Differential Diagnosis of wide QRS Complex Tachycardia by ECG

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Introduction

- A wide complex tachycardias (WCT) is defined as a rhythm with a rate >100/min with a QRS duration >120 ms.
- The elucidation of the mechanism of WCT is vital not only for acute arrhythmia management, but also for the further work-up, prognosis and chronic management
- Despite the published numerous ECG algorithms and criteria, the accurate, rapid diagnosis in patients with WCT remains a significant clinical problem, because many of these ECG criteria are complicated, not applicable in a large proportion of cases and difficult to recall in an urgent setting.
Objective

1. Evaluate some criteria in ECG of Ventricular Tachycardia.

2. Evaluate the common Algorithms in differential diagnosis of WCT by ECG
Method

- From 2008 to 8/2016, 101 Patients (pts) with WCT were done diagnosis by EP study.
- 69 pts were diagnosised on VT
- 32 pts were diagnosised on SVT
- Review the ECG by the common Algorithms.
Common Algorithms.

- the Brugada Algorithm
- Vereckei Algorithm
- Griffith (Bundle Branch Block) algorithm
- Ultrasimple Pava criteria
the Brugada Algorithm
(Circulation. 1991;83(5):1649-59)

Absence of an RS complex in all precordial leads

yes
VT

No
R to S interval > 100 ms in one precordial lead

Yes
VT

No

AV dissociation

Yes
VT

No

Morphology criteria for VT present both in precordial leads V1- V2 and V6

Yes
VT

No

SVT
Vereckei Algorithm
(Heart Rhythm 2008)

*aVR Lead:*

**Step 1**
Initial R wave in aVR present?

- (-) VT
- (+) VT

**Step 2**
Initial R wave > 40 ms

- (-) VT
- (+) VT

**Step 3**
notching on the initial downstroke of a predominantly negative QRS complex

- (-) VT
- (+) VT

**Step 4**
ventricular activation–velocity ratio $V_i/V_t \leq 1$

- (-) SVT
- (+) VT
Griffith Algorithm.

- **LBBB**: rS or QS wave in leads V1 and V2, delay to S wave nadir < 70 ms, and R wave and no Q wave in lead V6

- **RBBB**: RSr' wave in lead V1 and an RS wave in lead V6, with R wave height greater than S wave depth

Lancet. 1994 Feb12;343(8894):386-8
Ultrasimple Pava criterion

the R wave peak time in Lead II. They suggest measuring the duration of onset of the QRS to the first change in polarity (either nadir Q or peak R) in lead II. If the RWPT is ≥ 50ms the likelihood of a VT very high.

Heart Rhythm 2010 Jul;7(7):922-6
Occurrence of true as well as false-positive and negative results, as well as sensitivity and specificity

SPSS for Windows (version 17.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis. P .05 value was considered significant.
## Patient characteristics

<table>
<thead>
<tr>
<th></th>
<th>SVT (n=32)</th>
<th>VT (n=69)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs, mean ±SD)</td>
<td>36 ± 21</td>
<td>49 ± 18</td>
<td>&lt;0,05</td>
</tr>
<tr>
<td>Sex (male %)</td>
<td>53,1%</td>
<td>68,1%</td>
<td>&lt;0,05</td>
</tr>
<tr>
<td>Structural heart diseases (%)</td>
<td>6,2%</td>
<td>15,9%</td>
<td>&lt;0,01</td>
</tr>
<tr>
<td>Heart rate in tachycardia (c/min)</td>
<td>156 ± 18</td>
<td>178 ± 27</td>
<td>&lt;0,01</td>
</tr>
</tbody>
</table>
QRS interval in tachycardia

P < 0.01

SVT: 142 ± 18

VT: 165 ± 31
## ECG axis deviation

<table>
<thead>
<tr>
<th></th>
<th>SVT (n=32)</th>
<th>VT (n=69)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal axis (%)</td>
<td>46.9%</td>
<td>2.9%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Right axis (%)</td>
<td>28.2%</td>
<td>28.9%</td>
<td>NS</td>
</tr>
<tr>
<td>Left axis (%)</td>
<td>21.8%</td>
<td>31.9%</td>
<td>NS</td>
</tr>
<tr>
<td>Extreme axis (%)</td>
<td>3.1%</td>
<td>36.3%</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>
AV dissociation

11.6%

SVT  VT
Positive and negative concordance in the chest lead

21.7%
Josephson’s sign
Notching near the nadir of the S wave

P<0.01
6.2%

26.1%

SVT
VT
Positive R in aVR

P<0.01

3.1% SVT
40.5% VT

SVT
VT
QRS morphology in RBBB

V1: 58.2% SVT
V6: 62.7% VT

V1:...
V6:...

SVT
VT
QRS morphology in LBBB

SVT: 68.6%

VT: 63.5%
<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Sensitivity (95% CI)</th>
<th>Specificity (95% CI)</th>
<th>Positive Predictive Value (95% CI)</th>
<th>Negative Predictive Value (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vereckei</td>
<td>95.6 (93.6-98.4)</td>
<td>79.7 (64.7-94.2)</td>
<td>94.2 (81.8-99.2)</td>
<td>81.6 (68.1-91.2)</td>
</tr>
<tr>
<td>Brugada</td>
<td>88.6 (83.6-91.7)</td>
<td>72.6 (67.4-77.6)</td>
<td>89.5 (84.8-94.2)</td>
<td>67.2 (58.9-75.5)</td>
</tr>
<tr>
<td>Griffith</td>
<td>73.2 (67.1-79.4)</td>
<td>84.6 (77.2-90.8)</td>
<td>89.1 (84.2-94.6)</td>
<td>63.2 (55.1-71.8)</td>
</tr>
<tr>
<td>Pava</td>
<td>71.6 (67.5-77.8)</td>
<td>83.2 (76.8-90.2)</td>
<td>91.4 (88.2-95.3)</td>
<td>52.7 (45.1-60.4)</td>
</tr>
</tbody>
</table>
Conclusion

- Review quickly in ECG on WCT include extreme axis, positive R on aVR, concordance in chest lead, Josephson’s sign may be suggested VT.

- Vereckei algorithms is superior than other algorithms.
Thank you for your attention
QRS morphology in precordial leads (A/V relationship is unknown)

**Typical RBBB Or LBBB**
- SVT

**RBBB pattern**
- qR, Rs or Rr in V1
- Frontal plane axis range from +90 to -90 degrees
- VT

**LBBB pattern**
- R in V1 > 30 ms
- R to nadir of S in V1 > 60 ms
- qR or qS in V6
- VT

**Precordial leads**
- Concordant
- No R/S pattern
- Onset or R to nadir longer than 100 ms
- VT