The outcomes of ambulatory electrocardiography (AECG or Holter) performed for patients with symptoms related to cardiac arrhythmia in the primary care: a case series report

Chiang LK, Ng LV

Family Medicine & General Outpatient Department, Kwong Wah Hospital
Does this patient with Palpitation/Dizziness/Presyncope/Syncope … have a cardiac arrhythmia?

- Non-specific, very common, with wide differential diagnosis
- **Palpitation:** 16% in general medical outpatients
- Cardiac (43%), psychiatric (31%), miscellaneous (10%) and unknown in 16%.
- **Dizziness:** 1% of the population consult a general practitioner each year for this symptom.
- **Syncope:** 3-5% of all emergency department visits and 1-3% of hospitalizations.
Benign and Self limiting or Important abnormalities of cardiac rhythm or conduction

- Majority of patients require further investigation
- 24 Hrs Holter monitoring is widely used and remains the first line-investigation in many cardiac centers for evaluating palpitations and altered consciousness.
Ambulatory Electrocardiography (AECG or Holter)

- a dedicated portable recorder registers the ECG continuously during a prolonged period, usually 24 hours.
- allows diagnosis of transient disturbances of cardiac rhythm and conduction.

- Mr. Norman Jefferis Holter
Ambulatory Electrocardiography (AECG or Holter)

• The main indication, which include unexplained recurrent palpitation, unexplained syncope, near syncope, or episodic dizziness in which the cause is not obvious.

• American Heart Association and American College of Cardiology (ACC/AHA).

• Philips Zymed Digitrak Plus
Using Ambulatory Electrocardiography (AECG or Holter) in Primary Care

- aiming for early detection of possible life-threatening cardiac arrhythmia as a cause of symptoms.
- It can minimize the patient risk by shortening the time to diagnosis and initiate appropriate early referring to specialist care.
The outcomes of ambulatory electrocardiography (AECG or Holter) performed for patients with symptoms related to cardiac arrhythmia in the primary care: a case series report

- Objectives:
  - To delineate the presenting symptoms of patients indicated for Holter monitoring;
  - To examine outcomes of the Holter monitoring;
  - To find predictive patient characteristics associated with significant cardiac arrhythmia.
Methodology: Study Flowchart

Patient presented with symptoms related to cardiac arrhythmia
Initial assessment, investigation and management

Ordering Holter monitoring
Jan 2010 to Dec 2012: 220
- Patient characteristics, presenting symptoms

Exclude if:
- Confirm diagnosis
- Direct referring to specialist/other health

Pulitation: 180 (82%)
Dizziness: 11 (5%)
Syncope: 4 (2%)
Combined: 6 (3%)
Others: 19 (8%)

New Onset symptoms -> 139
- Symptom presented within 3 months on first medical attendance; and
- No past history of similar symptoms

Old Symptoms -> 81
- Symptom presented more than 3 months.
- Past history of similar symptoms

Significant Holter Outcomes / Cardiac arrhythmia

<table>
<thead>
<tr>
<th></th>
<th>New</th>
<th>Old</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVE/VE (Freq)</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Long QT syndrome</td>
<td>5</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>SVE/VE (Br/Tri)</td>
<td>8</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>AF/PAF</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>PSVT</td>
<td>8</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Brady/Tachy</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>SSS</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>HR (23 or 35)</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>ST change</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>50</td>
<td>38</td>
<td>88</td>
</tr>
</tbody>
</table>
Results: Patient demographics

Table 1: The demographic characteristics of patients:

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>65</td>
<td>29.5%</td>
</tr>
<tr>
<td>Female</td>
<td>155</td>
<td>70.5%</td>
</tr>
<tr>
<td>Age distribution: &lt;= 40</td>
<td>21</td>
<td>9.5%</td>
</tr>
<tr>
<td>41 – 60</td>
<td>90</td>
<td>41.0%</td>
</tr>
<tr>
<td>&gt;60</td>
<td>109</td>
<td>49.5%</td>
</tr>
<tr>
<td>Associated comorbidity:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension (94)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Diabetes Mellitus (24)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>IFG / IGT (12)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Dyslipidaemia (38)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Ischaemic heart disease (7)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure (1)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Cerebral vascular accident (5)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Transient ischemic attack (2)</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>No associated chronic disease</td>
<td>81</td>
<td>36.8%</td>
</tr>
<tr>
<td>Total:</td>
<td>220</td>
<td>100%</td>
</tr>
</tbody>
</table>

