

Embolitic Complications in Infective Endocarditis: How Can We Predict Using a Risk Evaluator Score (SORTIE or ABCDE)

Complicações Embólicas na Endocardite Infecçiosa: como Poderemos Prever Usando Escore Avaliador do Risco (ABCDE ou SORTIE)

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Introduction

Infectious Endocarditis (IE) is the infection of the endocardial wall or heart layers — leaflets or chordae, birth defects, chamber walls, periprosthetic tissue, patch or tubes. The earlier the diagnosis, the better the prognosis. About 10 to 60% of infectious endocarditis cases have no evidence of previous heart disease. The most important risk factors are rheumatic valvular heart disease, calcific degeneration of the elderly, prostheses, bicuspid aortic valves and mitral valve prolapse with regurgitation. Currently, there has been a change in the patient profile with greater contribution of acquired cases among chronic renal patients on hemodialysis and related to nosocomial infections.

Since 1994, we have followed the Duke University criteria, in which echocardiography was incorporated, in addition to clinical examination and blood culture; in 2000, the criteria were revised and SPECT CT and PET CT have been recently into the 2015 European guidelines, which have further empowered our diagnostic competence.

The role of echocardiography in infectious endocarditis is broad. It ranges from the identification of predisposing heart disease, diagnosis of endocarditis, to the detection of its complications, assessment of hemodynamic consequences, serial control and prognosis.

The causes of echo misinterpretation are poor image quality, degeneration and calcification, sclerosis and other masses. Myxomatous degeneration, healed vegetation, small vegetation and, believe me, overdiagnosis.

The weight of echocardiographic parameters as to the likelihood of peripheral embolism is worthy of note. The reason is that early diagnosis does not only reduce mortality but also patients' suffering, in addition to reducing hospital expenses by 3 to 4 times, as (timely) surgical replacement of valves with vegetations of embolic potential prevents

general surgery (splenectomy), vascular surgery (peripheral mycotic aneurysm) and neurosurgical procedures (cerebral mycotic aneurysm).

Vegetation size is a universally recognized parameter as to its likelihood of risk of embolization as demonstrated by various meta-analyses; the one conducted by Yang et al. included articles from 1994 to 2018 and highlighted differences in IE by *Staphylococcus aureus* from those caused by other agents, in which the risk ratio was 1.64. Data from the National Institute of Cardiology (INC) show that the average size of vegetations with maximum diameter of 19 mm has a higher frequency of systemic embolization, often detected by imaging methods, mainly tomography scans, as those are performed routinely in asymptomatic patients. In INC, we treat 35 to 40 cases of endocarditis in adults with definitive IE annually, according to Duke's modified criteria, of which 2/3 to 3/4 are surgical cases, since those are referred with the hemodynamic complications of the disease, with ruptures, perforations, abscesses, refractory CHF, uncontrolled infection, large vegetations. Acute heart failure or heart failure that has become acute due to severe aortic or mitral valve regurgitation are the main indications for surgery.

The role of echocardiographers in endocarditis is to inform about vegetations, stigmas and/or complications, which added to clinical examinations are fundamental for the strategic planning by the "endocarditis team," for the treatment of this potentially fatal disease. It is not always easy to diagnose vegetations because there are traps in the study of images.

It is important to define the aspects that allow us to characterize a mass as vegetation. These are: Texture, the vegetation has a gray scale similar to the endocardium. Site, commonly related to blood jet secondary to some valve lesion in the area with the lowest pressure. In the mitral valve, vegetation will be typically facing the left atrium and, in the aortic valve, the left ventricle. Movement, chaotic. Format, lobulated, amorphous. Associated abnormalities: abscesses, fistulas, prosthetic dehiscence, paraprosthetic leak, new or worsened regurgitation.

The use of harmonics accentuates the irregularities of the valves and changes the appearance of their texture, thus decreasing specificity and increasing sensitivity in the detection of a vegetation. We have diagnosed IE on transthoracic echocardiography (TTE) with harmonics, but we have ruled out diagnosis with high-accuracy transesophageal echocardiography (TEE).

When we detect vegetation, we must inform its diameters on two perpendicular planes, the mobility amplitude (sessile, pedunculated, prolapsant), density (calcified, partially

Keywords

Endocarditis; Echocardiography, Transthoracic; Echocardiography, Transesophageal; Echocardiography, Three-Dimensional.

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calcified, denser than the myocardium or with similar density); and extension (single, multiple, which leaflets, extravalvular extension, complications). Then we apply the ABCDE — Embolic Risk Score for Infectious Endocarditis.

Evolutionarily, we can observe: Vegetation growth; Perforation of native or prosthetic leaflet; Abscess, aneurysms and fistulas; Prosthesis dehiscence; Pericardial effusion; Stigmas of hemodynamic repercussion; Acute valve regurgitation or acute regurgitation turned acute; Heart failure and shunts; Presence of predisposing factors such as rheumatic involvement. Systemic embolization (kidney, brain, spleen, liver, arteries — mycotic aneurysm), the latter combined with other clinical and imaging methods.

How to prevent this catastrophe? By delivering early diagnosis and paying attention to signs or thinking of endocarditis, even in its early stages.

At an early stage, the clinical picture may be pleomorphic, and we echocardiographers have an important role in screening patients with dermatologists, ophthalmologists, gastroenterologists, infectologists, pulmonologists and angiologists.

What are the risk factors and implications of embolic complications for vegetation?

Even though many authors propose that the size of the vegetation is the most severe parameter of severity, some evidence and our experience lead us to accuse all of these elements of the ABCDE score together as determinants of embolization.

