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Low dose CT in detection of lung cancer –preliminary raport

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Abstract

Backgound: Lung cancer is the most common cause of cancer death worldwide. Every year in the world more people dies from lung cancer. Approximately 300 people in the Montenegro are diagnosed with lung cancer each year . Success in the treatment can be achieved by implementing screening programs.

Material and methods and rezults : From November 2013 through November 2014, a total of 120 asymptomatic men and women older than 50 with at least a 20 pack-year history of smoking were randomly assigned to undergo LDCT lung cancer screening. In 26% (32 individuals), one or more pulmonary nodules were detected. In our study low dose CT found asymptomatic lung cancer in 3.3% of scanned patients at one year into our study. We ordered biopsy for four nodules with malignant characteristic The rest of the nodules showed no enlargement during a follow-up period of 24 months and were presumed non-malignant.

Conclusion: In the current study, low-dose spiral CT was feasible for depicting small lung cancers by using a simple algorithm based on the size and attenuation of detected nodules to guide invasive

Keywords: pulmonay neoplasms, CT, screening program.

Introduction

Lung cancer is the second common cause of cancer incidence worldwide in both sexes and accounts 20% of all cancer deaths. The major risk factor is cigarette smoking which is implicated in 90% of cases and increase the risk of lung cancer 20-30 times.

In Montenegro, lung cancer is by far the most common cause of death from malignant tumors. According to official data from the Institute of Public Health of Montenegro, during the period from 2007- 2010 lung cancer was the cause of death in 40 % of all male cancer deaths, and approximately 300 people in the Montenegro are diagnosed with lung cancer each year (1).

Every year in the world more people dies from lung cancer than from other, more frequent malignancies together breast, prostate and colon carcinoma. The reason is provided with early screening programs.

In the last 30 years there was no significant reduction in mortality from lung cancer and it is considered to be due to inadequate screening protocols.

Lung cancer is usually asymptomatic or symptoms are not characteristic, so disease usually discovered in late stadium when therapeutic treatments are limited and prognosis therefore poor.

Early detection of lung cancer significantly affects the percentage of five-year survival; in the early stages of T1 is about 80%, whereas in advanced stage T4 about 10% (2).

X ray has a low sensitivity in the detection of lung cancer (15%).

CT examination in lung cancer screening has a high sensitivity, but also has a large radiation dose, which is why it can't be accepted as a screening method. Because dose reduction at CT does not substantially decrease sensitivity for small pulmonary nodules, low-radiation-dose CT should depict more tumors than does chest radiography, potentially improving the early detection and prognosis of lung cancer (3).

The objective of this study is to describe the low-dose CT (LDCT) screening process, the diagnosis and results of the initial round of LDCT lung cancer screening and also to compare results of this study to similar studies in Europe and worldwide (4),(5).

Materials and methods

In LDCT lung screening we randomly assigned asymptomatic men and women older than 50 with at least a 20 pack-year history of smoking.

The screening was performed on a 64 slice CT scanner, without IV contrast enhancement, 80 kVp, 33 mAs, pitch 2:1, data reconstructed into 6 mm transaxial slices, tube rotation 0.8 sec, filter B50. Average Dose index was calculated at 0.93 mGy. (larger patients received more.) We used a simple algorithm based on the size and attenuation of detected nodules to guide the diagnostic work-up. Screening results were classified as either positive or negative. We regarded all noncalcified pulmonary nodules greater than 4 mm in diameter as a positive result.

Homogeneously calcified nodules were regarded as benign and were not followed up with low-dose CT (negative test result).

For noncalcified pulmonary nodules of 10 mm or smaller, repeat low-dose CT was recommended for follow-up at 3, 6, 12, and 24 months to exclude growth.

Nodules larger than 10 mm were considered potentially malignant; however, it was decided individually whether the lesion was more likely to be benign or malignant on the basis of its morphology (eg, shape, good or poor definition, or smooth or irregular margination) and associated findings (eg, calcified hilar or mediastinal lymph nodes).