IFG / IGT: impaired fasting glucose / impaired glucose tolerance

Note: patients may have more than one comorbidity.
Results:

Table 2: Presenting symptoms of patients indicated for Holter monitoring

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>No of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Palpitation</td>
<td>180</td>
<td>82%</td>
</tr>
<tr>
<td>2. Dizziness</td>
<td>11</td>
<td>5%</td>
</tr>
<tr>
<td>3. Syncope / Presyncope / Loss of consciousness</td>
<td>4</td>
<td>2%</td>
</tr>
<tr>
<td>4. Combines symptoms</td>
<td>6</td>
<td>3%</td>
</tr>
<tr>
<td>5. Others, such as chest pain, incidental abnormal</td>
<td>19</td>
<td>8%</td>
</tr>
<tr>
<td>ECG findings, Follow up assessment etc</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>220</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
## Results:

**Table 3: Significant cardiac arrhythmia stratified by presenting symptoms**

<table>
<thead>
<tr>
<th>Frequency of significant Holter findings</th>
<th>Palpitation</th>
<th>Dizziness</th>
<th>Syncope</th>
<th>Combined</th>
<th>Others</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVE/VE (Freq)</td>
<td>18</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>22 (25%)</td>
</tr>
<tr>
<td>Prolong QT</td>
<td>11</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>13 (15%)</td>
</tr>
<tr>
<td>SVE/VE (Bi/Tri)</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>13 (15%)</td>
</tr>
<tr>
<td>AF/PAF</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>12 (14%)</td>
</tr>
<tr>
<td>PSVT</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>9 (10%)</td>
</tr>
<tr>
<td>Brady/Tachy</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8 (9%)</td>
</tr>
<tr>
<td>SSS</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5 (6%)</td>
</tr>
<tr>
<td>HB (2º or 3º)</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>ST change</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3 (3%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>69</strong></td>
<td><strong>3</strong></td>
<td><strong>2</strong></td>
<td><strong>4</strong></td>
<td><strong>10</strong></td>
<td><strong>88 (100%)</strong></td>
</tr>
</tbody>
</table>
Results:

Table 4: Significant cardiac arrhythmia stratified by new or old presenting symptoms

<table>
<thead>
<tr>
<th>Frequency of significant Holter findings</th>
<th>New Onset: 139</th>
<th>Old presentation: 81</th>
<th>Overall: 220</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVE/VE (Freq)</td>
<td>11</td>
<td>11</td>
<td>22 (25%)</td>
</tr>
<tr>
<td>Prolong QT</td>
<td>5</td>
<td>8</td>
<td>13 (15%)</td>
</tr>
<tr>
<td>SVE/VE (Bi/Tri)</td>
<td>8</td>
<td>5</td>
<td>13 (15%)</td>
</tr>
<tr>
<td>AF/PAF</td>
<td>6</td>
<td>6</td>
<td>12 (14%)</td>
</tr>
<tr>
<td>PSVT</td>
<td>8</td>
<td>1</td>
<td>9 (10%)</td>
</tr>
<tr>
<td>Brady/Tachy</td>
<td>5</td>
<td>3</td>
<td>8 (9%)</td>
</tr>
<tr>
<td>SSS</td>
<td>3</td>
<td>2</td>
<td>5 (6%)</td>
</tr>
<tr>
<td>HB (2° or 3°)</td>
<td>2</td>
<td>1</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>ST change</td>
<td>2</td>
<td>1</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (57%)</td>
<td>38 (43%)</td>
<td>88 (100%)</td>
</tr>
</tbody>
</table>
## Results:

Table 5: Predictive patient characteristics with significant Holter outcomes:

