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A Fearsome Prosthetic Valve Endocarditis: When Dreadful Complications Meet

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Abstract:

Infective endocarditis is a very common heart disease that occurs both on native and prosthetic valves. It may present with very different aspects and is actually highly associated with deadly complications .A 77 yo with multiple risk factors and history of cardiac surgery by a coronary artery bypass associated to aortic root replacement by a bentall procedure, was admitted with fever and signs of infection; cardiac examination revealed a 3/6 systolic aortic murmur and blood cultures grew immediately enterococcus feacalis.EKG showed a complete heart block. TEE revealed a sub valvular endocarditis associated to a thickened aortic valve with severe stenosis and a likely abscess on a tickned trigone. Cardiac CT confirmed an ungoing abscess and a 14mm vegetation , and a pseudoaneurysm of the membranous septum just around the aortic annulus ,permeable coronary artery bypass graft but an occluded right coronary artery. While a CAP CT revealed a splenic embolus. Antiobiotic was conducted and the patient underwent a reconstructive surgery by bentall replacement associated to CABG bridging , a gastric pacemaker and a primary closure of a peroperative unexpectedly discovered Left ventricule – right atrium fistula.A post operative pulmonary embolism was diagnosed on controle Chest scan and atrial fibrillation occurred the following days.

The complications of PVE are multiple and more difficult to handle. Septic embolism associated with PVE significantly increases mortality and morbidity. Similar to Native Valve Endocarditis it may manifest as cerebral, splenic, or renal abscess. Extension of such abscesses at the aortic root can destroy the mitralaortic intervalvular fibrosa and result in pseudoaneurysm formation. Rupture of a pseudoaneurysm can cause fistulous communications between the aorta and the left atrium, left ventricle, or pulmonary artery. Because of the close proximity to the right atrium, such paravalvular and root abscesses can also rupture into the right atrium resulting in a fistulous communication between aorta and right atrium.
Extension of aortic root abscess may involve the conduction system, resulting in AV conduction disturbances as in our patient.

Introduction:

Infective endocarditis is a very common heart disease that occurs both on native and prosthetic valves. It may present with very different aspects and is actually highly associated with deadly complications .

Case report :

A 77 yo diabetic and hypertensive patient, with a history of cardiac surgery by a coronary artery bypass associated to aortic root replacement by a bentall prosthesis , was admitted with fever and signs of infection; cardiac examination revealed a 3/6 systolic aortic murmur and blood cultures grew immediately enterococcus feacalis

EKG showed a complete heart block

TEE revealed a sub valvular endocarditis with 13*7mm mobile vegetation associated to a thickened aortic valve with severe stenosis and a likely abscess on a tickned trigone.

Cardiac CT confirmed an ungoing abscess and a 14mm vegetation , 9*6mm pseudoaneurysm of the membranous septum just around the aortic annulus ,permeable coronary artery bypass graft but an occluded right coronary artery. While a CAP CT revealed a splenic embolus.

Antiobiotic was conducted and the patient underwent a reconstructive surgery by bentall replacement for a silver tube and prosthesis associated to CABG bridging , a gastric pacemaker and a primary closure of a peroperative unexpectedly discovered Left ventricule – right atrium fistula.

Surgical outcomes were easy to handle at first , oxygen and drugs weanig was performed 24h later .A post operative pulmonary embolism was diagnosed on controle Chest scan and atrial fibrillation occurred the following days.

Valve culture grew to enterococcus feacalis while blood culture remains negative

Amoxicillin and gentamycin Antibiotic was pursued and anticoagulation initiated.

Discussion:

Prosthetic valve endocarditis is the most severe endovascular microbial infection. It is the most common complication associated to prosthetic valves and accounts for 20% of all cases of endocarditis and 1–6% of patients with valve prostheses.

It can occur withen the first year after surgery : early PVE or later : late PVE , and can affect both mechanical or biological prosthetic valve.

In PVE, staphylococcal enteroccoci and fungal infections are more frequent and streptococcal infection less frequent than in NVE

Early PVE (< 2months) is mostly due to perioperative contamination and usually caused by staphylococcus (S. epidermidis, S. aureus), streptococcus, fungi, gram negative bacilli, (HACEK group mostly) and occasionally diphtheroids.
In contrast, the microbiology of late PVE (> 2 months) mirrors that of NVE, with staphylococci, oral streptococci(are α-hemolytic streptococci) followed,by staphylococci , S. bovis and enterococci being the most frequent organisms, more likely due to community-acquired infections especially genitourinary source and dental manipulation.