Results

From November 2013 through November 2014, a total of 120 asymptomatic men and women older than 50 with at least a 20 pack-year history of smoking were randomly assigned to undergo LDCT lung cancer screening.

Of the 120 individuals that we had the study, 53 were men and 47 were women. The median age was 60 years. The median period tobacco consumption was 34 years.

In 26% (32 individuals), one or more pulmonary nodules were detected. 42 noncalcified pulmonary nodules of 4 mm or greater were found. 20 individuals had solitary pulmonary nodule and 12 individuals had more than 1 pulmonary nodules.

We ordered biopsy for three nodules larger than 10mm with malignant characteristic and for the one nodule smaller than 10mm, but with progression in size on control low dose CT after six months. Biopsy of 4 lesions revealed lung cancer in 4 lesions in 4 subjects. Two adenocarcinoma stage Ia, one squamocelular carcinoma stage Ib and 1 in advance stage III also adenocarcinoma.

The rest of the nodules showed no enlargement during a follow-up period of 24 months and were presumed non-malignant.

Also in 24% we found other pathology: coronary artery calcificatiuon, mediastinal lymphadenopathy, focal liver lesion, kidney stone, breast lesion.

In our study low dose CT found asymptomatic lung cancer in 3.3% of scanned patients at one year into our study. This is higher compared to similar studies worldwide in whom the asymptomatic lung cancer was found in 1,1%- 2,6% (3-6). Also found was a comparatively higher proportion of malignancies with an early tumor stage 75% (3 of 4).

Discussion

Screening program needs to affect mortality rate, needs to justify unwanted effects of this method and in the same time needs to be widely available and low cost. The population-level benefits must be greater than the risks.(6),(7),(8).

The data available, including suggest that the detection rate for lung cancer is, in fact, markedly higher with low-dose CT than with chest radiography.

The advantage of LDCT in lung cancer screening has been proven in national USA study, where it was published that using LDCT in lung cancer screening reduced mortality rate 20%. The major number of diagnosed lung cancers where in early, operabile stadium and five year survivale time was greater, about 80%.

There is increasing evidence that low dose lung cancer screening benefits outweigh the risks at this time for selected patient groups (9),(10).

Low-dose CT can greatly improve the likelihood of detection of small non-calcified nodules, and thus of lung cancer at an earlier and potentially more curable stage (11),(12),(13).

Limitations and potential harms is overdiagnosis and radiation risk. Patients with false positive may undergo an invasive diagnostic procedure, have surgical resection, be given a diagnosis of lung cancer, and require multiple sequential follow-up studies. The risk of increased cancer incidence associated with low-dose ionising radiation is an extremely controversial topic (14). The mean effective dose delivered to subjects participating to the ITALUNG trial of lung cancer screening who underwent LDCT examinations and further investigations is very low and about one-third of the effective dose that is associated with natural background radiation and diagnostic radiology in the same time period (15).

There is continued debate over the cost effectiveness of screening, but it may be cost effective if limited to the study population or selected subgroups of the study population.

In our study we confirm benefit of LDCT screening. We found asymptomatic lung cancer in 3.3% higher than in the other similar worldwide study. Also we didn't have too many invasive procedures.

Modern modalities of CT data presentation or computer-aided diagnosis show promise for increasing sensitivity and decreasing reporting time.

In conclusion, in the current study, low-dose spiral CT was feasible for depicting small lung cancers by using a simple algorithm based on the size and attenuation of detected nodules to guide invasive procedures.

In the future, once there are better biomarkers and imaging techniques to predict which individuals with a diagnosis of lung cancer will have more or less aggressive disease, treatment options can be optimized, and a mass screening program can become more valuable.

