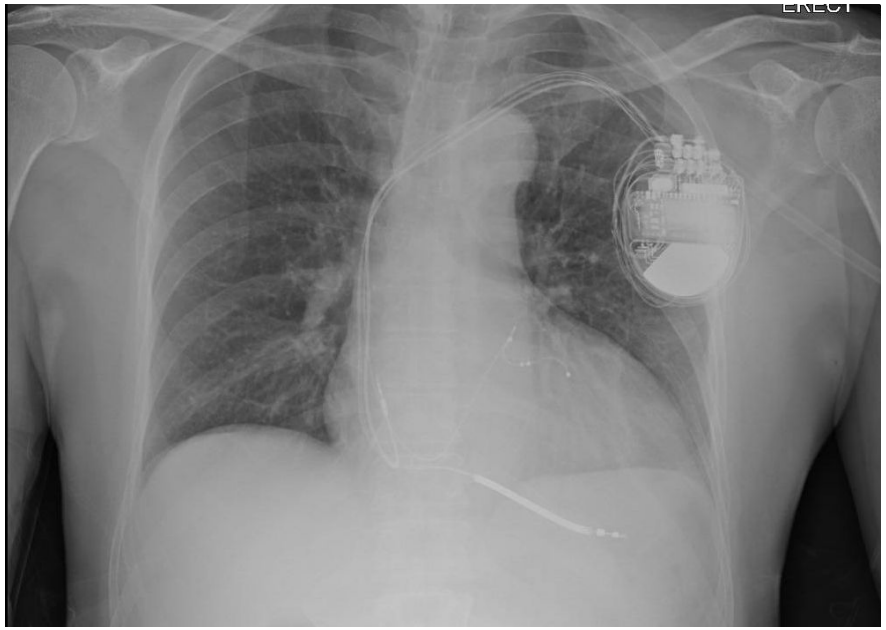
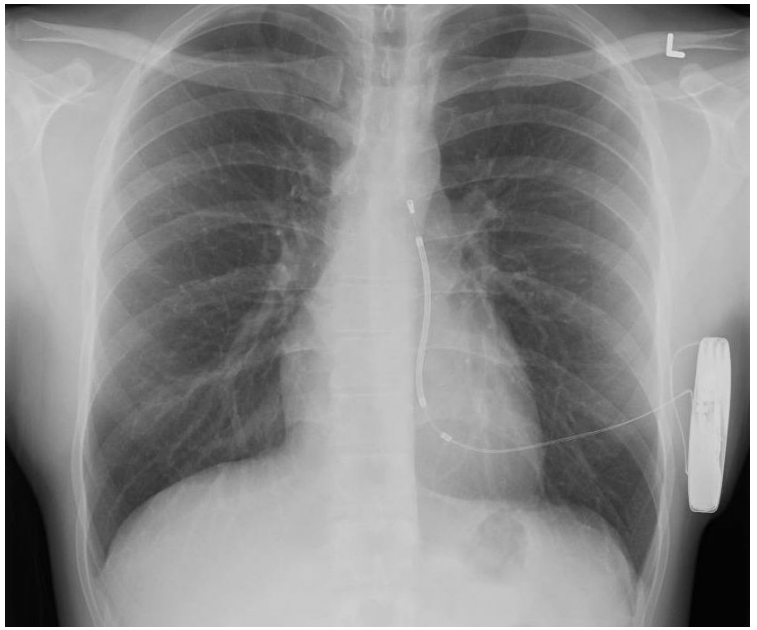
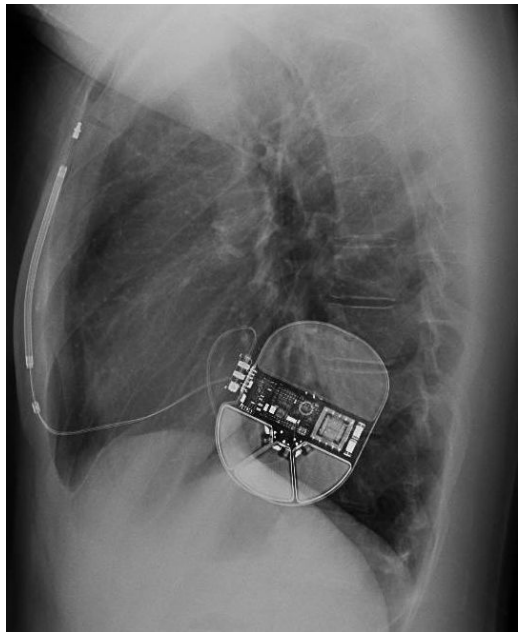
# TRP Device Troubleshooting

