Echocardiography for endocarditis during the COVID-19 pandemic.
A viewpoint from ACHD (Adult Congenital Heart Disease) Perspective.
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For the symptomatic patient with confirmed COVID-19, close contact with confirmed COVID-19, or pending result for COVID-19
Anecdotal reports suggests poor suitability for surgery if positive for COVID-19, and very high risk in aerosolising procedures of hospital staff infection.

- Assess likelihood of IE and suitability for surgery prior to any echocardiogram
- Perform Transthoracic Echocardiogram
  - **Positive Transthoracic Echocardiogram**
    - Meets criteria for surgery and Surgical candidate:
      - CT / PET to look for complications
      - TOE at time of surgery; Consider TOE
    - *Does not* meet criteria for surgery, and *not* Surgical candidate
      - CT / PET to look for complications
      - Medical management with serial TTE
      - Do not perform TOE
  - **Negative Transthoracic Echocardiogram (With Adequate Windows)**
    - Negative predictive value up to 97%; Sensitivity 40-66%
      - If surgical candidate
        - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
        - Consider repeat TTE after a brief trial of medical therapy
        - High risk of IE before TTE assessment, or high-risk features without meeting criteria for diagnosis on TTE
          - Perform CT / PET or other cross-sectional imaging to detect complications of IE
        - Do not perform TOE until at least 2 weeks post positive for COVID-19 and resolution of symptoms
      - *If not* surgical candidate
        - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
        - Consider repeat TTE after a brief trial of medical therapy
        - Do not perform TOE. Repeat TTE and monitor closely post treatment cessation, with low threshold for pragmatic treatment
- **Negative Transthoracic Echocardiogram (Without Adequate Windows)**
  *Negative predictive value likely much less than 93%; Sensitivity as low as 40%*

  - **If surgical candidate**
    - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
    - High risk of IE before echo assessment, or high risk features without meeting criteria for diagnosis on TTE
      - Perform CT / PET or other cross-sectional imaging to detect complications of IE
      - Do not perform TOE until at least 2 weeks post positive for COVID-19 and resolution of symptoms
    - Low risk of IE before echo assessment
      - Consider performing CT / PET or other cross-sectional imaging to detect complications of IE
      - Do not perform TOE. Repeat TTE and monitor closely for clinical progress post treatment cessation

  - **If not surgical candidate**
    - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
    - Consider repeat TTE after a brief trial of medical therapy
    - Do not perform TOE. Monitor closely post treatment cessation, with low threshold for pragmatic treatment
    - High risk of IE before echo assessment, or high-risk features without meeting criteria for diagnosis on TTE
      - Perform CT / PET or other cross-sectional imaging to detect complications of IE
For the patient with potential native IE:

- Assess likelihood of IE and suitability for surgery prior to any echocardiogram

- Perform Transthoracic Echocardiogram
  - **Positive Transthoracic Echocardiogram**
    - **Meets criteria for surgery and Surgical candidate:**
      - CT / PET to look for complications
      - TOE at time of surgery
    - **Does not meet criteria for surgery, and not Surgical candidate**
      - CT / PET to look for complications
      - Medical management with serial TTE
      - Consider local transmission patterns and risk of community spread / pre-symptomatic patient, before performing TOE

  - **Negative Transthoracic Echocardiogram (With Adequate Windows)**
    - *Negative predictive value up to 97%; Sensitivity 40-66%
      - **If surgical candidate**
        - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
        - Consider repeat TTE after a brief trial of medical therapy
        - High risk of IE before TTE assessment, or high-risk features without meeting criteria for diagnosis on TTE
          - Perform CT / PET or other cross-sectional imaging to detect complications of IE
          - Consider local transmission patterns and risk of community spread / pre-symptomatic patient, before performing TOE.
          - Use a relatively high threshold in the well patient
        - **If not surgical candidate**
          - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
          - Consider repeat TTE after a brief trial of medical therapy
          - Do not perform TOE. Repeat TTE and monitor closely post treatment cessation, with low threshold for pragmatic treatment
o **Negative Transthoracic Echocardiogram (Without Adequate Windows)**

