Arrhythmia Review Course 4

Wide QRS Tachycardia

프로그램 디렉터: 최기준
패널: 양필성, 박준범, 박영아, 문희선
Case

- M/74
- Aborted SCD d/t V-fib, MI (2013.09)
- CAOD 3VD, s/p PCI at pLCx, m-dRCA
- COPD
- Last TTE(2017.07): RWMA at LV inf. wall, LVEF=37%

- C.C: chest pain and palpitation / 2hrs
  - 가슴이 빨리 뛰며 흉부 불편감 있어 응급실 내원함

- V/S: BP 110/70 mmHg, HR 200bpm
During amiodarone IV, BP down (70/50 mmHg) → DC cardioversion 150J
ECG after CV
What is the diagnosis?

1. Ventricular tachycardia
2. SVT with underlying bundle branch block
3. SVT with aberrancy conduction
4. SVT with WPW syndrome; antidromic AVRT
Coronary angiography

- Patent previous stents at pLCx, m-dRCA, pLAD 60% LN (no interval change)
ICD implantation
VT / SVT DDx

Sensitivity: 98.7%, Specificity: 96.5%

AV dissociation

No

Concordance through precordial leads

No

R to S interval > 100ms in any of V1 to V6

No

Morphology criteria for RBBB or LBBB QRS

No

VT

SVT

RBBB configuration
QRS width >140 ms, left axis
QR, R, RSr’ complex in V1
qR in V1
R in V1
Rabbit ear in V1
RS <1 in V6
QS in V6

LBBB configuration
QRS width >160 ms, right axis
(A) Initial R in V1 >30 ms
(B) Slurring or notching of the downstroke of the S-wave in V1–2
(C) Begin QRS-nadir S-wave >70 ms in V1–2
Any Q V6

Any Q in V6

Brugada et al, Circulation 1991;83:1649-1659
Case

- M/36
- No medical history

- C.C: Palpitation / 2hrs
  - 오후 7시경 귀가 중 갑자기 가슴이 빨리 뛰며 머리 아프고 어지러워 응급실 내원함
  - 1st event

- V/S: BP 101/75 mmHg, PR 220bpm
ECG in ER

Adenosine 6mg, 12mg IV → no termination
Verapamil 5mg IV → no termination
DC cardioversion → termination
OPD ECG after event
What is the diagnosis?

1. Ventricular tachycardia
2. SVT with underlying bundle branch block
3. SVT with aberrancy conduction
4. SVT with WPW syndrome; antidromic AVRT
5. Other
ECG after verapamil IV injection
Atrial flutter

Atrial flutter, 2:1 conduction

Atrial flutter, 4:1 conduction

- Atrial rhythm is regular (about 300 bpm)
- Ventricular rate may be regular or irregular due to varying conduction down AV node (3:1, 4:1 or 3:2 conduction...)
- Commonly see 2:1 block with V rate 150 bpm
- Usually see inverted “p” waves or F waves in leads II, III, aVF in typical atrial flutter because atrial activation starts inferiorly and heads upward
Case

- F/64
- Rheumatic valve disease (mild MS, moderate MR)
- Atrial flutter

- Medication: Torsemide 5mg QD, Flecainide 75mg BID, warfarin 2mg QD
C.C. : Chest discomfort during exercise

- C.C. : Chest discomfort
  - “러닝머신하면 가슴이 답답하고 숨이 많이 차 다”

- V/S : BP 132/65 mmHg, HR 65/min
Treadmill test
What is the diagnosis?

1. Ventricular tachycardia
2. SVT with underlying bundle branch block
3. SVT with aberrancy conduction
4. SVT with WPW syndrome; antidromic AVRT
5. Other
Coronary angiography

Normal coronary artery
Use dependency of Flecainide

• **Class Ic**: *Slowest kinetics*
  - Dissociate slowly from the Na channels during diastole

• **Faster HR**, less time to dissociate from the receptor
  → **Increased drug effect**
  - 1. **AV node conduction acceleration** → Rapid ventricular response
  - 2. **QRS widening**
  → **Wide QRS tachycardia**

• **Using Flecainide (Tambocor) in AF or AFL,**
  → **Combination with AV nodal blocker (beta-blocker or CCB)**
Idiopathic VT (RVOT VT)
F/48. palpitation and syncope (ER admission)
F/48. palpitation and syncope (ER admission)
심전도 상 적절한 진단은?

1. Ventricular tachycardia from RV outflow tract
2. Ventricular tachycardia from LV outflow tract
3. Supraventricular tachycardia
4. WPW with Atrial fibrillation
<table>
<thead>
<tr>
<th></th>
<th>Septal</th>
<th>Free wall</th>
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<tbody>
<tr>
<td><strong>Lead I</strong></td>
<td></td>
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<tr>
<td>Post</td>
<td>R, Rs</td>
<td>R, Rs</td>
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<td>Mid</td>
<td>rs, qrs</td>
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<td>Ant</td>
<td>qs, rS</td>
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<td><strong>Notch in inf leads</strong></td>
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<td><strong>Precordial transition</strong></td>
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Limb: 10 mm/mV
Chest: 1
Torsades de Pointes (TdP)
M/69. Complete AV block => temporary PM insertion
다음날, 환자는 가슴이 두근거린다고 호소함.

