論 文 要 旨

Dual-Energy CT-Derived Electron Density for Diagnosing Metastatic Mediastinal Lymph Nodes in Non-Small Cell Lung Cancer: Comparison With Conventional CT and FDG PET/CT Findings

Background: Accurate nodal staging is essential to guide treatment selection in patients with non-small cell lung cancer (NSCLC). To our knowledge, measurement of electron density (ED) using dual-energy CT (DECT) is unexplored for this purpose.

Objective: To assess the utility of ED from DECT in diagnosing metastatic mediastinal lymph nodes in patients with NSCLC, in comparison with conventional CT and FDG PET/CT.

Methods: This retrospective study included 57 patients (36 men, 21 women; mean age 68.4±8.9 years) with NSCLC and surgically resected mediastinal lymph nodes who underwent preoperative DECT and FDG PET/CT. The patients had a total of 117 resected mediastinal lymph nodes (33 metastatic, 84 nonmetastatic). Two radiologists independently reviewed nodes' morphologic features on the 120 kVp images and also measured nodes' iodine concentration (IC) and ED using maps generated from DECT data; consensus was reached for discrepancies. Two separate radiologists assessed FDG PET/CT examinations in consensus for positive node uptake. Diagnostic performance was evaluated for individual and pairwise combinations of features.

Results: The sensitivity, specificity, and accuracy for nodal metastasis were 15.2%, 98.8%, and 75.2% for presence of necrosis; 54.5%, 85.7%, and 76.9% for short-axis diameter >8.5 mm; 63.6%, 73.8%, and 70.9% for long-axis diameter >13.0 mm; 51.5%, 79.8%, and 71.8% for attenuation on 120 kVp images ≤95.8 HU; 87.9%, 58.3%, and 66.7% for ED ≤3.48×10^{23}/cm^3; and 66.7%, 75.0%, and 72.6% for positive FDG uptake, respectively. Among pairwise combinations of features, accuracy was highest for the combination of ED and short-axis diameter (accuracy 82.9%, sensitivity 54.5%, specificity 94.0%) and the combination of ED and positive FDG uptake (accuracy 82.1%, sensitivity 60.6%, specificity 90.5%); these accuracies were greater than for the individual features (p<.05). Remaining combinations exhibited accuracies ranging from 74.4% to 77.8%. Interobserver agreement analysis demonstrated intraclass correlation coefficient of 0.90 for ED. IC was not significantly different between metastatic and nonmetastatic nodes (p=.18) and was excluded from the diagnostic performance analysis.

Conclusion: ED derived from DECT may help diagnose metastatic lymph nodes in NSCLC given decreased ED in metastatic nodes.

Clinical Impact: ED may complement conventional CT findings and FDG uptake on PET/CT in diagnosing metastatic nodes.