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Effectiveness of Anti-Smoking Interventions after General Medical Examination in a Health Promotion Center-Based Smoking Cessation Settings: Experience of a Single Clinic in Korea

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Background: The effectiveness of the smoking cessation intervention provided by a smoking cessation clinic of a single health promotion center in Seoul, South Korea was evaluated, and the predictors of successful smoking abstinence were determined.

Methods: The clinical records of 143 smokers who received practical counseling on smoking cessation from January 2005 to December 2009, after undergoing general medical examinations, were reviewed.

Results: All the smokers were male, 75% were 40-59 years of age, 77% had college-level or other higher education, and 81% had monthly incomes of over US\$4,000. The median smoking commencement age was 20 years, and 59% smoked 20 or fewer cigarettes per day. All the smokers received individual counseling, 14 were given additional nicotine replacement therapy (NRT), and 100 were prescribed oral anti-smoking pharmacotherapy (varenicline, n=67; bupropion, n=33). The total number of visits to the smoking cessation clinic and a prior history of more-than-three-month smoking abstinence were associated with six-month successful smoking abstinence. A total of 69 subjects (48%) continually abstained from smoking for six months. The six-month smoking abstinence rates were 58% (95% CI: 43.9-77.3%) in the bupropion group, 51% (95% CI: 37.3-61.2%) in the varenicline group, 43% (95% CI: 16.9-68.8%) in the NRT group, and 34% (95% CI: 17.2-51.8%) in the counseling-only group (P=0.691).

Conclusion: The study results suggest that in the real post-marketing setting, the six-month continuous-smoking-abstinence rates were not different among the smokers receiving the four tested interventions. Promoting good adherence to the clinic instructions may be more important in attaining six-month-or-longer smoking cessation, and maybe even permanent smoking abstinence, in highly motivated smokers.

Key Words: Cessation; Primary health care; Mass screening; Health services

접수일 : 2011년 10월 4일
수정일 : 2011년 12월 20일
승인일 : 2011년 12월 28일

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The authors declared that no
conflicts of interest exist.

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Background

Tobacco use is one of the most significant risk factors in terms of general morbidity and mortality and is a major risk factor for many cancers.(1) Mortality rates from smoking-related cancers are increasing, and lung cancer is a leading cause of cancer death in Korea.(2) Smoke-free campaigns by the Korean government stress the harmful long-term effects of smoking; most smokers know that the habit is harmful but find it difficult to quit. In Korea, smoking is regarded as a personal matter and about 47.7% of men are smokers, compared to only 7.4% of women.(3) Although many smokers attempt to quit smoking, most try to do so without any help, which results in low smoking cessation rate among self-quitters.(3)

In Korea, periodic health examinations are commonly used to prevent disease or to detect health problem early. According to the 2009 National Health Insurance Corporation report,(4) 66.3% of Koreans undergo annual health checkup. Thus, health-promotion centers could provide good opportunities of smoking cessation for motivated individuals, following a general medical examination.

Many studies have indicated that smoking cessation interventions are effective.(5,6) In particular, it has been shown in Western societies that smoking cessation programs combining medication with counseling increase the likelihood both of quitting and of continued abstinence at 6 months.(7-12) However, studies on programs that treat tobacco dependence with pharmacotherapy after periodic health evaluation are rare. The purpose of the present work was to examine the characteristics of adult Korean smokers and the effectiveness of smoking cessation interventions offered by a health promotion center-based smoking cessation clinic.

Methods

1. Subjects and methods

We retrospectively reviewed the clinical records of 159 smokers who visited a smoking cessation clinic (Center for Health Promotion of the Samsung Medical Center, Seoul, Korea), soon after having executive health evaluations between January 2005 and December 2009. We excluded 16 subjects because their data were incomplete; we thus ultimately analyzed information on 143 subjects who were followed-up more than 6 months. Information on smoking patterns including nicotine dependence using Fagerström score; alcohol consumption; and any history of medical illness was collected through a self-administered questionnaire. Stress was initially evaluated by using the Korean Psychological Well-being Index [SF-PWI; 18 questions, four-point scale; 0-8 points: normal; 9-26 points: moderate stress; 27 points or above: high stress].(13) Each patient was scheduled to have regular consultations with a physician every 2-4 weeks during the following 6 months and enrolled in a smoking cessation program that was individually designed. All patients received audiovisual information on the risks of smoking and the benefits of quitting. They were told that tobacco smoking is a chronic disease that requires treatment and were asked to write a smoking diary in order to monitor their own behaviors. Medication was prescribed except in instances of refusal or when contraindications were evident.