From dot plots to EGMs

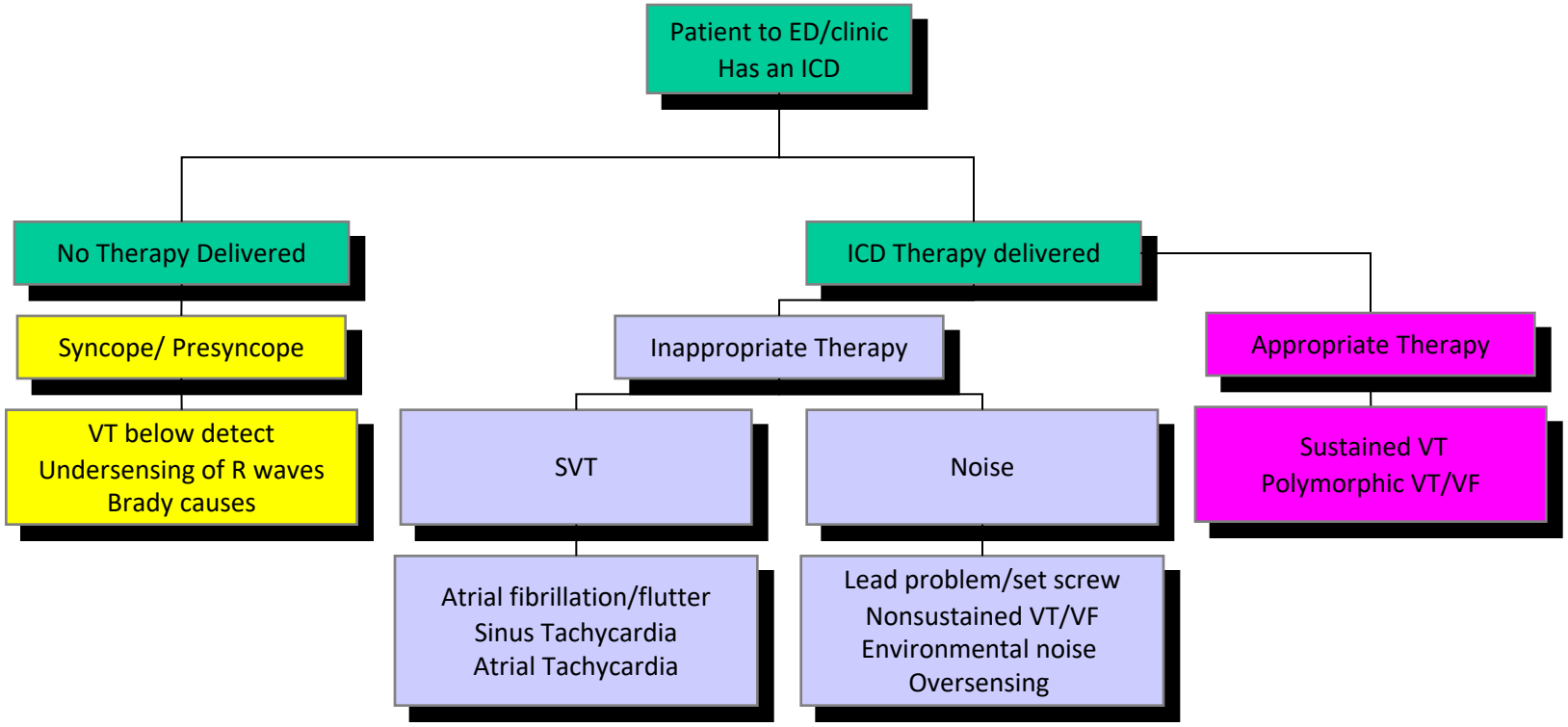
April 2021



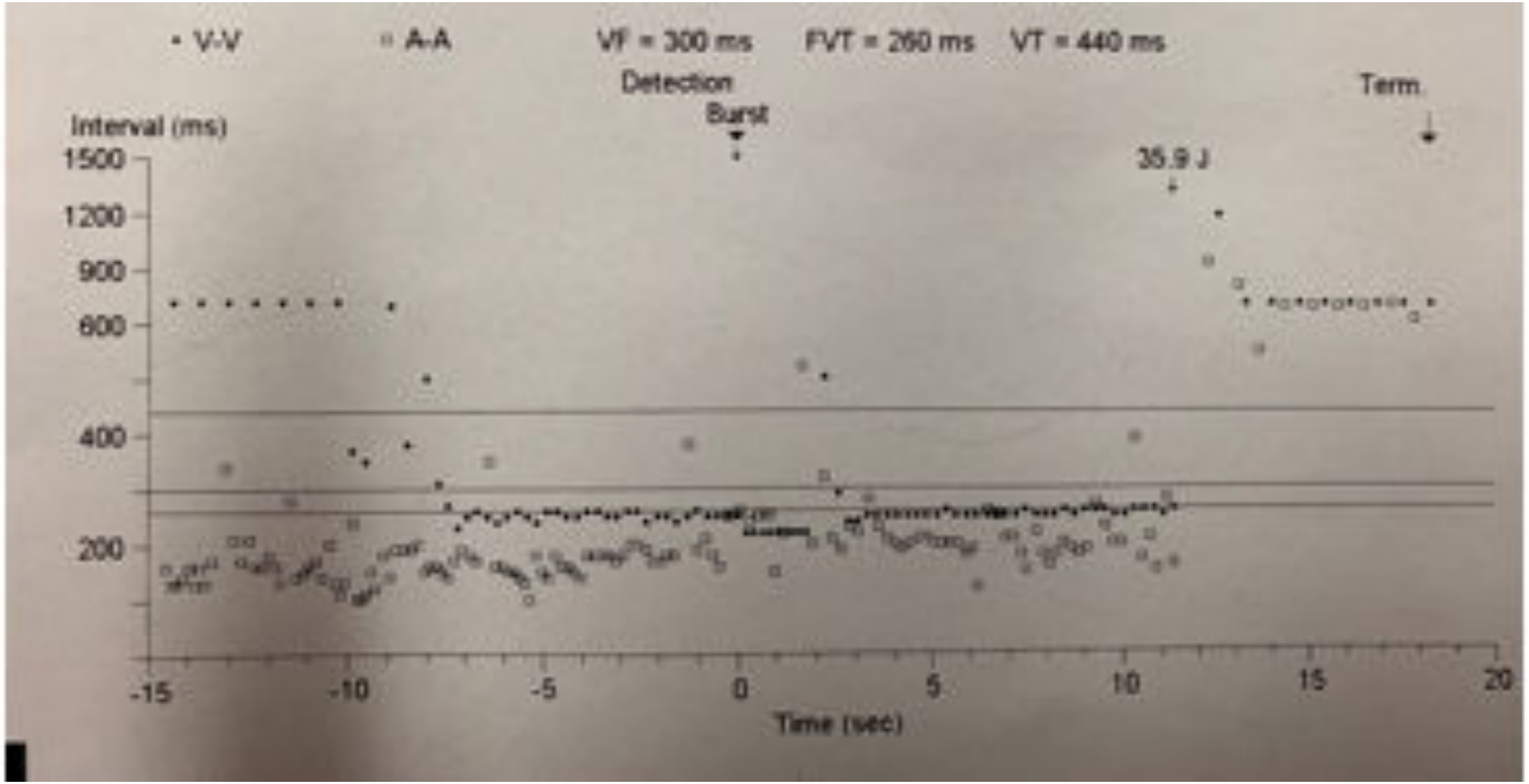


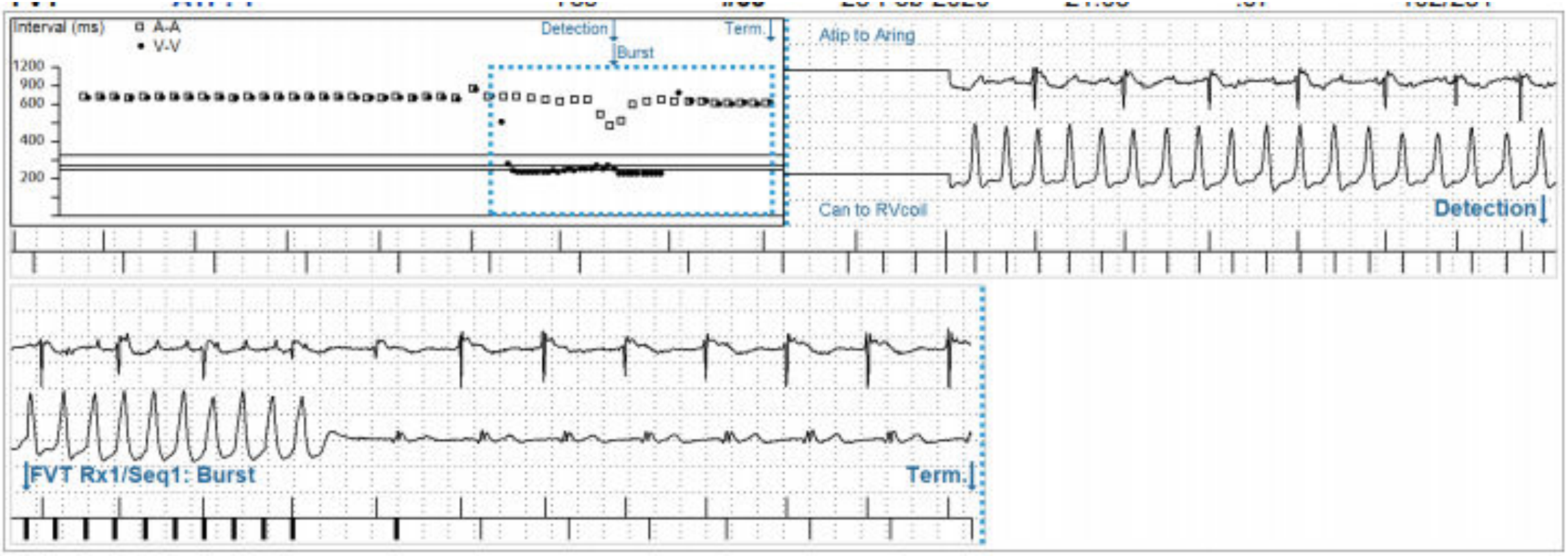
# ICD Troubleshooting Algorithm



Interpret the following dot plot.
Did the device perform appropriately?



Interpret the following dot plot.
Did the device perform appropriately?



Interpret the interrogation on the next four slides.
Did the device perform appropriately?

ST. JUDE MEDICAL

**Fortify Assura™ DR 2359-40C ICD** 1107852
Following Physician: ST MICHAELS HOSPITAL

**15:16**
In-Clinic

## FastPath™ Summary

⚠ 3 Alerts



**Battery**
Longevity: 5.7-6.4 yrs


| | |
|---|---|
| Implant Date: | Sep 15, 2015 |
| Last Max Charge | 9.5 sec (Feb 22, 2018) |
| Battery Current | 12 uA |
| Remaining Capacity to ERI | 67% |

**Test Results** Apr 26, 2018 — Ⓐ Automatic

| | Capture | Sense | Lead Impedance |
|---|---|---|---|
| A | **1.25V @ 0.5ms** (Bi)<br>1.0V @ 0.5ms (Bi) Jan 25, 2018 | **1.1mV** (Bi) Ⓐ<br>1.9mV (Bi) Jan 25, 2018 | **490 Ω** (Bi) Ⓐ<br>580 Ω (Bi) Jan 25, 2018 |
| V | **0.75V @ 0.5ms** (Bi)<br>0.75V @ 0.5ms (Bi) Jan 25, 2018 | **>12.0mV** (Bi) Ⓐ<br>>12.0mV (Bi) Jan 25, 2018 | **450 Ω** (Bi) Ⓐ<br>480 Ω (Bi) Jan 25, 2018 |
| HV | | | **74 Ω** (RV to Can) Ⓐ<br>79 Ω (RV to Can) Jan 25, 2018 |

**Parameters**

| | | | VT-1 | VT-2 | VF |
|---|---|---|---|---|---|
| Mode | DDD | Zone Configuration | | | |
| Base Rate | 40 min-1 | Detection Criteria | ▸**141** min-1 | 200 min-1 | 230 min-1 |
| Max Track Rate | 100 min-1 | Therapy **(ENABLED)** | ATP x3 | ATP x1 | ATP x1 |
| Paced AV Delay | 350 ms | | 25.0 J | 25.0 J | 36.0 J |
| Sensed AV Delay | 325 ms | | 36.0 J | 36.0 J | 36.0 J |
| | | | 40.0 J x2 | 40.0 J x2 | 40.0 J x4 |

| **Capture & Sense** | **A** | **V** |
|---|---|---|
| ACap™ Confirm/V. AutoCapture | Off | Off |
| Pulse Amplitude (Margin) | ▸**2.5** V (2.0:1) | 2.0 V (2.6:1) |
| Pulse Width | 0.5 ms | 0.5 ms |
| AutoSense | On | On |
| Sensitivity | Auto A | Auto A |

**Diagnostics Summary** Since Jan 25, 2018

| | |
|---|---|
| AP | <1 % |
| VP | <1 % |
| AMS Episodes | 86 |
| Mode Switch | 1.4% |
| AT/AF Burden | 1.2% |

**VT/VF Episodes: 0** Since Jan 25, 2018

| | VT-1 | VT-2 | VF |
|---|---|---|---|
| Episodes | 0 | 0 | 0 |
| ATP Delivered | 0 | 0 | 0 |
| Shocks Delivered | 0 | 0 | 0 |