Our objective is to refine the indication of surgery, as we know that infection with valve destruction, when there is an embolic phenomenon, or when there is persistent abscess infection, are recognized indicators of surgery, whereby the ABCDE score loses its usefulness.

Risk factors of embolic complication in IE

ABCDE or SORTIE score points and parameters

Despite diagnostic and therapeutic progress, infectious endocarditis is still considered a disease of high morbidity and

mortality. We will then reduce it with echocardiography and assessment by ABCDE vegetation score in order to help in the early indication of surgery before embolic episodes occur. By doing so, we avoid a major catastrophe.

The future is an invention of the impatient (GGalizza)

We are always trying to avoid a dramatic future. There are obviously favorable factors for IE in current medicine, besides echocardiography, using the ABCDE or SORTIE scores. These are: new antimicrobials, new methods for microbial identification, hemodynamic supports, even more sensitive imaging methods (PET CT and SPECT/CT) recommended in specific situations, and 3D TEE can help differentiate a loose suture material from a vegetation as well as the swinging motion of a valve in partial dehiscence. The dehiscence site and the quantification of the area of regurgitant jets can be acquired with multiplanar images or 3D color modes.

In contrast, we are increasingly facing new, more resistant germs and more complex surgical patients.

We are then faced with a Darwinian natural selection, in which bacteria, because their biomass is superior to that of human species, and they (bacteria) will surely survive, and we (homo sapiens) will have to use our multiple intelligences (mechanical, abstract, scientific, artificial, etc.) to come together to this future. The future is now; we have to make all said resources available to all.

-Good luck to us and to our patients. The future is now!

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Symbolic anecdotal title in honor of great writer Monteiro Lobato, who enriched the Brazilian culture:

Reigns of an Echocardiographer at the National Institute of Cardiology Farm in Laranjeiras

Chart 1 - ABCDE or SORTIE score points and parameters.

| Description | Points | | | |
|--|--|--|--|--|
| | 1 | 2 | 3 | 4 |
| A - Range (Amplitude) of motion or mobility: | Vegetation fixed to mitral valve | Fixed or mobile insert edge | Pedicated and mobile on its longest length | Prolapsant during the cardiac cycle |
| B - Bacteria leading to: | Slow insidious conditions | Favorable blood culture | Unknown bacteria or negative blood culture | Virulent or potentially destructive acute conditions |
| C - Consistency of vegetation: | Fully calcified | Partially calcified + contrast areas | Absence of calcification + areas of fibrosis | Sonic texture similar to the myocardium |
| D - Dimension of vegetation: | < 5 mm | 5-10 mm | 11 and 19 mm | > 20 mm |
| E - Extension of vegetation: | If it is isolated in the leaflet (<5 mm) | Multiple vegetations in a single leaflet | Vegetations in more than one valve leaflet | Vegetation in non-valve structures |

Score 4 to 6 mild (<10%), Score 7 to 9 moderate (50%), Score 10 and up, major (> 90%) for the probability of embolization.

References

1. Daniel WG, Mugge A, Grote J, Hausmann D, Nikutta P, Laas J, et al. Comparison of transthoracic and transesophageal echocardiography for detection of abnormalities of prosthetic and bioprosthetic valves in the mitral and aortic positions. *Am J Cardiol.* 1993;71(2):210–5.
2. Durack DT, Lukes AS, Bright DK. New criteria for diagnosis of infective endocarditis: utilization of specific echocardiographic findings. Duke Endocarditis Service. *Am J Med.* 1994;96:200–9.
3. Fosbøl EL, Park LP, Chu VH, Athan E, Delahaye F, Freiburger T, et al. The association between vegetation size and surgical treatment on 6-month mortality in left-side infective endocarditis. *Eur Heart J.* 2019. pii: ehz204.5-Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta JP, Del Zotti F, et al. 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). *Eur Heart J.* 2015;36(44):3075–128.
4. Jorge SC, Arnoni AS, Dinkhuysen JJ, Abdulmassih Neto C, Chacur P, Gun C, et al. Tratamento cirúrgico na endocardite infecciosa *Arq Bras Cardiol.* 1995;65(1):37–42.
5. Yang A, Tan C, Daneman N, Hansen MS, Habib G, Salaun E, et al. Clinical and echocardiographic predictors of embolism in infective endocarditis: systemic review and meta-analysis. *Clin Microbiol Infect.* 2019 Feb;25(2):178–87.º- Miro JM, Anguera I, Cabell CH, Chen AY, Stafford JA, Corey GR, et al. Staphylococcus aureus native valve infective endocarditis: report of 566 episodes from the International Collaboration on Endocarditis Merged Database. *Clin Infect Dis.* 2005;41(4):507–14.
6. Monteiro TS, Correia MG, Golebiovski WF, Barbosa GIF, Weksler C, Lamas CC. Asymptomatic and symptomatic embolic events in infective endocarditis; associated factors and clinical impact. *Braz J Infect Dis.* 2017;21(3):240–7.
7. Thuny F, Disalvo G, Belliard O, Avierinos JF, Pergola V, Rosenberg V, et al. Risk of embolism and death in infective endocarditis: prognostic of echocardiography, a prospective multicenter study. *Circulation.* 2005;112:69–75.
8. Vieira ML, Grinberg M, Pomerantzeff PM, Andrade JL, Mansur AJ. Repeated echocardiographic examinations of patients with suspected infective endocarditis. *Heart.* 2004;90:1020–4.