Clinical presentation is frequently atypical in PVE what make diagnosis very difficult . New heart murmur, left bundle brunch block, heart failure, or embolic events are suggestive for PVE. Other signs such as Osler's nodes, Janeway's lesions, and Roth's spots are not common in these patients.And since fever and inflammatory syndromes are very common in the early postoperative period , clinical presentation can't be reliable for early PVE diagnosis.

Positive blood cultures can be contributive;however they often remain sterile

Imaging in PVE is challenging , alls patients must have a TTE as an initial assessment

Although TEE is far superior than TTE and has become crucial in detecting prosthetic valve malfunction, in assessing periprosthetic leaks(which is a major criteria) and in detecting fistulas and tracking their interchamber communications by color flow imaging. It also detects abscess formation especially for posterior part of the aortic ring and its extension to the the subaortic curtain or upper interventricular septum and or the mitral-aortic intervalvular fibrosa . However a normal echocardiography does not rule out the diagnosis.

It is to be remembered that even TEE can underestimate the extent of infection and perivalvular destruction , that's why an dditional imaging modality could be considered (such as CT or nuclear imaging).

Recently, nuclear techniques, particularly 18F-FDG PET/CT, have been shown to be useful for the diagnosis of PVE. It is based on the high sensitivity of 18F-FDG PET/CT in detection of inflammatory activity within the focus of infection

The finding of abnormal 18F-FDG accumulation at the site of an artificial valve has become a novel major criterion for PVE has thus been pointed out. Recent meta-analysis showed that diagnostic accuracy with 18FFDG PET/CT for PVE was improved with sensitivity of 80.5% and specificity of 73.1%

An algorithm for evaluation of patients with suspected PVE, including echocardiography and PET/CT has been suggested.

18F-FDG PET/magnetic resonance imaging (MRI) has been recently proposed as an even better technique than PET/ CT because of its significantly better special resolution. However, data regarding this topic are still scarce.

A very high in-hospital mortality rate of 20–40% has been reported in PVE , particulary with people of older age, diabetes mellitus, healthcare associated infections, staphylococcal or fungal infection, early PVE, heart failure, stroke and intracardiac abscess.

Luciani et al. showed that female gender, shock status, previous surgical procedures within 3 months from the treatment, multivalvular involvement, abscess, and urgent surgery were independent predictors of short-term (30-day) mortality in PVE patients

The complications of PVE are multiple and more difficult to handle: persistently positive blood cultures, septic embolism, heart failure, as well as death.

Heart failure is first complication of PVE with the incidence up to 56% while persistent infection come second ; but both are the strongest predictive factors of in-hospital mortality.

The exact definition of persistent bacteremia or relapse represents a problem since duration of bacteremia depends on microorganism. Infection caused by S. viridans might become sterile even after 48 h, while in methicillin-resistant S. aureus (MRSA) bacteremia positive blood cultures might be found even after 7 days of appropriate treatment .

Septic embolism associated with PVE significantly increases mortality and morbidity. Similar to NVE it may manifest as cerebral, splenic, or renal abscess. In the group of 111 patients with PVE the incidence of stroke was found to be 23%. Additionally, 42% of patients with PVE experienced hemorrhagic transformation, most likely secondary to anticoagulation therapy that is frequently given in these situations .

It has been reported that in early PVE the risk of spreading infection into myocardium is increased.

It is also associated with perivalvular abscess which increases the risk of heart failure and mortality, in up to 55% of cases .

Abscesses are seen more frequently in patients with staphylococcal endocarditis and more so with aortic valve involvement, although any virulent organism, particularly gram-negative species, may also produce paravalvular abscesses

Extension of such abscesses at the aortic root can destroy the mitralaortic intervalvular fibrosa and result in pseudoaneurysm formation. Rupture of a pseudoaneurysm can cause fistulous communications between the aorta and the left atrium, left ventricle, or pulmonary artery. Because of the close proximity to the right atrium, such paravalvular and root abscesses can also rupture into the right atrium resulting in a fistulous communication between aorta and right atrium.

Extension of aortic root abscess may involve the conduction system, resulting in AV conduction disturbances as in our patient.

Bundle branch block, fascicular block, and AV dissociation are some of the conduction abnormalities noted in the setting of aortic root or paravalvular abscess. The presence of a new heart block in a patient with infective endocarditis should alert the physician to the possibility of paravalvular abscess, although electrocardiography has a sensitivity of only 50%.

In patients with PVE of the aortic valve who develop prolongation of the PR interval and or right bundle branch block, TEE must be performed immediately to detect abscess formation.