SVT Episodes: 0
Non-sustained Episodes: 0

**Alerts**

**High V. Rates during AT/AF**
**Exceeded AT/AF Burden**
**Long AT/AF Episode(s)**

## VT/VF Episodes

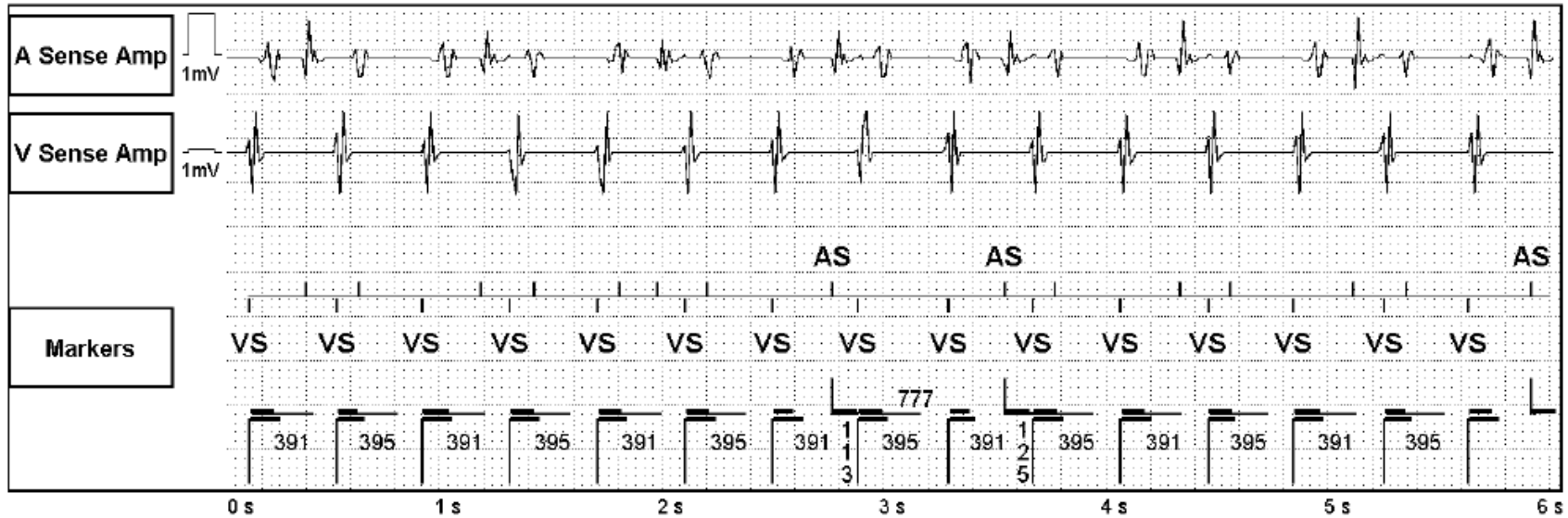
No episodes recorded

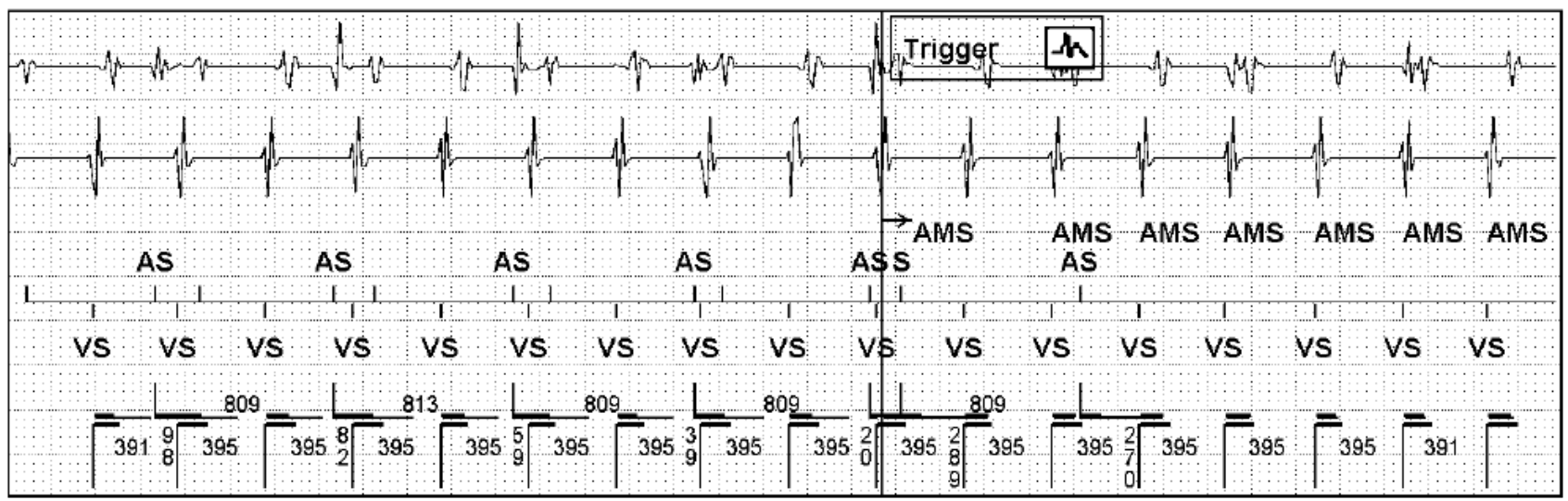
## Other Episodes

| Date / Time | Type | Peak A / V Rate (min-1) | Duration (D:H:M:S) | Alerts |
|---|---|---|---|---|
| Apr 16, 2018 15:53 | AMS | 549 / 162 | 0:15:32:20 | |
| Apr 16, 2018 15:40 | AMS | 569 / 154 | 0:00:12:00 | |
| Apr 16, 2018 15:22 | AMS | 591 / 154 | 0:00:18:36 | |
| Apr 16, 2018 14:53 | AMS | 569 / 155 | 0:00:28:10 | |
| Apr 16, 2018 14:46 | AMS | 569 / 154 | 0:00:06:46 | |
| Apr 16, 2018 14:45 | AMS | 591 / 154 | 0:00:01:02 | |
| Apr 16, 2018 14:31 | AMS | 591 / 155 | 0:00:12:48 | |
| Apr 16, 2018 14:29 | AMS | 569 / 155 | 0:00:02:08 | |
| Apr 16, 2018 14:25 | AMS | 240 / 155 | 0:00:00:38 | |
| Apr 16, 2018 14:23 | AMS | 229 / 155 | 0:00:01:22 | |
| Apr 16, 2018 14:20 | AMS | 223 / 155 | 0:00:01:18 | |
| Apr 16, 2018 14:12 | AMS | 279 / 155 | 0:00:03:32 | |
| Apr 16, 2018 13:32 | AMS | 327 / 157 | 0:00:38:56 | |
| Apr 16, 2018 13:28 | AMS | 223 / 154 | 0:00:01:42 | |
| Apr 16, 2018 13:09 | AMS | 295 / 154 | 0:00:05:14 | |
| Apr 16, 2018 12:50 | AMS | 334 / 157 | 0:00:15:52 | |
| Apr 16, 2018 11:59 | AMS | n/a / n/a | | |
| Apr 16, 2018 11:56 | AMS | n/a / n/a | | |
| Apr 16, 2018 11:47 | AMS | n/a / n/a | | |
| Apr 16, 2018 11:02 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:56 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:55 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:53 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:52 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:47 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:46 | AMS | n/a / n/a | | |
| Apr 16, 2018 10:21 | AMS | n/a / n/a | | |

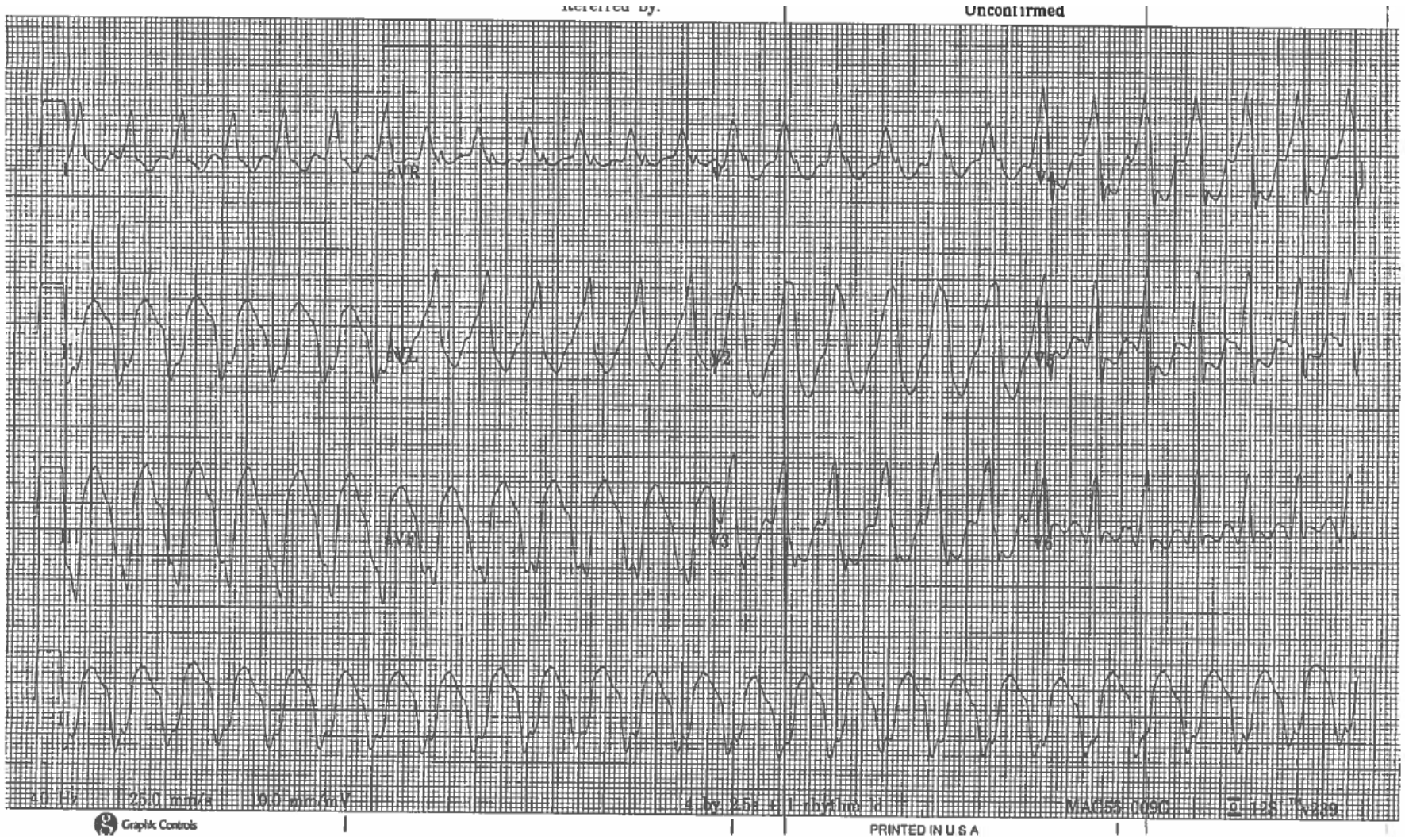
1: A Sense Amp AutoGain (4.8 mm/mV)
2: V Sense Amp AutoGain (0.4 mm/mV)
3: Markers

