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Journal: Clinical nuclear medicine

Year: 2016 Nov

Issue: 41

Volume: 11

Pages: e491-e492

DOI: 10.1097/RLU.0000000000001365

^{68}Ga-NODAGA-RGDyK PET/CT Imaging in Esophageal Cancer: First-in-Human Imaging

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Key Words: ^{68}Ga-NODAGA-RGDyK, FDG, PET/CT, esophageal cancer,

ABSTRACT

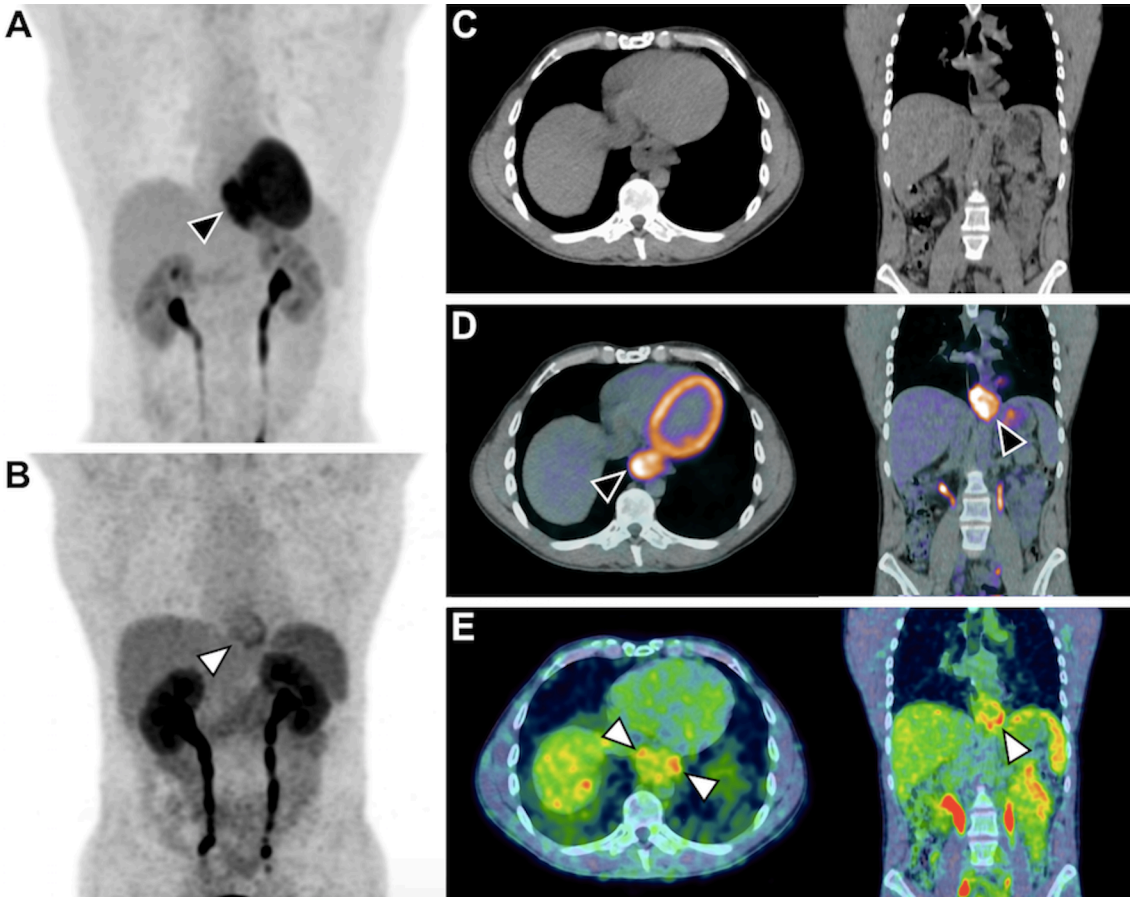
68Ga-NODAGA-RGDyK(cyclic) and FDG PET/CT were per- formed in a 39-year-old man for the work-up of a moderately differentiated carcinoma of the gastro-esophageal junction within a clinical study protocol. Although FDG PET images showed intense, diffuse hypermetabolic lesion activity, NODAGA-RGDyK illustrated the neo-angiogenesis process with tracer uptake clearly localized in non-FDG-avid perilesional structures. Neo-angiogenesis is characterized by αvβ3 integrin expression at the lesion surface of newly formed vessels. This case supports evidence that angiogenesis imaging might therefore be a crucial step in early disease identification and localization, metastatization potential, and in monitoring the efficacy of antiangiogenic therapies.

Figure 1

A 39-year-old man with a history of progressive dysphagia underwent a positron emission tomography/computed tomography with ^{18}F-fluorodeoxyglucose (FDG PET/CT) in the diagnostic work-up of a known moderately differentiated carcinoma of the gastro-esophageal junction. Images showed intense diffuse hypermetabolic lesion activity (black arrowheads; **A**, **D**). Several radiolabeled monomeric cyclic arginine-glycine-aspartic (RGD) peptides and analogs have been developed for monitoring and quantifying integrin αvβ3 (a molecular target involved in angiogenesis) expression noninvasively in tumors with PET.[1–3] Then, to investigate the tumor-associated neo-angiogenesis within a clinical study protocol, it was secondly performed

a PET/CT 58 minutes after intravenous injection of 215 MBq of 68Ga-NODAGA-RGDyK(cyclic), a new ^{68}Ga-labeled radiopharmaceutical binding to αvβ3 integrin through its RGD motif.[4,5] Oral and written informed consent were obtained. Images clearly illustrated the neo-angiogenesis process by a NODAGA-RDGyK uptake of non–FDG-avid perilesional structures (white arrowheads; **B**, **E**). Indeed, neo-angiogenesis is characterized by an integrin expression at the lesion surface of newly formed vessels that differs from that present on native vessels. The αvβ3 integrin is highly expressed on activated endothelial cells during angiogenesis, playing an essential role regulating tumor growth, local invasiveness, and metastatic potential. It plays an important role in many pathological processes, such as rheumatoid arthritis, psoriasis, cardiovascular diseases, tumor growth, and tumor metastasis.[6] To the best of our knowledge, this is the first human clinical PET imaging using ^{68}Ga-NODAGA-RGDyK PET in esophageal cancer. It supports evidence that angiogenesis imaging might therefore be a crucial step in early disease identification and localization, metastatization potential, and in monitoring the efficacy of antiangiogenic therapies. (**A**) FDG PET (maximum-intensity-

projection) MIP; (**B**) ^{68}Ga-NODAGA-RGDyK(cyclic) PET MIP; (**C**) CT images in axial and coronal views; (**D**) FDG PET/CT fusion; (**E**) ^{68}Ga-NODAGA-RGDyK PET/CT fusion.



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