The level of exhaled carbon monoxide (CO) was used to confirm continued abstinence (The level [ppm] of CO for "continued abstinence" status is defined as 5 or less). Vital signs, body mass index, and exhaled CO level were measured at every visit. Three months after smoking cessation, lipid profiles, fasting blood sugar levels, C-reactive protein (CRP), and pulmonary function were measured again. A 6-month prolonged smoking cessation was regarded as being abstinent. The clinical characteristics of smokers and the effectiveness of smoking

cessation interventions were monitored after the routine health check-ups. This study was approved by the Institutional Review Board of the Samsung Medical Center.

2. Statistical analysis

We used SPSS version 18.0 for Windows (SPSS, Chicago, IL), and SAS (SAS Institute Inc., Cary, NC) for statistical analysis. Quantitative variables are summarized as medians with interquartile ranges (IQRs) unless otherwise indicated. The Wilcoxon two-sample *t*-test was used to compare categorical variables and the *t*-test was employed to compare continuous variables. Simple logistic regression analysis for univariate analysis employing Bonferroni's correction was used to evaluate factors associated with successful smoking cessation. Multiple logistic regression analysis for multivariate analysis was done using to analyze the contributions of variables. We also evaluated changes in vital signs, body weight, lipid profiles, fasting blood sugar levels, and lung function after smoking cessation, using a mixed model. A two-sided *P*-value of 0.05 was considered statistically significant.

Results

1. Subject characteristics

Table 1 summarizes the demographic characteristics of the 143 smokers. All were male and were aged 23–69 years, with 75% being 40–59 years of age, 77% having college-level or other higher education, and 81% having monthly incomes over \$4,000. The median age of smoking commencement was 20 years; 69% started smoking at age 20 or younger, and 59% smoked 20 or fewer cigarettes per day. The baseline demographic characteristics, smoking histories, nicotine dependence using Fagerström score, alcohol drinking frequency, and stress level were similar in the successful cessation and cessation-failure groups, except for a prior history of more than 3 months of smoking abstinence and the total number of visits to

a clinic (Table 1). One hundred fifteen smokers (80.4%) had previous serious quit attempts that were longer than 24 hours, and these subjects identified stress (43%) and lack of volition (34%) as the most important reasons for the previous failure of smoking cessation. Forty-seven smokers (33%) previously had been abstinent for more than 3 months. The most common reasons for quitting attempts were detection of a new disease (42%) and health promotion (37%), followed by advice of family members, advice of a doctor, and social unacceptability of cigarette smoking (Fig. 1). Among the 60 smokers who decided to quit followed by diagnosis of a new disease, 50% had lung problems (with newly detected lung nodules), 27% diabetes, 22% hypertension, 13% hyperlipidemia, 8% cardiovascular diseases, and 3% cancer.

Table 1. Baseline demographics.

Variable	Overall (n = 143)
Age (years)	49 (44, 55)
Male to female ratio	143 : 0
BMI (kg/m ²)	25.4 (23.5, 26.7)
College-level or other higher education	110 (77%)
Monthly incomes over \$4,000	116 (81%)
Drinking frequency (/week)*	2 (1,3)
Stress level* [†]	28 (25, 35)
Fagerström score	6 (4,7)
No. of years of smoking	30 (25, 40)
No. of cigarettes per day	20 (20, 35)
No. of previous serious quit attempts	116 (81%)
Past history of more than 3 months abstinence*	47 (33%)
Longest period of past abstinence (days)	30 (2, 180)
Initial exhaled CO level (ppb)	17 (11, 22)
Initial COHb (%)	2.7 (1.8, 3.6)
No. of visit	7 (4, 9)

Abbreviations: BMI, body mass index; No, number; CO, carbon monoxide; COHb, carboxyhaemoglobin.

Quantitative variables were summarized as medians with interquartile ranges. Frequency was summarized as number with percentage.

*The Wilcoxon two-sample test was used to compare categorical variables. The *t*-test or Mann-whitney test was employed to compare continuous variables comparing a difference between the two groups.

