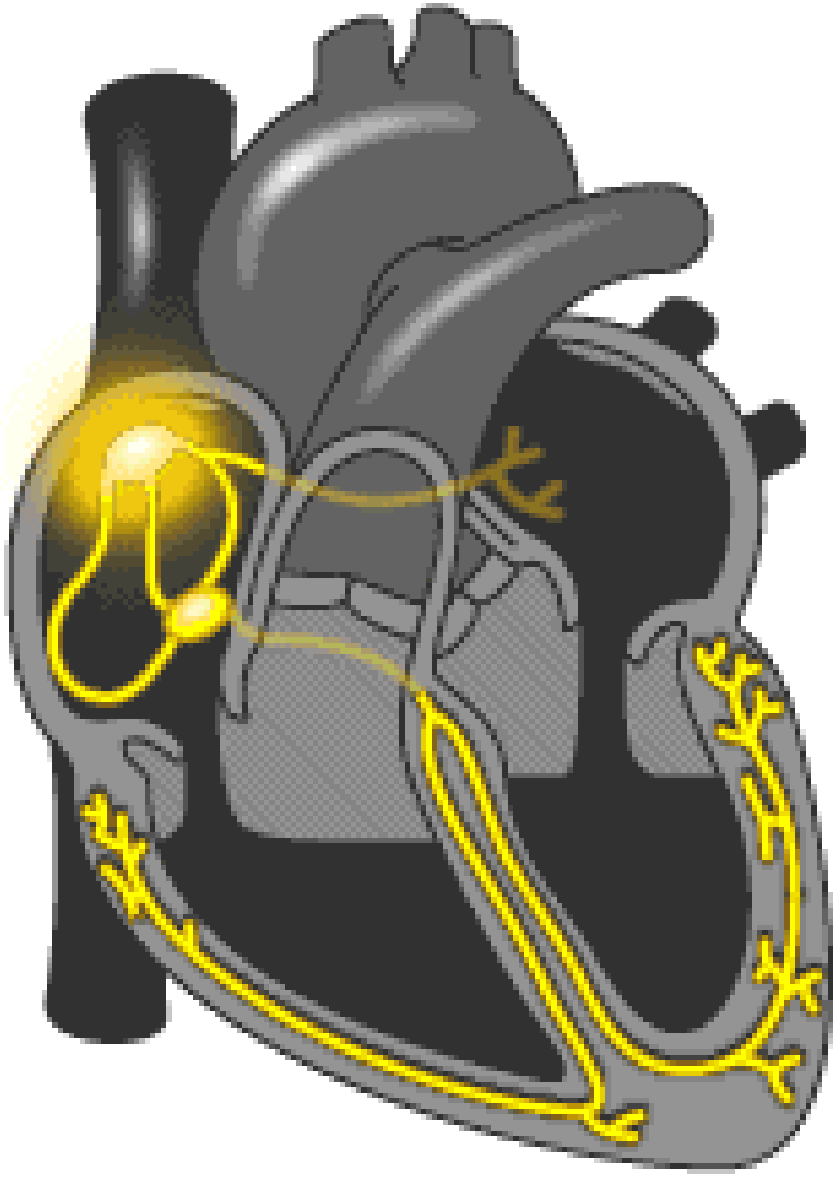
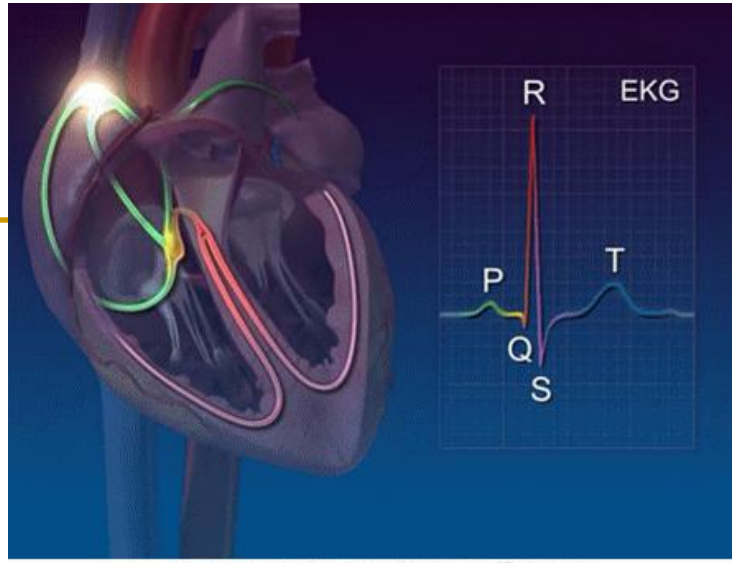
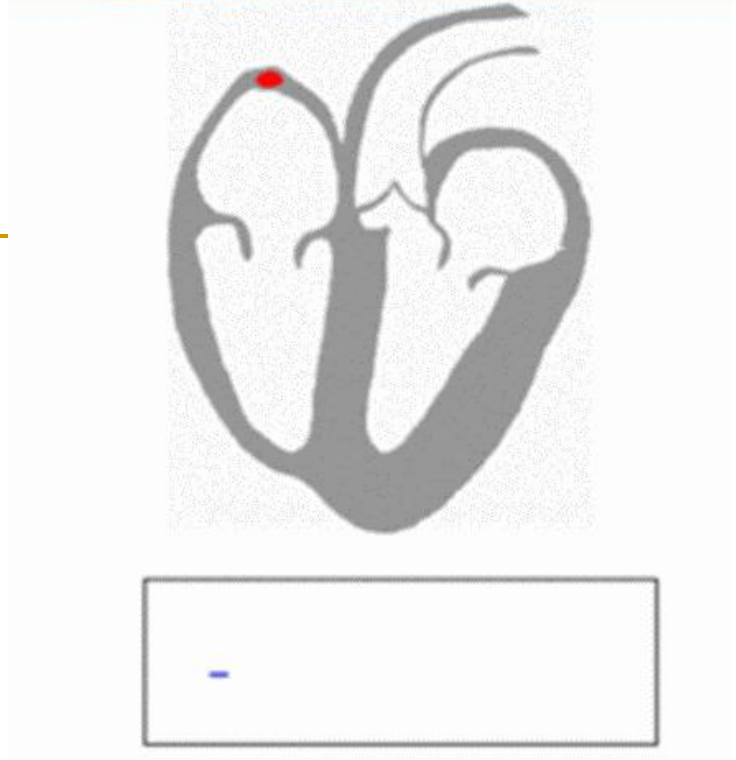
心电图--ECG



