学 位 論 文 の 要 旨

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学 位 論 文 名　Results of 10 Years of Mobile Low-Dose Computed Tomography Screening for Lung Cancer in Shimane, Japan.

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論 文 内 容 の 要 旨

INTRODUCTION

Lung cancer is the leading cause of cancer death in Japan. Efforts to detect lung cancer at an early stage are expected to contribute to reducing lung cancer mortality. The National Lung Screening Trial (NLST), which was the largest trial conducted in the United States, showed that CT screening reduces lung cancer mortality. NLST targeted approximately 53,000 people aged 55–74 years with a history of heavy smoking (≥30 pack-years). Lung cancer mortality was reduced by 20% in the group who underwent low-dose chest CT as lung cancer screening. In addition, a Dutch-Belgian lung cancer screening trial (NELSON) was reported in 2020. This trial targeted people with a smoking history of >15 cigarettes/day for >25 years or >10 cigarettes/day for >30 years. Lung cancer mortality was reduced by 24% in the group that underwent low-dose CT examinations compared with the group that did not receive any CT examinations. Two large randomized controlled trials showing the effectiveness of low-dose CT lung cancer screening have been published. However, there are few studies on the effectiveness of CT screening in never smokers.

JA Shimane Kouseiren’s Examination Division has been conducting CT screening since 2009.JA Shimane Kouseiren used mobile low-dose CT screening unit. Department of Medical Oncology and Respiratory Medicine, Shimane University Faculty of Medicine, that is, we are in charge of quality control of the CT Screening of JA Shimane Kouseiren and interpretation of CT image.We and JA Shimane Kouseiren’s CT screening group have been named JASKLCT.(Japan Agricultural Cooperatives (JA) Shimane Kouseiren Lung CT). We report the results of CT

screening for 10 years.

MATERIALS AND METHODS

JA Shimane Koseiren provides information on CT screening in the residents' medical examination guides of each municipality. Those who wish to have a CT screening apply for the desired date by themselves. If about 30 participant gather for each screening day, CT screening can be performed. Member of JA Shimane Koseiren can optionally add a CT screening to the occupational health examinations conducted by JA.

All screening occurred with a car-mounted 4-row multi-slice CT scanner. CT images were read by two pulmonologists. If any lesion required more detailed examination, JASKLCT mailed the results to participants and recommended a visit to a hospital with doctors that are board-certified by the Japanese Respiratory Society.

RESULTS AND DISCUSSION

Over 10 years, a total of 25,189 individuals underwent screening (13,686 males and 10,503 females). The median age of participants was 57(21-87) and 58(21-89) years in 2009 and 2010, with participants under 50 years of age accounting for nearly 30% of all screening participants. Since 2011, the median age has been 61–67 years; 85% of participants have been over 50 years of age. Current or former smokers accounted for more than 50% of male participants. Most females were never smokers, with less than 10% being current smokers.

Over 10 years of screening, 847 were required to undergo detailed examination due to suspected lung cancer. Of the participants with suspected lung cancer, 82 were diagnosed with lung cancer. Lung cancer occurred in 46 males and 36 females, with a median age of 69 years (45–89). There were 37 (45.1%) cases of lung cancer in current and former smokers, respectively. By gender and smoking status, the detection rate of lung cancer in men was 0.26% for non-smokers, 0.36% for smokers. And the detection rate of lung cancer in women was 0.33% for non-smokers and 0.43% for smokers. Since most female participants were never smokers, the observed detection rate of lung cancer was similar for both smokers of men and never smokers of women. Stage IA cancer accounted for 63% of all lung cancer cases, but there were 8 (10%) stage IV cases.

JACKLCT has been conducting low-dose CT screening using a mobile low-dose CT screening unit since 2009. Based on the NLST results, our CT screening program recommended that people aged ≥40 years with a history of smoking undergo screening. However, in this study, most female participants were never smokers. Lung cancer was detected in never smokers as well as current or former smokers. Although no conclusions have been reached regarding the effectiveness of CT screening in never smokers, it has been reported that lung cancer detection rates are high in female never smokers in Japan. A randomized controlled trial of low-dose lung CT screening in groups who are not at high risk (smoking index <600) is currently underway.

The first edition of the Japanese Society of CT Screening Quality Management guidelines recommended the overall required detailed examination rate for screening was less than 15% for the initial screening and less than 8% for the repeated screening. The overall required detailed examination rate for suspected lung cancer was 3.4% in this study. We think that the accuracy of our screening is properly maintained.

Our CT screening has some characterized points. One of them is using of a mobile low-dose CT screening unit. Shimane Prefecture spans 230 km from east to west, and there are substantially fewer medical institutions in the western part of the prefecture than in the eastern part. The mobile low-dose CT screening unit provided opportunities for medical examinations to people in areas with limited access to medical institutions. And another characterized point is interpretation by two pulmonologists. Pulmonologists commonly determine which cases required further examination or treatment for respiratory diseases other than lung cancer based on clinical practice.

Regarding lung cancer detection, the rate of stage IA lung cancer in this study was 63%, which was slightly lower than previously reported. A certain number of stage IV lung cancers were also detected each year, with no decreasing trend. JASKLCT does not specifically recommend the screening interval, which may be one of the factors that cause advanced cancer to be detected. It is necessary to consider an appropriate screening interval in the future.

CONCLUSION

We examined the results of 10 years of CT screening with a mobile low-dose CT screening unit in Shimane Prefecture, mainly for detecting lung cancer. This study clarified that lung cancer can be detected in never smokers as well as current or former smokers. Our CT screening program was based on NLST results, which may not be effective for never smokers. We believe that it is necessary to continue studying the effectiveness of CT screening in never smokers; our CT screening program might need to change based on such studies. Problems with this screening program, such as how to deal with young people who wish to undergo CT screening and the interval between CT screenings, became clear. In order to carry out high-precision CT screening, JASKLCT will continue to review the results of CT screening and the lung cancer detection rate annually. We are working on quality control by examining the program's performance.