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Differentiation between malignancy and inflammation in pulmonary ground-glass nodules: The feasibility of integrated ^{18}F-FDG PET/CT

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Abstract

Keywords

Reference

Abstract

Background

^{18}F-FDG PET/CT has been used to

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differentiate malignant solid lung nodules from benign nodules. We assess the feasibility of integrated ^{18}F-FDG PET/CT for the differentiation of malignancy from inflammation manifested as ground-glass nodules (GGNs) on chest CT.

Methods

A total of 68 GGNs in 45 patients (M:F = 24:21; mean age, 61) fulfilled the following criteria: (a) nodules composed of ≥50% ground-glass opacity, (b) patients who underwent integrated PET/CT within 1 week following dedicated chest CT, (c) definitive diagnosis determined by pathological specimen or at least 9 months of follow-up, and (d) lesions ≥10 mm in diameter. 36 malignant GGNs were pathologically proved as adenocarcinoma (*n* = 20), bronchioloalveolar carcinoma (*n* = 11), low-grade lymphoma (*n* = 3), metastatic mucinous adenocarcinoma (*n* = 1) and unknown low-grade malignancy (*n* = 1). 32 inflammatory GGNs were confirmed as pneumonic infiltration as they had disappeared on follow-up CT and were associated with compatible clinical features (*n* =

26) or as chronic inflammation with fibrosis by VATS biopsy (*n* = 6). Using CT density histogram analysis, 14 were classified as pure GGNs and 54 as part-solid nodules. Integrated PET/CT was evaluated by measuring the maximum standardized uptake value (SUV) at the region of interest located at each lesion. The Mann–Whitney *U* test was performed to compare the SUV of malignancy and inflammation. The optimal cut-off value of SUV to differentiate malignancy from inflammation was determined using a receiver operating characteristic-based positive test. Sensitivity, specificity, accuracy, and positive predictive values (PPV) and negative predictive values (NPV) were calculated at the level of the optimal cut-off value. SUV showing 100% PPV for inflammatory GGNs was evaluated.

Results

In part-solid nodules, the maximum SUV was significantly higher in inflammation (2.00 ± 1.18; range, 0.48–5.60) than in malignancy (1.26 ± 0.71; range, 0.32–2.6) ($P = 0.018$). On the other hand, in pure GGNs, the

maximum SUV of malignancy (0.64 ± 0.19; range, 0.43–0.96) and inflammation (0.74 ± 0.28; range, 0.32–1.00) showed no difference (*P* = 0.37). Using the optimal cut-off value of SUV as 1.2 (*P* = 0.01) sensitivity, specificity, accuracy, PPV and NPV in part-solid nodules were 62.1%, 80.0%, 70.4%, 78.3% and 64.5%, respectively. Six part-solid nodules, which showed a maximum SUV of higher than 2.6, were all inflammations.

Conclusion

The part-solid nodules with positive FDG-PET could be inflammatory nodules rather than malignant nodules. This is a quite paradoxical result when considering the basic knowledge that malignant pulmonary nodules have higher glucose metabolism.

Keywords

Ground-glass nodule • Ground-glass opacity • GGN • GGO • Solitary pulmonary nodules • PET/CT • 18F-FDG

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