes mellitus are related to blood lipid levels. The change of lipid metabolism that was resulted from previous studies of 9-12 months' continuous exercise was not found in this study. It is believed that 12-weeks and low or moderate intensity of exercise was not enough to change the blood lipid levels and their dietary control was not enough at their residence comparing to hospital. Thus, an additional study followed up by intensity of exercise and diet should be needed to evaluate the change of lipid metabolism.

No significant differences were found in the numbers of obese patients in the teaching and control groups after the program. Obesity is related to the size of meals, the amount of drinking and lack of exercise. This result is believed to be due to the fact that the duration and intensity of exercise and diet, over 12-weeks and with an inevitable low or moderate intensity of exercise is not enough to effect body weight reductions.

In Western societies where myocardial infarction threatens public health, there are various cardiac rehabilitation programs that have positive effects on the reduction of atherosclerosis risk factors and of cardiac function. In Korea, most patients with MI have only routine care without rehabilitation programs. However, our study results imply that routine care is not enough to encourage a patient to practice healthy behavior. We should consider a counter-plan to increase the adoption of healthy behavior by MI patients such as MI Case Management. To increase healthy behavior, patients need more specific knowledge and strong motivation. It may be helpful to make telephone calls or home visits to encourage and assess their compliance with supplementary care suitable for Koreans with MI.

The individualized teaching program provided in this study did not significantly affect physiological factors, such as obesity, the level of cholesterol, triglyceride and LDL-cholesterol, but it did significantly increase the number of subjects who exercised, and non-smoking and HDL-cholesterol levels. It is extremely hard to draw definite conclusions from these results, but it is suggested that this teaching program may be helpful and beneficial at reducing the risk factors of atherosclerosis in myocardial infarction patients.
REFERENCES