Evaluation of 2-deoxy-2-[^{18}F]fluoro-D-glucose positron emission tomography in gastric carcinoma: relation to histological subtypes, depth of tumor invasion, and glucose transporter-1 expression

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Objective: Variable uptake of 2-deoxy-2-[^{18}F]fluoro-D-glucose (FDG) has been noticed in positron emission tomography (PET) studies of gastric carcinoma patients, with low uptake occurring especially in some particular histological subtypes and early carcinomas. But this phenomenon has not been adequately explained. The aim of the present study is to clarify FDG uptake in gastric carcinomas especially focusing on histological subtypes, the depth of tumor invasion, and glucose transporter-1 (GLUT-1) expression which is considered to be one of the major factors for higher FDG uptake in human malignant tumors. ***Methods:*** FDG-PET was performed on 35 preoperative patients with gastric carcinoma. Forty macroscopically distinguishable lesions on a surgical specimen were histologically classified into two subtypes: Cohesive type (papillary adenocarcinoma, tubular adenocarcinoma, and solid type poorly differentiated adenocarcinoma) or Non-cohesive type (signet-ring cell carcinoma and non-solid type poorly differentiated carcinoma). GLUT-1 expression was immunohistochemically determined. Histological parameters (GLUT-1 expression, histological subtypes, the depth of invasion, lymphatic permeation, venous invasion and tumor size) were evaluated, and factors for FDG uptake (detectability and the degree) and GLUT-1 overexpression were determined by multiple regression analysis. ***Results:*** Nineteen of 40 gastric carcinomas showed detectable FDG uptake (48%), multiple regression analysis revealed that both the depth of invasion and histological subtypes are independent factors that influence the detectable FDG uptake in gastric carcinoma ($R^2 = 0.66$). GLUT-1 expression was seen from an early cancer stage and the cohesive type was an independent factor influencing the overexpression of GLUT-1 ($R^2 = 0.66$). GLUT-1 expression was the most influential factor for the degree of FDG uptake in gastric carcinoma ($R^2 = 0.68$). ***Conclusions:*** This study provided important information on the clinical application of FDG-PET in gastric carcinoma that early or non-cohesive gastric carcinoma may show lower FDG uptake. Therefore, the usefulness of FDG-PET for the detection of gastric carcinoma is limited. But there is a possibility that FDG uptake associated with GLUT-1 expression may serve as a prognostic factor of gastric carcinoma representing tumor metabolism.

Key words: gastric carcinoma, adenocarcinoma, 2-deoxy-2-[^{18}F]fluoro-D-glucose (FDG), glucose transporter type 1 (GLUT-1), positron emission tomography (PET)