Ventricular tachycardia and Shock
=> Recurrent VT and shock

적절한 조치는?
1) Electrolyte imbalance 를 확인한다.
2) Amiodarone 를 정주한다.
3) Coronary angiography 를 확인하고 ischemic lesion 이 있는지 확인하다.
4) PM QRS sending value 조절/lead 위치 변경
5) EPS and ICD 를 고려한다.
• Sensing failure
• VT induction by (RonT phenomenon)

PM 위치를 조정한다.
R on T phenomenon & Torsade de pointes

R on T phenomenon

Electrocardiogram image showing: young luo ha 18504713
NBED 19 2/6/2011 19:19:58 25 mm/sec
*** V-TACH at 19:20:09
HR 124
PVC 4 NRP 7/7(2) PULSE ? RESP 12 [CK00400]
N V V V V V V V V V V V V V V N N
84/F.
Stroke with paroxysmal AF

s/p Non ST elevation MI (dLCX)
HF with reduced EF (42%)

Amiodarone, concor 5mg 복용중
EKG findings

- Long QTc interval

- Frequent PVC
위 심전도에서 보이는 소견은?

1) Long QTc interval
2) Frequent PVC
3) R on T phenomenon
4) Tordase de Pointes
5) All
Polymorphic ventricular tachycardia (Torsade de pointes)

• This is a form of VT where there is usually no difficulty in recognizing its ventricular origin.
• Multiple morphologies
• Changing R - R intervals
• The axis seems to twist about the isoelectric line
• It is important to recognize this pattern as there are a number of reversible causes
  • Hypokalemia, hypomagnesemia, hypocalcemia
  • Bradyarrhythmias; AV block, SA node dysfunction
  • LV dysfunction, hypothyroidism, intracranial lesion
  • Drugs; sotalol, amiodarone, macrolides, tricyclic antidepressants, astemizole, domperidone, etc.
CASE 1. 79/M

• DOE, Dizziness
  10 days ago, DOE (NYHA III~IV) during climbing r/o PSVT (other clinic) -> AF after adenosine IV
  Sustained dyspnea afterward

• Past Hx: HTN, DM
• V/S: 120/70-120-20-36.4°C
ECG at ER

Device Settings:
- Speed: 25 mm/sec
- Limb: 10.00 mm/mV
- Chest: 10.00 mm/mV
- 60 - 0.5 - 100 Hz
- STD-12
- PH080A

ECG Leads:
- I
- II
- III
- aVR
- aVL
- aVF
- V1
- V2
- V3
- V4
- V5
- V6
문제1. 심전도 진단은?

1. Ventricular tachycardia
2. SVT with ventricular preexcitation
3. Atrial flutter with preexisting bundle branch block
4. Paroxysmal supraventricular tachycardia
ECG after 1 hour
EPS

Initial Rhythm
EPS

Termination of tachycardia during RF ablation
EPS

CTI block during RF ablation
Final ECG
Atrial flutter

- Macro-reentrant atrial rhythm
  - Atrial rate of around 300bpm, No isoelectric line
  - Ventricular rate is determined by the AV conduction ratio

- Most common type (typical)
  - In structurally normal heart,
    - CTI (cavotricuspid isthmus) as a part of circuit

- Non CTI dependent occur in diseased atria (atypical)
  - Post surgical flutters
  - Post AF ablation flutters
Atrial flutter Classification

• Typical atrial flutter
  1. *Counterclockwise reentry (Common 90%)*
     – Inverted flutter waves in leads II, III, aVF
     – Positive flutter waves in V1
  2. *Clockwise reentry (uncommon)*
     – Positive flutter waves in leads II, III, aVF
     – Broad, inverted flutter waves in V1

• Atypical atrial flutter
CASE 2. 54/M

• Palpitation
  Intermittent palpitation since 10 years ago
  Increasing intensity and duration since then

• Past Hx: none

• V/S: 150/90-130-20-36.5°C
ECG at ER
문제2. 가장 가능성이 높은 심전도 진단은?

1. Ventricular tachycardia
2. SVT with ventricular preexcitation
3. Atrial flutter with preexisting bundle branch block
4. Paroxysmal supraventricular tachycardia
ECG at ER (next day)
During tachycardia
During ablation
EPS
EPS
Idiopathic LV fascicular VT

- Verapamil-sensitive VT
- In structurally normal heart
- ECG: Monomorphous QRS, RBBB, Superior axis
- Mechanism: Reentry
- Treatment: Verapamil or RFCA
Idiopathic LV fascicular VT
CASE 3. 57/M

- **Dyspnea and palpitation**
  Sudden palpitation during sleeping 1 day ago
  Aggravating dyspnea since (NYHA II-III)
  Diagnosed of HF (Other clinic) without medication

- **Past Hx:** HF (5 years ago)
- **Family Hx:** none
- **V/S:** 100/60-190-20-36.5
ECG at ER
ECG at ER (After defib)
문제3. 적절한 조치는?