<table>
<thead>
<tr>
<th>Associated comorbidity:</th>
<th>Frequency</th>
<th>Significant Cardiac arrhythmia</th>
<th>Chi-square p-value</th>
<th>Likelihood ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>65</td>
<td>34</td>
<td>0.016</td>
<td>5.76</td>
</tr>
<tr>
<td>Female</td>
<td>155</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age distribution:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;= 40</td>
<td>21</td>
<td>8</td>
<td>0.000</td>
<td>19.05</td>
</tr>
<tr>
<td>41– 60</td>
<td>90</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;60</td>
<td>109</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associated comorbidity:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>(94)</td>
<td>(46)</td>
<td>0.004</td>
<td>8.37</td>
</tr>
<tr>
<td>DM /IFG /IGT</td>
<td>(36)</td>
<td>(20)</td>
<td>0.037</td>
<td>4.25</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>(38)</td>
<td>(19)</td>
<td>0.167</td>
<td>1.88</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>(7)</td>
<td>(6)</td>
<td>0.005</td>
<td>8.11</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>(1)</td>
<td>(0)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>CVA /TIA</td>
<td>(7)</td>
<td>(5)</td>
<td>0.085</td>
<td>2.93</td>
</tr>
<tr>
<td>No associated chronic disease</td>
<td>81</td>
<td>24</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DM /IFG /IGT: Diabetes mellitus /Impaired fasting glucose /Impaired glucose tolerance
CVA /TIA: Cerebral vascular accident / Transient ischemic attack
Note: patients may have more than one comorbidity.
Summary of Holter Outcomes: Five leading findings for all patients

<table>
<thead>
<tr>
<th>Significant Holter findings</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frequent supraventricular / ventricular ectopics</td>
<td>25%</td>
</tr>
<tr>
<td>2. Long QT syndrome</td>
<td>15%</td>
</tr>
<tr>
<td>3. Supraventricular / ventricular ectopics in bigeminy or trigeminy</td>
<td>15%</td>
</tr>
<tr>
<td>4. Paroxysmal atrial fibrillation</td>
<td>14%</td>
</tr>
<tr>
<td>5. Paroxysmal supraventricular tachycardia</td>
<td>10%</td>
</tr>
</tbody>
</table>
Summary of Holter Outcomes: Five leading findings for patients with palpitation

<table>
<thead>
<tr>
<th>Significant Holter findings</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frequent supraventricular / ventricular ectopics</td>
<td>22%</td>
</tr>
<tr>
<td>2. Supraventricular / ventricular ectopics in bigeminy or trigeminy</td>
<td>19%</td>
</tr>
<tr>
<td>3. Paroxysmal supraventricular tachycardia</td>
<td>19%</td>
</tr>
<tr>
<td>4. Paroxysmal atrial fibrillation</td>
<td>14%</td>
</tr>
<tr>
<td>5. Long QT syndrome</td>
<td>10%</td>
</tr>
</tbody>
</table>
## Outcomes of other Studies of Holter Monitoring

<table>
<thead>
<tr>
<th>Author</th>
<th>Setting</th>
<th>Presenting Symptoms</th>
<th>Significant Cardiac arrhythmia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chu CKK</td>
<td>AED, Hong Kong</td>
<td>Syncope: 51%</td>
<td>Overall: 19.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dizziness: 12%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palpitation: 15%</td>
<td></td>
</tr>
<tr>
<td>Yue CS</td>
<td>Cardiology, Hong Kong</td>
<td>Syncope / Dizzy spell: 37%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Chan WK</td>
<td>Medical, Hong Kong</td>
<td>Palpitation: 47%</td>
<td>Overall: 6.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Syncope: 27%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dizziness: 10%</td>
<td></td>
</tr>
<tr>
<td>Summerton N</td>
<td>General practice, UK</td>
<td>Palpitation: 100%</td>
<td>19%</td>
</tr>
<tr>
<td>Sreekumar S</td>
<td>Hospital, UK</td>
<td>Altered consciousness: 41.7%</td>
<td>15.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palpitation: 36.2%</td>
<td>16.4%</td>
</tr>
<tr>
<td>Kuhne M</td>
<td>Cardiology, Switzerland</td>
<td>Syncope: 17%</td>
<td>Syncope related: 8.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Overall: 13.6%</td>
</tr>
</tbody>
</table>
Limitations & Implications

• Patients from one primary care clinic, uncertain whether represent patients of primary care setting or not?
• Not including all patients with indicated presenting symptoms.

• High diagnostic yield.
• Enabled an early detection of cardiac arrhythmia, including serious arrhythmia and speeded up their management.
Conclusion:

- **40%** of Holter monitoring for patients in the primary care have significant cardiac arrhythmia.
- **34%** of Holter monitoring for patients with *newly onset palpitation* in the primary care have significant cardiac arrhythmia.
Thanks!

家庭醫學，全人護療，夥伴同行顧身心
基層醫療，把關社區，預防協調促安康