[†]Stress was initially evaluated by using the Korean Psychological Well-being Index [SF-PWI; 18 questions, four-point scale; 0–8 points: normal; 9–26 points: moderate stress; 27 points or above: high stress].

2. Continuous abstinence rates

A total of 84 subjects (59%) stopped smoking for 3 months and 69 subjects (48%) continuously remained abstinence for 6 months. A total of 29 smokers received individual counseling only, 14 were given various types and dosages of nicotine replacement therapy (NRT), and 100 were prescribed oral anti-smoking pharmacotherapy (varenicline, maintenance 2 mg/day for 67, bupropion, 300 mg/day for 33). The median duration of varenicline treatment was 9 weeks (IQR: 5 weeks, 13 weeks) and that of bupropion therapy was 7 weeks (IQR: 5 weeks, 12 weeks). At 3 months, the continuously abstinence rate was 68% (95% CI: 50.6–82.8%) in the bupropion group, 66% (95% CI: 54.3–77.0%) in the varenicline group, 50% (95% CI: 23.8–76.2%) in the NRT group, and 38% (95% CI: 20.3–55.6%) in the counseling only group; $P=0.174$. The 6-month abstinence rates was 58% (95% CI: 43.9–77.3%) in the bupropion group, 51% (95% CI: 37.3–61.2%) of smokers in the varenicline group, 43% (95% CI: 16.9–68.8%) in the NRT group, and 34% (95% CI: 17.2–51.8%) in the counseling only group; $P=0.691$ (Fig. 1) (Table 2).

Figure 1. Distribution of smoking cessation rate for the tested interventions. Vertical bars show continuous cessation rate with 95% confidence interval using logistic regression models.

3. Factors associated with successful 6-month smoking cessation

Univariate analysis indicated that the number of clinic visits was relevant to successful smoking cessation but that none of smoking pattern, Fagerström score, underlying diseases, a new disease detection, or pharmacotherapy was significantly relevant (Table 3). Multivariate analysis showed that only a prior history of more than 3 months of smoking abstinence (OR=3.365, 95% CI: 1.199–

Table 2. The univariate analysis results of odds ratios for the tested interventions.

Group	3 month continuous abstinence			6 month continuous abstinence		
	Odds ratio	95% CI	P-value	Odds ratio	95% CI	P-value
Counseling only	1.00			1.00		
NRT	1.64	0.34-7.90	0.908	1.43	0.29-7.03	N.S
Bupropion	3.27	0.92-11.69	0.052	2.92	0.82-10.36	0.085
Varenicline	3.13	1.04-9.42	0.027	1.84	0.61-5.56	0.368

Abbreviations: NRT, nicotine replacement therapy; CI, confidence Interval. Simple logistic regression analysis for univariate analysis employing Bonferroni's correction was used.

Table 3. The univariate analysis results of the variables influencing 6-month smoking cessation.

Variables	Odds ratio	95% CI	P-value
No. of years of smoking (per 1 year)	1.026	0.990-1.063	0.157
No. of cigarettes per day (per 1 cigarette)	0.997	0.967-1.027	0.843
Fagerström score (per 1 score)	1.004	0.875-1.151	0.956
No. of previous serious quit attempts (per 1 trial)	1.030	0.952-1.114	0.461
Past history of more than 3 months abstinence (no = 1, yes)	1.976	0.973-4.016	0.059
Initial exhaled CO level (ppb, per 1 ppb)	0.977	0.940-1.016	0.241
Initial COHb (% per 1%)	0.900	0.708-1.145	0.391
No. of visit (per 1 visit of clinic)	1.842	1.520-2.233	< 0.001
Underlying disease (no = 1, yes)	2.142	0.969-4.737	0.060
New disease detection (no = 1, yes)	1.006	0.517-1.955	0.987

Abbreviations: No, number; CO, carbon monoxide; COHb, carboxyhaemoglobin; CI, confidence Interval.

Simple logistic regression analysis for univariate analysis employing Bonferroni's correction was used to evaluate factors associated with successful smoking cessation.

Table 4. The multivariate analysis results for variables influencing 6-month smoking cessation.

