Echocardiography in Infective Endocarditis

Three-dimensional Echocardiography in Decision Making
DECLARATION OF CONFLICT OF INTEREST

• Nothing to disclose
Three-dimensional Echocardiography in Decision Making

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MEXICO

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INFECTIVE ENDOCARDITIS

• Life-threatening disease
• Still associated with a high morbi-mortality
• Echocardiography is crucial
• Diagnosis
• Prognostic assessment
• Follow-up
• During the pre, intra, post operative period
ROLE OF ECHOCARDIOGRAPHY IN IE

OVERUSE

UNDERUSE

PRETEST PROBABILITY

TTE, TEE

CONFIRM RULE-OUT
<table>
<thead>
<tr>
<th><strong>Surgery/necropsy</strong></th>
<th><strong>Echocardiography</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetation</strong></td>
<td>Oscillating or non-oscillating intracardiac mass on valve or other endocardial structures, or on implanted intracardiac material</td>
</tr>
<tr>
<td></td>
<td>Perivalvular cavity attached to an endocardial structure, or on implanted intracardiac material</td>
</tr>
<tr>
<td><strong>Abscess</strong></td>
<td>Thickened, non-homogeneous perivalvular area with echodense or echolucent appearance</td>
</tr>
<tr>
<td></td>
<td>Perivalvular cavity with necrosis and purulent material not communicating with the cardiovascular lumen</td>
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<tr>
<td><strong>Pseudoaneurysm</strong></td>
<td>Pulsatile perivalvular echo-free space, with colour-Doppler flow detected</td>
</tr>
<tr>
<td></td>
<td>Perivalvular cavity communicating with the cardiovascular lumen</td>
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<td>----------------------</td>
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<tr>
<td>Perforation</td>
<td>Interruption of endocardial tissue continuity</td>
</tr>
<tr>
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<td>Interruption of endocardial tissue continuity traversed by colour-Doppler flow</td>
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<tr>
<td>Fistula</td>
<td>Communication between two neighbouring cavities through a perforation</td>
</tr>
<tr>
<td></td>
<td>Colour-Doppler communication between two neighbouring cavities through a perforation</td>
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<tr>
<td>Valve aneurysm</td>
<td>Saccular outpouching of valvular tissue</td>
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<tr>
<td></td>
<td>Saccular bulging of valvular tissue</td>
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<tr>
<td>Dehiscence of a prosthetic valve</td>
<td>Dehiscence of the prosthesis</td>
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<tr>
<td></td>
<td>Paravalvular regurgitation identified by TTE/TEE, with or without rocking motion of the prosthesis</td>
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</tbody>
</table>
Zur Anzeige wird der QuickTime™ Dekompressor benötigt.
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ROLE OF ECHOCARDIOGRAPHY IN IE

Clinical suspicion of IE

TTE

ROLE OF ECHOCARDIOGRAPHY IN IE

Clinical suspicion of IE

TTE

Negative

Clinical suspicion of IE

High

TEE

Stop

Low
ROLE OF ECHOCARDIOGRAPHY IN IE

Clinical suspicion of IE

TTE

Prosthetic valve intracardiac device

TEE*

Negative

Clinical suspicion of IE

High

TEE

Low

Stop
ROLE OF ECHOCARDIOGRAPHY IN IE

Clinical suspicion of IE → TTE

- Prosthetic valve
- Intracardiac device

- Poor-quality TTE

- Positive
- Negative
  - Clinical suspicion of IE
    - High
      - TEE
      - Low
        - Stop

TEE*
ROLE OF ECHOCARDIOGRAPHY IN IE

Clinical suspicion of IE

TTE

Prosthetic valve
Intracardiac device

Poor-quality TTE

Positive

Negative

Clinical suspicion of IE

High

Low

Stop

TEE

TEE*

If initial TEE is negative but suspicion for IE remains, repeat TEE within 7–10 days
• 2D TTE:
• Is limited in the evaluation of valvular vegetation

• 2D TEE:
• Circumvents many of the TTE limitations

• 2D TTE vs. 2DTEE
• Specificity: 98% vs. 100%
• Sensitivity: 44% vs. 94%

• TEE provides additional information

• 2DTEE
• Still limited
• Requires mental reconstruction
• RT3D TEE:
  • It has the ability to visualize cardiac structures.
  • Images as realistic as resembles true pathology.
• RT3D TEE:
  • Has shown itself to be useful in:
    • Mitral valve disease evaluation
    • Aortic valve pathologies
    • Aortic dissection
    • Congenital heart disease
    • Guidance of percutaneous procedures
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<tr>
<th>AUTHOR</th>
<th>JOURNAL</th>
<th>YEAR</th>
<th>VALVE</th>
<th># PTS</th>
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No previous similar reports
Prospective study
To compare accuracy of 2D-TTE and RT-3DE
To evaluate the possible role of RT-3DE in IE
46 subjects suspicious of IE
2D-TTE and RT-3DE
• performed in same evaluation
• No prior knowledge of clinical information
• 25 male (54%), age 61 ± 17 years
• IE was diagnosed in 12 (26.1%), vegetations in
  • 8 mitral valve
  • 2 tricuspid valve
  • 1 aortic valve
  • 1 both, aortic and mitral valves

