Time course of tumor metabolic activity during chemoradiotherapy of esophageal squamous cell carcinoma and response to treatment.

PURPOSE: To evaluate the time course of therapy-induced changes in tumor glucose use during chemoradiotherapy of esophageal squamous cell carcinoma (ESCC) and to correlate the reduction of metabolic activity with histopathologic tumor response and patient survival.

PATIENTS AND METHODS: Thirty-eight patients with histologically proven intrathoracic ESCC (cT3, cN0/+, cM0) scheduled to undergo a 4-week course of preoperative simultaneous chemoradiotherapy followed by esophagectomy were included. Patients underwent positron emission tomography with the glucose analog fluorodeoxyglucose (FDG-PET) before therapy (n = 38), after 2 weeks of initiation of therapy (n = 27), and preoperatively (3 to 4 weeks after chemoradiotherapy; n = 38). Tumor metabolic activity was quantitatively assessed by standardized uptake values (SUVs). Results Mean tumor FDG uptake before therapy was 9.3 +/- 2.8 SUV and decreased to 5.7 +/- 1.9 SUV (-38% +/- 18%; P<.0001). The preoperative scan showed an additional decrease of metabolic activity to 3.3 +/- 1.1 SUV (P<.0001). In histopathologic responders (< 10% viable cells in the resected specimen), the decrease in SUV from baseline to day 14 was 44% +/- 15%, whereas it was only 21% +/-
14% in nonresponders (P =.0055). Metabolic changes at this time point were also correlated with patient survival (P =.011). In the preoperative scan, tumor metabolic activity had decreased by 70% +/- 11% in histopathologic responders and 51% +/- 21% in histopathologic nonresponders. CONCLUSION: Changes in tumor metabolic activity after 14 days of preoperative chemoradiotherapy are significantly correlated with tumor response and patient survival. This suggests that FDG-PET might be used to identify nonresponders early during neoadjuvant chemoradiotherapy, allowing for early modifications of the treatment protocol.