*Negative predictive value likely much less than 93%; Sensitivity as low as 40%*

- **If surgical candidate**
  - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
  - High risk of IE before echo assessment, or high risk features without meeting criteria for diagnosis on TTE
    - Perform CT / PET or other cross-sectional imaging to detect complications of IE
    - Consider local transmission patterns and risk of community spread / pre-symptomatic patient, before performing TOE. Use a relatively high threshold in the well patient
  - Low risk of IE before echo assessment
    - Consider performing CT / PET or other cross-sectional imaging to detect complications of IE
    - Do not perform TOE. Repeat TTE and monitor closely for clinical progress post treatment cessation

- **If not surgical candidate**
  - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors
  - Consider repeat TTE after a brief trial of medical therapy
  - Do not perform TOE. Repeat TTE and monitor closely post treatment cessation, with low threshold for pragmatic treatment
  - High risk of IE before echo assessment, or high-risk features without meeting criteria for diagnosis on TTE
    - Perform CT / PET or other cross-sectional imaging to detect complications of IE
For the patient with potential prosthetic valve or device-related IE:

- Assess likelihood of IE and suitability for surgery prior to any echocardiogram
- Perform Transthoracic Echocardiogram

  o Positive Transthoracic Echocardiogram
    ▪ Meets criteria for surgery and Surgical candidate:
      • CT / PET to look for complications
      • TOE at time of surgery
    ▪ Does not meet criteria for surgery, and Surgical candidate
      • CT / PET to look for complications
      • Medical management with serial TTE
      • Consider local transmission patterns and risk of community spread / pre-symptomatic patient, before performing TOE

  o Negative Transthoracic Echocardiogram (With Adequate Windows)
    \textit{Negative predictive value much less than 97%; Sensitivity 20-46%}
    ▪ Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors

    ▪ \textbf{If surgical candidate}
      • Consider repeat TTE after a brief trial of medical therapy
      • Perform CT / PET or other cross-sectional imaging to detect complications of IE
      • High risk of IE before TTE assessment, or high-risk features without meeting criteria for diagnosis on TTE
        o Consider local transmission patterns and risk of community spread / pre-symptomatic patient, before performing TOE. Use a relatively low threshold in patient with prosthesis
      • Low risk of IE before echo assessment
        o Do not perform TOE. Repeat TTE and monitor closely for clinical progress post treatment cessation

    ▪ \textbf{If not surgical candidate}
      • Consider repeat TTE after a brief trial of medical therapy
      • Do not perform TOE. Repeat TTE and monitor closely post treatment cessation, with low threshold for pragmatic treatment
- **Negative Transthoracic Echocardiogram (Without Adequate Windows)**
  
  *Negative predictive value likely much less than 93%; Sensitivity as low as 40%*
  
  - Consider risk:benefit of pragmatic medical management in first instance, taking into account pathogen, local resistance profiles, and patient-specific factors

  **If surgical candidate**
  
  - Perform CT / PET or other cross-sectional imaging to detect complications of IE
  - High risk of IE before echo assessment, or high risk features without meeting criteria for diagnosis on TTE
    - Consider local transmission patterns and risk of community spread / pre-symptomatic patient, before performing TOE. Use a relatively high threshold in the well patient
  - Low risk of IE before echo assessment
    - Do not perform TOE. Repeat TTE and monitor closely for clinical progress post treatment cessation

  **If not surgical candidate**
  
  - High risk of IE before echo assessment, or high-risk features without meeting criteria for diagnosis on TTE
    - Perform CT / PET or other cross-sectional imaging to detect complications of IE
  - Do not perform TOE. Repeat TTE and monitor closely for clinical progress post treatment cessation, and low threshold for pragmatic treatment