心电图（ECG）

是利用**心电图机**在体表记录心脏每一**心动周期**所产生**电活动变化** 的曲线图形





心肌细胞电生理

↓

心电向量

↓

心电图

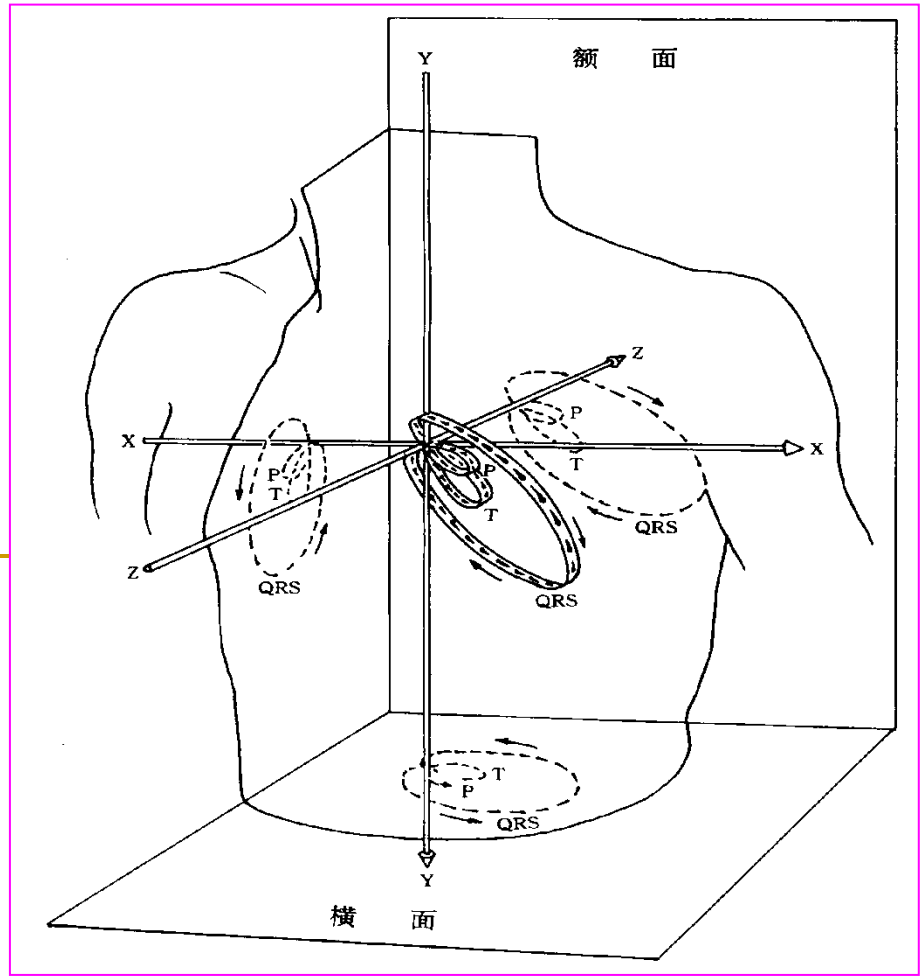
二次投影概念

- **第一次投影：立体心电向量环在三个平面（额面、横面、侧面）投影成平面向量环**

立体向量环 → 平面

↓

平面向量环



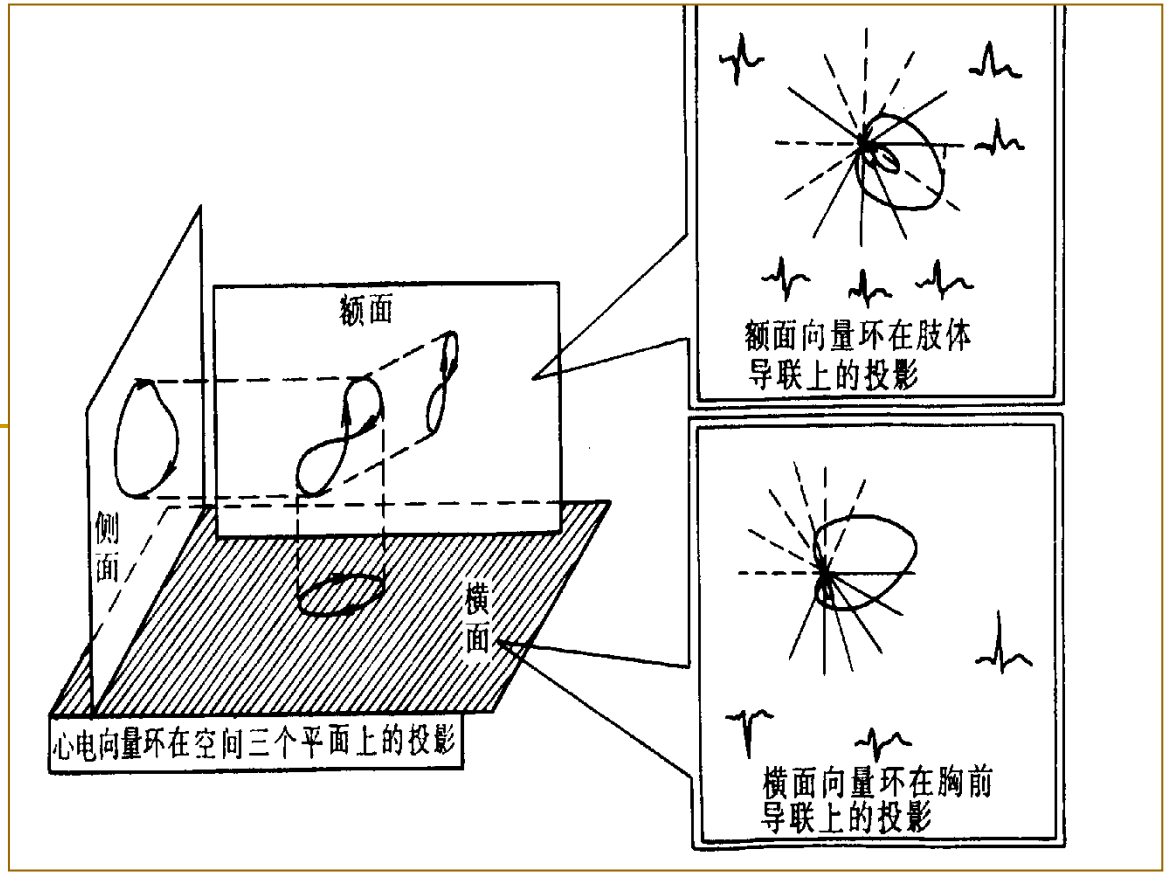
二次投影概念

第一次投影

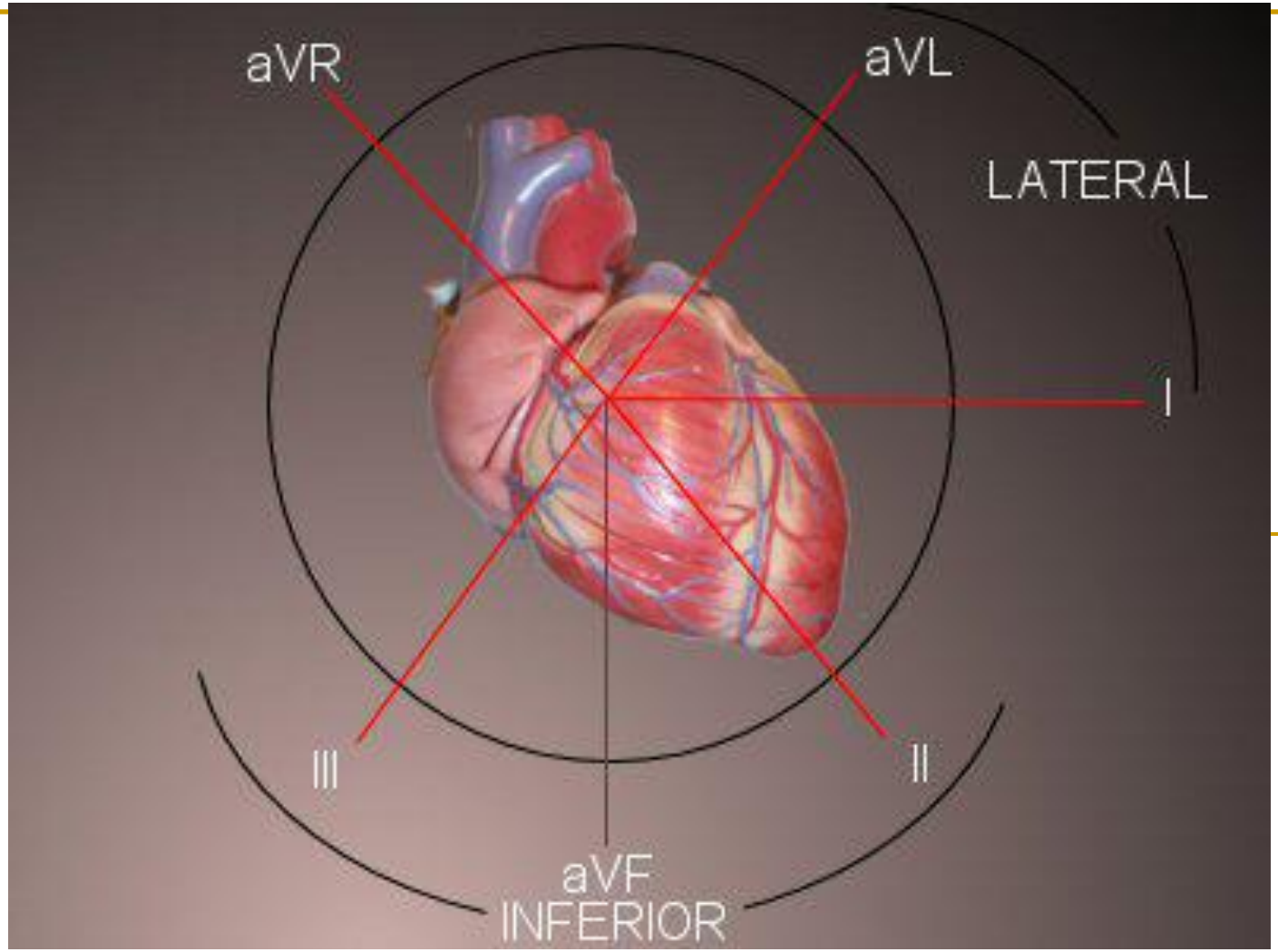
立体 ⟶ 平面

第二次投影

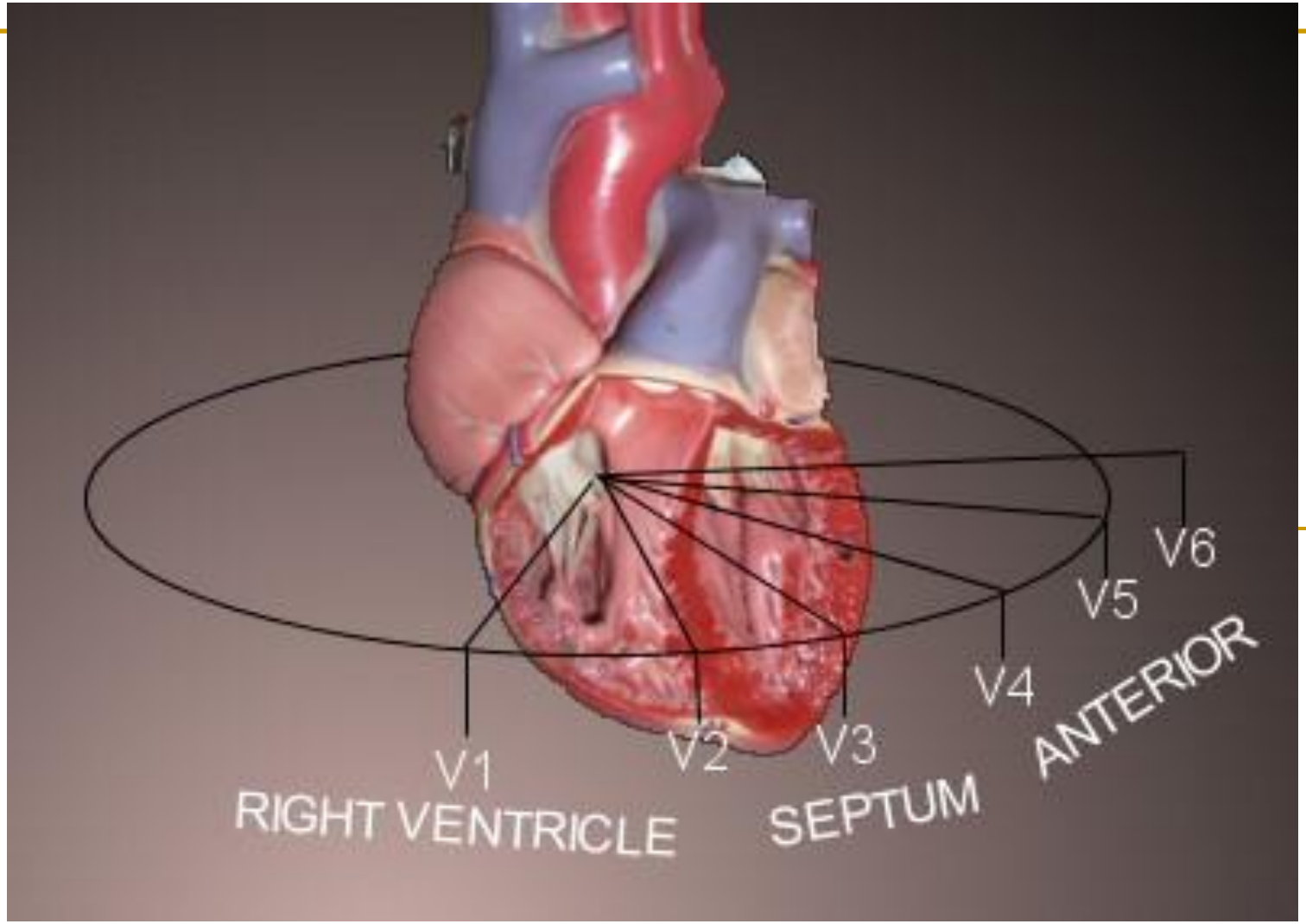
平面 ⟶ 导联轴



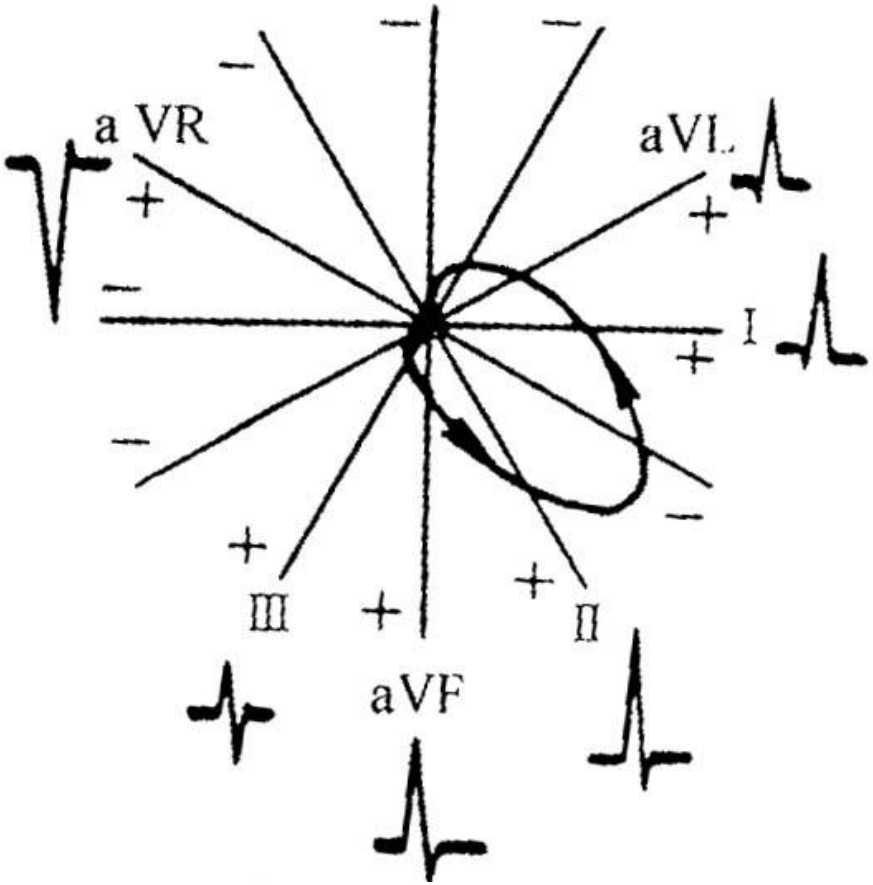
肢体导联系统—反映冠状面（额面）情况

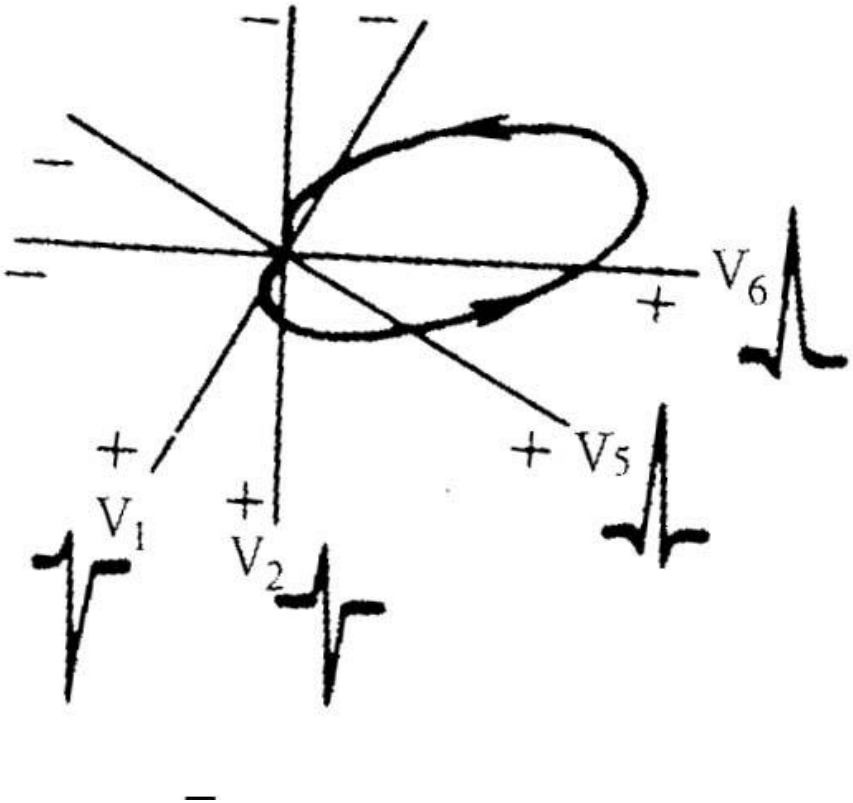


胸导联—反映水平面（横面）情况



QRS向量环与心电图的关系





A　额面　　B　横面

临 床 应 用

诊断
- 1、心律失常
- 2、心肌梗塞（定位、分期）

协助诊断
- 3、心房、心室肥大的诊断
- 4、各种心肌疾患的诊断：如心肌炎、心肌病等
- 5、各种心包疾患的诊断

6、观察电解质紊乱情况

7、观察药物对心肌的影响

心电图的分析步骤

- 全面的一般性阅读：看有无干扰、基线、定标电压
- 确定基础心律
- 计算心率
- 确定心电轴的方向，必要时精确计算
- 观察和测量各波、段的形态、方向、时间和电压，测量间期的时间，判断是否正常
- 注意四方问题：心律、传导、房室肥大、心肌
- 阅读临床提供的申请单，结合病人的一般信息和表现进行综合分析作出心电图诊断