Variables	Odds ratio	95% CI	P-value
No. of years of smoking (per 1 year)	1.020	0.971-1.072	0.424
Past history of more than 3 months abstinence (no = 1, yes)	3.325	1.178-9.385	0.023
No. of visit (per 1 visit of clinic)	2.028	1.605-2.564	< 0.001
Underlying disease (no = 1, yes)	2.088	0.597-7.303	0.249
Anti-smoking interventions			
Counseling only	1		
NRT	0.524	0.102-2.693	N.S
Bupropion	0.380	0.046-3.125	0.820
Varenicline	1.007	0.112-9.021	N.S

Abbreviations: No, number; NRT, nicotine replacement therapy; CI, confidence interval.

Multiple logistic regression analysis for multivariate analysis was done using to analyze the contributions of variables.

9.439) and number of visits to the clinic (OR=2.007, 95% CI: 1.597–2.522) were independently associated with 6-month smoking cessation (Table 4).

4. Changes in variables following successful abstinence

For participants who remained abstinent for 6 months, the median body weight was 73 kg (IQR: 69, 79 kg) before smoking cessation, 74 kg (IQR: 68.6, 79.8 kg) at 1 month, 76 kg (IQR: 70.3, 79.7 kg) at 3 months, and 76 kg (IQR: 68.9, 80.8 kg) at 6 months. Initial median fasting blood sugar, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and C-reactive protein level was 95 mg/dl (interquartile range 87–106 mg/dl), 46 mg/dl (interquartile range 41–51 mg/dl), 131 mg/dl (interquartile range 98–146 mg/dl), and 0.09 mg/dl (interquartile range 0.05–0.15 mg/dl), each. Three months after quitting, fasting blood sugar (median 98 mg/dl, interquartile range 88–109 mg/dl, $P=0.04$) and high-density lipoprotein cholesterol (median 48 mg/dl, interquartile range 44–53 mg/dl, $P=0.007$) levels increased whereas low-density lipoprotein cholesterol (median 119 mg/dl, interquartile range 91–141 mg/dl, $P=0.008$) level fell; but C-reactive protein (median 0.08 mg/dl,

interquartile range 0.04–0.12 mg/dl, $P=0.146$) level was not changed. Neither lung function nor blood pressure changed significantly before and after smoking cessation.

5. Adverse drug events

Adverse drug events occurred in 26 of the 114 smokers (22.8%) treated with pharmacotherapy, but no serious event was detected. Among the 67 subjects who were prescribed varenicline, 21 adverse events were reported; they were gastrointestinal discomfort with nausea (17.9%), abnormal dreams (6.0%), development of re-active depressive mood with general weakness (4.5%), headache (3.0%), hypertension (1.5%), and syncope (1.5%). One subject with essential hypertension and sleep apnea who had taken varenicline for 3 weeks experienced unexplained syncope 1–2 seconds in duration. Among the 33 subjects treated with bupropion, three adverse events (insomnia, dry mouth, and anxiety) were detected. Of the 14 subjects treated with NRT, skin rash occurred in 2.

Discussion

Smoking is the major preventable risk factor for many cancers, cardiovascular diseases, and other conditions. (1,14) Smoking cessation is associated with a substantial reduction in the risk of all-cause mortality regardless of age, gender, or nationality of patients. (14,15) While most smokers know that smoking is harmful and are willing to quit, they are likely to fail because of nicotine dependence. (16) As nicotine activates reward pathways (circuitry within the brain that regulates feelings of pleasure and euphoria), it can create a physical and psychological dependence and thus an addiction similar to that experienced by users of cocaine, amphetamines, and opiates. (16) Clinicians can assist smokers to quit by assessment of nicotine dependence, by motivating patients, and by

recommending counseling and pharmacotherapy.(5) However, most smokers try to quit without assistance, believing that medication is not needed, and do not seek consultation for help with smoking cessation unless disease is detected. Thus, health promotion center-based smoking cessation interventions may be helpful to smokers who are motivated to quit by providing an easy access to individualized cessation programs.

Smoking patterns and rates rely on socioeconomic status, age, and nationality.(17,18) Swan et al. reported that a low amount of stress, a high level of quitting motivation, and a previous attempt to quit that lasted for more than 6 months, were all predictors of abstinence at 6 months.(19) In our study, health concern such as detection of a new disease and a desire to promote good health were the most common factors motivating smoking cessation. The number of visits to the smoking cessation clinic and a previous attempt to quit smoking that was longer than 3 months in duration were associated with successful 6-month continuous abstinence. However, none of smoking pattern, stress, detection of a new disease, or pharmacotherapy increased the success rate of 6-month abstinence. A dose-response relationship was evident between the number of clinic visits and successful smoking cessation. This suggests that a high level of motivation to quit combined with an intensive interventional program promoting good adherence to clinic might be an important issue to increase 6-month smoking cessation in the highly motivated Korean male smokers.

