Early Detection and Screening of Lung Cancer

Biography

Professor Pan-Chyr YANG is Chair Professor of National Taiwan University. He is former president of National Taiwan University and member of Academia Sinica, World Academic of Science and the National Academy of Inventors. His research interests are lung cancer genomics and precision cancer therapy. He is actively involved in developing novel strategies, including multi-omics, aptamer, nanotechnology and siRNA to improve diagnosis and therapy for cancer and infectious diseases, including COVID-19. His team recently by proteogenomics revealed distinct genetic and environmental signatures of lung cancer pathogenesis and progression in never-smokers. He received the 2020 IASLC Joseph W. Cullen Distinguished Award because of the contributions in leading the lung cancer screening and improving the survival of lung cancer patients.

Abstract

Lung cancer is the leading cause of cancer mortality world-wide. Although smoking-related lung cancer ranks first in cancer mortality, lung cancer in individuals who never smoked is the fifth most common cause of cancer mortality in 2023. It is estimated that at least one-third of global lung cancers occur in never smokers, especially in women and in East Asia. Lung cancer is the most common cause of cancer mortality in both men and women in Taiwan, and more than 60% of them have no smoking history. Our proteogenomic study revealed that lung cancer in never smokers is a different disease; we identified distinct signatures of oncogenesis and progression in never-smoking lung cancer, suggesting that both endogenous genetic susceptibility and exogenous environmental carcinogens may play important roles. In a prospective study, we showed that a family history of lung cancer (LCFH) is a risk factor for lung cancer. The 10-year cumulated lung cancer detection rate was 4.5%. Low-dose computed tomography (LDCT) is the most effective way to detect lung cancer in its early stages and can reduce lung cancer mortality by 20-24%. Most LDCT lung cancer screenings have focused on heavy smokers. We initiated a study known as the Taiwan Lung Cancer Screening in Never-Smoker Trial (TALENT) in 2015. The first round of screening results yielded a lung cancer detection rate of 2.65%, with 96.5% at stage 0-1. The study further confirmed a higher lung cancer detection rate among individuals with LCFH than in those without (3.2% vs. 2.0%). To further improve lung cancer control, Taiwan initiated a National Lung Cancer Early Detection Program on July 1, 2022, offer biennial LDCT lung cancer screenings to heavy smokers (30 pack-years) and nonsmokers (including light smokers) with LCFH aged 45-74 years for females and aged 50-74 years for males. A total of 78,000 individuals participated in this program until December 31, 2023, with 57% male and 43% female participants; 40% were heavy smokers, 56% were nonsmokers with LCFH, and 4% had both risk factors. Lung cancer was confirmed in 956 subjects by surgery or biopsy, with 85.0% at stage 0-1. The lung cancer detection rate was 1.2%. Subjects with LCFH exhibited a higher detection rate (overall: 1.6%, nonsmokers: 1.7%, and light smokers: 0.9%) compared to heavy smokers (0.7%) and those with both risk factors (1.1%). This is the first large-scale lung cancer screening service

enrolling 40% heavy smokers and 60% nonsmokers or light smokers with LCFH. The potential effectiveness of early detection was demonstrated for both targets. The inclusion of nonsmoking individuals with LCFH is pivotal and may provide valuable insights for future implementation of similar LDCT screening programs in other countries with a high prevalence of non-smoking lung cancers.