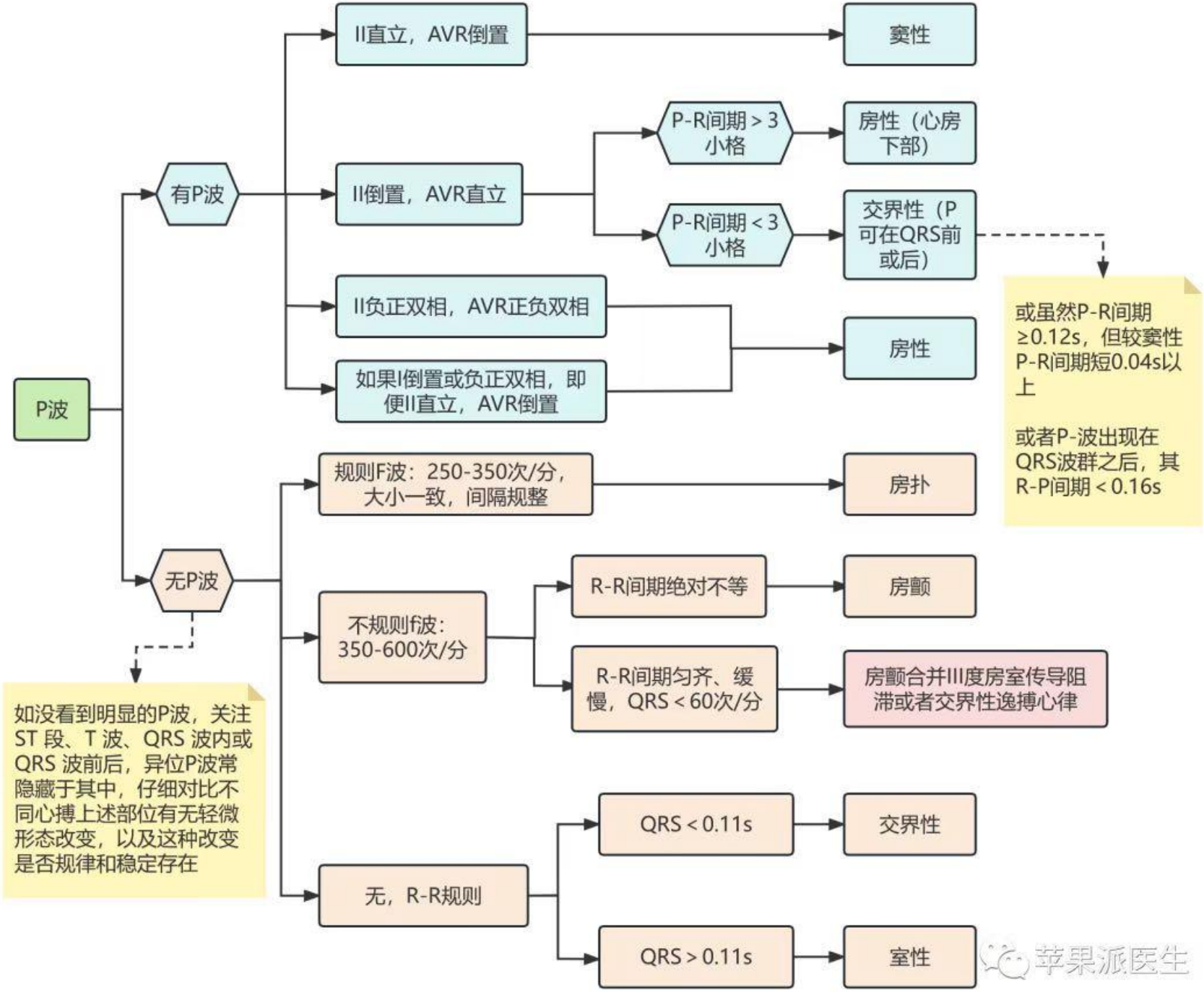
正常心电图

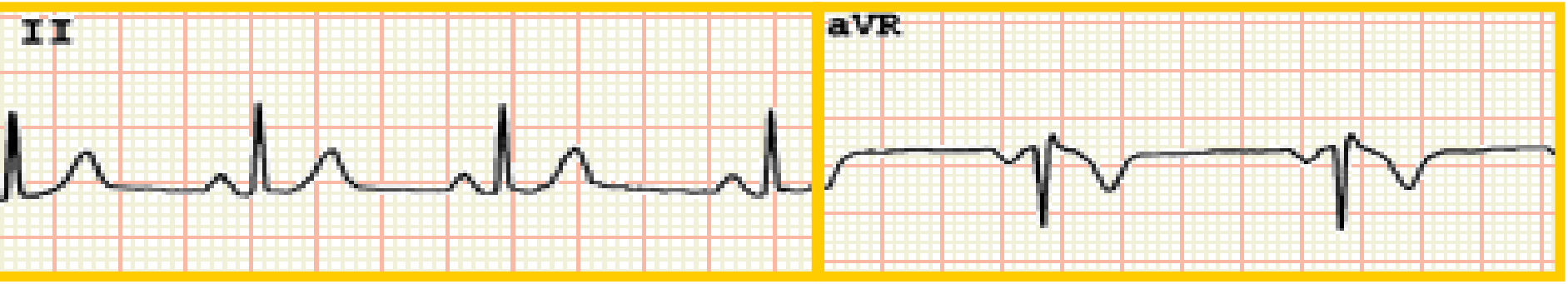
窦性心律

- 窦性心律(sinus rhythm)

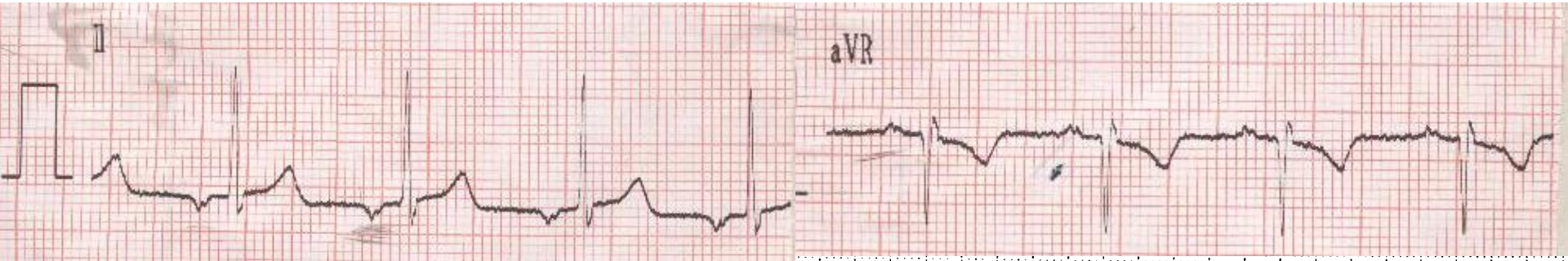
凡激动起源于窦房结的心律称为窦房结性心律，简称窦性心律

- 正常窦性心律心电图诊断
  - P波方向：PⅡ直立，PavR倒置
  - P-R间期：0.12～0.20s
  - P-P间期： PP间期的互差在同一导联＜0.12秒
  - 频率： 60～100次/分

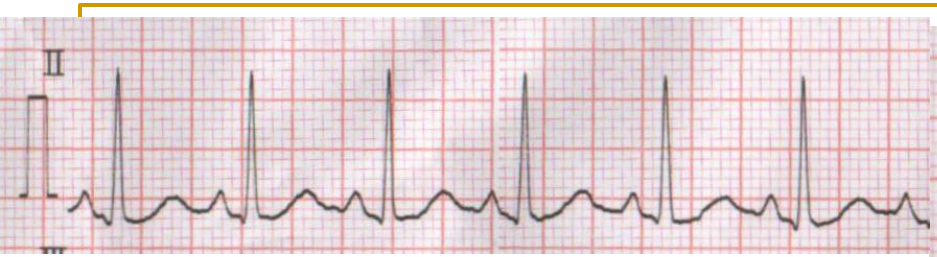

P波
有P波
II直立，AVR倒置
窦性
II倒置，AVR直立
P-R间期 > 3小格
房性（心房下部）
P-R间期 < 3小格
交界性（P可在QRS前或后）
或虽然P-R间期≥0.12s，但较窦性P-R间期短0.04s以上
或者P-波出现在QRS波群之后，其R-P间期 < 0.16s
II负正双相，AVR正负双相
如果I倒置或负正双相，即便II直立，AVR倒置
房性
无P波
如没看到明显的P波，关注ST 段、T 波、QRS 波内或QRS 波前后，异位P波常隐藏于其中，仔细对比不同心搏上述部位有无轻微形态改变，以及这种改变是否规律和稳定存在
规则F波：250-350次/分，大小一致，间隔规整
房扑
不规则f波：350-600次/分
R-R间期绝对不等
房颤
R-R间期匀齐、缓慢，QRS < 60次/分
房颤合并III度房室传导阻滞或者交界性逸搏心律
无，R-R规则
QRS < 0.11s
交界性
QRS > 0.11s
室性
苹果派医生

