

CARDIOVASCULAR IMAGES

COVID-19 Pandemics

A Surprising Link to Bread Flour With Collateral Damage to a Prosthetic Heart Valve

A 40-year-old woman with a long history of intravenous drug abuse was referred for a suspicion of prosthetic valve endocarditis (PVE). She underwent a first aortic valve replacement after *Enterococcus faecalis* endocarditis 14 years earlier and a second replacement associated to ascending aorta replacement after a recurrent PVE caused by concomitant infection of *Proteus mirabilis* and *Aspergillus niger* 2 years earlier. She received a 6-month treatment course of isavuconazole 200 mg/day after surgery. Due to her history of PVE with *A niger*, an imaging follow-up with ¹⁸F-fluodeoxyglucose (¹⁸F-FDG) positron emission tomography (PET)/computed tomography (CT) was decided, to monitor for PVE recurrence.

At admission, the patient was afebrile (36.7°C) and asymptomatic; blood pressure was 95/67 and pulse was 87/minute regular. A Levin III/VI systolic ejection murmur was audible at the intravenous intercostal space of the left sternal border. The blood test revealed slightly raised white blood cell count and serum C-reactive protein level of 10800/cm³ and 19.6 mg/dL, respectively.

Transthoracic echocardiography only showed moderate increase in transaortic pressure gradient (mean of 13 mm Hg) compared with previous examinations, but the aortic prosthesis was otherwise unremarkable. The transesophageal echocardiogram showed prosthetic valve dysfunction with severe thickening and restricted movement of the cusps (Figure 1A and 1B), as well as the presence of a large 20×27×8-mm heterogeneous echolucent cavity along the posterior aspect of the aortic root, typical for a paravalvular abscess. The transaortic mean pressure gradient was 17 mm Hg (Figure 1C and 1D). The other valves were free from lesions.

The FDG PET/CT revealed a mild diffuse FDG uptake in the area of the aortic bioprosthesis, as well as periprosthetic intense FDG uptake in continuity with an intense FDG uptake of the graft up to 4 cm above the valvular plane. Moreover, it showed a focal intense subpleural ¹⁸F-FDG uptake of the lower right pulmonary lobe suggestive of septic embolism (Figure 2).

Contrast-enhanced CT (CT angiography) showed periprosthetic abscess and thickening of the prosthetic leaflets (Figure 3), as well as micro emboli of the spleen and kidney.

Blood cultures were negative, as was the workup for endocarditis with negative blood cultures. In the absence of microbiological documentation, the diagnosis of PVE was possible according to Duke criteria (1 major and 2 minor criteria). Indication for replacing the aortic root was retained, and large spectrum intravenous antibiotic therapy (2 g/day vancomycin and 120 mg/day gentamicin) was initiated immediately, as well as antifungal therapy with voriconazole for suspected recurrent *Aspergillus* endocarditis.

Intraoperative findings confirmed infective endocarditis with the porcine graft floating in pus and the aortic leaflets filled with gelatinous, thrombus-like material. All the infected material was replaced with a new biological aortic root. The postopera-