Sweep Speed: 25 mm/s

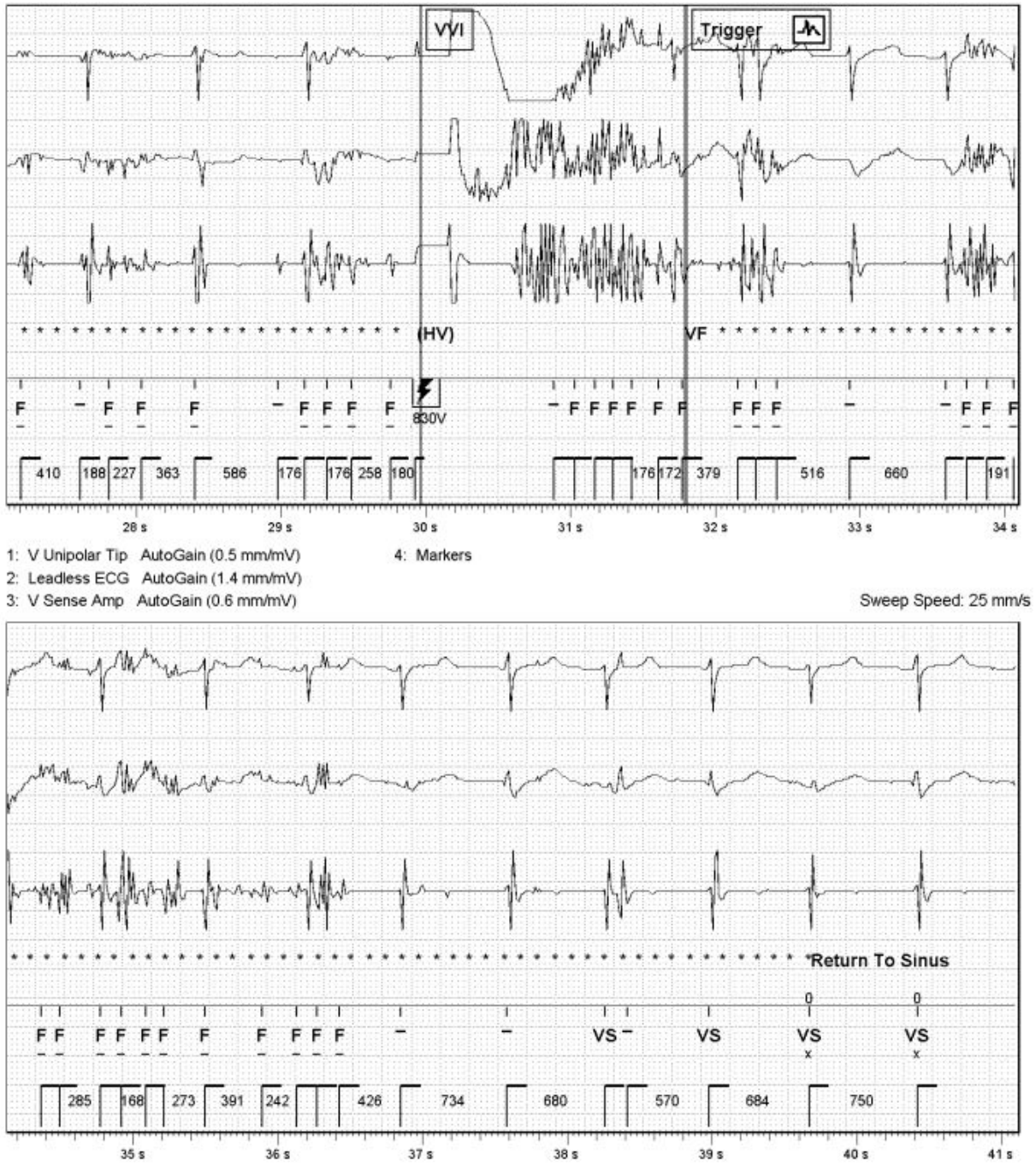


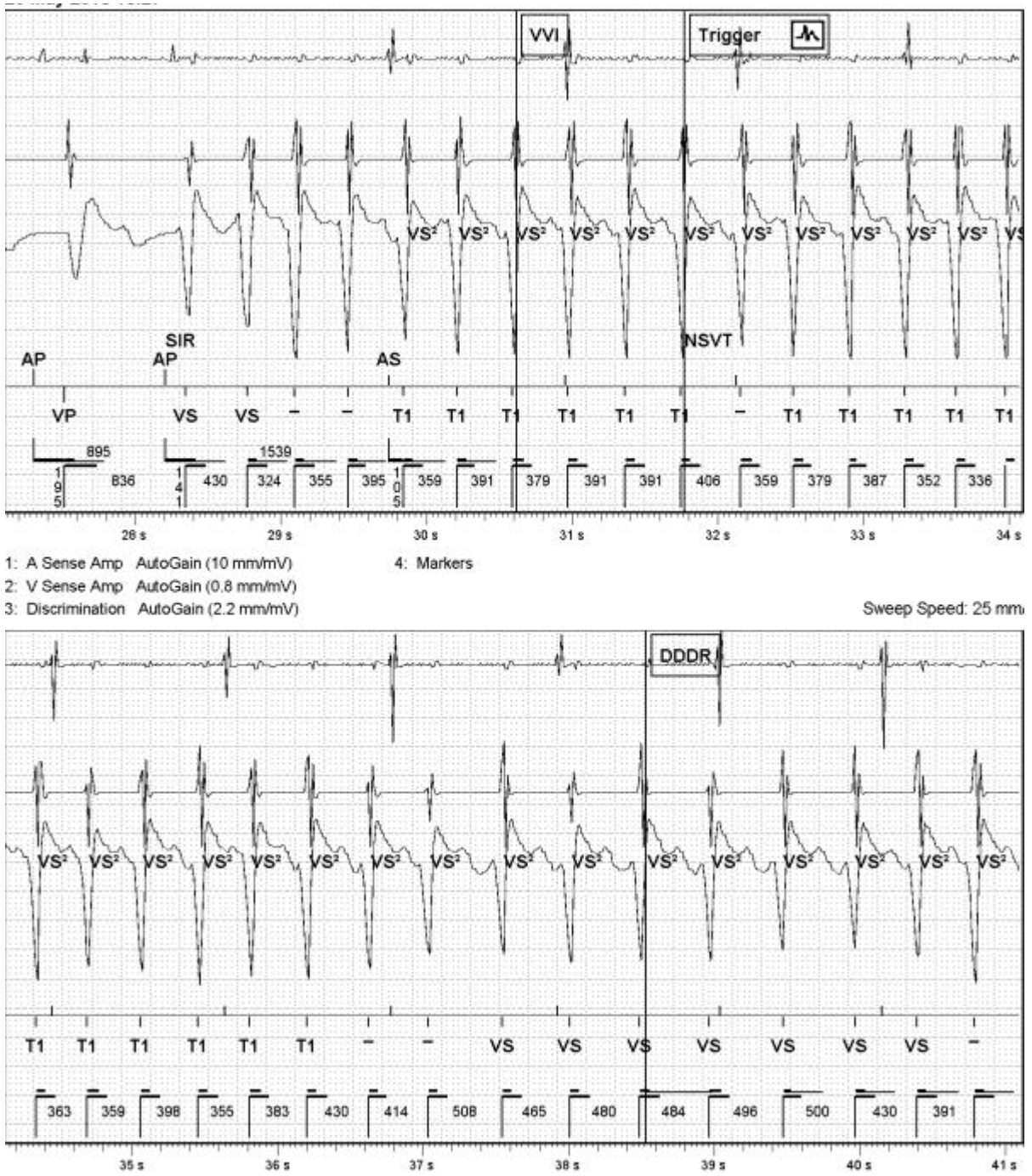
- The patient is in the device clinic.
- What would you like to do now.


Referred By:
Unconfirmed
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
25.0 mm/s
10.0 mm/mV
4 by 2.5s + 1 rhythm
MAC55 009C
PRINTED IN U.S.A.

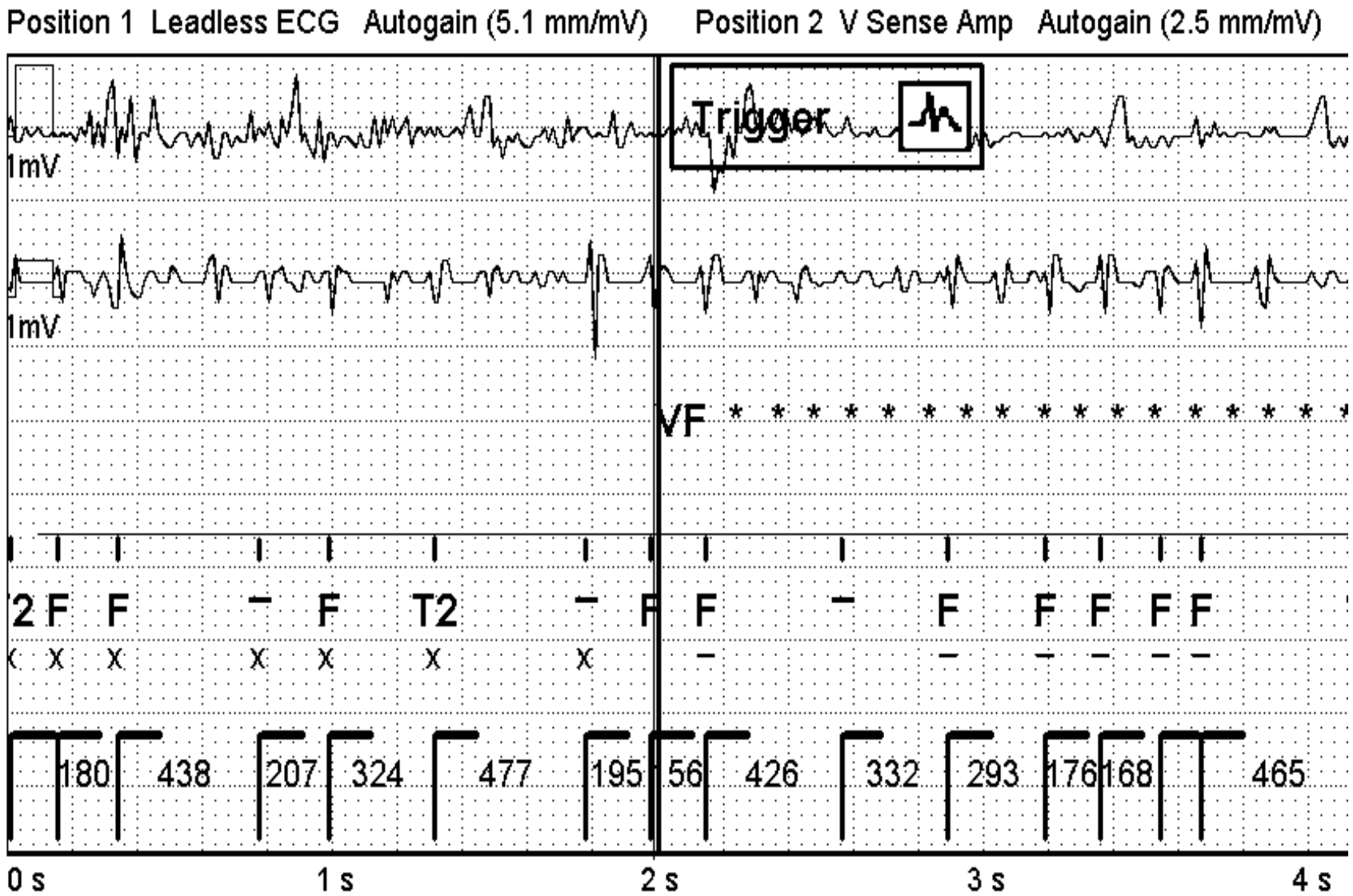
Interpret the following intracardiac tracing.
What is your diagnosis?
Did the device perform appropriately?



