

## **SUMMARY**

### **THE VALUE OF DYNAMIC CONTRAST-ENHANCED COMPUTERIZED TOMOGRAPHY IN THE ASSESSMENT OF SOLITARY PULMONARY NODULES**

#### **OBJECTIVE**

The purpose of this study is to assess the value of dynamic contrast enhanced computerized tomography in the differential diagnosis of solitary pulmonary nodules.

#### **MATERIAL & METHOD**

Thirty adult patients who had a solitary pulmonary nodule ranging between 1 – 3 cm on chest X-Ray were enrolled in this prospective study. The study was approved by the ethical committee of Adnan Menderes University. Patients were informed about the study and signed consent was obtained.

First of all; single breath-hold pre-contrast thorax CT examination was done with the following parameters: slice thickness: 7 mm, 120 kVp, 200 mAs, pitch: 1,5/1. The nodule was localized; diameter and the contour properties were noted. Then, the internal characteristics of the nodule such as the presence of calcification, cavitation or fat tissue density was evaluated. In addition, mediastinal lymph nodes bigger than 1 cm were also noted.

The second step of the study was the contrast enhanced scan. One of the widely used non-ionic iodinated contrast materials (Omnipaque®, Ultravist®, Iomeron®, Optiray® or Pamiray®) were given via the intravenous route. Contrast material amount was standardized according to the patient weight.

The nodules were re-scanned after contrast material injection at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 10<sup>th</sup> and 15<sup>th</sup> minutes, and the time versus enhancement curves were derived. The maximum enhancement value was accepted as the “peak enhancement value”; the time for this value was named as the “peak enhancement time”. Pre-contrast density of the nodule was subtracted from the peak enhancement value to define the “maximum attenuation value”. The threshold value for maximum attenuation was set as 15 HU, and the nodules with maximum attenuation value above this level were accepted to be malignant. The results of this study were compared with histopathological diagnosis when tru-cut biopsy samples were available; otherwise follow-up CT and/or PET-CT results were used for comparison. Sensitivity and specificity

values of the dynamic contrast enhanced CT were calculated according to the maximum attenuation threshold.

## **FINDINGS**

Thirty patients (F/M : 12/18) were enrolled in this prospective study. Twelve nodules (40 %) of the nodules in the study group were malignant, rest of the nodules (N=18, 60 %) were benign lesions. Nine patients in malignant group were men. The histopathological diagnosis of the malignant nodules were as follows: 5 adenocarcinoma (41 %), 3 non-small cell undifferentiated cancers (35 %), 1 carcinoid (8 %), 1 squamous cell cancer (8 %), 1 clear cell carcinoma (8 %) and 1 epithelial cancer metastasis (8 %). Age of the patients ranged between 29-82 years. Median age of the malignant patients was 68 years (25<sup>th</sup> percentile: 65 years – 75<sup>th</sup> percentile: 73 years). Median age of the patients with benign lesions was 59 years (25<sup>th</sup> percentile: 46 years – 75<sup>th</sup> percentile: 75 years). No statistical difference was found between the median age of benign or malignant patients (p=0.305).

No statistical significant difference was present for gender of the patients and the location of the nodules between malignant and benign groups (p= 0,121 and p=0,611, respectively). On the other hand, diameter and the maximum attenuation values of the malignant nodules were significantly higher than the benign nodules (p= 0,039 and p=0,045, respectively). Median diameter of the malignant nodules was 2.5 cm (25<sup>th</sup> percentile: 2.0 cm – 75<sup>th</sup> percentile: 2,87 cm), median diameter of benign nodules was 1,6 cm (25<sup>th</sup> percentile: 1,3 cm – 75<sup>th</sup> percentile: 2,4 cm). Median value of peak enhancement time was 2,5 minutes for malignant nodules (25<sup>th</sup> percentile: 1,25 minutes – 75<sup>th</sup> percentile: 3,75 minutes) and 5 minutes for benign nodules (25<sup>th</sup> percentile: 2 minutes – 75<sup>th</sup> percentile: 5 minutes).

First of all, the average density values calculated for consecutive scans were compared to each other. The difference between the pre-contrast scan and all the post-contrast consecutive scans for malignant nodules were statistically significant (p<0,005). A similar difference was present between the 4<sup>th</sup> and 5<sup>th</sup> minute scans and the 15<sup>th</sup> minute scan as well (p=. Also the post-contrast average densities for benign lesions were statistically significantly higher than pre-contrast scan (p>0,005). There was not also a significant difference between the post-contrast 15<sup>th</sup> minute and the pre-contrast scans of benign lesions, totally different than the malignant ones (p=0,086).

Sensitivity, specificity, positive and negative predictive values for this study according to the 15 HU threshold were 92 %, 50 %, 58 % and 90 %, respectively.

## **CONCLUSION**

Dynamic contrast enhanced CT is a highly sensitive but not so specific test for the assessment of solitary pulmonary nodules. The test may aid in the diagnosis of the selected cases, if the malignant or benign discrimination is not possible clinically.

Keywords: Solitary pulmonary nodule, dynamic contrast enhanced CT