A Randomized Controlled Trial on the Efficacy of Thoracic CT Screening for Lung Cancer in Non-smokers and Smokers of <30 Pack-years Aged 50–64 Years (JECS Study): Research Design

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In order to assess the efficacy of lung cancer screening using low-dose thoracic computed tomography, compared with chest roentgenography, in people aged 50–64 years with a smoking history of <30 pack-years, a randomized controlled trial is being conducted in Japan. The screening methods are randomly assigned individually. The duration of this trial is 10 years. In the intervention arm, low-dose thoracic computed tomography is performed for each participant in the first and the sixth years. In the control arm, chest roentgenography is performed for each participant in the first year. The participants in both arms are also encouraged to receive routine lung cancer screening using chest roentgenography annually. The interpretation of radiological findings and the follow-up of undiagnosed nodules are to be carried out according to the guidelines published in Japan. The required sample size is calculated to be 17,500 subjects for each arm.

Key words: lung cancer screening – computed tomography – efficacy – randomized controlled trial

INTRODUCTION

Lung cancer is the leading cause of cancer death in Japan as well as western countries. To decrease the lung cancer mortality, lung cancer screening using low-dose thoracic computed tomography (CT) may be a promising measure (1,2). Although there has been one report of a randomized controlled trial (RCT) in smokers (30 pack-years or over) demonstrating mortality reduction in the CT screening group (3), the efficacy of CT screening for lung cancer in non-smokers/smokers of <30 pack-years has not been reported so far. To demonstrate the efficacy in non-smoking subjects is very important, because non-smokers have recently been increasing in Western countries and lung cancer mortality even in non-smokers is considerably high.

In a recent Japanese cohort study, mortality reduction by thoracic CT screening was even suggested in non-smokers/smokers of <30 pack-years. Therefore, we are now conducting the JECS Study (The Japanese randomized trial for evaluating the Efficacy of low-dose thoracic CT Screening for lung cancer in non-smokers and smokers of <30 pack-years).

PROTOCOL DIGEST OF THE STUDY

PURPOSE

The aim of this study is to assess the efficacy of lung cancer screening tests using low-dose thoracic CT once every 5 years, compared with chest roentgenography (XP), in people aged 50–64 years with a smoking history of <30 pack-years.
STUDY SETTING
This study is a multi-regional prospective RCT, with 6 participating centers and 11 municipalities in 5 prefectures in Japan as of 1 May 2012.

ENDPOINTS
The primary endpoints of this trial are comparing the sensitivity and specificity of the screening modality for lung cancer between CT and XP performed in the first year of this study. The secondary endpoints are comparing the distribution of the stages of lung cancers, the diameter of lung cancers and the rate of advanced lung cancers, which are possible surrogate markers for mortality reduction. The potential risks of this screening, such as surgical resection, needle aspiration cytology or bronchoscopy for benign nodules, will also be identified and compared, by collecting further data on diagnostic procedures in all screening-positive cases. Although mortality reduction will be directly evaluated after a follow-up of 10 years, evaluating mortality reduction cannot be set as primary endpoint because of a short-term funding regulation.

ELIGIBILITY CRITERIA
The inclusion criteria are as follows:
(i) people aged 50–64 years when registered,
(ii) people whose smoking history is <30 pack-years,
(iii) people who received a lung cancer screening using chest XP in the previous year,
(iv) people who provide informed consent to participate in this study.

The exclusion criteria are as follows:
(i) people with a history of lung cancer,
(ii) people under investigation/follow-up due to a suspicion of lung cancer,
(iii) people with a history of a malignant disease other than lung cancer within 5 years,
(iv) people with a history of thoracic CT screening within 10 years,
(v) people in poor general condition, who are not expected to live for 5 years.

SCREENING METHODS
After informed consent is obtained from each participant, the participants’ eligibility will be confirmed. Then, the screening methods will be randomly assigned individually by the Assignment Center of the Japanese Study Group for Evaluating the Efficacy of Thoracic CT Screening (4,5).

The duration of this trial is 10 years. In the intervention arm, low-dose thoracic CT is performed for each participant in the first year and the sixth year. The participants in this arm are encouraged to receive annual routine lung cancer screening using chest XP in the other years.

In the control arm, chest XP is performed for each participant in the first year. The participants in this arm are encouraged to receive annual routine lung cancer screening using chest XP in the other years.

The interpretation of CT findings, especially determining whether some invasive diagnostic procedure should be adopted or not, and the follow-up of undiagnosed nodules are performed according to the ‘Low-dose CT Lung Cancer Screening Guidelines for Pulmonary Nodules Management (6)’ established by the Japanese Society of CT Screening. A positive rate of <5% is preferred. The interpretation of chest XP findings is performed according to ‘The Manual of the Lung Cancer Screening (7)’ section in the ‘General rule for clinical and pathological record of lung cancer’ published by the Japan Lung Cancer Society.

STATISTICAL CONSIDERATIONS
The sample size was calculated on the hypothesis that thoracic CT is expected to improve the sensitivity to 95% in the CT group compared with 60% in the XP group. Assuming the detection rate of lung cancer by thoracic CT screening to be 320/100 000, 17 500 subjects in each arm are needed to achieve a 5% statistical significance with an 80% power. The same sample size is also required to detect a 60% mortality reduction after 10 years.

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Conflict of interest statement

None declared.

References