The overall continuous abstinence rate at 6 months was 48%, and the rate was similar to that of previous studies.(20-22) Subgroup analysis indicated that the 6-month continuous abstinence rates did not differ significantly among smokers receiving the four tested interventions (varenicline 51%, bupropion 58%, NRT 43%, behavioral counseling only 34%). This may be because 77 of the 100 participants on oral anti-smoking pharmacotherapy stopped taking medication of their own volition.

In real post-marketing use, most smokers did not receive pharmacotherapy as recommended in the drug product information. Such low compliance may have been attributable to the high cost of the medications, a desire to quit smoking without medication, and/or the belief that medication was no longer needed even though withdrawal symptoms and cravings were thereby reduced. But our results suggested that premature discontinuation of pharmacotherapy might be not a plausible reason for poorer quit outcomes, and a good adherence to clinic encouraging persistence of abstinence with counseling might be more important to increase 6-month smoking cessation in the highly motivated smokers. It is important that clinicians and health-care systems consistently identify patients who smoke, inform them that smoking is a chronic disease that often requires multiple attempts to quit, and perform repeated interventions using both counseling and/or medication.(5,23) It is also important to develop awareness of using appropriate education including cognitive and behavioral strategies to help smokers cope with stressful situations, to promote adherence to recommended anti-smoking interventions, and to provide insurance coverage for tobacco dependence treatments. Implementation of such measures could substantially increase smoking cessation rates, thus improving public health and reducing medical expenditures.(5,6)

Our present study had some limitations. First, the work was performed in a single health promotion center without any control group. So we could not compare the 6-month continuous abstinence rate with other results. Further well designed study might be needed to identify that health promotion center-based smoking cessation clinics, compared to other public smoking cessation clinics, could improve the 6-month continuous abstinence rate in those who are motivated to quit. Second, we studied relatively healthy male smokers of high SES who were more motivated to quit than smokers in a typical primary care population. Seventy-five percent of the

study population was 40–50 years of age, with only 14% being under the age of 40 years and 11% aged over 60 years. Thus, our results may not apply to female subjects or to the general Korean population. Third, Koreans can purchase NRT without a prescription, and we were thus unable to evaluate the exact doses or durations of NRT treatment. Fourth, there might be some difference of counseling type and intensity among clinicians.

In summary, the 6-month continuous abstinence rates were not different among smokers receiving the four tested interventions. Promoting good adherence to clinic might be an important issue to increase 6-month smoking cessation in the highly motivated smokers.

요 약

연구배경: 건강검진 후 금연상담을 하면 건강에 대한 관심이 높아져 있는 흡연자의 금연 성공률을 높일 수 있을 것이다. 이 연구는 일개 병원 건강검진센터 내 금연클리닉 수진자들을 대상으로 금연상담의 효과 및 6개월 금연성공에 미치는 인자를 분석하였다.

방법: 2005년 1월부터 2009년 12월까지 일개 종합병원에서 건강검진 후 금연클리닉을 방문, 6개월 이상 추적 가능한 143명의 흡연자를 대상으로 하였다.

결과: 대상자는 모두 남성으로, 75%가 40–59대, 77%가 대졸 이상의 학력 및 81%가 월 400만원 이상의 소득자였다. 29명은 금연상담만 받았으며, 14명의 경우 니코틴 대체요법, 33명은 bupropion 경구약, 나머지 67명은 varenicline을 처방받았다. 6개월 금연 성공률은 48%였다. 금연클리닉 방문 횟수 및 과거 3개월 이상 금연과거력이 있는 경우가 6개월 금연 성공률과 상관관계가 있었다. 6개월 금연 성공의 경우 금연방법에 유의한 차이는 없었다.

결론: 건강검진 후 건강에 대한 관심 증가는 금연에 대한 적극적인 동기 부여에 영향을 줄 수 있으며 6개월 금연 성공과 연관된 요인으로서는 과거 3개월 이상의 금연과거력, 금연클리닉 방문횟수였고 단독 상담군과 약물 요법군의 금연률은 차이가 없었다.

중심단어: 금연; 일차 건강 관리; 건강검진; 건강 서비스

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