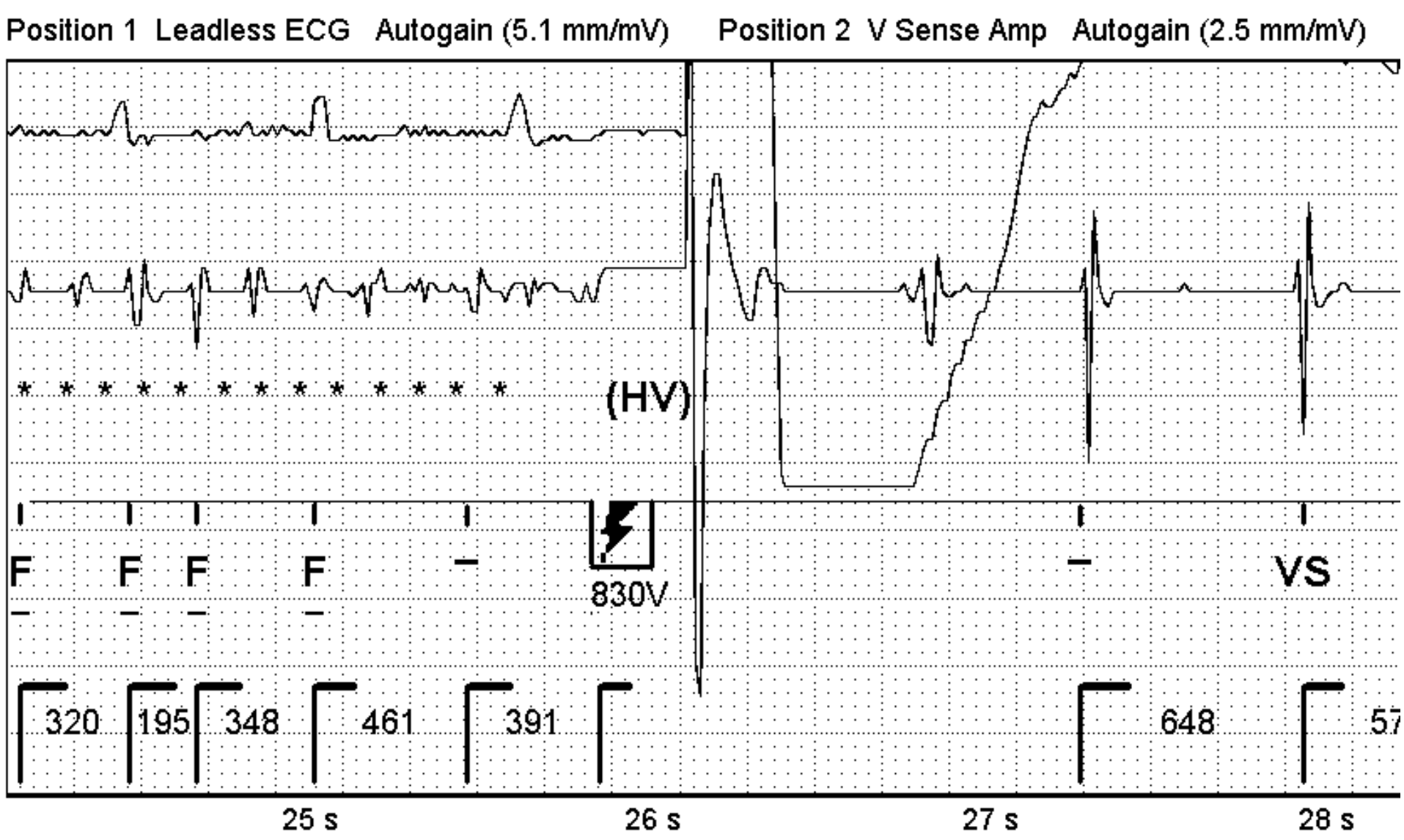
Interpret the following intracardiac tracing.
What is your diagnosis?
Did the device perform appropriately?

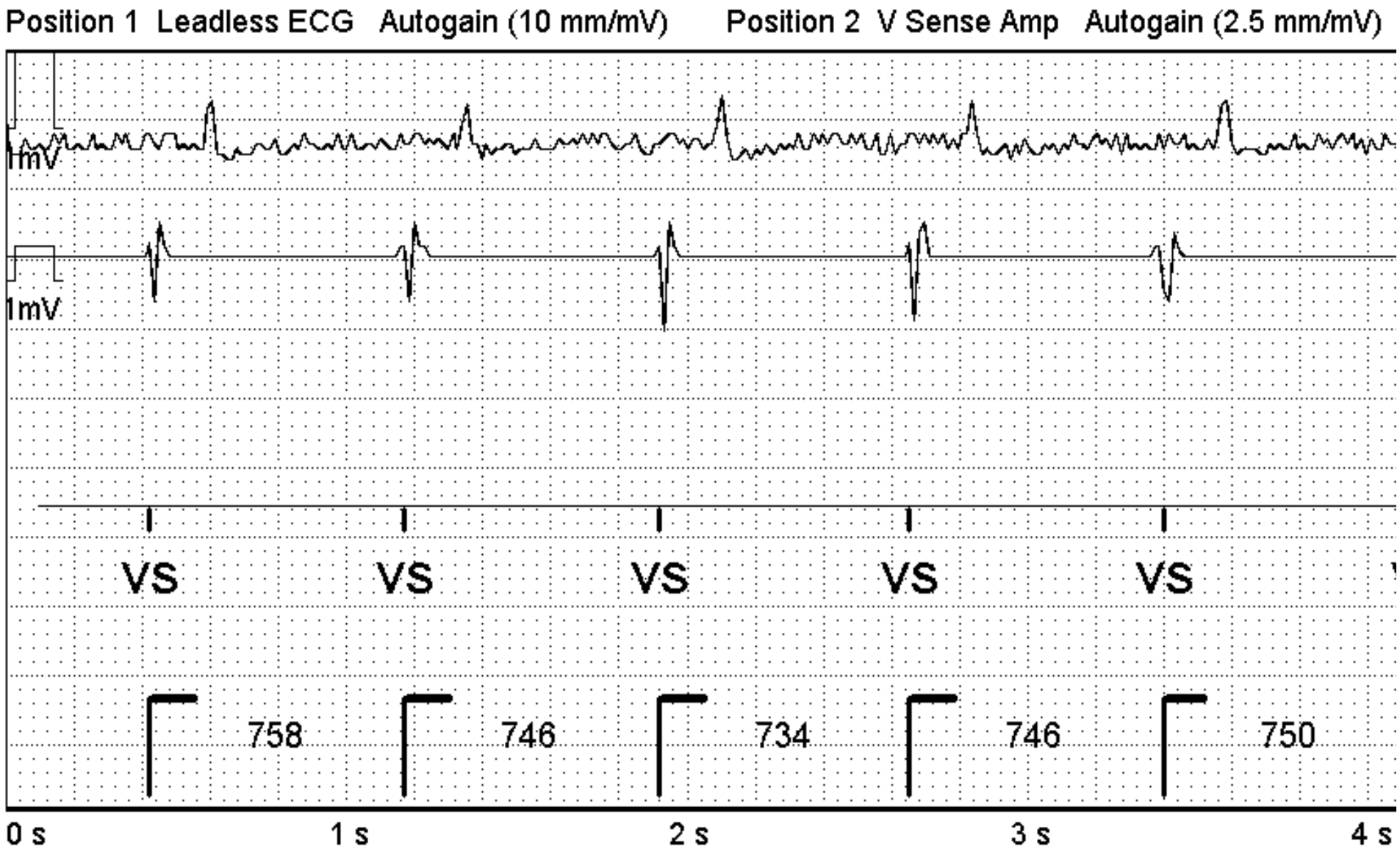


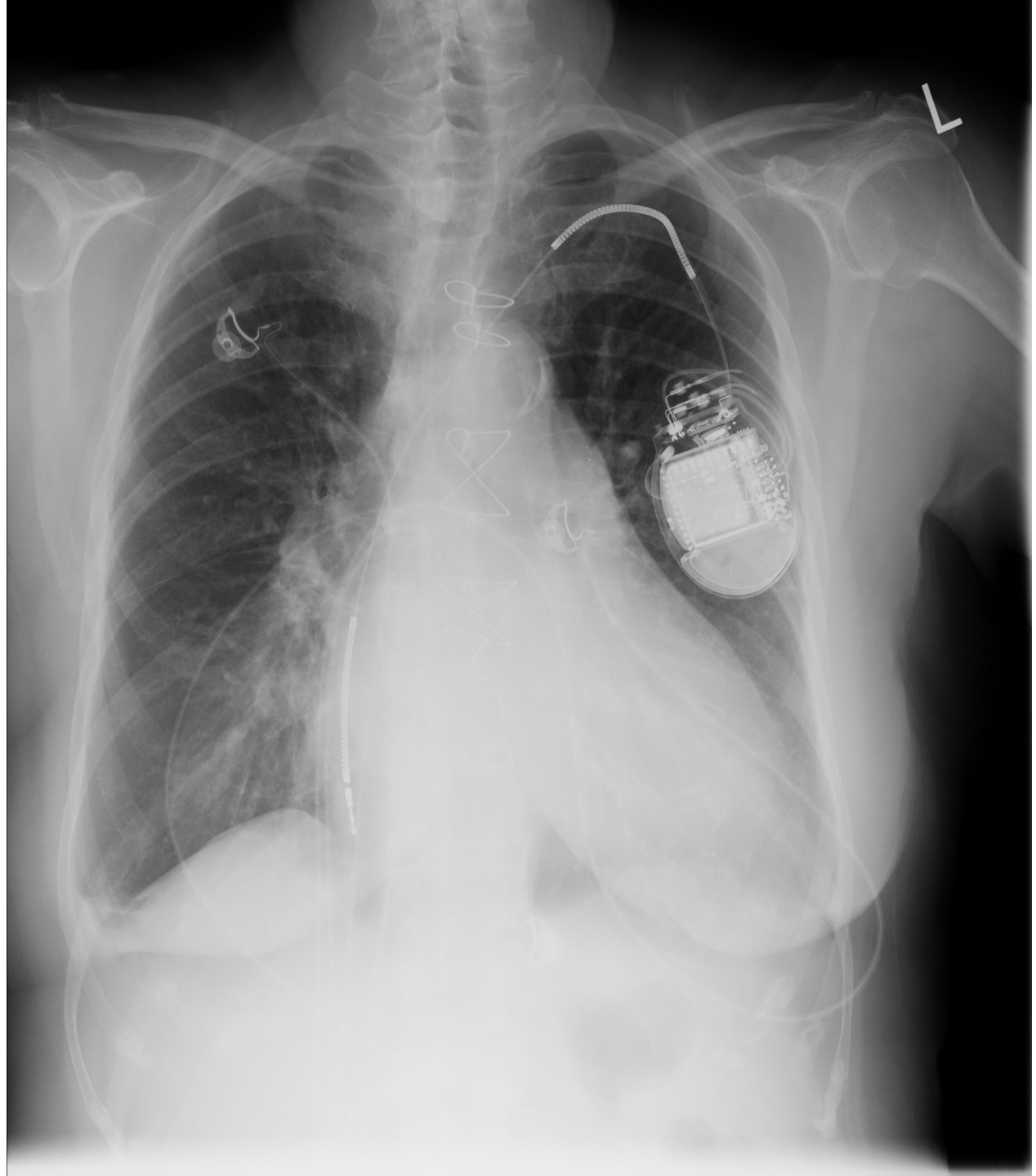
Interpret the intracardiac tracings on the next three slides
What is your diagnosis?
Did the device perform appropriately?



