Third and fourth heart sounds had low sensitivity but moderate to high specificity for predicting left ventricular dysfunction.


Clinical impact ratings IM/Ambulatory care  ★★★★★★★ Cardiology  ★★★★★★★

Q In patients referred for non-emergent left sided heart catheterisation, how accurate are the third (S3) and fourth (S4) heart sounds detected by computerised phonocardiography for predicting left ventricular dysfunction?

**METHODS**

Design: blinded comparison of S3 and S4 with B type natriuretic peptide (BNP) concentration, left ventricular end diastolic pressure (LVEDP), and left ventricular ejection fraction (LVEF) as reference standards.

Setting: a university teaching hospital in the US.

Patients: 90 patients (mean age 62 y, 61% men) who were referred for elective left sided heart catheterisation. Exclusion criteria included age <18 years and systolic pressure <90 mm Hg.

Description of test: S3 and S4 were obtained from audiologic cardio graphic data generated by the Audicor System (Audicor, Inovice Medical Inc, Portland, OR, USA), with the audiocardiographic leads attached to V3 and V4 positions and connected to a Marquette MAC 5000 (General Electric Healthcare Technologies, Waukesha, WI, USA).

Diagnostic standards: BNP concentrations measured using a membrane immunoassay blank; LVEDP recorded using a 6F pigtail catheter and a fluid filled pressure transducer, with an LVEDP >15 mm Hg specified as abnormal; and LVEF measure obtained using transhoracic echocardiography (Acuson Sequoia, Mountain View, CA, USA; or SONOS 5500, Philips Medical Systems, Andover, MA, USA). An LVEF <50% was defined as abnormal.

Outcomes: sensitivity and specificity, and positive and negative likelihood ratios calculated from data in the article.

**MAIN RESULTS**

46% of patients had abnormal LVEDP, 28% abnormal LVEF, and 58% abnormal BNP. The table shows sensitivity, specificity, and positive and negative likelihood ratios of S3 and S4.

**CONCLUSION**

In patients referred for non-emergent left sided heart catheterisation, third and fourth heart sounds detected by phonocardiography had low sensitivity but moderate to high specificity for predicting left ventricular dysfunction.

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Source of funding: National Institutes of Health Mentored Patient-Oriented Research Career Development Award.

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**Diagnostic properties of the third (S3) and fourth (S4) heart sounds detected by phonocardiography for predicting left ventricular dysfunction**

<table>
<thead>
<tr>
<th>Heart sound</th>
<th>Gold standard</th>
<th>Sensitivity [95% CI]</th>
<th>Specificity [CI]</th>
<th>+LR</th>
<th>-LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3</td>
<td>LVEDP</td>
<td>41% (26 to 58)</td>
<td>92% (80 to 98)</td>
<td>5.13</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>LVEF</td>
<td>52% (31 to 73)</td>
<td>87% (76 to 94)</td>
<td>4.00</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>BNP</td>
<td>43% (20 to 66)</td>
<td>92% (78 to 98)</td>
<td>4.00</td>
<td>0.74</td>
</tr>
<tr>
<td>S4</td>
<td>LVEDP</td>
<td>46% (31 to 63)</td>
<td>80% (66 to 90)</td>
<td>2.30</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>LVEF</td>
<td>43% (23 to 66)</td>
<td>72% (59 to 82)</td>
<td>1.54</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>BNP</td>
<td>40% (26 to 54)</td>
<td>78% (61 to 90)</td>
<td>1.82</td>
<td>0.77</td>
</tr>
<tr>
<td>S3 and S4</td>
<td>LVEDP</td>
<td>68% (52 to 82)</td>
<td>73% (59 to 85)</td>
<td>2.52</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>LVEF</td>
<td>74% (52 to 90)</td>
<td>64% (52 to 76)</td>
<td>2.06</td>
<td>0.41</td>
</tr>
<tr>
<td></td>
<td>BNP</td>
<td>57% (42 to 70)</td>
<td>72% (55 to 86)</td>
<td>2.04</td>
<td>0.60</td>
</tr>
</tbody>
</table>

* LVEDP = left ventricular end diastolic pressure; LVEF = left ventricular ejection fraction; BNP = B type natriuretic peptide. Diagnostic terms defined in glossary. LR = Likelihood ratio. Data calculated from article.
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*Evid Based Med* 2005 10: 182
doi: 10.1136/ebm.10.6.182

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