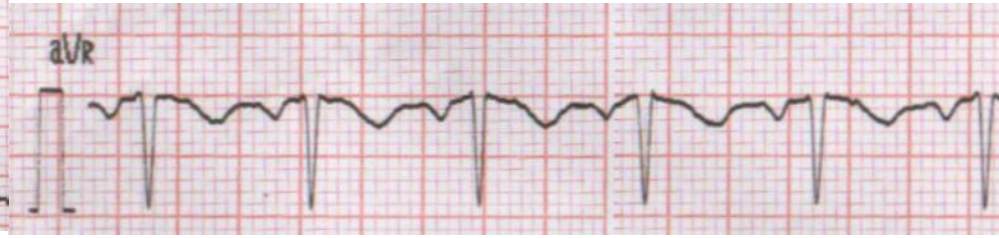

II
aVR


II
aVR

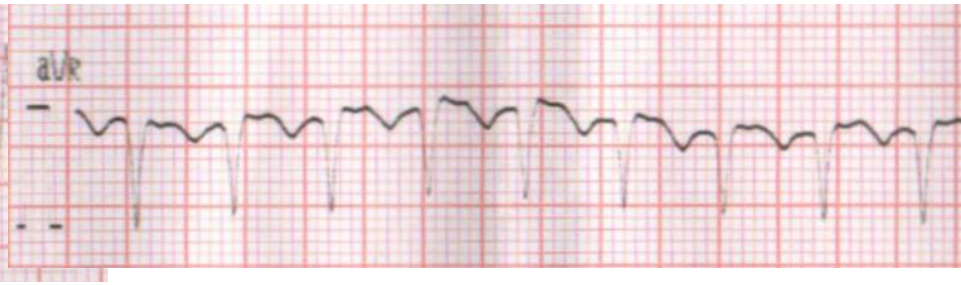

II
aVR


II

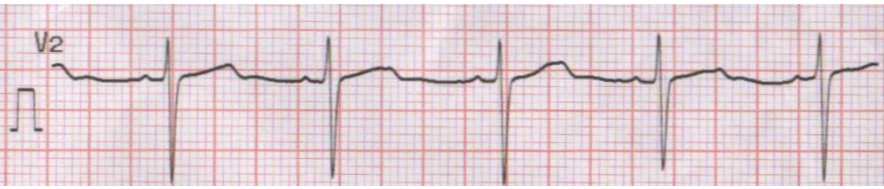

II

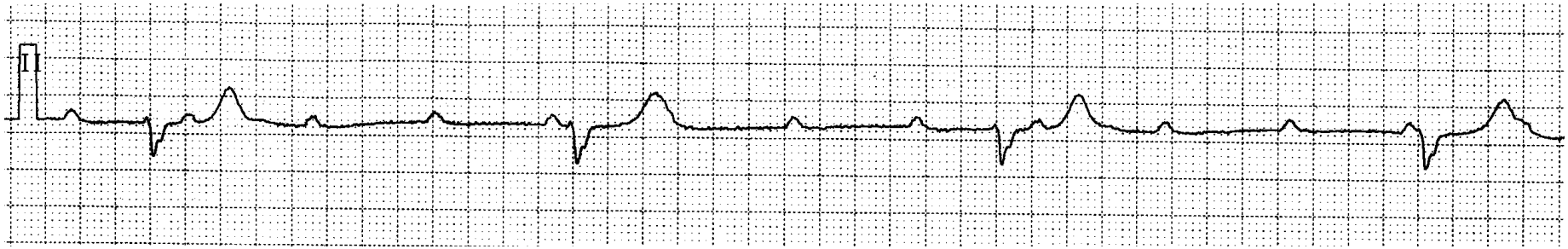

aVR


II

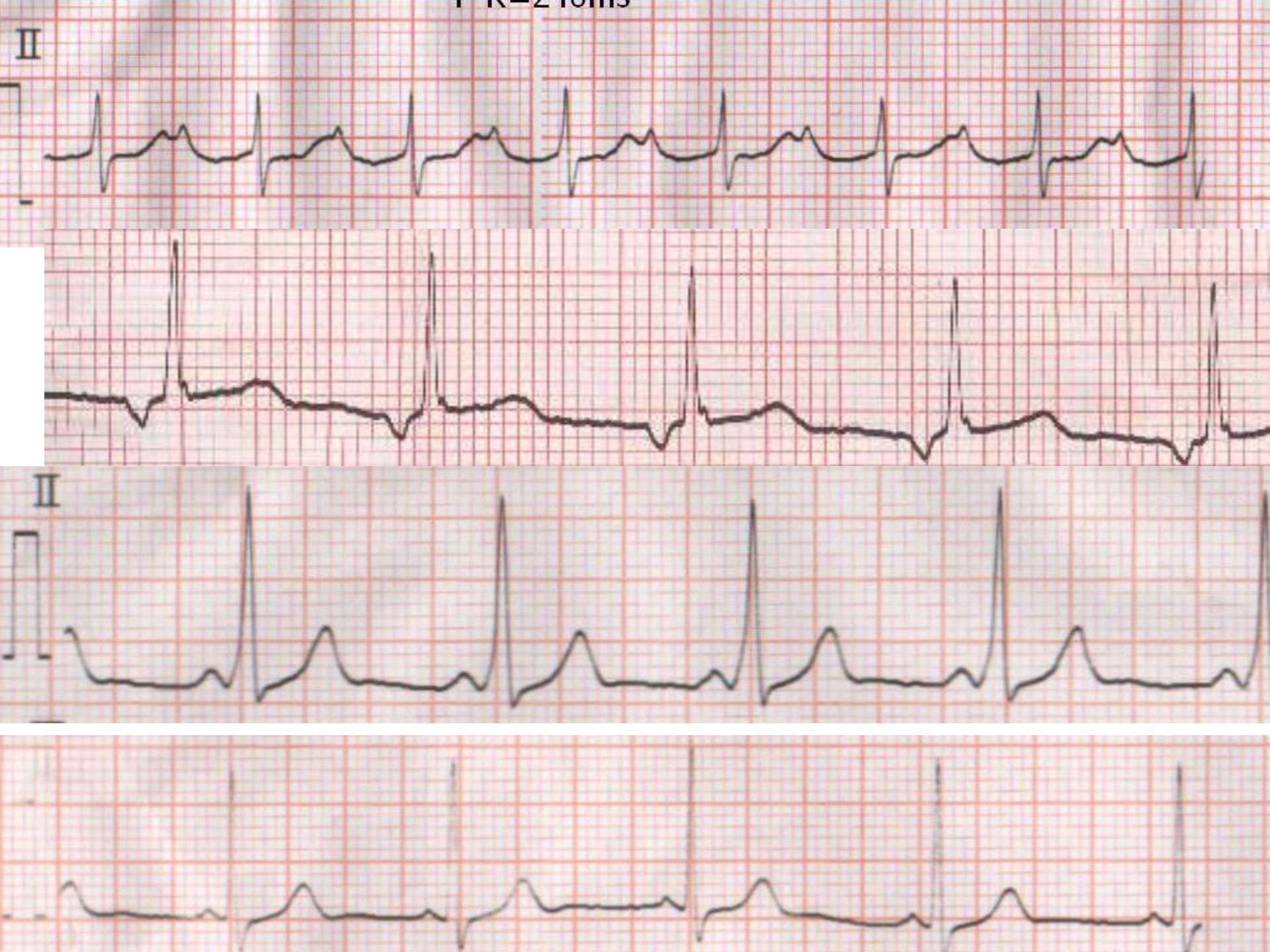

aVR


II


V2

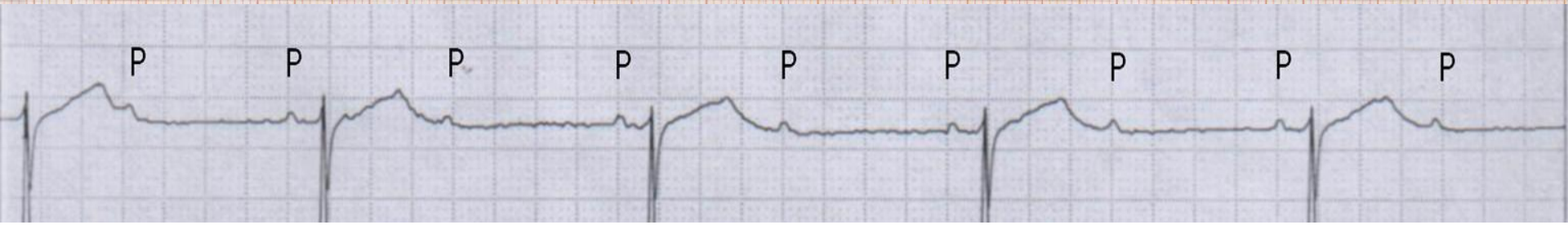

II

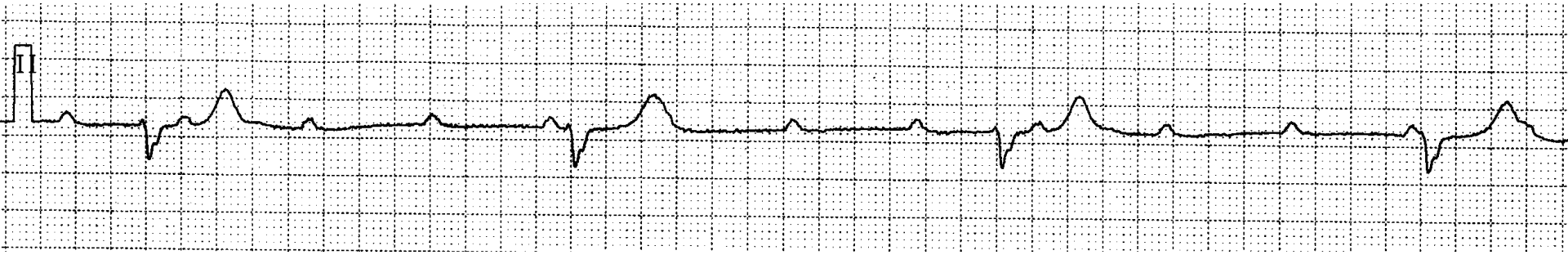