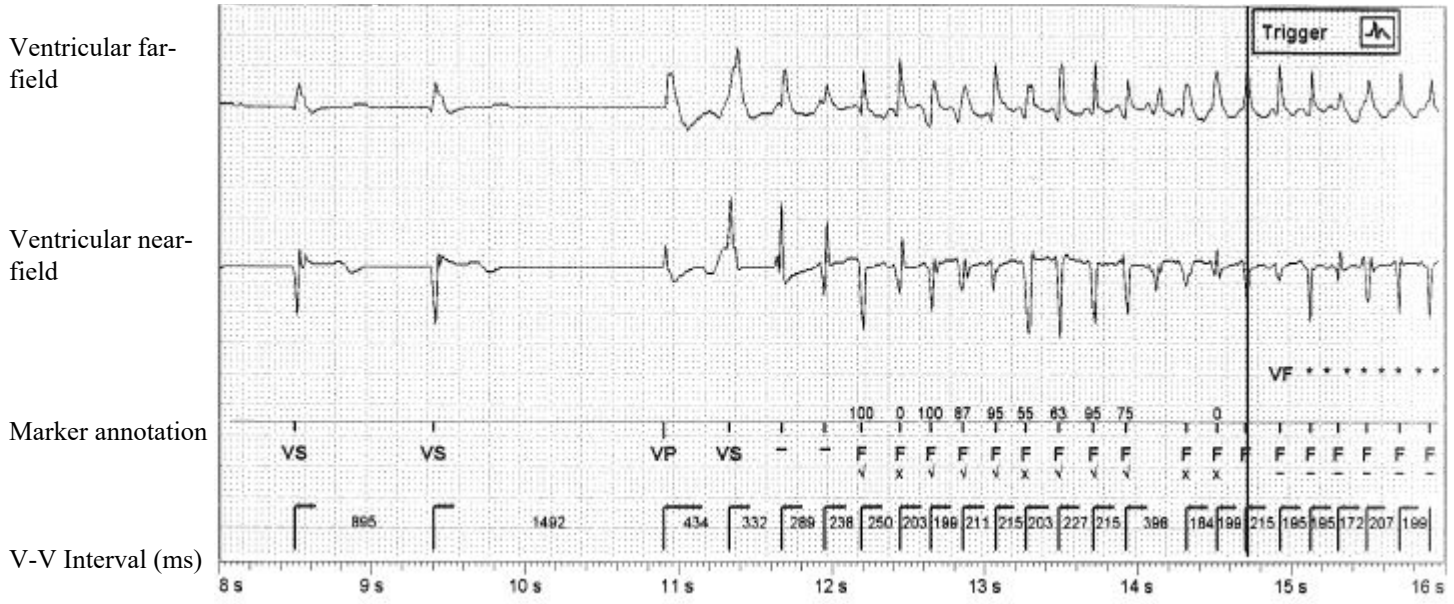
(Continued) **VF** 22 Jun 2010 20:46

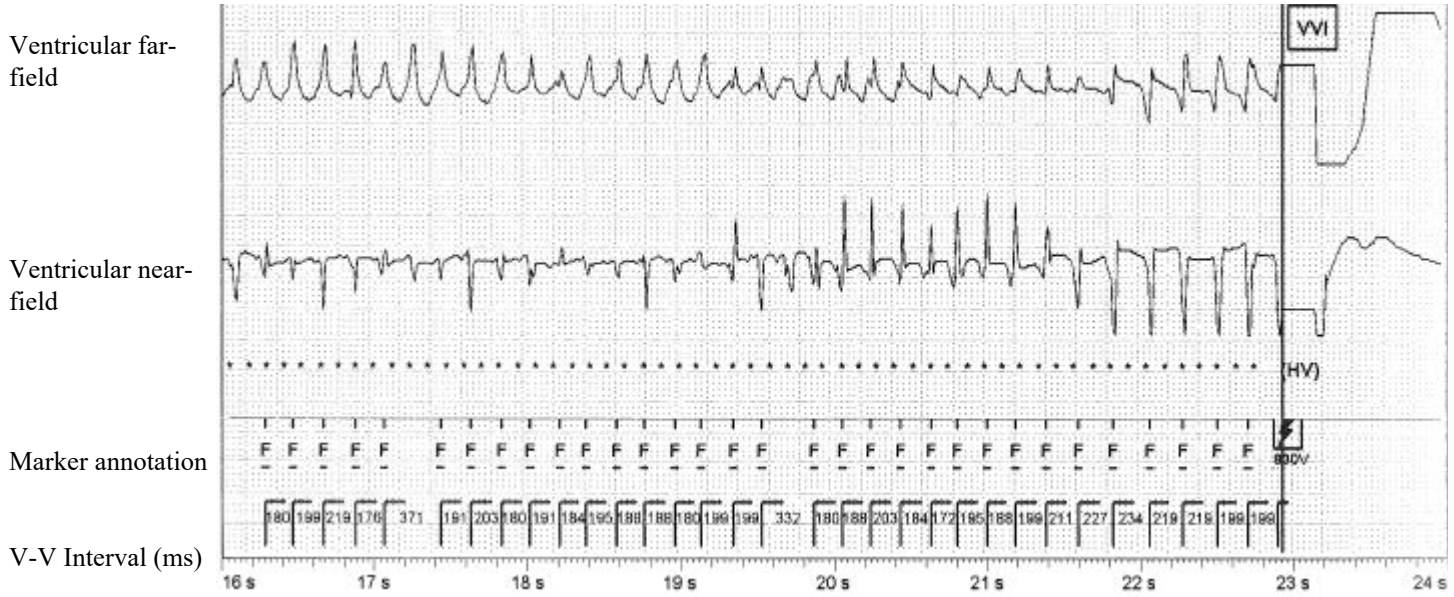



Position 1 Leadless ECG Autogain (10 mm/mV)
Position 2 V Sense Amp Autogain (2.5 mm/mV)
1mV
1mV
VS
VS
VS
VS
VS
758
746
734
746
750
0 s
1 s
2 s
3 s
4 s


L

Interpret the following intracardiac tracing. What is your diagnosis? Did the device perform appropriately?



# “Device-induced” ventricular tachyarrhythmia

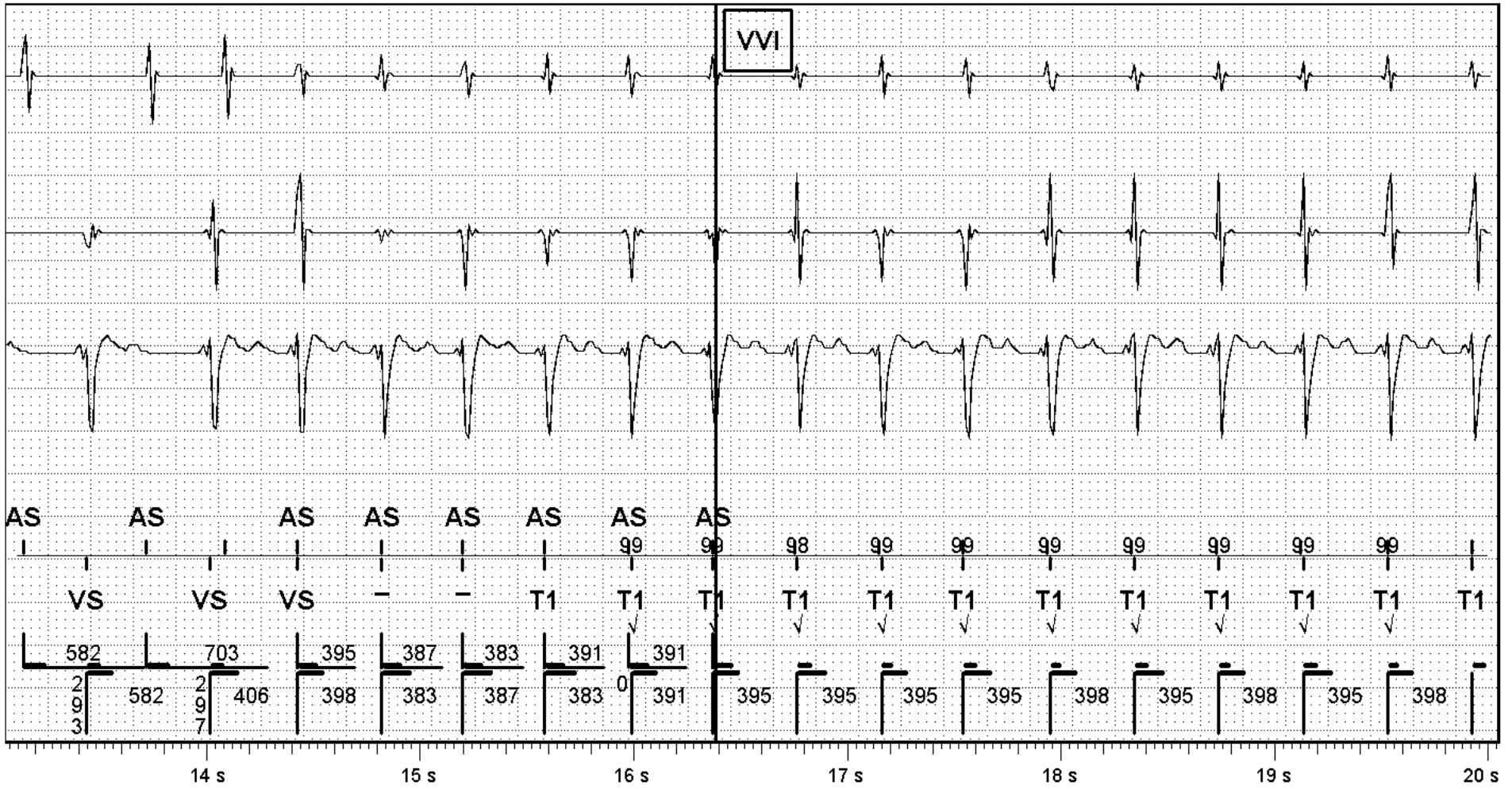
- Mechanical irritation causing ectopy and nsVT is not uncommon (not dependent on pacing)
- Short-long sequence (ectopy followed by pause and backup pacing) can trigger poly VT/VF [1,2]
- pacing induced polyVT (not pause-dependent) has been described with LV pacing [3]


1. Vlay et al. PACE 20:132
2. Sweeney et al. JACC 50:614
3. Rivero-Ayerza et al. Circulation 109:2924

Interpret the following intracardiac tracing on the next 3 slides

What is your diagnosis?

