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Positron emission tomographic imaging with ^{11}C-choline in differential diagnosis of head and neck tumors: comparison with ^{18}F-FDG PET

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The aim of this study was to evaluate the clinical value of positron emission tomography (PET) with ^{11}C-labeled choline (CHOL) for the differential diagnosis of malignant head and neck tumors from benign lesions as compared with ^{18}F-fluorodeoxyglucose PET. ***Methods:*** We studied 45 patients (28 males, 17 females, age range, 29–84 years) with suspected lesions in the head and neck region using both CHOL and FDG PET within a 2-week period on each patient. All patients fasted for at least 6 hours for both the CHOL and FDG studies. PET imaging was performed 5 min and 50–60 min after intravenous injection of CHOL and FDG, respectively. After data acquisition, PET images were corrected for attenuation, and the reconstructed images were analyzed by visual interpretation. Then, the standardized uptake value (SUV) was calculated for semiquantitative evaluation of tumor tracer uptake. Finally the results of PET scans were compared with the histological diagnoses from surgical specimens or biopsies. ***Results:*** With CHOL PET, malignant tumors were correctly detected in 24 (96%) of 25 patients, and benign lesions in 14 (70%) of 20 patients with an accuracy of 84.4%. With FDG PET, malignancy was correctly diagnosed in 23 (92%) of 25 patients, and benign lesions in 13 (65%) of 20 patients resulting an accuracy of 80%. A significant positive correlation between CHOL and FDG SUVs was found for all lesions ($r = 0.677$, $p = 0.004$, $n = 45$). Malignant tumors showed significantly higher tracer accumulation than the benign lesions in both CHOL and FDG studies (5.69 ± 1.61, $n = 25$ vs. 2.98 ± 2.13, $n = 20$, $p < 0.0001$; 9.21 ± 4.23, $n = 25$ vs. 3.60 ± 2.57, $n = 20$, $p < 0.0001$). The cutoff SUV for differentiating malignant and benign lesions was 3.5 for CHOL and 3.9 for FDG. CHOL showed slightly better differentiation between malignant and benign lesions than FDG although some overlap existed on both studies. But the difference was not statistically significant. ***Conclusion:*** The results of this study indicate that CHOL PET may be feasible clinically for head and neck tumor imaging. PET imaging with CHOL seems to be able to detect malignant head and neck tumors as effectively as FDG PET. The advantages of CHOL PET were shorter examination period and low uptake in the muscle. However, both CHOL and FDG have some limitations in the evaluation of salivary gland lesions.

Key words: PET, CHOL, FDG, head and neck tumors, SUV