P-R=2 tons

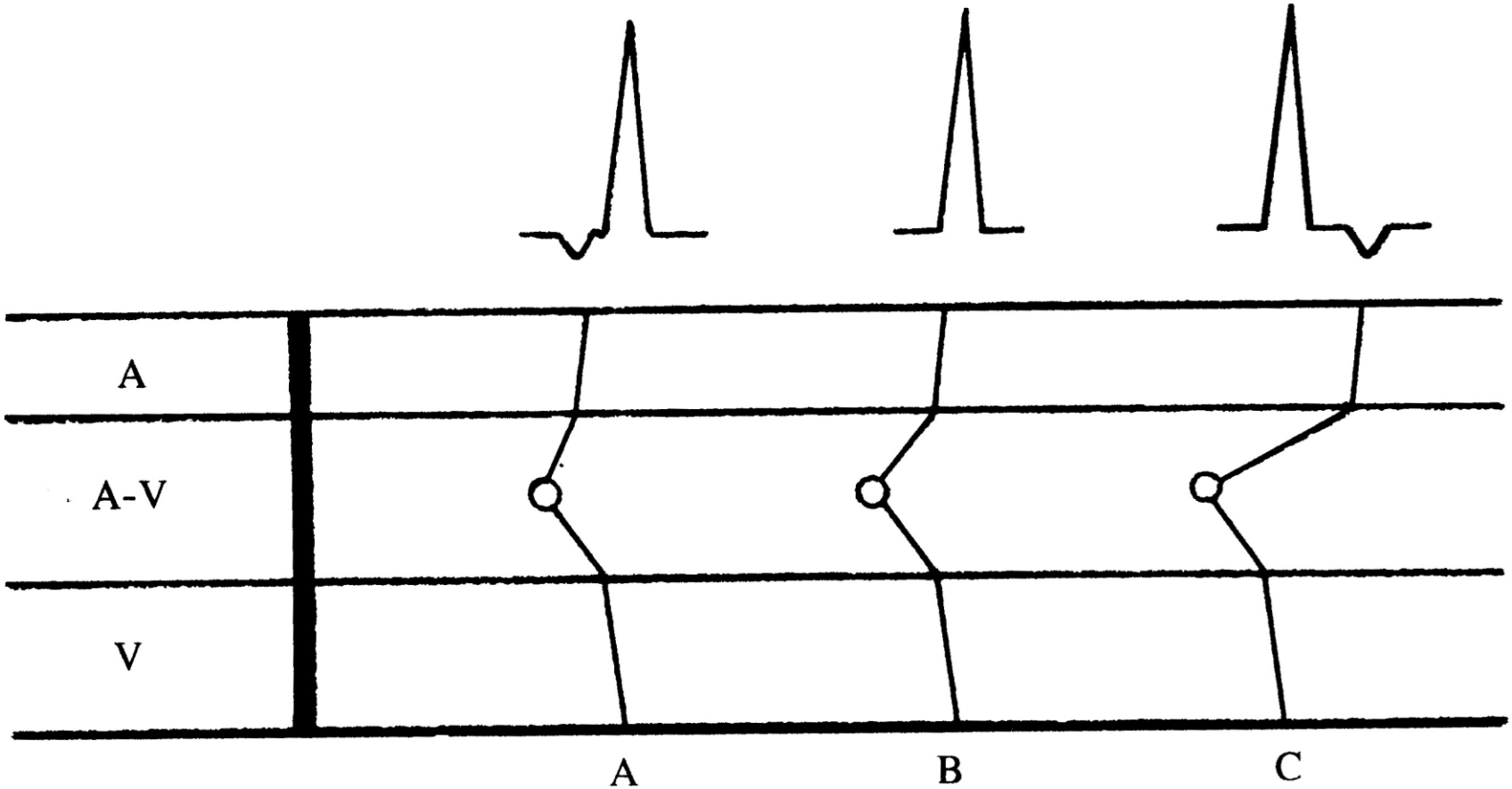


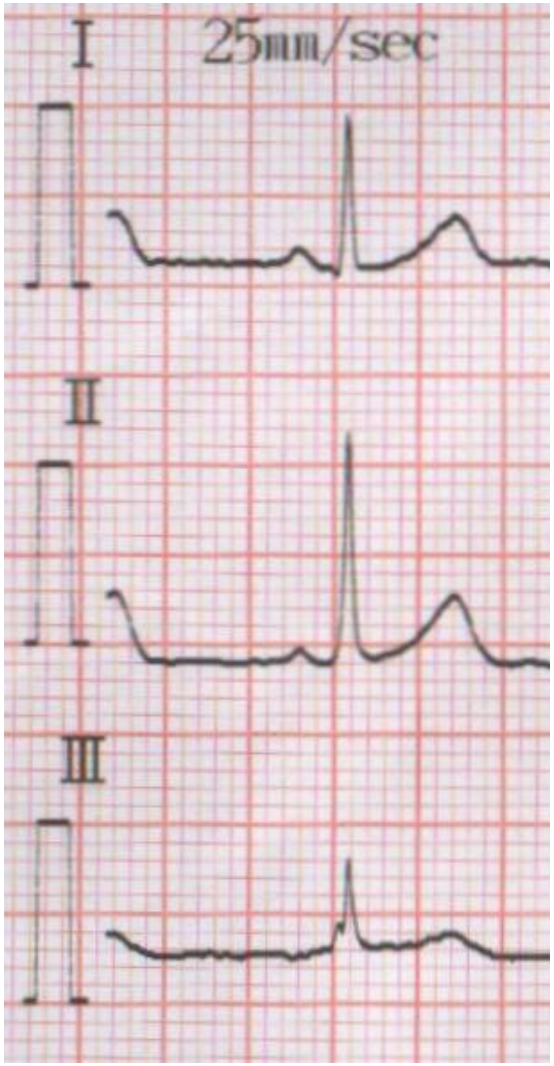

1.22S
1.03s
00:20
53 bpm


II
aVR

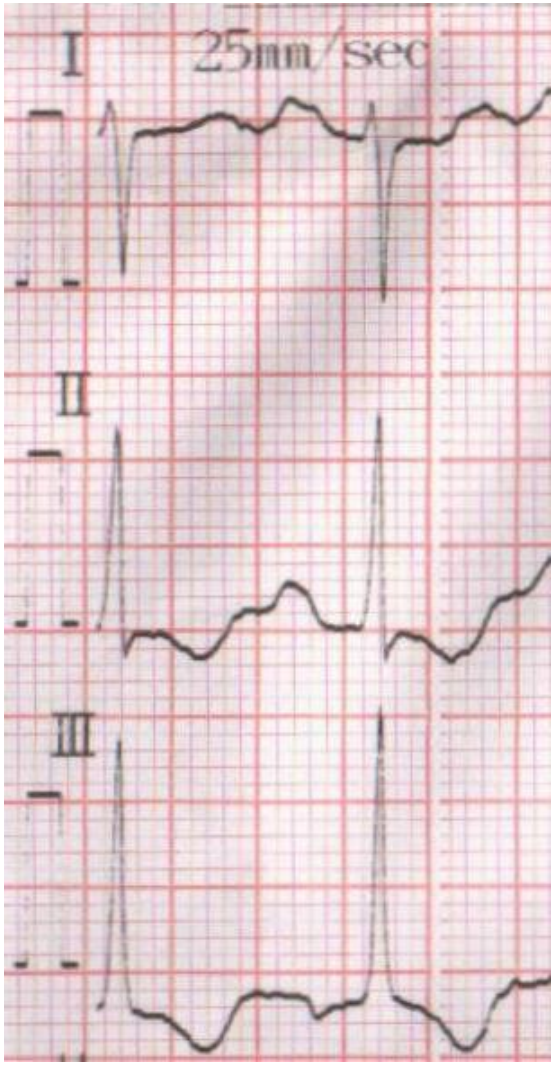

P
P
P
P
P
P
P
P
P


I

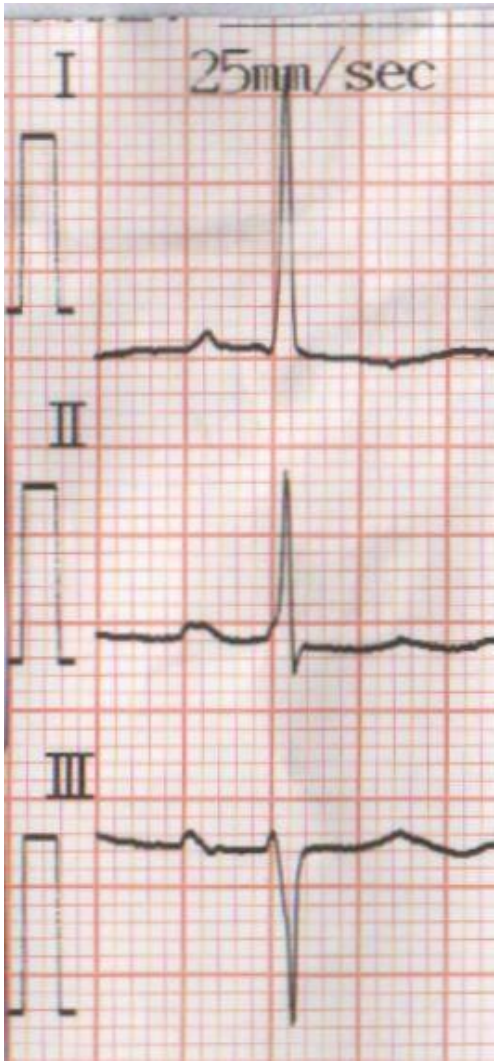

A
A-V
V
A
B
C



电轴不偏

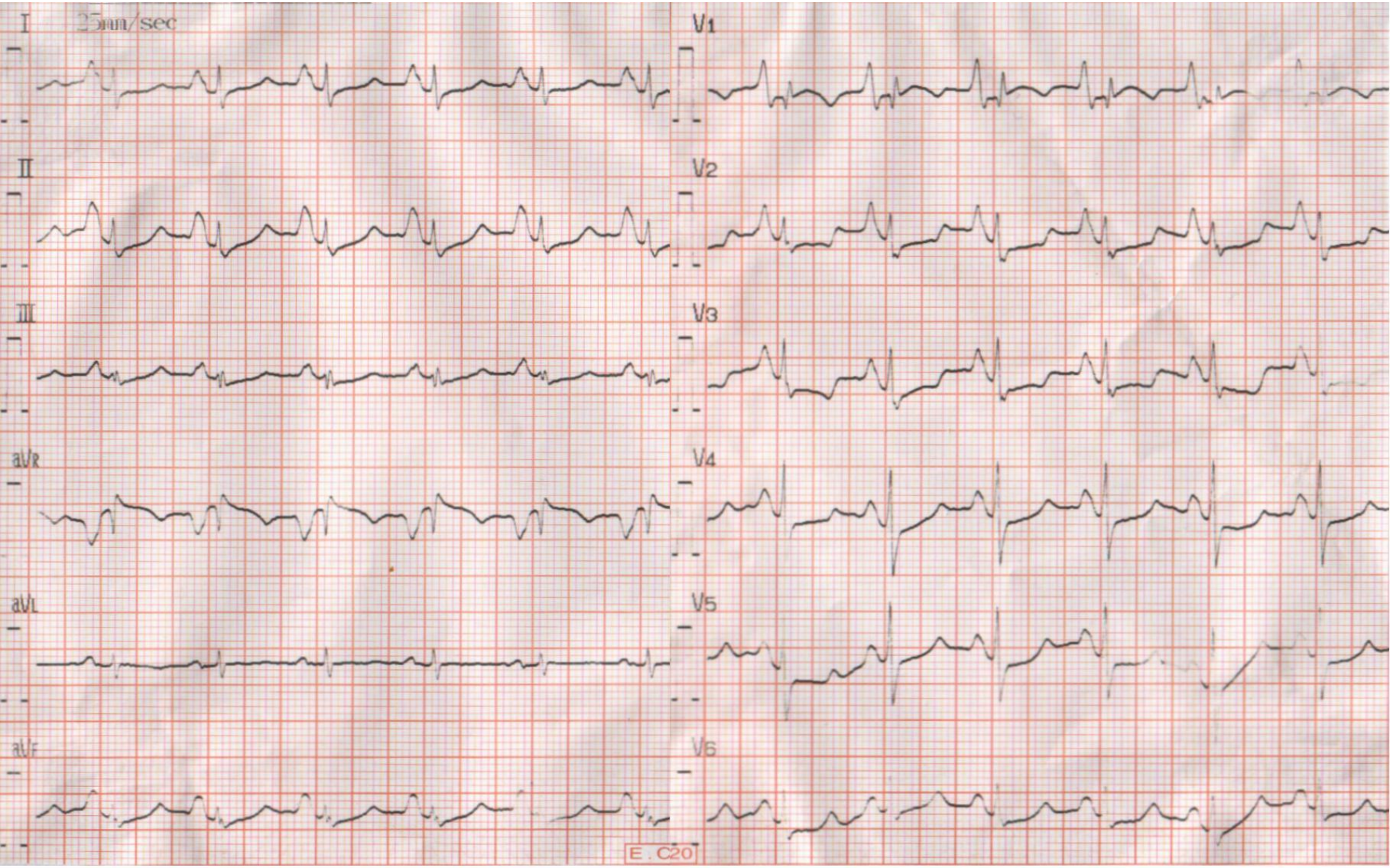


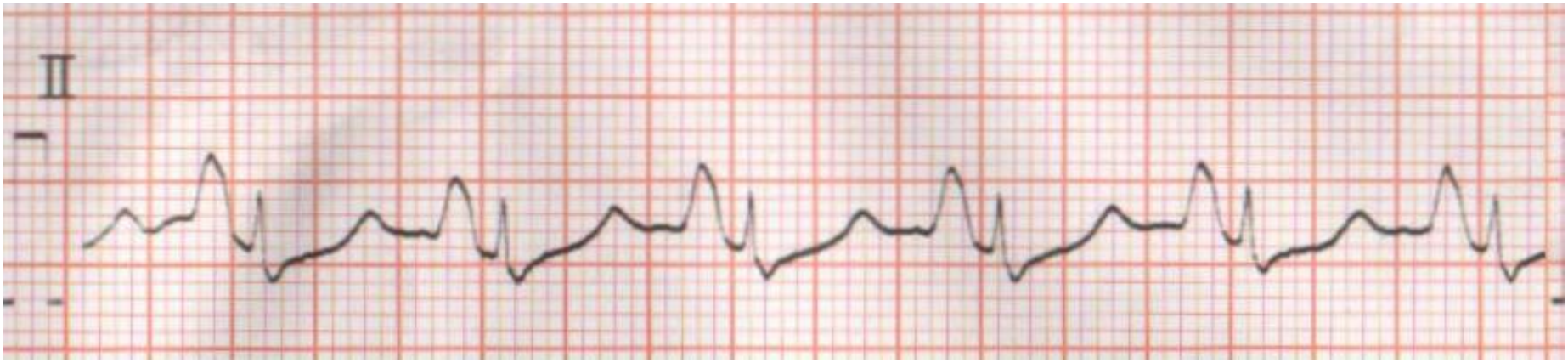
电轴右偏

