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18F-FDG PET/CT improves diagnostic certainty in native and prosthetic valve infective endocarditis over the modified Duke's criteria

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Introduction
ESC Infective Endocarditis (IE) Guidance (2015) recognises the shortcomings of the modified Duke’s criteria in cases where transoesophageal echocardiography remains equivocal despite high index of suspicion. 18F-FDG PET/CT (PET) can be helpful, based on class C evidence. We explored the role for PET to improve diagnostic certainty in both native (NVE) and prosthetic valve endocarditis (PVE).

Methods
Dual centre retrospective study of patients with suspected IE undergoing PET (01/2010 to date); patients with implantable cardiac device infection were excluded. Myocardial suppression technique was used in all cases, and studies were assessed for the pattern/distribution of tracer uptake. Patients were classified as confirmed/probable/rejected IE pre- and post-PET, with incremental benefit assessed vs actual diagnosis. This was defined by surgical specimen or Endocarditis Team consensus at up to 3-months following index admission. PET diagnostic performance was assessed by Receiver Operating Characteristic (ROC) analysis and Net Reclassification Index (NRI).

Results
PET was performed in 69 patients; 32 for NVE and 37 for PVE (male=56; mean age 61.4y; range 19–89y). Myocardial suppression failed in 3 cases. 16/69 (23%) cases were culture negative, making a pre-PET diagnosis by Duke’s criteria challenging. 22/69 (32%) patients required surgery.

PET sensitivity, specificity, positive and negative predictive values were 75%, 92%, 94% & 69% respectively in NVE, and 87%, 86%, 91% & 80% in PVE. The pattern of tracer avidity was especially important in PVE, with focal uptake suggestive of infection and diffuse uptake reflecting post-surgical change. PET accurately reclassified patients to both confirm and refute IE [NRI: NVE 0.89; PVE 0.90] (Table 1). ROC curves showed significant incremental benefit of PET over Duke’s criteria alone in both PVE (AUC 0.877 vs 0.633) and NVE (AUC 0.883 vs 0.750) (Figure 1).

Conclusion
PET improves diagnostic certainty when combined with modified Duke’s criteria in diagnosing both NVE and PVE.
Abstract: 19F-FDG PET/CT improves diagnostic certainty in native and prosthetic valve infective endocarditis over the modified Duke’s criteria.

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<table>
<thead>
<tr>
<th>Diagnosis by Duke's Criteria</th>
<th>Native Valve Endocarditis</th>
<th>Prosthetic Valve Endocarditis</th>
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</thead>
<tbody>
<tr>
<td>Pre-PET</td>
<td>Post-PET</td>
<td>Discharge Diagnosis</td>
</tr>
<tr>
<td>Definite</td>
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<td>16</td>
</tr>
<tr>
<td>Probable</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Rejected</td>
<td>6</td>
<td>14</td>
</tr>
</tbody>
</table>

Net re-classification index (NRI): NVE 0.89 (positive reclassification, NRI 0.44; negative reclassification, NRI 0.45) and PVE 0.90 (positive reclassification, NRI 0.50; negative reclassification, NRI 0.40) demonstrating the ability of PET to both successfully diagnose and refute IE.

Figure 1 ROC curves for IE patients as per discharge diagnosis. Pre- and post-PET modified Duke’s classification as definite/probable IE versus rejected A NVE (n=32): pre-PET AUC 0.750 vs post-PET AUC 0.883 (95% Confidence Intervals 0.554 – 0.946 & 0.753 – 1.0, respectively) B PVE (n=37): pre-PET AUC 0.633 vs post-PET AUC 0.877 (95% Confidence Intervals 0.441 – 0.825 & 0.745 – 1.0, respectively).