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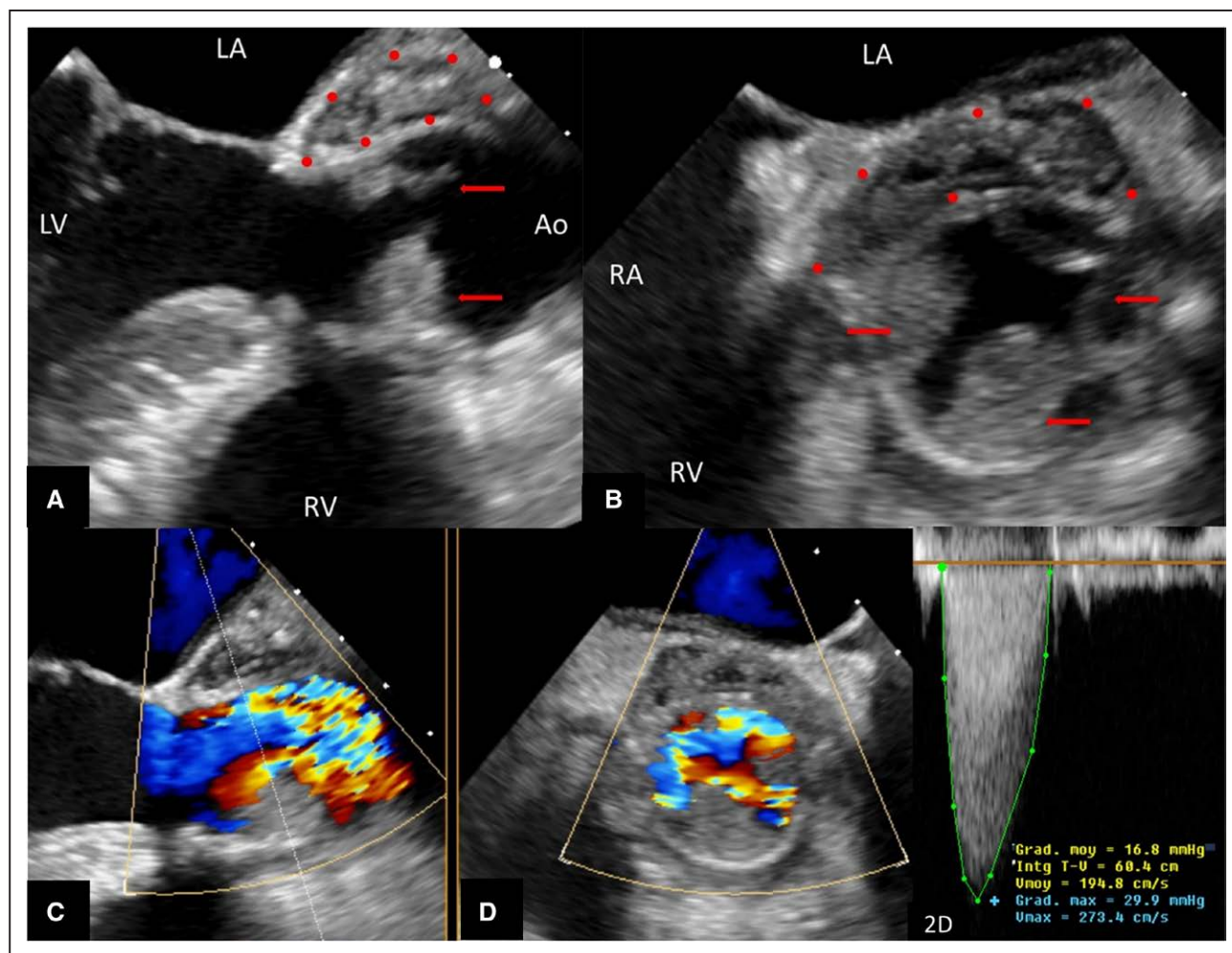


Figure 1. Echocardiographic findings.

A, Long-axis view in transesophageal echocardiogram showing thickening of the right coronary cusp and the noncoronary cusp. An abscess is visualized in the posterior segment of the aortic bioprosthesis (red dots). **B**, Short-axis view in transesophageal echocardiogram showing thickening of the right and the noncoronary cusps (red arrows), as well as an abnormal area with heterogeneous echogenicity directly adjacent to the posterior segment of the aortic bioprosthesis (red dots). **C**, Color flow Doppler in Xplane mode demonstrating aliasing throughout the aortic bioprosthesis. **D**, Continuous wave Doppler showing mild-to-moderate bioprosthetic stenosis with a maximum and mean pressure gradient at 30 and 17 mmHg, respectively. Ao indicates aorta; LA, left atria; LV, left ventricle; RA, right atria; and RV, right ventricle.