Literature:

1. Malvezzi M., Bertuccio P., Rosso T., Rota M., Levi F., La Vecchia C., Negri E. European cancer mortality predictions for the year 2015: does lung cancer have the highest death rate in EU women? Annals of Oncology 2014; 26(4): 779-786.

2. National Lung Screening Trial Research Team, Aberle DR, Adams AM, Berg CD, Black WC, Clapp JD, Fagerstrom RM, et al. Reduced lung-cancer mortality with low-dose computed tomographic screening. N Engl J Med. 2011;365: 395-409.

3. Diederich S[1], Wormanns D, Semik M, Thomas M, Lenzen H, Roos N, Heindel W.Screening for early lung cancer with low-dose spiral CT: prevalence in 817 asymptomatic smokers.Radiology. 2002 Mar;222(3):773-81.

4. National Lung Screening Trial Research Team, Church TR, Black WC, Aberle DR, Berg CD, Clingan KL, Duan F, Fagerstrom RM, Gareen IF, Gierada DS, et al. Results of initial low-dose computed

tomographic screening for lung cancer. N Engl J Med. 2013 May 23; 368(21):1980-91.

5. Lopes PA, Picozzi G, Falaschi F, Carrozzi L, Falchini M, Carozzi FM, Pistelli F, Comin C, Deliperi A, Grazzini M, Innocenti F, Maddau C, Vella A, Vaggelli L, Paci E, Mascalchi M:Four-year results of low-dose CT screening and nodule management in the ITALUNG trial. J Thorac Oncol 2013, 8:866-875.

6. Swensen SJ, Jett JR, Hartman TE, et al. Lung cancer screening with CT: Mayo Clinic experience.Radiology. 2003;226:756–761. (PubMed)

7. National Lung Screening Trial Research T, Church TR, Black WC, Aberle DR, Berg CD, et al. (2013)Results of initial low-dose computed tomographic screening for lung cancer. N Engl J Med 368: 1980–1991 doi: 10.1056/NEJMoa120912023697514 (PMC free article) (PubMed)

8. J. Vansteenkiste, C. Dooms, C. Mascaux, and K. Nackaerts. Screening and early—detection of lung cancer. Ann. Onc. 2012 23: x320-x327.

9. Stephen G Spiro Screening for lung cancer: we still need to know more. *Thorax* 2012;67:283-285 doi:10.1136/thoraxjnl-2011-201541

10. Patz EF, Jr, Pinsky P, Gatsonis C, et al. Overdiagnosis in Low-Dose Computed Tomography Screening for Lung Cancer.*JAMA Intern Med.* 2014;174(2):269-274. doi:10.1001/jamainternmed.2013.12738.

11. Anthony B. Miller Screening for Lung Cancer With Low-Dose Computed Tomography. The Oncologist August 2013 vol. 18 no. 8 897-899.

12. Saghir Z, Dirksen A, Ashraf H et al. CT screening for lung cancer brings forward early disease: The randomised Danish Lung Cancer Screening Trial: Status after five annual screening rounds with low-dose CT. Thorax2012;67:296-301.

13. Macmahon H, Austin JH, Gamsu G et-al. Guidelines for management of small pulmonary nodules detected on CT scans: a statement from the Fleischner Society. Radiology. 2005;237 (2): 395-400. doi:10.1148/radiol.2372041887 -Pubmed citation

14. Stojanović, S., Petrović, K., Anđelić, D., Njagulj, V., Krsmanović, A.& Boban, N. 2009, Mogućnosti niskodoznog CT protokola u skriningu karcinoma pluća, Acta chirurgica iugoslavica, vol. 56, no. 4, pp. 57-62.

15. M Mascalchi, L N Mazzoni, M Falchini, G Belli, G Picozzi, V Merlini, A Vella, S Diciotti, F Falaschi, A Lopes Pegna, and E Paci, Dose exposure in the ITALUNG trial of lung cancer screening with low-dose CT, The British Journal of Radiology 2012 85:1016, 1134-1139