

Clinically Occult Rectal Carcinoma Identified in a Case of *Streptococcus bovis* Endocarditis on Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography: A Case Report and Review of Literature

Abstract

Numerous studies over past four decades have implicated a strong association of *Streptococcus bovis* infection with colorectal carcinomas. Strong is this association that a screening colonoscopy for identifying malignancy is considered mandatory in patients whose blood/fecal cultures show growth of this particular pathogen. Here, we report an interesting case of a 61-year-old female patient who presented with pyrexia of unknown origin for 3 weeks. Positron emission tomography/computed tomography, in addition to helping diagnose mitral valve endocarditis, also identified a clinically occult T2N0 rectal carcinoma.

Keywords: *Bovis*, carcinoma, endocarditis, fluoro-deoxy-glucose, positron emission tomography/computed tomography, rectal, *Streptococcus*

Case Report

A 61-year-old female with no previous history of any medical illness presented with high-grade fever for 3 weeks. The initial routine blood investigations were normal, except for raised erythrocyte sedimentation rate, and C-reactive protein. Transthoracic echocardiography (TTE) showed severe mitral valve regurgitation, but no vegetations were identified. Whole body positron emission tomography/computed tomography (PET/CT) was done to localize possible infective foci. 2-fluoro-deoxy-glucose (FDG) PET/CT scan showed increased FDG uptake most prominently in the marrow of axial skeleton and mildly enlarged spleen-suggestive of systemic inflammation [Figure 1a]. Low-grade FDG uptake was noted in the perivalvular region of the mitral valve [Figure 1b and c] which was more apparent on the delayed image acquired at 2.5 h [Figure 1d and e] and was reported as being suspicious for infective endocarditis (IE). PET/CT also revealed a large rectal polyp (3.5 cm-maximum standardized uptake value 25.19) for which the patient was completely asymptomatic [Figure 2]. A transesophageal echocardiogram (TEE) was done after

1 week which identified small freely mobile vegetations. Subsequent blood cultures reported growth of *Streptococcus bovis*. The patient responded well to antibiotics. In view of this atypical organism's growth on blood culture, PET/CT findings, and its known association with colonic malignancy, a surveillance colonoscopy was done which revealed a large rectal polyp. Rectal biopsy was suggestive of tubular adenoma with adenocarcinoma-like changes. Low anterior resection was done with the dissection of locoregional nodes. Histopathology report was suggestive of pT2N0 well-differentiated adenocarcinoma of rectum. In view of stage II disease, she did not need adjuvant chemotherapy. The patient is being planned for mitral valve surgery.

Discussion

IE caused by *S. bovis* is rare and seen in up to 4% of all patients with IE.^[1] IE caused by *S. bovis* is seen predominantly in older populations, associated with smaller vegetations, more commonly involvement of native valves, with less in-hospital mortality/complications and with higher association of colonic tumors, compared to the other common organisms causing endocarditis.^[1] Echocardiography and blood

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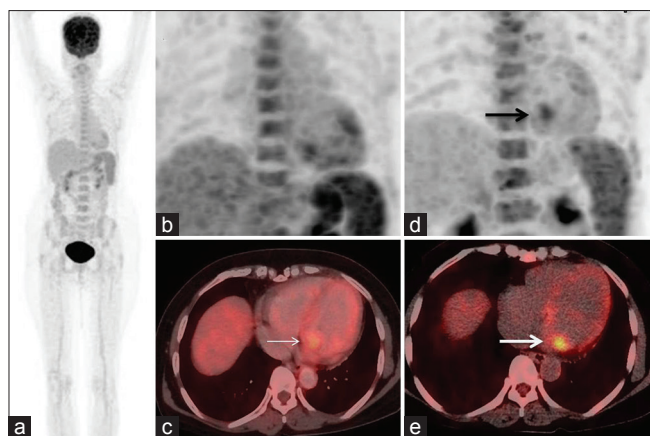


Figure 1: (a) Whole body PET-maximum intensity projection image-anterior/posterior view-showing low-grade diffuse fluorodeoxyglucose uptake in the marrow and spleen. Zoomed MIP image of thorax (b) and transaxial PET/CT of the heart showing low-grade focal fluorodeoxyglucose uptake in the periphery of mitral valve (thin white arrow, c), which is more apparent on delayed ECG-gated PET images (black arrow, d and bold white arrow e) after gradual washout of the physiologic myocardial fluorodeoxyglucose uptake. PET/CT: Positron emission tomography/computed tomography

cultures are main investigations for diagnosing IE. The sensitivity for diagnosing IE of TTE is 75%, less compared to TEE which ranges from 85% to 90%. Echocardiography may be falsely negative in 15% of cases, particularly in the cases of severe mitral valve prolapse and prosthetic valves.

