Differential diagnosis of Wide QRS tachycardia

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Wide QRS tachycardias

VT

SVT+ aberrancy

Pre-excited Tachycardia
: preexited AFL>>
  antidromic AVRT
• Ventricular tachycardia
  – Occurrence of a series of three or more consecutive, abnormally shaped premature ventricular complexes whose duration exceeds 120 ms

• VT
  – AV dissociation
  – Capture beat
  – Fusion beat
16/M, sarcoma, adriamycin-induced CMP
ECG1. 70/M, old MI, s/p CABG
palpitations, stable V/S, normal CK-MB, troponin

Unconfirmed diagnosis.
Question 1. Dx?

(1) Ventricular tachycardia
(2) Supraventricular tachycardia with left bundle branch block
(3) Preexcited tachycardia
Question 2. Morphology of the tachy

(1) left bundle branch block
(2) right bundle branch block
Summary

Regular tachycardia in structural heart disease
(old myocardial infarction, dilated cardiomyopathy,
hypertrophic cardiomyopathy)

- VT if wide QRS tachy (If there is no BBB)
- VT or SVT if baseline QRS is narrow
Answer to Q1

- QRS duration = 200 ms > 120 ms
- AV dissociation+

→ VT
Answer to Q2, where is the onset of QRS?

- QS pattern in V1 → LBBB morphology
- RR pattern in V6
Causes of LBBB morphology VT

- Old MI
- post TOF op
- DCMP:BBR-VT
- Normal RV

Reentry ARVD
Reentry
Reentry
Triggered activity

- ARVD: arrhythmogenic right ventricular cardiomyopathy/dysplasia
- BBR-VT: bundle branch reentry VT
Repetitive monomorphic VT
LBBB morphology tachycardia
Anatomy of right ventricle

RAO 30

Left lateral

MPA
PV
RVOT (outlet)
RA
TV
inlet
Apex

PV
RVOT
RA
TV
RV
ECG2. 47/F palpitations, structurally normal heart
Question 3. Morphology of the tachy (ECG2)

(1) left bundle branch block
(2) right bundle branch block
Question 4. Dx of ECG2?

(1) Ventricular tachycardia

(2) Supraventricular tachycardia with left bundle branch block

(3) Preexcited tachycardia
answer to Q3 and Q4: sinus rhythm with LBBB
Answer to Q4

- QRS duration = 120 ms
- retrograde P+, 1:1 VA relationship
- preexisting BBB+ SVT (OAVRT using concealed left free wall AP)

OAVRT: orthodromic AV reentrant tachycardia
VT vs SVT with aberrancy (1)

VT:
- Slurred, notched S in V1

SVT:
- Wide r
- Narrow r & steep S

V1
V2
V3
VT vs SVT with aberrancy (2)
ECG3.
58/M, dilated CMP(FC III), palpitations & dyspnea, hypotension
Question 4. Morphology of the tachy (ECG3)

(1) left bundle branch block
(2) right bundle branch block
Question 5. Dx of ECG3?

(1) Ventricular tachycardia
(2) Supraventricular tachycardia with left bundle branch block
(3) Preexcited tachycardia
Answer to Q5: where is the onset of QRS complex?

- QRS duration=160 ms
- monophasic R wave in V1 → RBBB pattern
- QRS axis: no men’s axis → VT
another VT with RBBB morphology
66/M with old anterior MI
66YO man with old anterior MI

morphologic discrimination – isoelectric TP segment?
Causes of RBBB morphology VT

- Old MI
- Dilated CMP
- HCMP
- normal LV

Reentry
Reentry
Reentry
Reentry

Automaticity
29/M paroxysmal palpitations
VT with RBBB pattern (1)

V1

V2

V3

R=R’
in V1

? in V1

Monophasic R
in V1

R<R’
in V1
VT with RBBB pattern (2)

QS in V6

R/S<1
69/M
61-YO man with palpitations
SBP 80 mmHg, systolic murmur Gr III at 2\textsuperscript{nd} RICS
Diagnosis?
Echo; bicuspid AV with moderate AS

(1) Ventricular tachycardia

(2) Supraventricular tachycardia

(3) Preexcited tachycardia
12- lead ECG post DC cardioversion
ECG: bicuspid AV with moderate AS
Preexcited atrial tachycardia

P wave

1:1 ventricular activation via AP

2:1 ventricular activation via AP

A-H-V

A-no V A-V

1:1 ventricular activation via AP
Preexcited tachycardia

Atrial flutter

Antidromic tachycardia

Accessory pathway

AV node
Absence of an RS complex in all precordial leads

R to S interval > 100 ms in one precordial leads?