tive course was uneventful. Bacterial and fungal cultures of the surgical specimens were negative. Serum galactomannan was negative, but serum 1,3- β -d-glucan (Fungitell) turned positive (189 pg/mL) the day of the surgery. Broad-spectrum 16S rDNA polymerase chain reaction for bacterial detection was negative on all samples, as well as specific polymerase chain reactions for causative agents of blood culture-negative endocarditis. However, panfungal polymerase chain reaction targeting the 18S rDNA ultimately came positive for *Saccharomyces cerevisiae* on the 2 samples of para-aortic abscess (2800 and 4900 copies/mL). We considered the diagnosis of *S cerevisiae* endocarditis based on operative findings, the positive 1,3- β -d-glucan in serum and the identification of this yeast on preoperative samples. We started the treatment with liposomal amphotericin B 5 mg/kg per day (550 mg/day) for 7 days followed by anidulafungin 200 mg loading dose, then 100 mg/day.

The therapeutic plan was to complete 6 weeks of intravenous therapy with anidulafungin, followed by fluconazole maintenance therapy for at least 12 months. We scheduled ^{18}F -FDG PET/CT in 6 months.

DISCUSSION

Echocardiography remains the first-line imaging modality in suspected infective endocarditis. However, the diagnosis of PVE can be challenging in about 30% of cases due to acoustic shadowing induced by the prosthesis¹. Saby et al investigated the usefulness of ^{18}F -FDG PET/CT in the diagnosis of active inflammatory and infectious processes considering abnormal FDG uptake around the prosthetic valve. They demonstrated a significant increase of the sensitivity of the modified Duke criteria from 70% to 97%.² The European Society of Cardiology endorsed these evidences in 2015 including ^{18}F -FDG PET/CT as major criteria for PVE in the modified