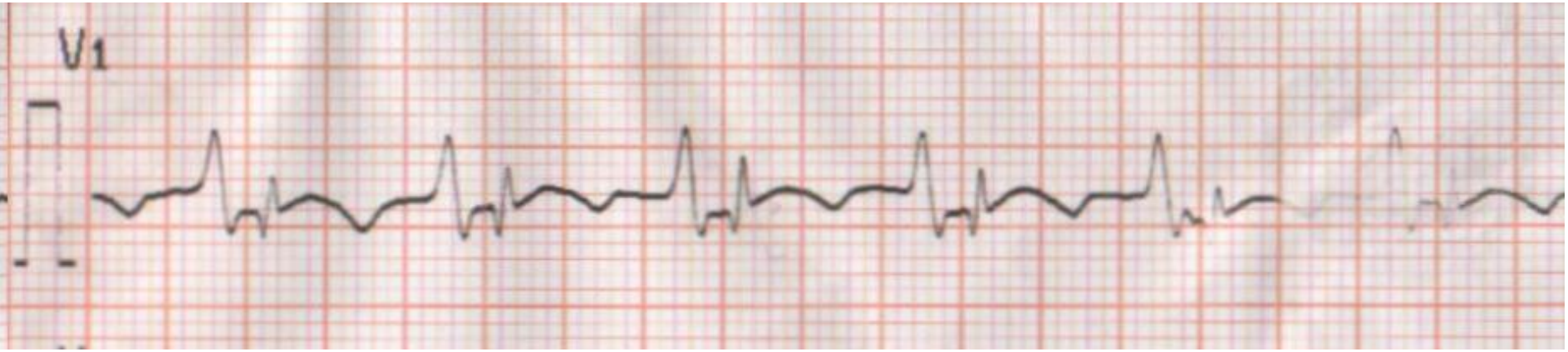


电轴左偏

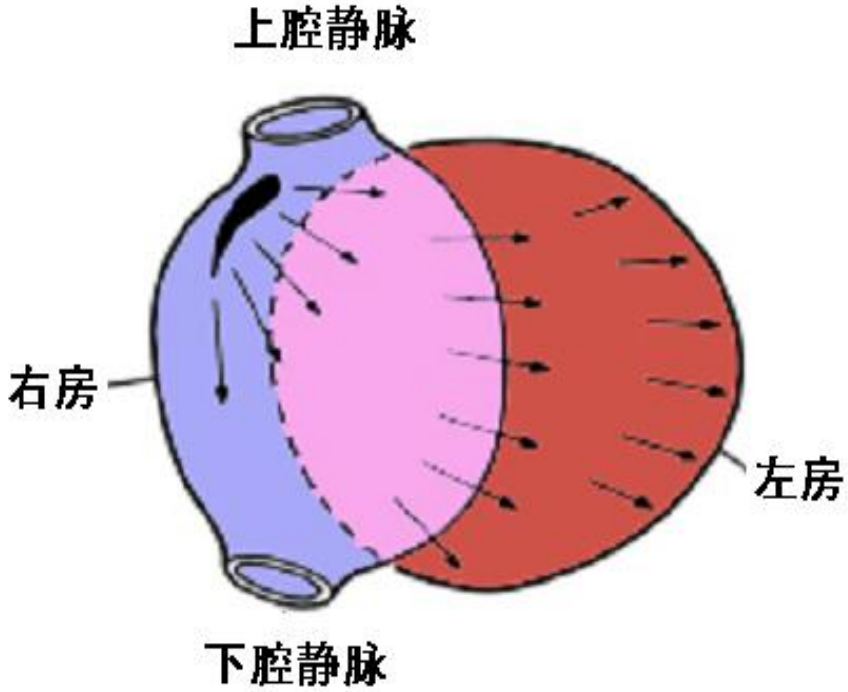
右 房 肥 大



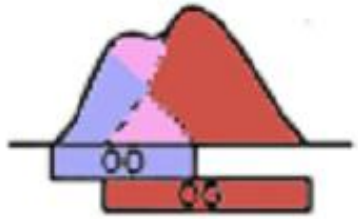

II


V1

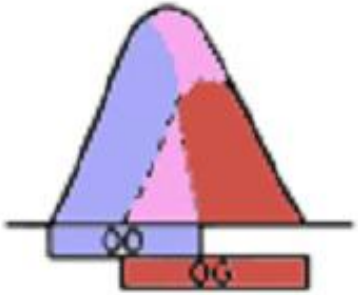
心房肥大示意图



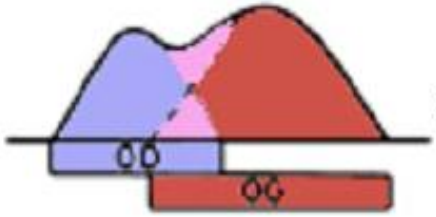
正常心房冲动传递



正常

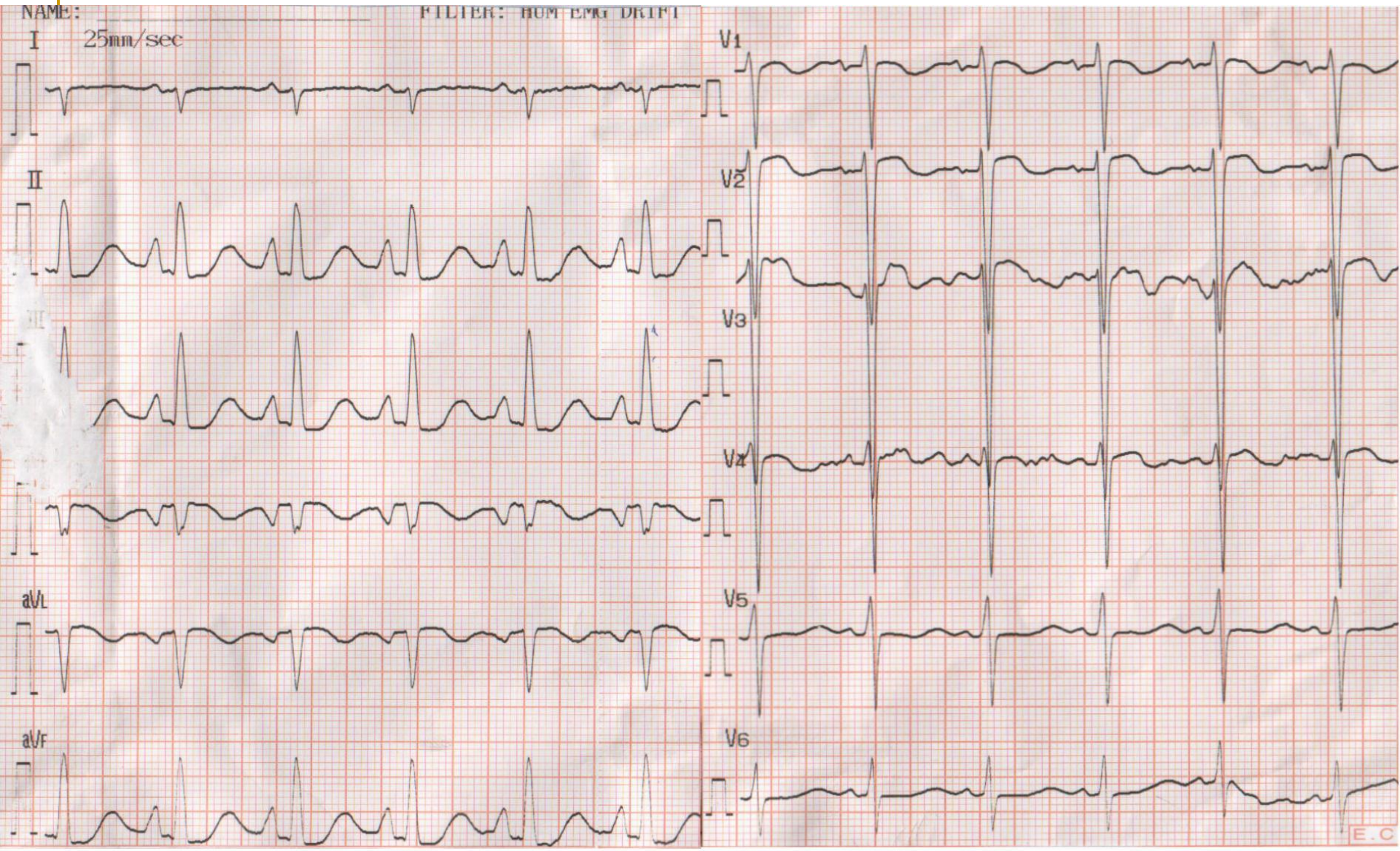


右房肥大

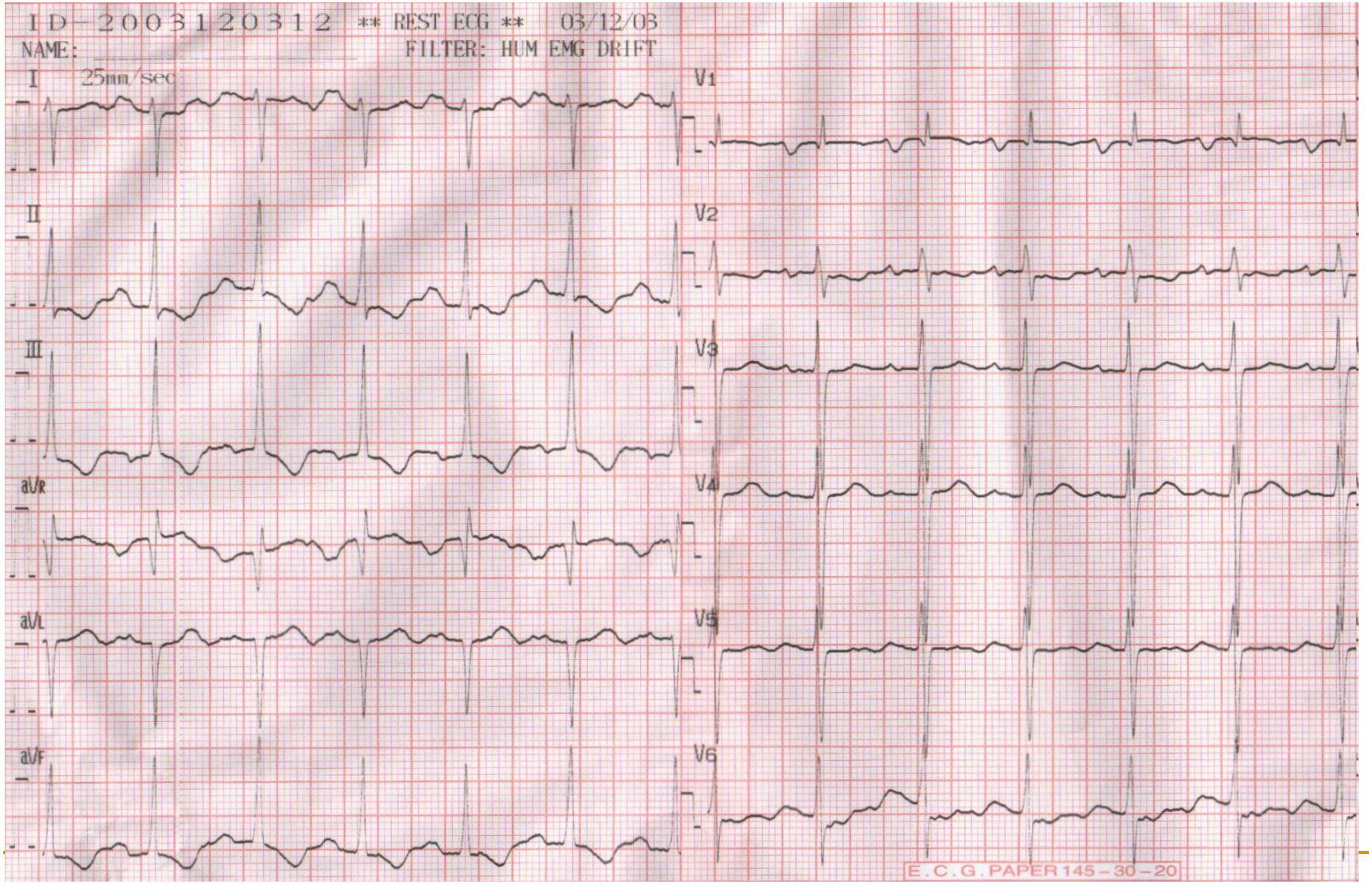