AV dissociation?

Morphologic criteria for VT present both in precordial leads V1-2 and V6

Yes VT

No

SN=21% SP=100%

SN=66% SP=98%

SN=82% SP=98%

SN=99% SP=97%

SN=97% SP=99%

RS interval

SVT

VT

RS<100 ms

RS>100 ms
RS complex in precordial leads (1)
RS complex in precordial leads (2)

- V1
- V2
- V3
- V4
- V5
- V6
RS complex in precordial leads (3)

RS complex in precordial leads (3)
RS complex in precordial leads (4)

- RS complex: V1, V4
  - RS = 120 ms

- RS complex: V1, V5
  - RS = 160 ms

- RS complex: V2, V5

- RS complex: V2, V6
  - RS = 60 ms

- RS complex: V3, V6
  - RS = 60 ms

- RS complex: V4, V5

- RS complex: V4, V6
  - RS = 60 ms
RS complex in precordial leads (5)

No RS $\rightarrow$ VT

pt c old ant MI

RS=80 ms, atypical LBBB $\rightarrow$ VT

pt c old inf MI
Bidirectional VT due to Chou toxicity
- frequently misdiagnosed as PVC bigeminy
Bidirectional VT vs PVC bigeminy
36/M palpitations dizziness
Dx?

(1) Ventricular fibrillation
(2) Torsades de pointes
(3) Preexcited AF
- ABNORMAL ECG -

Unconfirmed diagnosis.
Case 3. 21/M, palpitation, ECG during atrial pacing
Induced tachyarrhythmia 1
Induced tachycardia 2
Induced tachycardia 3
52/F paroxysmal palpitations, AF, DDD pacemaker
Wide QRS-complex tachycardia (QRS duration greater than 120 min)

Regular or irregular?

Regular

Is QRS identical to that during SR? If yes, consider:
- SVT and BBB
- Antidromic AVRT

Previous myocardial infarction or structural heart disease? If yes, VT is likely.

Irregular

Atrial fibrillation
Atrial flutter/AT with variable conduction and
a) BBB or
b) antegrade conduction via AP
Summary 3

1 to 1 AV relationship?  

Yes or unknown  

QRS morphology in precordial leads  

Typical RBBB or LBBB } SVT  

Precordial leads  

- Concordant*  
- No R-S pattern  
- Onset of R to nadir longer than 100 min  } VT

RBBB pattern  

- qR, Rs, or Rr' in V1  
- Frontal plane axis range from +90° to -90°  } VT

LBBB pattern  

- R in V1 longer than 30 min  
- R to nadir of S in V3 greater than 60 min  
- qR or qS in V6  } VT

No  

V rate faster than A rate  

VT

A rate faster than V rate  

Atrial tachycardia, Atrial flutter
Absence of an RS complex in all precordial leads

Yes VT
SN=21% SP=100%

Yes VT
SN=66% SP=98%

Yes VT
SN=82% SP=98%

Yes VT
SN=99% SP=97%

R to S interval > 100 ms in one precordial leads?

Yes VT
SN=66% SP=98%

Yes VT
SN=82% SP=98%

Yes VT
SN=99% SP=97%

AV dissociation?

Yes VT
SN=97% SP=99%

Morphologic criteria for VT present both in precordial leads V1-2 and V6

AV Dissociation present?

Yes VT

Initial R wave in aVR present?

Yes VT

QRS morphology unlike BBB Or FB?

Yes VT

Vi/Vt ≤1?

Yes VT

SVT

No

No

No

No

Vereckei A, Eur Heart J 2007;28:589-600
Presence of an initial R wave?

- Yes VT
- No

Presence of an initial r o q wave > 40 ms?

- Yes VT
- No

Presence of a notch on the descending limb of a negative onset and predominantly negative QRS?

- Yes VT
- No

Vi/Vt ≤1?

- Yes VT
- No

SVT

Vereckei A, Heart Rhythm 2008;5:89-98
\[ v_i = 0.15 \quad v_t = 0.6 \quad v_i/v_t < 1 \rightarrow VT \]

\[ v_i = 0.4 \quad v_t = 0.2 \quad v_i/v_t > 1 \rightarrow SVT \]
RWPT (R wave peak time) ≥ 50 ms in lead II
RWPT (R wave peak time) ≥50 ms in lead II
Final Exercise: 30-year-old M recent MI(5/17)
Final Exercise
Summary

- Monomorphous wide QRS tachycardia
  - Ventricular tachycardia
  - Supraventricular tachycardia with aberrancy
  - Preexcited tachycardia

- Several algorithms are useful in differential diagnosis of wide QRS tachycardia