[2]

The addition of imaging such as CT, PET/CT, and SPECT/CT to the diagnostic the evaluation of IE improves the overall sensitivity of the duke's criteria and are now included in the European Society of Cardiology 2015 modified duke's criteria. FDG PET/CT is an established modality in the diagnosis of IE and has been included as one of the major criteria for diagnosing prosthetic valve endocarditis (PIE).^[2] The sensitivity and specificity for diagnosing cardiac device infection are 89% and 86%, respectively. In addition to diagnosing the valve infection, PET/CT can also detect metastatic and embolic infections (seen in about 20%–50% patients), which might be clinically occult/missed on conventional imaging, thereby impacting clinical management.^[2] In comparison to the PIE, PET/CT is conventionally considered to have a low sensitivity in diagnosing native-valve endocarditis (NIE) and hence not routinely done.^[2,3] A systematic review of multiple studies, including 1402 patients showed a sensitivity of 14% for PET/CT for the diagnosis of NIE. This very low sensitivity of FDG PET/CT in diagnosing NIE however can be improved by better patient preparation suppressing the physiological FDG uptake by the myocardium (low carbohydrate-high fat diet) or integration of CT angiography in the PET/CT protocol, rather than using low-dose CT.^[3] Dual point imaging using a delayed image acquisition (at 2-3 h following a negative PET/CT at 1 h) may also improve the infection/background activity ratio, thereby improving

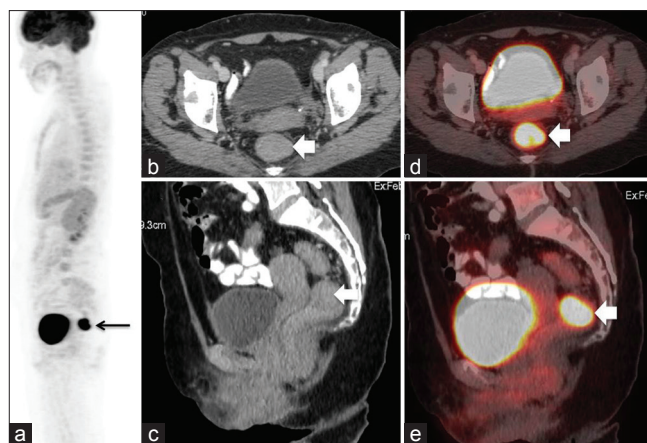


Figure 2: (a) Whole body PET-maximum intensity projection image-lateral view showing intense focal tracer uptake in the rectal area (thin black arrow). Transaxial and sagittal CT (bold white arrow, (b) and (c) and correlated PET/CT images (bold white arrow, (d) and (e) showing fluorodeoxyglucose avid well-defined enhancing lesion in the lower rectum. PET/CT: Positron emission tomography/computed tomography

the diagnosis of NIE on FDG PET/CT.^[4,5] In addition, electrocardiogram (ECG) gated PET acquisition would generate a better image contrast and can further improve the sensitivity.^[6] In our case, we were able to localize the mitral valve infection better with a delayed ECG gated acquisition image at 2.5 h.

Evidence of association of bacterial infections with cancer has been demonstrated with (most convincingly) *Helicobacter pylori* (with gastric cancers and mucosa-associated lymphoid tissue lymphoma) and few other organisms such as *Salmonella typhi* (gall bladder cancers) and *Chlamydia pneumonia* (with lung cancers). Another such bacterium called *S. bovis*, is increasingly being recognized as an important risk factor for the developing colorectal cancers.^[7] One of the first such evidence of this association was reported in a study done by Klein *et al.*, which showed high prevalence of *S. bovis* in fecal cultures of patients with colonic carcinoma compared to controls.^[8] *S. bovis* is a commensal of human gastrointestinal tract and found in 15% of normal fecal specimens. Phylogenetically, it is classified into two biotypes, Type I (*Streptococcus gallolyticus*) and Type II (*Streptococcus pasturianus*). Type I is more commonly associated with colonic cancers with incidence ranging from 18% to 62%.^[9,10] Production of inflammatory cytokines, causing chronic colonic inflammation and subsequent cancer transformation is postulated as one of the pathophysiologic mechanism of such association.^[9] However, whether *S. bovis* is an etiology or a biomarker of colorectal cancers remains an unsolved question. Nonetheless, the association of the infection and colorectal cancer is so strong that a surveillance colonoscopy is considered mandatory in case of *S. bovis* bacteremia.^[9-11]

Survival in colorectal cancers has improved remarkably in the last few decades, not just because of improvement in

surgical techniques and advances in chemotherapeutics, but also due to screening.^[12] Earlier detection of asymptomatic colorectal cancers in a high-risk patient such as *S. bovis* infection can be potentially curative, as seen in this case. Screening for colonic malignancies is traditionally done by colonoscopy and rarely CT colonography. CT colonography is a noninvasive highly sensitive investigation for the evaluation of colonic polyps (as sensitive as colonoscopy for lesions >1 cm) and is an excellent alternative to patients who are unfit or unwilling for colonoscopy.^[13] Conventionally, PET/CT use is not recommended for screening or staging of early colonic cancers, due to lack of widespread availability of PET/CT, limitation of PET/CT in identifying small lesions, along with high physiologic radioactivity in colon. FDG PET/CT can be useful for identifying large obstructive colonic tumors which cannot be traversed by colonoscopy and for identifying synchronous tumors elsewhere in the colon.^[14] In addition, PET/CT is the preferred investigation for the identification of any hepatic and extrahepatic distant metastasis in colorectal cancers. Combining PET with CT colonography have been found to be both clinically feasible and very accurate for staging colonic tumors.^[14,15] Hence, FDG/CT colonography can be used as a one-stop shop noninvasive approach for simultaneous evaluation of endocarditis as well as screening of colonic malignancies in patients with *S. bovis* endocarditis.

Conclusion

This case report further consolidates the importance of colonic surveillance in cases of *S. bovis* bacteremia and important adjuvant role of FDG PET/CT to colonoscopy for screening/diagnosing early, potentially-curable, clinically occult colonic cancers. This case also demonstrates the utility of delayed ECG-gated PET acquisition at 2–3 h of FDG injection for improving the diagnostic accuracy of PET/CT in NIE.

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Conflicts of interest

There are no conflicts of interest.

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