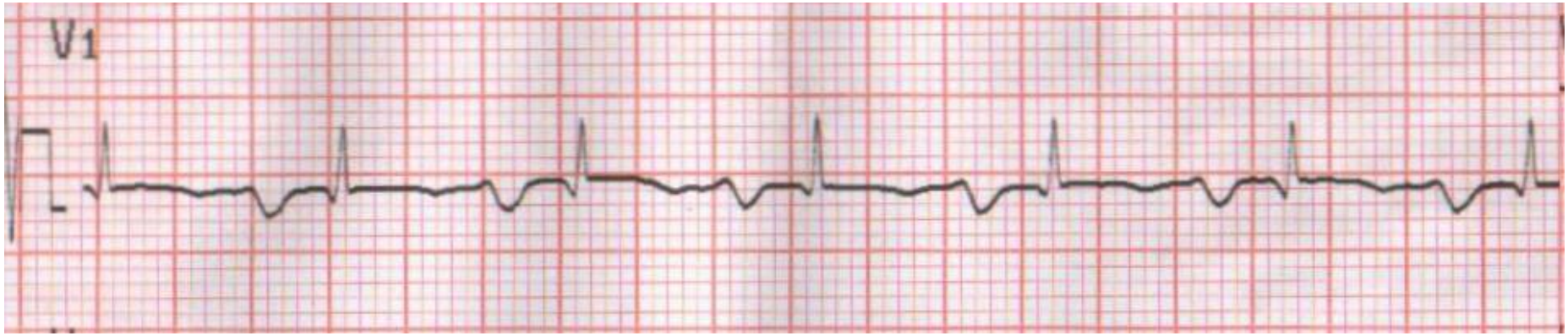
左房肥大

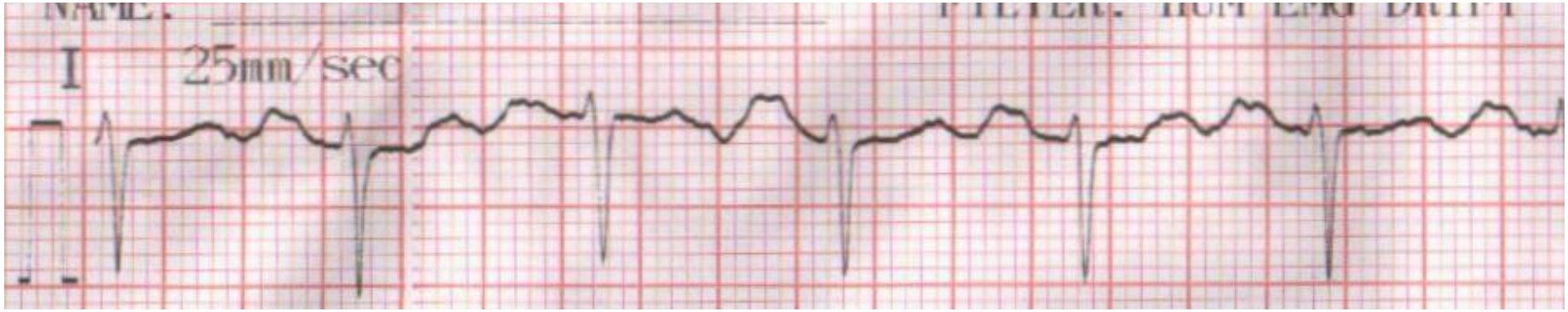
右房右室肥大


NAME:
FILTER: HUM EMG DRIFT
I
25mm/sec
II
III
aVL
aVF
V1
V2
V3
V4
V5
V6
E.C

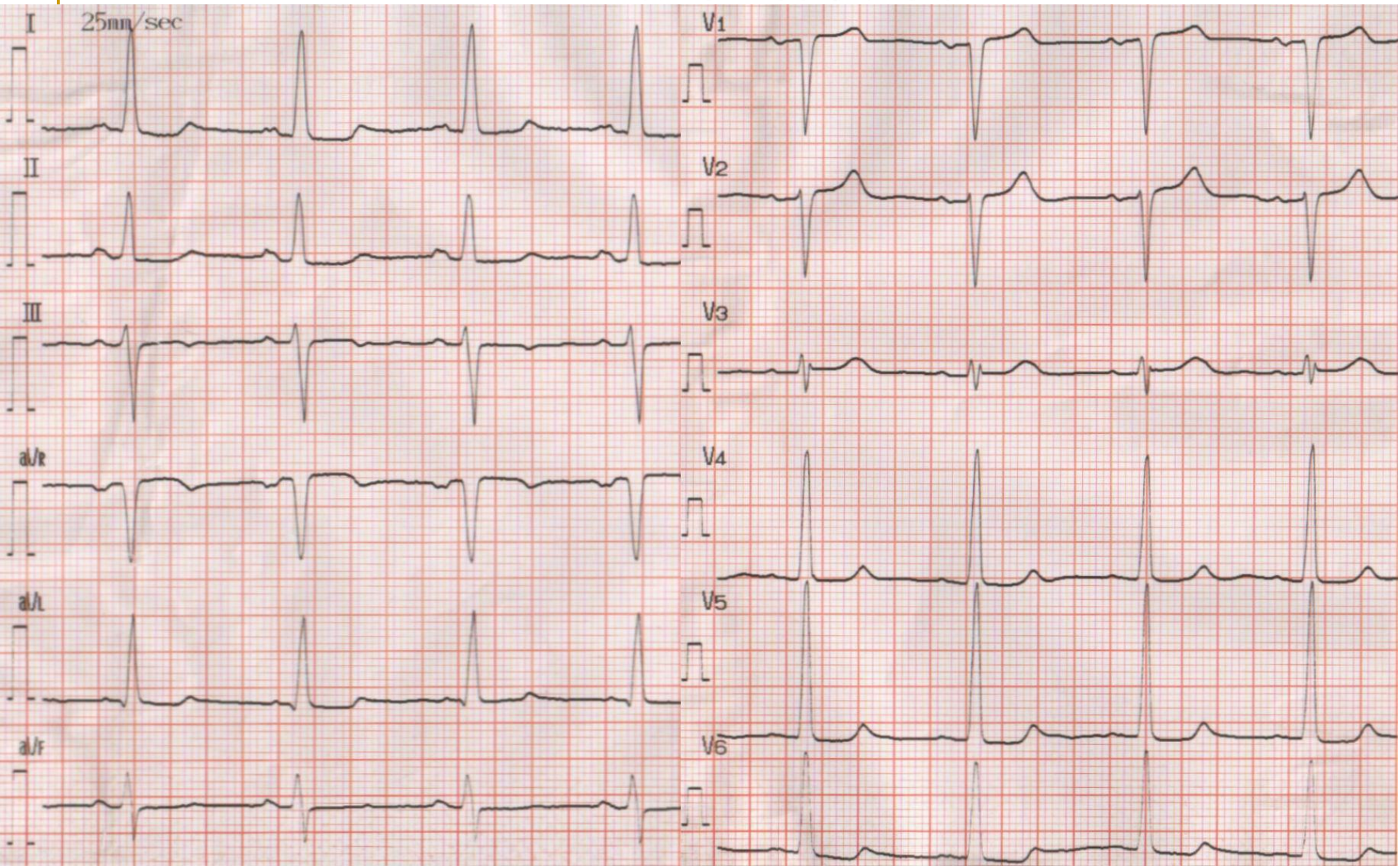
左房右室肥大


ID-200312031 2 ** REST ECG ** 03/12/03
NAME:
FILTER: HUM EMG DRIFT
25mm/sec
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
E.C.G.PAPER 145-30-20