Did the device perform appropriately?



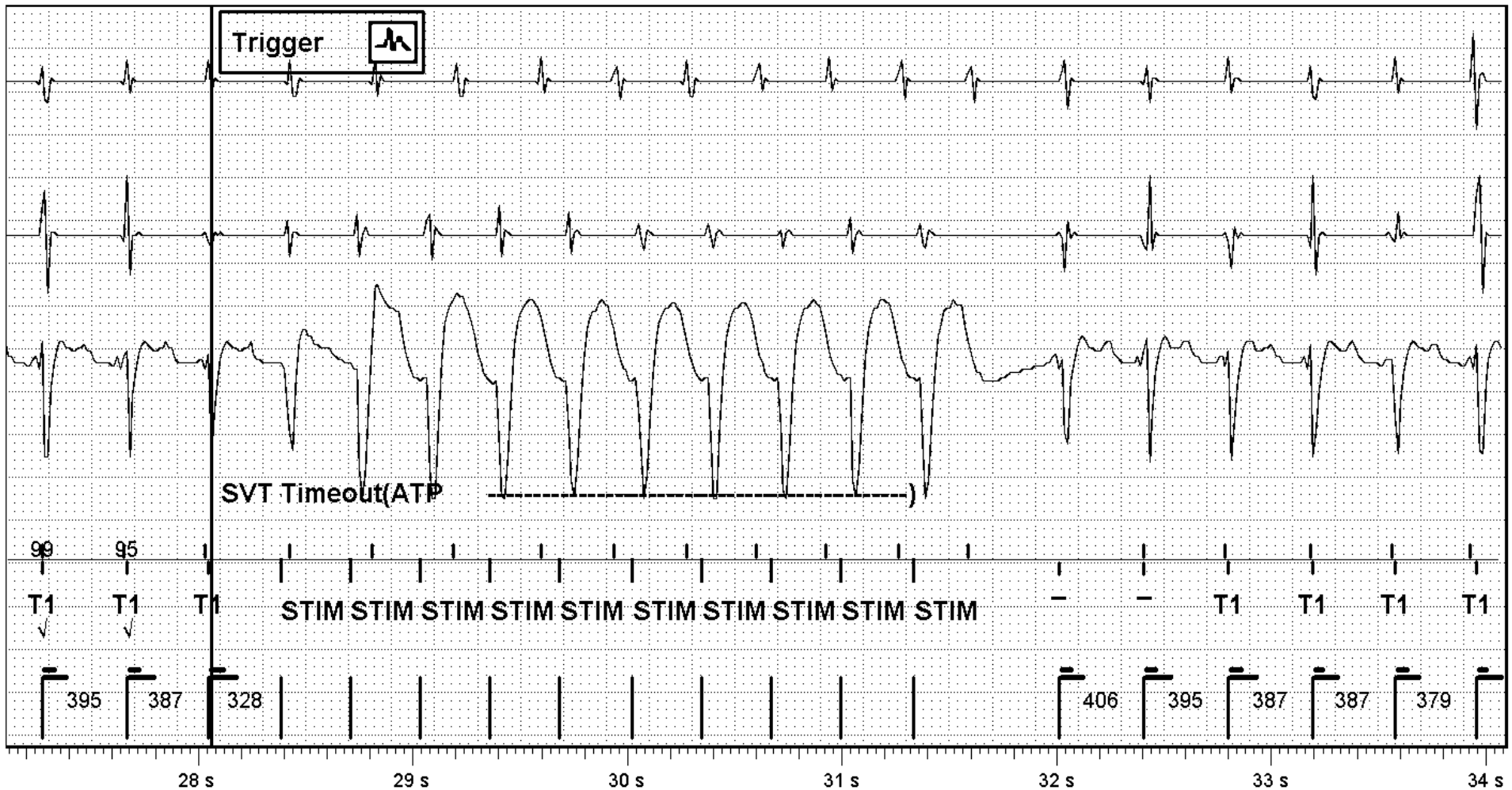

1: A Sense Amp AutoGain (1.3 mm/mV)

2: V Sense Amp AutoGain (0.6 mm/mV)

3: Discrimination AutoGain (1.4 mm/mV)

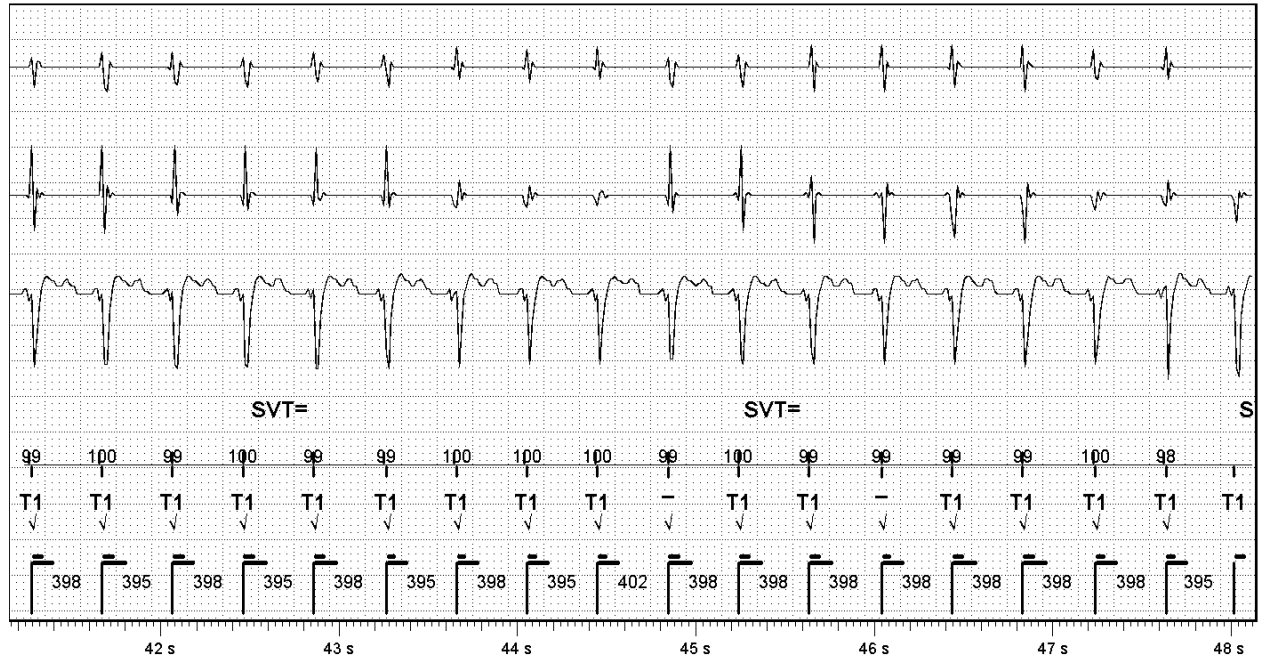
4: Markers

Sweep Speed: 25 mm/s



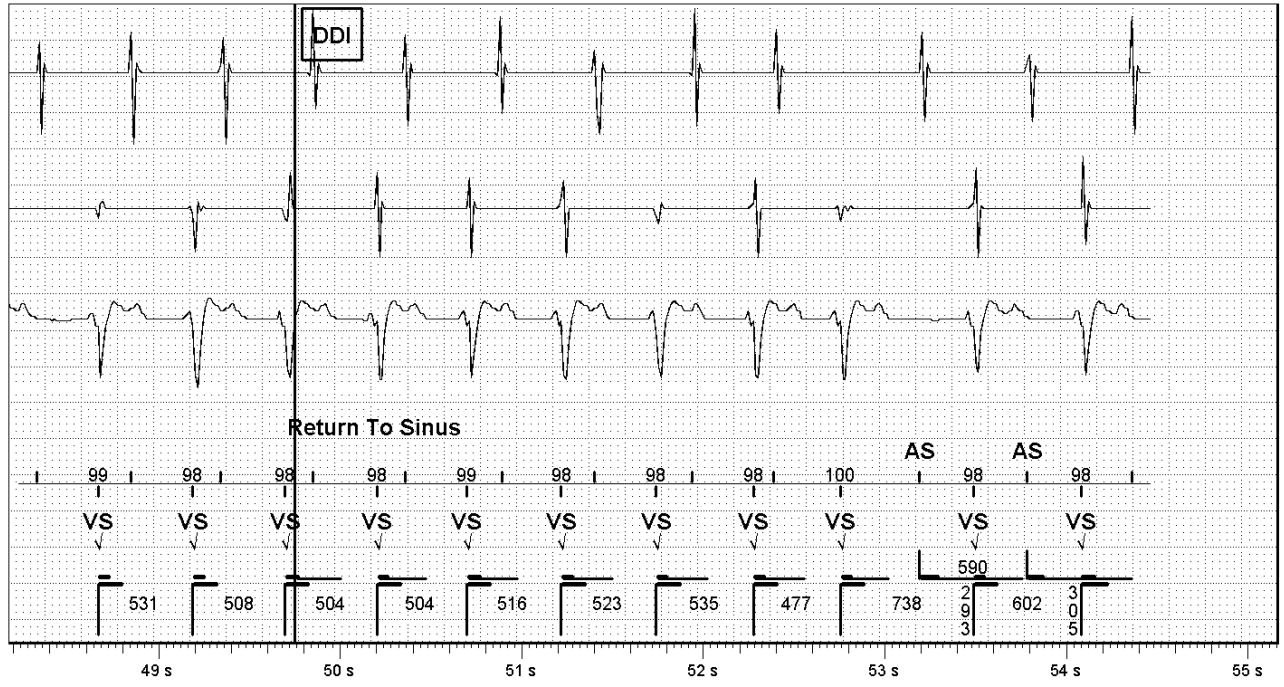

1: A Sense Amp AutoGain (1.7 mm/mV)
2: V Sense Amp AutoGain (0.6 mm/mV)
3: Discrimination AutoGain (1.6 mm/mV)
4: Markers

