Mr Patrick Gladding
Cardiologist and Internal Medicine
North Shore Hospital
Auckland

Saturday, June 11, 2016
(Room 12)
14:00 - 14:55  WS #137: How to Make Sense of ECGs
15:05 - 16:00  WS #149: How to Make Sense of ECGs (Repeated)
Dr. Patrick Gladding
Cardiologist
Mason Likar vs Lund electrode positions
Lead reversal – LA and RA
Lead reversal – LA and RA
ECG normal morphology

Rhythm strip

Lateral

Anterior

Septal

Inferior

200msecs
Interference

67 year old woman
ED Monitor reads 240 bpm
Parkinsons tremor

*** AGE AND GENDER SPECIFIC ECG ANALYSIS ***
ACCELERATED JUNCTIONAL RHYTHM WITH FUSION COMPLEXES
LOW VOLTAGE QRS
T WAVE ABNORMALITY, CONSIDER LATERAL ISCHEMIA
PROLONGED QT
ABNORMAL ECG

Electrical Interference
Interpretation

- Name, date
- Leads correct
- Rate (300 ÷ big squares between QRS)
- Rhythm (HR <60bpm, >100bpm)
- Axis
- ST segments
- Wide or narrow complex
37 year old with palpitations
AVNRT vs AVRT

- Atria
- AV node
- His’ bundle
- Ventricles
- Slow-fast
- Fast-slow
- AV nodal reentry
- AV reentry using accessory pathway
17 year old cleaning diesel drums at Devonport Naval base
Measurements

Heart Rate: 119 bpm  
P Duration:  
PR Interval:  
QRS Duration: 196 ms  
QT Interval: 334 ms  
QTc Interval: 479 ms  
P, QRS, T Axis: -68°, -55°  

Interpretation (Unconfirmed)

Junctional tachycardia
Multifocal ventricular extrasystole(s)
Fused ventricular extrasystole(s)
Abnormal complete right bundle branch block
Left QRS axis deviation
Left ventricular hypertrophy with secondary abnormal repolarisation
Inferior infarction, probably recent or with ventricular asystole
Ischemic ST-T changes compatible with epicardial injury in inferior leads
Ischemic ST-T changes in inferior leads
<table>
<thead>
<tr>
<th>Cal</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>AVR</th>
<th>AVL</th>
<th>AVF</th>
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<tbody>
<tr>
<td></td>
<td>x1 25mm/s</td>
<td>x1 25mm/s</td>
<td>x1 25mm/s</td>
<td>x1 25mm/s</td>
<td>60bpm</td>
<td>x1 25mm/s</td>
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<tr>
<td></td>
<td>AVR</td>
<td>V1</td>
<td></td>
<td>V4</td>
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<td>V2</td>
<td>V5</td>
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<td>V3</td>
<td>V6</td>
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<tr>
<td>III</td>
<td>aVF</td>
<td>V1</td>
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<tr>
<td></td>
<td>Rhythm[II] x1</td>
<td>Rhythm[III] x1</td>
<td>Rhythm[II] x1</td>
<td>Rhythm[II] x1</td>
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</tr>
</tbody>
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Mount edge of trace along this line
SVT – mechanism of onset
Note paper speed and mm/mV
57 year old with palpitations
68 year old man
Acute dyspnoea, orthopnoea
Pale, sweaty, crackles to apices
Torsades de Pointes
ST segment changes
Lateral ST depression
LVH with strain
Anterior ST elevation
Inferior ST elevation
61 year old man presenting with stroke
61 year old man presenting with stroke: Now with fever
LBBB
Heart block

1. 1st Degree AV Block
2. Type I (Wenckebach) 2nd Degree AV Block
3. Type II (Mobitz) 2nd Degree AV Block
4. Complete (3rd Degree) AV Block
Quick challenge
Hypertrophic cardiomyopathy
Anterior ST elevation MI
**LBBB**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Rate</td>
<td>59</td>
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<tr>
<td>PR</td>
<td>207</td>
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<tr>
<td>QRSd</td>
<td>151</td>
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<tr>
<td>QT</td>
<td>459</td>
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<tr>
<td>QTc</td>
<td>455</td>
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</table>

- Sinus rhythm
- Normal P axis, V-rate 50-99
- IVCD, consider atypical LBBB
- QRSd>120, notch/silur R I aVL V5-6

Axes:
- P: 83
- QRS: 81
- T: -88

- **ABNORMAL ECG**

Unconfirmed diagnosis

Requested by:
2:1 HB with LBBB
AF with complete heart block
Personalised Advanced Electrocardiography
ECG - History

1842 - Waller recorded first electrical activity from human heart
1887 - ECG entered the US.
1893 - Einthoven first used the term EKG
1901 - Einthoven built string galvanometer based 3 lead EKG machine
1908 - Wilson invented the central terminal. Precordial leads are born.
1924 - Goldberg used the central terminal with augmentation. Augmented unipolar leads are born.
1934-1938 - AHA standardized 12-Lead EKG as we know it now.
1954 - Miniaturisation, wireless
- Advanced signal processing
- Remote Cloud-based
- Advanced Analytics
- Pattern recognition, artificial intelligence
Advanced ECG

• Sensitive, high sampling frequency, accurate.
43 year old man with BP 220/140
Advanced Electrocardiography Identifies Left Ventricular Systolic Dysfunction in Non-Ischemic Cardiomyopathy and Tracks Serial Change over Time

Kerryanne Johnson 1,*, Stacey Neilson 1, Andrew To 1, Nezar Amir 1, Andrew Cave 1, Tony Scott 1, Martin Orr 1,2, Mia Parata 1, Victoria Day 1 and Patrick Gladding 1,3,4

Table 3. Diagnostic accuracy of cardiologists and general practitioners assessing for LVSD.

<table>
<thead>
<tr>
<th></th>
<th>Cardiologists</th>
<th>General Practitioners</th>
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<tbody>
<tr>
<td><strong>Multiple Diagnoses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>Specificity</td>
<td>71%</td>
<td>42%</td>
</tr>
<tr>
<td><strong>Binary Diagnosis (Normal/Abnormal)</strong></td>
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<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>90%</td>
<td>85%</td>
</tr>
<tr>
<td>Specificity</td>
<td>63%</td>
<td>58%</td>
</tr>
</tbody>
</table>

Average sensitivity and specificity for two readers reporting on a random sample of 22 ECGs from the overall cohort.

- A-ECG LVSD Sensitivity 93-95%, Specificity 95%
Case: Coronary artery disease and tracking

- 54 year old man, multisport enthusiast
Advanced ECG

$3,500

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