The New Strategy in Infective Endocarditis: Early Surgery Based on Early Diagnosis
Are We Too Late When Early Surgery Is Best?

Raimund Erbel, MD

Patients with infective endocarditis (IE) have a poor prognosis because of complications such as congestive heart failure, paravalvular abscess formation, central and peripheral embolism, and hemorrhagic stroke. Patients with IE and congestive heart failure (CHF) have a mortality as high as 50%. The poor prognosis seems to have improved in recent years. In Sweden, 7,603 patients with IE received a close follow-up with assessment of the 30-day mortality and 5-year follow-up including autopsy in all fatal events sampled from 1997 to 2007. During the observation period, no change of mortality was found despite an increase in the incidence of IE from about 7 to 7.5 per 100,000 to 8 to 8.5 per 100,000 inhabitants. To provide a contemporary picture of the presentation, cause, and outcome of IE, a worldwide International Collaboration on Endocarditis-Prospective Cohort Study (ICE PCS) was started in 58 hospitals in 25 countries in 2000. In this issue of Circulation, Chu VH et al report the recent 2008 to 2012 results of the ICE-PCS database of 1296 IE patients with left-sided IE. The hospital mortality for surgery, performed in only 661 (76%) of 863 patients with indications for surgery, reached 14.8% and the 6-month mortality reached 17.5% compared with 26% and 31.4%, respectively, when no surgery was provided.

Transesophageal echocardiography (TEE) opened a new window to the heart. TEE was found to be superior to transthoracic echocardiography (TTE), particularly for the diagnosis of IE. The sensitivity of TEE reached 82% and 96%, and the specificity, 98%, positive and negative predictive accuracy, 88% and 100%, respectively. TEE induced a paradigm change, when the previously used Beth Israel criteria, later called von Reyn criteria, with which the diagnosis of “definite IE” was made only when overt destruction of the valve was confirmed by surgery or autopsy, were replaced by the Duke criteria, presented in 1994. Now, echocardiography was assigned to provide clinical criteria for the “definite” diagnosis of IE, with signs of endocardial involvement of the disease including masses, abscess formation, and new partial dehiscence of prosthetic valves or new valvular regurgitation. The Duke criteria reached a higher sensitivity than the Beth Israel (von Reyn) criteria, which enabled the diagnosis of “definite IE” in only one third of patients with endocarditis. And more IE patients were deemed to be appropriate for surgery. The widespread use of the Duke criteria led to a refinement of the major criteria, strengthening the role of echocardiography for the diagnosis of prosthetic valve IE. So-called “minor” echocardiographic criteria were no longer used.

The modified Duke criteria were included in the 2005 AHA scientific statement on IE. The flowchart on the approach to the diagnostic use of echocardiography included TEE for patients with moderate to high clinical suspicion or candidates with technically difficult TTE images. It was recommended that echocardiography be performed as soon as possible (<12 hours) after initial evaluation. TEE was preferred, but TTE was used as first line if TEE was not immediately available. If TEE was not performed initially, it should have been obtained after a positive TTE and as soon as possible in high-risk patients for complications as well as after 7 to 10 days afterward, if suspicion for endocarditis persisted without the confirmation of the IE diagnosis or a worsening clinical course. Potential need for surgical intervention was described for specific TTE/TEE features (Table). However, the role of surgery to prevent systemic embolization was regarded as complex. Surgery was seen to be indicated in the setting of recurrent emboli (≥2) and persistent vegetation despite appropriate antibiotic therapy. The greatest benefit was seen in the early phase of IE, in case of involvement of the anterior mitral leaflet and during the first 2 weeks of antimicrobial therapy.

The recent 2014 AHA/ACC Guideline for the Management of Patients with Valvular Heart Disease recommend early surgery (meaning during initial hospitalization before completion of full therapeutic course of antibiotics) for those
Table. Echocardiographic Features Suggesting Potential Need for Surgical Intervention Including Current Recommendations of the 2014 AHA/ACC Guideline for Management of Patients With Valvular Heart Disease

<table>
<thead>
<tr>
<th>Feature</th>
<th>Class and Level of Evidence</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent vegetation after systemic embolism</td>
<td>Class IIa, level of evidence B</td>
<td>For those with mobile vegetations &gt;10 mm, surgery may be required because of risk of embolization.</td>
</tr>
<tr>
<td>(Anterior mitral leaflet) vegetation size in length &gt;10 mm*</td>
<td>Class IIb, level of evidence B</td>
<td>For the first time, a recommendation is given for patients with recurrent emboli and persistent vegetations despite appropriate antimicrobial therapy (Class IIa, level of evidence B). For those with mobile vegetations &gt;10 mm in length, early surgery may be considered (Class IIb, level of evidence B). The new 2014 AHA/ACC guideline also recommends that one base decisions about timing of surgical interventions by consensus of a multidisciplinary team that comprises cardiologists, cardiothoracic surgeons, and infectious disease specialists to reduce biases and provide best practices in patients with IE (Class I, level of evidence B).</td>
</tr>
<tr>
<td>≥1 embolic events during the first 2 weeks of antimicrobial therapy*</td>
<td>Class IIa, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
</tr>
<tr>
<td>Increase in vegetation size despite appropriate antimicrobial therapy†</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Valvular dysfunction</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Acute aortic or mitral insufficiency with signs of ventricular failure†</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Heart failure unresponsive to medical therapy†</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Valve perforation or rupture†</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Perivalvular extension</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Valvular dehiscence, rupture, or fistula†</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>New heart block‡</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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<td>Large abscess or extension of abscess despite appropriate antimicrobial therapy</td>
<td>Class I, level of evidence B</td>
<td>For patients within 7 days. Patients who did not have surgery had a higher rate of heart failure, embolic events, abscess formation, severe valvular regurgitation, and larger vegetation size. Only persistent bacteremia was not significantly found more often. Moderate to severe liver disease, stroke prior to decision concerning surgery, and S. aureus infection were significant predictors for the nonsurgical management.</td>
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Table is a modified version from Infective Endocarditis: Diagnosis, Antimicrobial Therapy, and Management of Complications: Baddour L.M. et al,19 Copyright 2005, Lippincott Williams & Wilkins, Hagerstown, Md. 

References


Key Words: Editorials • echocardiography • endocarditis • surgery • transesophageal echocardiography
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Circulation. 2015;131:121-123; originally published online December 5, 2014;
doi: 10.1161/CIRCULATIONAHA.114.013872

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the
World Wide Web at:
http://circ.ahajournals.org/content/131/2/121

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