

A New Method in the Detection of Lymph Node Metastasis of Non-Small Cell Lung Cancer: 3D Micro-CT

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Introduction

Lymph node (LN) metastasis status is the major determinant of prognosis in operated patients with non-small cell lung carcinoma (NSCLC). Traditionally, to evaluate metastasis, hematoxylin and eosin (HE) sections from formalin fixed and paraffin embedded blocks (PBs) of resected LNs are inspected under a light microscope. Metastatic areas may remain undetected in PBs, due to the two-dimensional nature of this technique.

The entire PB can be scanned without compromising the integrity with Micro CT imaging. In this study, it was aimed to analyze the micro CT data of metastatic and non-metastatic non-tumoral areas in PBs of mediastinal lymph node specimens from patients with NSCLC.

Method

Paraffin blocks from Ankara University Faculty of Medicine, Department of Pathology, were used for histopathological evaluation. LNs of 8 NSCLC patients, a total of 47 "region of interest" (ROIs), consisting of tumor (n=17), lymphoid tissue (n=11), adipose tissue (n=10), and anthracosis (n=9) were selected on HE stained virtual slides. Different structural parameters (percent object volume, intersection surface, tissue thickness, structure linear density, connectivity, connectivity density, percent open porosity, and closed porosity) were evaluated in these ROIs in PBs examined by Micro-CT (1275, Bruker, Kontich, Belgium) ROI groupings were calculated blindly by the radiologist and statistician.

Results

Group 1 and 2, when clustering analysis was performed with all parameters, tumor, lymphoid tissue, and anthracosis areas were 58.8%, respectively; 90.9%; and it was 100% compatible. The agreement of the percentage of open and closed porosity and the tumoral area between the groups was 100%, and the agreement for closed porosity alone was 82.4% (Figure 1).

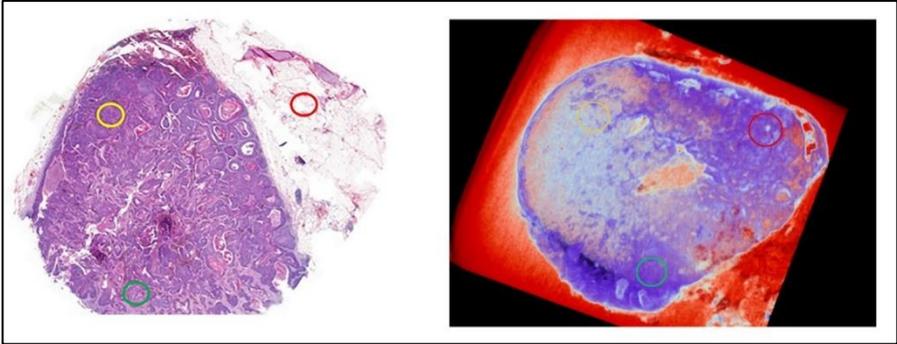


Figure 1. Histopathological and Micro CT images.

In the presence of ≥ 1990 values with only the connectivity parameter by ROC analysis, the tumoral area was 100%; if ≤ 474.5 lymphoid tissue 72.7%; If 474.6-919 is 90% adipose tissue; For 920-1989, the anthracnose tissue was 100% accurate.

Discussion and Conclusion:

This study is a pilot study and the first study on this subject, and it has been shown that paraffin embedded LNs can be evaluated with micro-CT without disrupting their integrity. Using the quantitative and qualitative information obtained by this evaluation, tumor and non-tumor areas in paraffin blocks can be distinguished from each other. Detection of metastasis status by evaluation of the entire LN with micro-CT may enable the adjuvant treatment decision to be based on more accurate data. In addition, quantitative data obtained from micro-CT can form the basis of artificial intelligence algorithms.