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EFFECT OF PASSIVE SMOKING ON ANGINA PECTORIS

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Abstract The effect of passive smoking on exercise-induced angina in a well ventilated and in an unventilated room was evaluated in 10 patients with angina. Patients exposed to 15 cigarettes smoked within two hours in a well ventilated room or an unventilated room increased their resting heart rate, systolic and diastolic blood pressure, and venous carboxyhemoglobin and decreased their heart rate and systolic blood pressure at angina. Patients exposed to passive smoking in an unventilated room had a larger increase in resting heart rate, systolic and diastolic blood pressure, and venous carboxyhemoglobin and a greater reduction in heart rate and systolic blood pressure at angina. The duration of exercise until angina was decreased 22 per cent after passive smoking in a well ventilated room ($P<0.001$), and decreased 38 per cent after passive smoking in an unventilated room ($P<0.001$). Passive smoking aggravates angina pectoris. (N Engl J Med 299:21-24, 1978)

PASSIVE smoking is the breathing of smoke-containing air composed of mainstream smoke exhaled by smokers and of sidestream smoke, which leaves the burning end of the tobacco product during puff intermissions. The amount of smoke produced, the depth of inhalation on the part of the smoker, the ventilation available for the removal or dispersion of the smoke, the nearness of the nonsmoker to the smoker and the duration of the exposure to the pollutants in tobacco smoke influence the passive smoker's absorption of the atmospheric pollutants caused by smoking.[1]

In patients with angina pectoris anginal pain develops sooner after exercise when they have smoked high-nicotine cigarettes,[2] low-nicotine cigarettes[3] or non-nicotine cigarettes.[4] The effect of passive smoking on duration of exercise until angina pectoris also needed to be investigated. Therefore, I performed a randomized study evaluating the effect of passive smoking in a ventilated room and in an unventilated room on duration of exercise until the onset of angina pectoris. The data from this study are reported below.

MATERIALS AND METHODS

Ten men, with a mean age of 54.3±8.1 years (±1 S.D.), who had classic stable exertional angina pectoris and angiographic evidence of severe coronary-artery disease with >75 per cent narrowing of at least one major coronary vessel were subjects. Eight subjects were ex-smokers. Two subjects smoked two to four cigarettes daily but did not smoke for at least 16 hours before the study or during the study on each of the three study mornings. After careful explanation of the risks involved, written informed consent was obtained from all 10 men with angina pectoris who participated in this study. The subjects understood the experimental design. Care was taken during the informed-consent discussion not to introduce psychologic factors related to the risk of passive smoking.

The 10 subjects were familiarized with the equipment and the procedures and practiced exercising upright on a Collins* constant-load bicycle ergometer before the study began. The study was performed on three consecutive mornings.

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On three successive study mornings, at 8 o'clock, with the subject in the fasting state, venous blood was drawn and analyzed for carboxyhemoglobin and hemoglobin levels with a 182 Co-Oximeter.† Then, Leads 2 and V_5 were simultaneously recorded with an electrocardiograph with the patient sitting on the bicycle ergometer. The resting heart rate was obtained from this electrocardiogram. The resting blood pressure was then measured with a mercury sphygmomanometer.

Each subject then exercised upright on the bicycle ergometer with a progressive work load until the onset of angina pectoris, and the duration of exercise was recorded with a stopwatch. The patient was monitored by telemetry with Leads 2 and V_5 throughout exercise. An electrocardiogram with Leads 2 and V_5 simultaneously was recorded at the onset of angina pectoris. The heart rate was obtained from this electrocardiogram. The blood pressure was recorded at the onset of angina pectoris, with the patient continuing to exercise until the blood pressure was obtained.

In a room 3.51 meters (11.5 ft) long, 3.20 meters (10.5 ft) wide and 2.74 meters (9.0 ft) high, near the research exercise laboratory, the subject then sat with three asymptomatic volunteers for two hours. The patient and asymptomatic volunteers talked, read newspapers or magazines or listened to music. On one morning, the asymptomatic volunteers did not smoke. On a second morning, each of the asymptomatic volunteers smoked five cigarettes, his or her own brand, during the two hours. The room was well ventilated, with a ventilation rate of 11.4 volumetric air changes per hour. On a third morning, each of the asymptomatic volunteers smoked five cigarettes, his or her own brand, during the two hours, with the room unventilated. The order of exposure of the patients with angina pectoris to no smoking, smoking in a well ventilated room or smoking in an unventilated room was randomized.

After exposure to no smoking for two hours, exposure to passive smoking for two hours in a well ventilated room, and exposure to passive smoking for two hours in an unventilated room, the patient sat on the bicycle ergometer and had an electrocardiogram with Leads 2 and V_5 simultaneously recorded. The heart rate was measured from this electrocardiogram. Then, the blood pressure was recorded with a mercury sphygmomanometer. Venous blood was next drawn and analyzed for carboxyhemoglobin and hemoglobin levels.

Subsequently, the patient exercised upright on the bicycle ergometer until the onset of angina pectoris, and the duration of exercise was recorded with a stopwatch. An electrocardiogram with Leads 2 and V_5 was simultaneously recorded at the onset of angina pectoris. The heart rate was obtained from this electrocardiogram. The blood pressure was recorded at the onset of angina pectoris, with the patient continuing to exercise until the blood pressure was obtained. The physician who performed the exercise tests knew whether the patients were exposed to no smoking, smoking in a well ventilated room or smoking in an unventilated room.

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