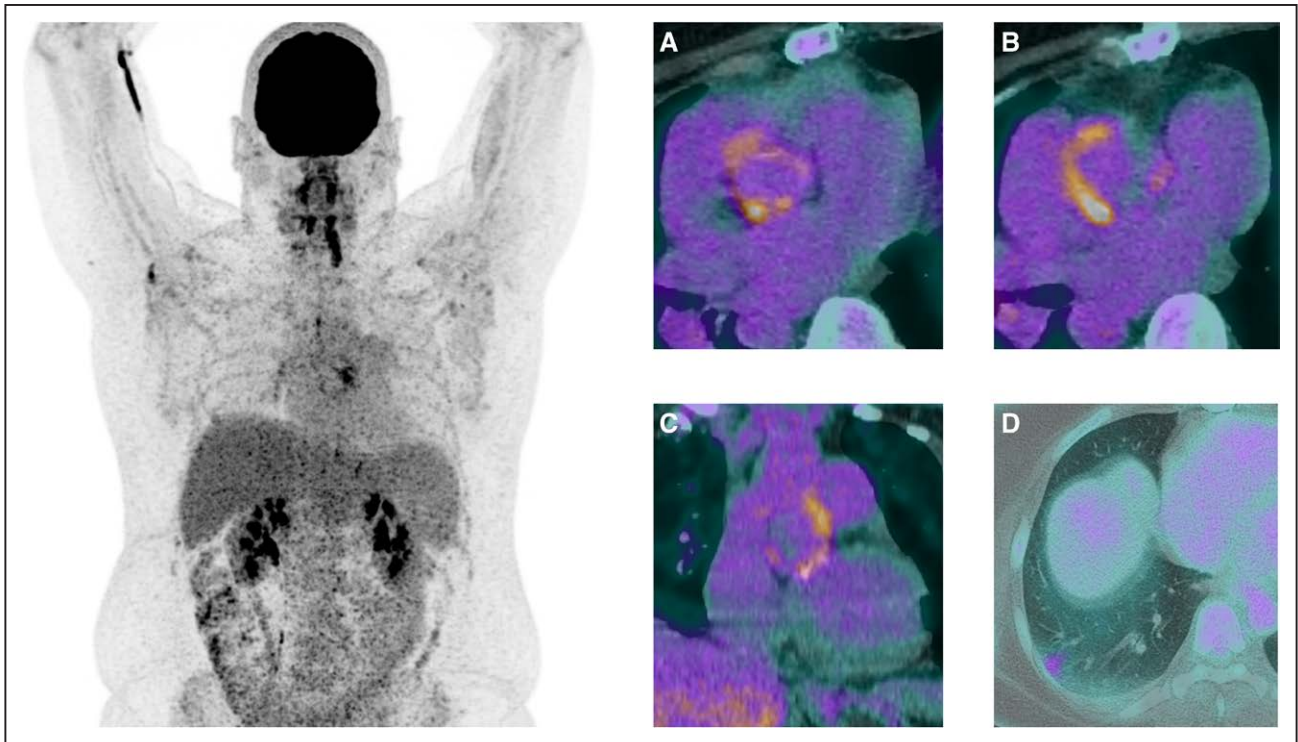


Figure 2. Positron emission tomography (PET)/computed tomography (CT) findings.
Left, Maximum intensity projection image of the upper body showing pathological accumulation of ¹⁸F-fluodeoxyglucose (¹⁸F-FDG) in the heart area. **Right, A,** Surgeon’s view of ¹⁸F-FDG PET/CT showing a focal intensity (at 7 o’clock) on discrete diffuse accumulation at the level of the PV ring (SUV_{max,esof}/SUV_{max,liver}, 1.5). **B,** Intense accumulation of ¹⁸F-FDG involving half of the periprosthetic area. **C,** Coronal view showing intense accumulation of ¹⁸F-FDG in the prosthesis graft up to 4 cm above the valvular plane. **D,** Transaxial view of ¹⁸F-FDG PET/CT showing focal subpleural accumulation of FDG in the lower right pulmonary lobe. PV indicates prosthetic valve; and SUV, standardized uptake valve.

Duke criteria. Inflammatory cells, especially monocytes, demonstrate increased glycolytic activity allowing their visualization by ¹⁸F-FDG PET/CT.³ This FDG uptake is not specific for infection, as the prosthesis itself leads to host tissue reaction with a normal characteristic uptake pattern (diffuse discrete homogeneous or discrete

heterogeneous).³ However, this uptake pattern differs from the one in the presence of infection (focal intense or heterogeneous intense).

S cerevisiae is considered as nonpathogenic, and it is widely used in the production of bread and beer, as well as in pharmaceutical industry as a probiotic and dietary