Other findings suggestive of abscess formation are persistent sepsis despite antibiotics and new or worsening heart failure symptoms.

Partial or complete valve dehiscence represents a specific type of complication.

TTE is commonly the first diagnostic modality, particularly using color flow Doppler interrogation to assess for continuous (systolic and diastolic) high-velocity flow. Live three-dimensional TTE performed with full-volume and color Doppler in multiplanar and nonmultiplanar modes can assist in locating and measuring the orifices of fistulas.

TEE has higher sensitivity and specificity for diagnosis of aortic root abscesses and can be used if the quality of transthoracic imaging is suboptimal.

Cardiac computed tomography has similar sensitivity and specificity to TEE for detecting valvular abnormalities in IE and is superior to TEE in the detection of pseudoaneurysm formation.

It is also useful in the evaluation of coronary atherosclerosis in preparation for cardiac surgical intervention and can detect extracardiac complications of endocarditis such as septic emboli.

Although cardiac magnetic resonance imaging can identify valvular vegetations and structural complications of endocarditis, its role in addition to computed tomography and TEE is uncertain.

As in NVE, prognostic assessment is of crucial importance in PVE, as it allows identification of high-risk subgroups of patients in whom an aggressive strategy may be necessary

Hemodynamic stable patients with uncomplicated non-staphylococcal and non-fungal late PVE can be managed conservatively and be treated with antibiotic therapy alone

Antimicrobial therapy for PVE is similar to that for NVE. An exception is S. aureus PVE, which requires a more prolonged (≥6 weeks) antibiotic regimen (particularly in association with aminoglycosides) and frequent use of rifampin.

All above-mentioned complications – heart failure, large vegetation with high embolization risk and risk for valvular obstruction and development of acute heart failure, abscess formation, persistently positive blood cultures, staphylococcal and fungal bacteremia – are indications for more aggressive treatment which usually includes surgery in addition to antibiotic therapy.

Early surgery is recommended in PVE patients with relapsing infection or large vegetation even in the absence of hemodynamic significant complications in the European and American guidelines

Benefits of early surgical interventions from clinical studies are controversial. However, emergent redo surgery is required in case of refractory heart failure with risk of progression to acute pulmonary edema and cardiogenic shock

Surgery for PVE follows the general principles outlined for NVE. The cornerstone of surgical treatment in patients with PVE is complete radical debridement of all infected material including the original prosthesis, and any calcium remaining from previous surgery the implantation of new valve in healthy tissue,. Homografts, stentless xenografts or autografts may be considered in aortic PVE, and homograft or xenograft root replacement is indicated for any abnormality of the aortic root that distorts the aortic sinuses. Alternatively, a valved Dacron conduit can be used.

A very high in-hospital mortality rate of 20–40% has been reported in PVE .In many series early surgery was associated with lower in-hospital and 1-year mortality; however it is beneficial in patients with the greatest need for surgery, including valve regurgitation, vegetation and dehiscence or paravalvular abscess/fistula

Luciani et al. showed that female gender, shock status, previous surgical procedures within 3 months from the treatment, multivalvular involvement, abscess, and urgent surgery were independent predictors of short-term (30-day) mortality in PVE patients

Perioperative mortality in mitral PVE is high – up to 13%, especially when it comes to surgical treatment of mitral perivalvular abscess which is extraordinarily challenging .
However, it is unclear whether surgery in addition to antibiotics offers any benefit compared to antibiotic therapy alone. The mortality in patients treated only with antibiotics has been estimated to be 23–29%, while in those who underwent additional surgical treatment it is 24–35%

Antibiotic prophylaxis is highly recommended in all patients with prosthetic valves, prosthetic materials used in reconstructive surgery, previous transcatheter valve replacement, or previous episode of IE

Patients who are initially treated medically require close follow-up because of the risk of late events

- Conclusion:

In summary, PVE represents 20% of all cases of IE, with an increasing incidence and it is a serious potential complication of valve replacement surgery with significant mortality.
Establishing a diagnosis is not an easy task. Nowadays several imaging modalities with good ratio between sensitivity and specificity are available. However, echocardiography remains the first choice.
Complications of PVE are several and can be associated like in our case . Absesses are seen more frequently while fistulas are not rare neither.
The treatment of PVE is even more challenging because of PVE complexity and high-risk profile of these patients. The best therapeutic option in PVE is still debated. Although surgery is generally considered the best option when PVE causes severe prosthetic dysfunction or HF.

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