Sweep Speed: 25 mm/s




1: A Sense Amp AutoGain (2.3 mm/mV)
2: V Sense Amp AutoGain (0.6 mm/mV)
3: Discrimination AutoGain (1.9 mm/mV)
4: Markers

Sweep Speed: 25 mm/s



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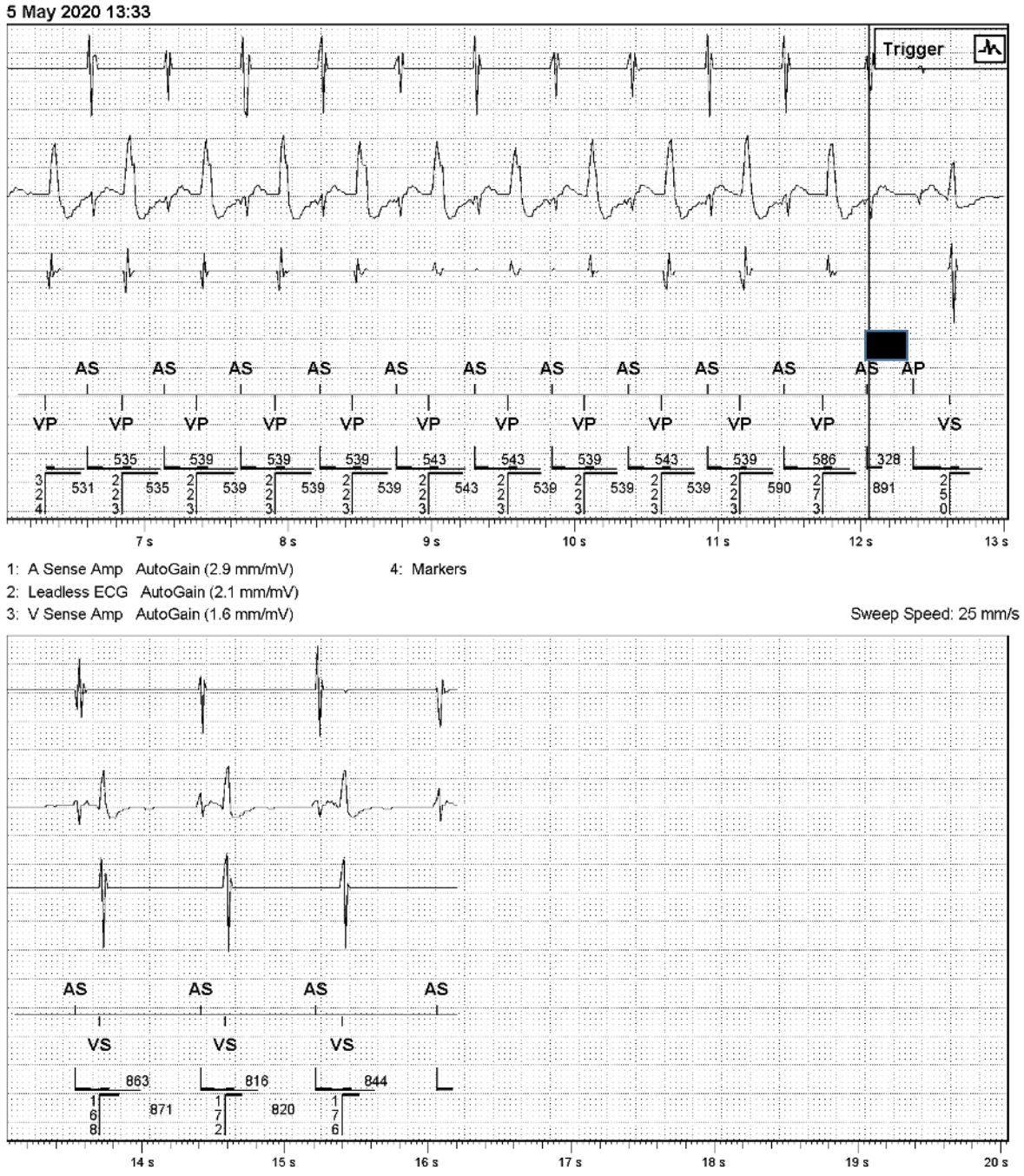
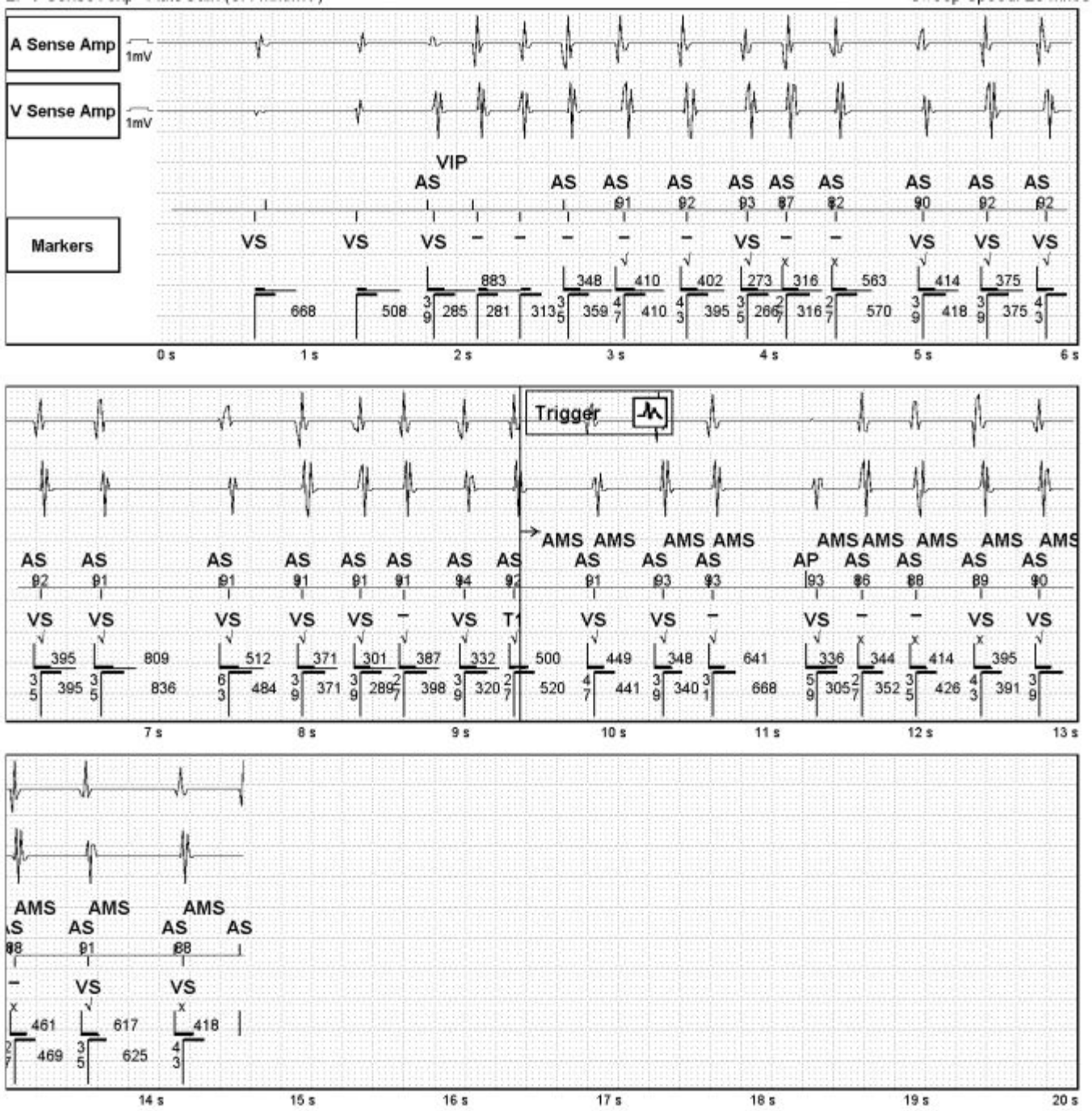
What is your diagnosis?
Did the device perform appropriately?



Interpret the following intracardiac tracing.
What is your diagnosis?
Did the device perform appropriately?



# ICD's in the OR

- Donut magnet taped to device throughout the procedure will inhibit therapies
    - Monitoring throughout magnet application
- Turn therapies OFF
- Magnet will not cause asynchronous (D/VOO) pacing in an ICD

    -pacemaker dependent patients need D/VOO or noise reversion on for the procedure since cautery can suppress pacing

# Urgencies/ Emergencies

- **Multiple ICD shocks**
  - **Appropriate**
    - Electrical storm
      - Assess secondary causes – sepsis, ischemia, hyperthyroidism
      - Treat VT/VF – Amiodarone, BB, correct electrolytes, sedate
      - Call for interrogation of ICD

# Urgencies/ Emergencies

- **Multiple ICD shocks**

- **Inappropriate**
  - Sinus/ Atrial Tachycardias
  - Atrial Fibrillation
  - Lead issues (# or dislodgement)
  - Noise

  - **Tx: MAGNET, MAGNET, MAGNET**

# Urgencies/ Emergencies

- Patient in VT/VF with an ICD but not receiving therapy
  - VT at rates < ICD rate cut off
  - Lead issues
  - Small signal amplitude

  Treat VF/VT
  - Amiodarone, BB, External Defib

# Emergency Treatment

- ALL ICDs have tachycardia therapy disabled with a magnet  (not brady)
- Feel for the can (chest or abdomen or left axilla – subcutaneous device)
- In an arrest, treat the patient as though he did not have an ICD
- Caregivers will not get a shock