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EDITORIAL COMMENT

Infective endocarditis: Positron emission tomography/computed tomography in clinical practice

Endocardite infeciosa: TC-PET na prática clínica

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Infective endocarditis is still a clinical challenge due to its high mortality and difficult diagnosis. Since it was first described by Osler in 1885, the profile of the disease has changed dramatically.[1,2] Nowadays, it tends to affect older patients with various comorbidities, and healthcare-associated bacteremia is frequently implied in the pathophysiology of the disease.[3-5] Resistance to antibiotic therapy is a common problem in modern practice and a potential source of undesirable outcomes.[6] Degenerative valve disease and cardiac prostheses and implanted devices are common risk factor conditions. Early diagnosis and aggressive treatment are required in order to prevent complications, but this is often difficult, as the clinical presentation is non-specific. The diagnosis is based on the modified Duke criteria, the cornerstones of which are microbiological analysis of blood cultures and echocardiographic evidence of endocardial involvement. Additional imaging may be necessary, especially when prosthetic valves or intracardiac devices are involved.[6]

Recent developments in nuclear medicine have widened the availability of hybrid imaging devices such as positron emission tomography (PET)/computed tomography (CT), in which the radiotracer signal is combined with an anatomic assessment by CT, improving image interpretation and clinical acceptance. ^{18}F-fluoro-2-deoxyglucose (^{18}F-FDG) is a glucose analog radiotracer that has the highest uptake in regions of high metabolism, such as those with activated leukocytes.[7,8] It has several advantages, including high sensitivity for hypermetabolic activity, high spatial resolution and the ability to detect peripheral events. The use of ^{18}F-FDG PET/CT in infective endocarditis has been incorporated in the latest European Society of Cardiology guidelines for the management of infective endocarditis.[6]

The study by Casas et al. published in this issue of the *Journal* prospectively assessed 43 patients with suspected infective endocarditis by transesophageal echocardiography and ^{18}F-FDG PET/CT.[9] The diagnosis was confirmed, using the modified Duke criteria, in 30 patients and overall sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were 80%, 92%, 96% and 66% for PET/CT and 36%, 94%, 94% and 36% for echocardiography, respectively. Of the 43 patients, 19 had prosthetic valves and seven had intracardiac devices. The results indicate that PET/CT had a better diagnostic performance in the latter group, with sensitivity of 91% and specificity of 85% compared with echocardiography, which presented sensitivity of 25% and specificity of 100%. In patients with infective endocarditis of native valves, echocardiography was superior to PET/CT, with sensitivity and specificity of 83% and 66% vs. 33% and 100%, respectively.[9]

These results are similar to those of other studies in which PET/CT combined with the modified Duke criteria or with echocardiography showed higher diagnostic accuracy, especially in patients with prosthetic valves. A large prospective study of 303 episodes of suspected endocarditis, in 188 prosthetic valves and 115 native valves, found sensitivity,

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specificity, PPV and NPV of 93%, 90%, 89% and 94%, respectively, when PET/CT was combined with the Duke criteria on admission in patients with prosthetic valves and 22%, 100%, 100%, and 66%, respectively, in patients with native valves.[10] There are several possible explanations for the lower sensitivity of PET/CT in native valves, including low level of metabolism, vegetation size, heart movement and background tracer uptake.[2] In a multicenter study, Swart et al. found improved sensitivity for prosthetic valve endocarditis (100%) when semi-quantitative methods for tracer uptake were applied.[11]

The diagnostic accuracy of PET/CT for prosthetic valves is such that a positive exam before structural damage occurs could help prevent complications.

The indications for cardiac implantable electronic devices continue to grow, encompassing heart failure, bradyarrhythmias and tachyarrhythmias. However, infections associated with these devices carry a significant risk of morbidity and mortality. Early diagnosis can prevent complications, including avoiding the need to remove the device. ^{18}F-FDG PET/CT is able to identify foci of cardiac and extracardiac infection. In a meta-analysis of 14 studies, PET/CT had pooled sensitivity and specificity of 96% and 97% for identification of pocket infection, and 76% and 83% for lead infection, respectively.[12]

Despite the advantages of this imaging technique, it is also known to have several limitations, including high costs and limited availability, radiation exposure and lack of standardized protocols.[1,2] In Portugal, PET/CT equipment is usually found in large-volume nuclear medicine departments, where its major application is in oncology, and the ability to perform cardiology exams is limited. There is a need for standardization across centers regarding threshold values of tracer uptake and protocols for patient preparation. The lower specificity of PET/CT in patients with recently implanted prosthetic valves, due to procedure-related inflammation, should also be noted.

To overcome the limitations of PET/CT and take advantage of its potential, it is crucial to recognize the importance of a multidisciplinary approach with a dedicated team in which clinicians and imaging specialists pool their knowledge to select the most appropriate diagnostic and risk stratification tools, in order to improve therapeutic guidance and patient outcome.

Conflicts of interest

The author has no conflicts of interest to declare.

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