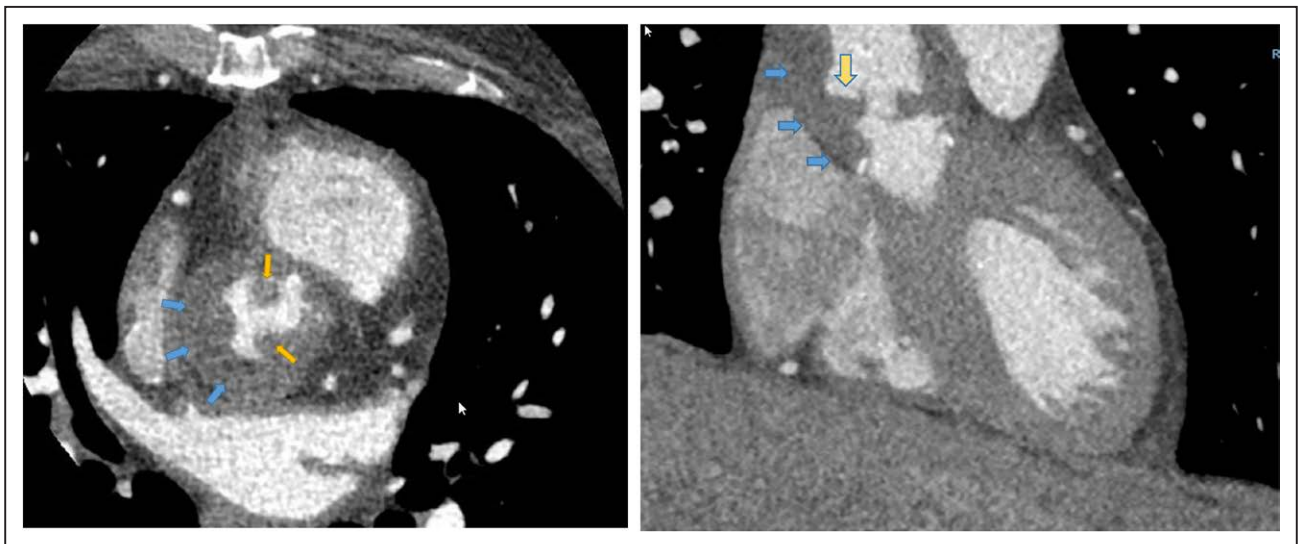


Figure 3. Cardiac computed tomography angiography scan.
 EKG gated, contrast-enhanced computed tomography of the heart. Axial and coronal views of the aortic root. Blue arrows show periprosthetic abscess at the level of the aortic root. Yellow arrows show thickening of the prosthetic leaflets.

supplement. However, in a study conducted on 1600 patients with invasive mycotic infections, *S cerevisiae* was found in 2 cases (incidence of 0.1%),⁴ and there is limited experience in its treatment. This yeast exhibits some level of azole resistance but high in vitro susceptibility to amphotericin B and echinocandins, which motivated our antifungal strategy.

S cerevisiae gained access to the bloodstream after intravenous drug injection because the patient's drug dealer had cut the cocaine with bread flour premixed with dried yeast. The dealer confessed that because of the coronavirus disease 2019 (COVID-19) pandemic, he ran out of stock of lactose powder he routinely used as a cutting agent. As a result, he used standard supermarket flour without realizing it was mixed with dried yeast. The patient self-injected the flavored cocaine only twice, 2 weeks before her hospital admission.

Even a yeast traditionally considered nonpathogenic could, in specific conditions, be a threat to human life. It is fundamental to identify the causative pathogen in any case to provide appropriate antibiotic treatment and save patients' life.

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REFERENCES

- Ivanovic B, Trifunovic D, Matic S, Petrovic J, Sacic D, Tadic M. Prosthetic valve endocarditis - a trouble or a challenge? *J Cardiol*. 2019;73:126–133. doi: 10.1016/j.jcc.2018.08.007
- Saby L, Laas O, Habib G, Cammilleri S, Mancini J, Tessonnier L, Casalta JP, Gouriet F, Riberi A, Avierinos JF, et al. Positron emission tomography/computed tomography for diagnosis of prosthetic valve endocarditis: increased valvular 18F-fluorodeoxyglucose uptake as a novel major criterion. *J Am Coll Cardiol*. 2013;61:2374–2382. doi: 10.1016/j.jacc.2013.01.092
- Pizzi MN, Roque A, Fernández-Hidalgo N, Cuéllar-Calabria H, Ferreira-González I, González-Alujas MT, Oristrell G, Gracia-Sánchez L, González JJ, Rodríguez-Palomares J, et al. Improving the diagnosis of Infective endocarditis in prosthetic valves and intracardiac devices with 18F-fluorodeoxyglucose positron emission tomography/computed tomography angiography: initial results at an infective endocarditis referral center. *Circulation*. 2015;132:1113–1126. doi: 10.1161/CIRCULATIONAHA.115.015316
- Rees JR, Pinner RW, Hajjeh RA, Brandt ME, Reingold AL. The epidemiological features of invasive mycotic infections in the San Francisco Bay area, 1992-1993: results of population-based laboratory active surveillance. *Clin Infect Dis*. 1998;27:1138–1147.