<table>
<thead>
<tr>
<th>Echocardiogram</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
<th>PPV (%)</th>
<th>NPV (%)</th>
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<tr>
<td>2DE</td>
<td>91.6</td>
<td>88.2</td>
<td>73.3</td>
<td>96.8</td>
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<tr>
<td>RT-3DE</td>
<td>91.6</td>
<td>100</td>
<td>100</td>
<td>94.4</td>
</tr>
</tbody>
</table>

PPV: positive predictive value; NPV: negative predictive value.
2DE: Two-dimensional echocardiography.
RT-3DE: Real time three-dimensional echocardiography.
• Specificity and PPV was higher for 3D
• Mobile nodules were the most accurate finding

Limitations
• Population included was from a tertiary hosp
• Images acquisition requires short breath-hold
• Study was not possible in patients
  • with arrhythmia or severe dyspnea
• Intraoperative 2D-TEE and 3D-TEE
• 13 patients
• 3 female, 10 male (age 31-81 years), involved
• 9 mitral valve
• 4 aortic valve
• 1 pulmonic valve
• 1 both, aortic and pulmonic valves
• Surgeon identified specific areas of affection
<table>
<thead>
<tr>
<th>PATIENT</th>
<th>2DTEE</th>
<th>3DTEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>53, male</td>
<td>+</td>
<td>+++++</td>
</tr>
<tr>
<td>76, male</td>
<td>+</td>
<td>+++++</td>
</tr>
<tr>
<td>43, female</td>
<td>++</td>
<td>+++++</td>
</tr>
<tr>
<td>60, male</td>
<td>+</td>
<td>+++++</td>
</tr>
<tr>
<td>81, male</td>
<td>+</td>
<td>+++++</td>
</tr>
<tr>
<td>39, female</td>
<td>+</td>
<td>+++++</td>
</tr>
<tr>
<td>31, male</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>40, male</td>
<td>++</td>
<td>+++++</td>
</tr>
<tr>
<td>32, female</td>
<td>+++</td>
<td>+++++</td>
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<td>77, male</td>
<td>+</td>
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<tr>
<td>34, male</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>42, male</td>
<td>+</td>
<td>+++++</td>
</tr>
<tr>
<td>63, male</td>
<td>++</td>
<td>+++++</td>
</tr>
</tbody>
</table>

Comparison between 2DTEE and 3DTEE obtained data (modified table)
RT-3DTEE: Assessment of valvular vegetations
The arrows point to a vegetation involving the A3 segment.
AO = aorta; LAA = left atrial appendage; MV = mitral valve.
RT-3DTEE: Assessment of valvular vegetations
The two upper arrowheads point to two vegetations involving the aortic valve (AV)
A large vegetation (lower arrowhead) is also noted on the pulmonary valve (PV)
• Preliminary results suggests
• Superiority of RT-3DTEE over 2D-TEE
  • In the evaluation of valvular vegetations
  • Provided superior images
• Better correlation with surgery findings
  • Both, presence and site of vegetations
• Incremental knowledge
• Useful for cardiac surgeons
WHAT ABOUT RECOMMENDATIONS?

If initial TEE is negative but suspicion for IE remains, repeat TEE within 7–10 days.
WHAT ABOUT RECOMMENDATIONS?

Recommendations for Evaluation of Prosthetic Valves With Echocardiography and Doppler Ultrasound

A Report From the American Society of Echocardiography’s Guidelines and Standards Committee and the Task Force on Prosthetic Valves, Developed in Conjunction With the American College of Cardiology Cardiovascular Imaging Committee, Cardiac Imaging Committee of the American Heart Association, the European Association of Echocardiography, a registered branch of the European Society of Cardiology, the Japanese Society of Echocardiography and the Canadian Society of Echocardiography, Endorsed by the American College of Cardiology Foundation, American Heart Association, European Association of Echocardiography, a registered branch of the European Society of Cardiology, the Japanese Society of Echocardiography, and Canadian Society of Echocardiography
RT 3D TEE

• Play a role in IE
• It has the ability to visualize cardiac structures
• Allow percutaneous interventions in high risk pts
• Provides a powerful tool to image:
  • valves and its annulus
  • intracardiac devices
• Enhance our appraisal to prosthetic valve function
• Potential to supplement 2DTEE information
• Increasing experience will offer additional importance to echocardiographic evaluation in IE