1. Beta blocker
2. ICD implantation
3. EPS and RFCA
4. All above
ICD implantation
Secondary Prevention of SCA
Secondary Prevention of SCA

- Class I
  - Survivors of cardiac arrest due to VF or hemodynamically unstable sustained VT without a reversible cause
  - Patients with structural heart disease and spontaneous sustained VT
Case. M/20; Sudden collapse

- 20세 통신병 일병.
- 2018-2-23 훈련 대기차 앉아있다가 두근거린다고 하더니 10분 뒤 엎으로 쓰러짐.

- V/S: 부대간부-맥박은 촉지되나 호흡이 거칠었다 → 5분 뒤 군의관-맥박이 촉지되지 않아 CPR 시작

- Medical history: 초등학교 때부터 1년에 7~8번, 30분~한시간 지속되는 두근거림이 있었다.
ECG rhythm strip retrieved from AED

Grid size is 5mm per second
ECG after ROSC

rhythm strip after ROSC
이 환자의 진단은?

1. SVT with aberrancy
2. SVT with underlying bundle branch block
3. Antidromic AVRT with underlying concealed bypass tract
4. WPW syndrome with AF
5. Idiopathic LV tachycardia
Radiofrequency catheter ablation

**Catheter position**

RA: high right atrium; CS: coronary sinus; His: His bundle area; ABLd: distal ablation catheter.

**Surface EKG I, III, aVF; CS 7,8: CS ostium; ABL d: distal electrode of ablation catheter; ABL p: proximal electrode of ablation catheter.**
12 leads EKG after catheter ablation
< WPW syndrome with AF >

- AF can occur in patients with accessory pathways.

- Rapid anterograde accessory pathway conduction during AF can result in SCD with a 10-year risk ranging from 0.15% to 0.24%.

- Increased risk of SCD is associated with a history of symptomatic tachycardia, multiple accessory pathways, and a shortest pre-excited R-R interval of <250 ms during AF.
< Treatment of WPW with AF >

Synchronized cardioversion for acute treatment in hemodynamically unstable patients with pre-excited AF!

- AV nodal-blocking agents may be contraindicated in patients at risk of rapid conduction down the accessory pathway during AF.

2015 ACC/AHA/HRS SVT Guideline
Case. M/20; Palpitation

- 20세 일병.
- 주로 1년전부터 점프하거나 축구하면 두근거림.

< 24 Hr-Holter monitoring >
Baseline 12 leads ECG
이 환자의 진단은?

1. SVT with aberrancy
2. SVT with underlying bundle branch block
3. Antidromic AVRT with WPW syndrome
4. Orthodromic AVRT with WPW syndrome
5. Idiopathic LV tachycardia
Induction of wide QRS tachycardia during EPS (by RVP 260ms)
12 leads EKG during wide QRS tachycardia
Compared with 24 Hr Holter
Induction of narrow QRS tachycardia during EPS (by PAC)
< 정상 전도 >
Case. M/38; Palpitation with dyspnea

- 38세 상사.
- 3개월전부터 간헐적으로 두근거리면 숨찬감 동반.

- V/S:
  BP 113/87, PR 136, RR 22, BT 36.2, SPO2 92%

- Medical history: 3주전 맥박이 빠르고 혈압이 낮다고 하여 헌혈을 할 수 없었으며 이후 1주 간격으로 2회 더 시도하였으나 같은 이유로 거절당함.
Tachycardia ECG
Termination of tachycardia after amiodarone loading (900mg)
이 환자의 심부전의 원인은?

1. Ventricular tachycardia
2. SVT with aberrancy
3. SVT with underlying bundle branch block
4. Antidromic AVRT
Induction of VT by RVP 600ms
Follow-up Echo and CXR

- Next day after RFA
- 2 weeks later
- 2 years later
< Idiopathic left ventricular tachycardia >

• Among idiopathic VTs, ILVT is second most common form (7-12% of idiopathic VTs).
• Typically in young adult with a slight male preponderance
• Presentation consists of palpitations, presyncope and rarely syncope, but not sudden cardiac death.
Treatment of ILVT

- Referred to as verapamil-sensitive LV tachycardia
  - Slow or terminate with intravenous verapamil
  - No effect typically with adenosine

- The predominant mechanism of fascicular VT is macroreentry using the left posterior (less commonly anterior) fascicle and abnormal Purkinje tissueful.

→ Catheter ablation is highly success.