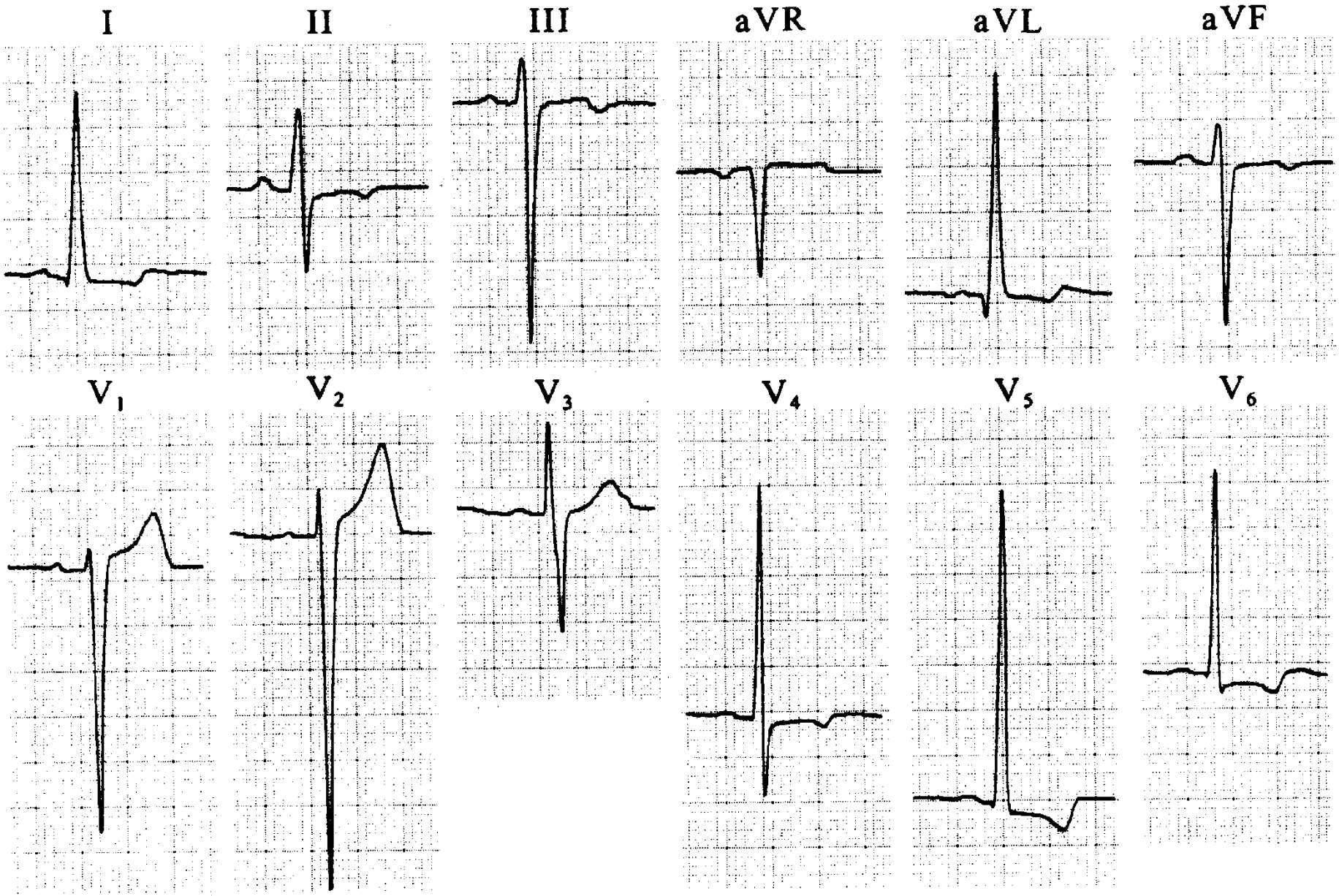

V1


I
25mm/sec

左室肥大伴劳损



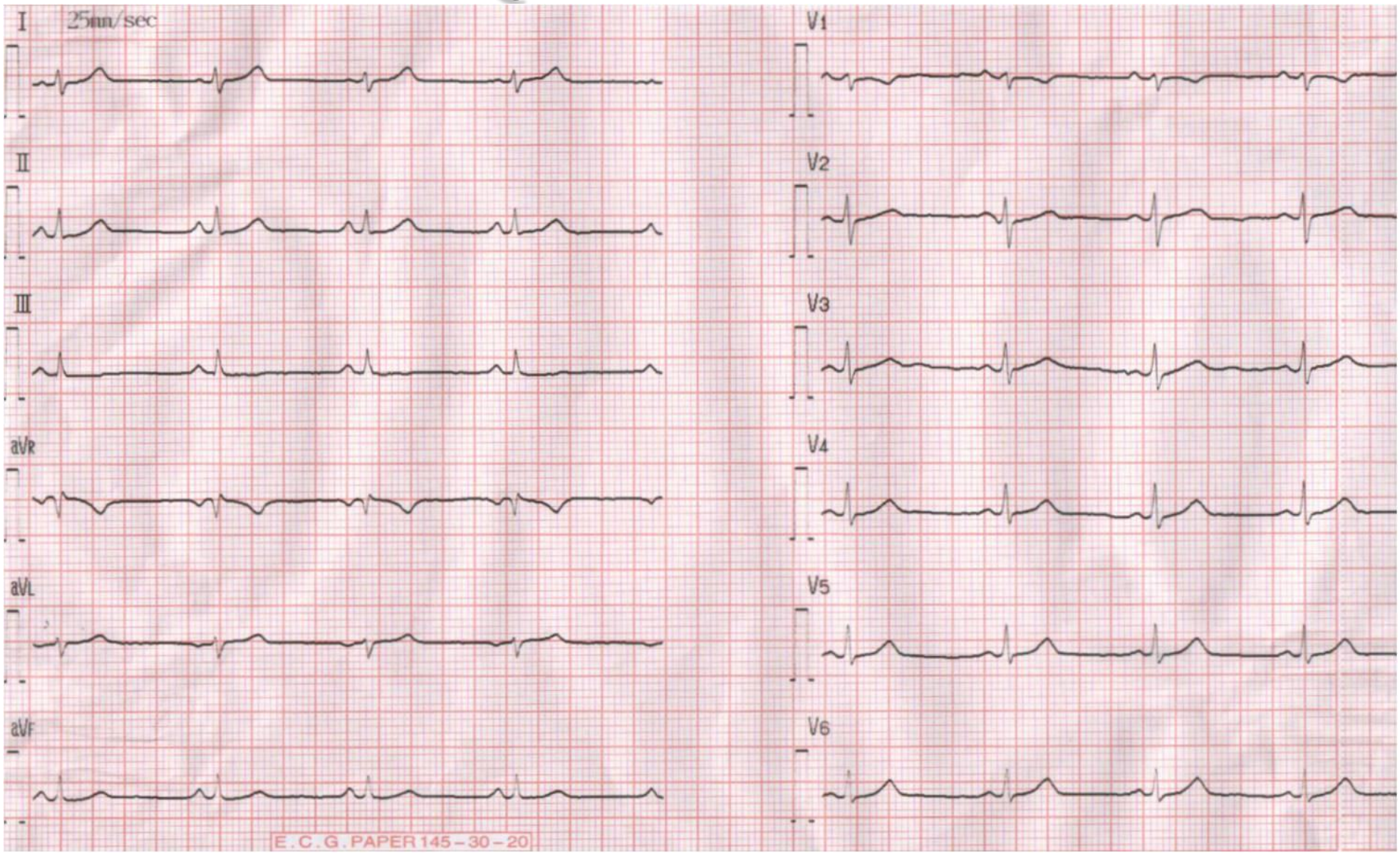
左室肥大伴劳损

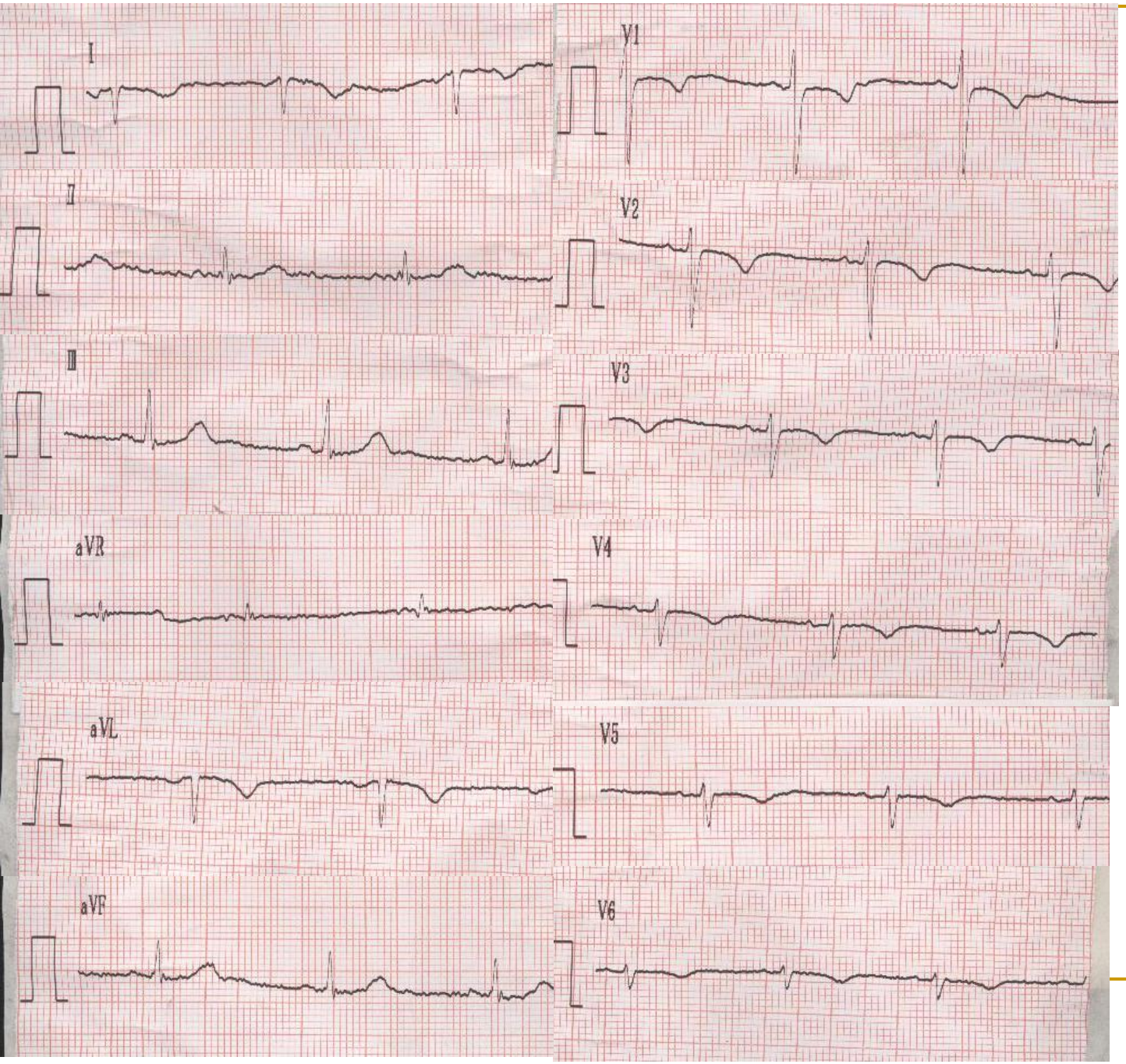


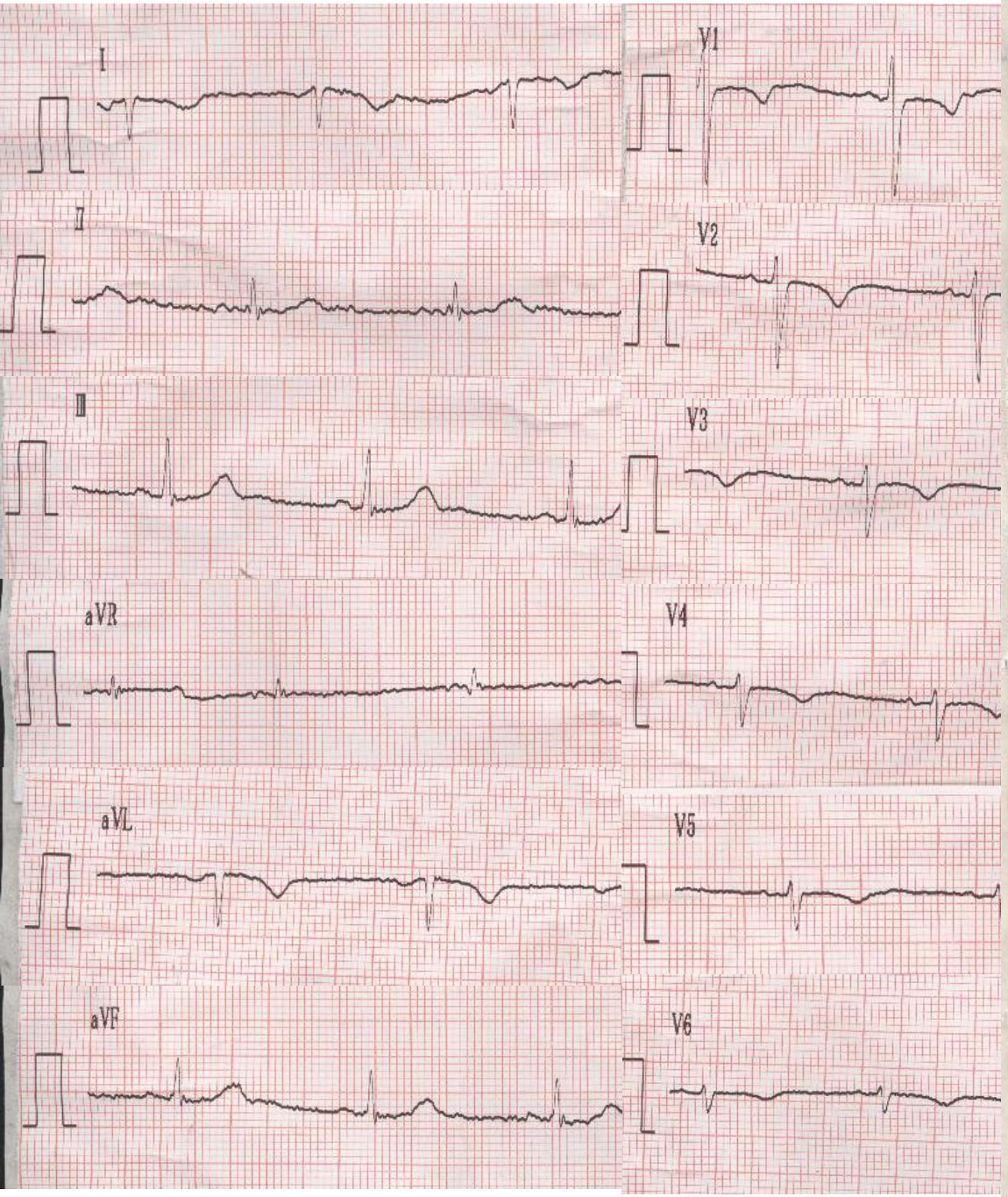
心房、心 室 肥 大

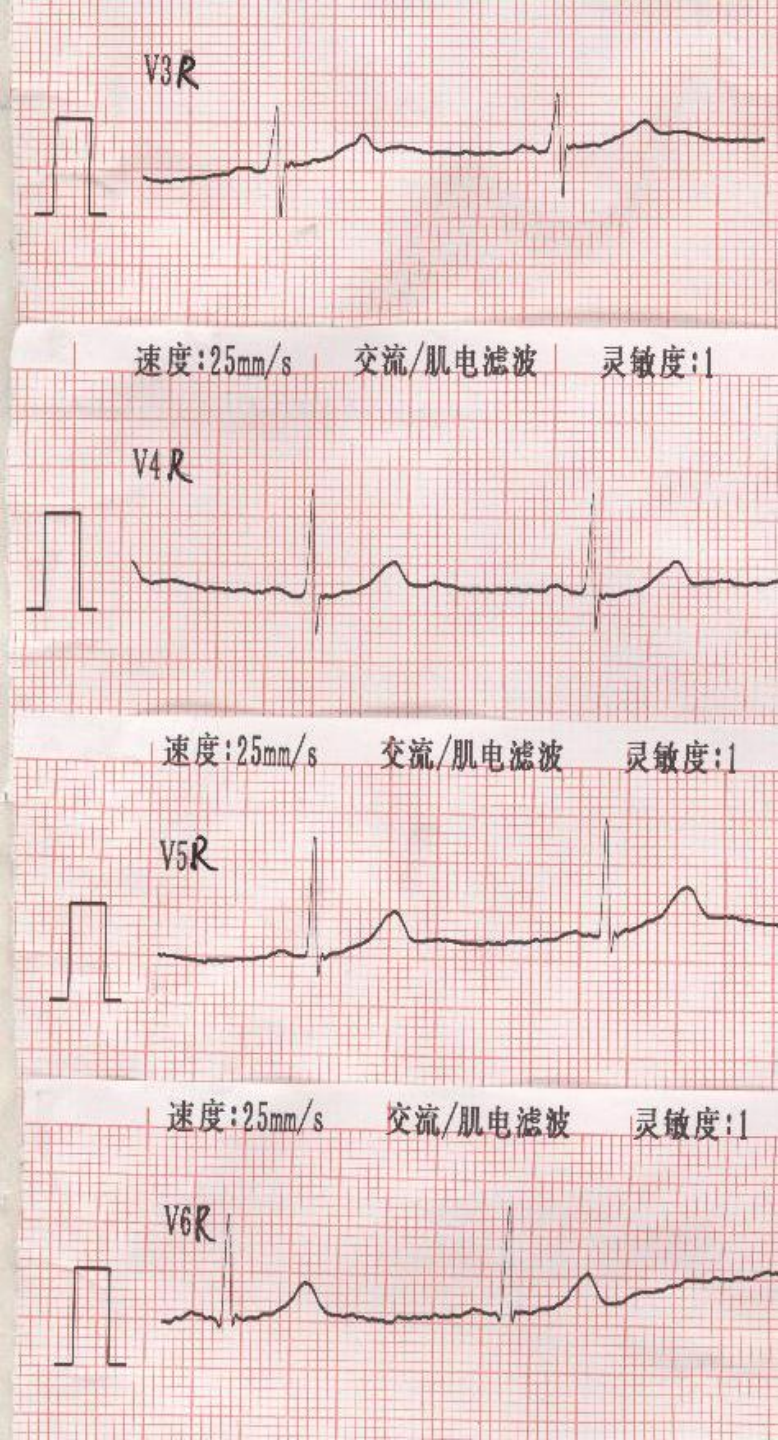
- 心电图变化机理
  - 心肌纤维肥大与增粗，除极面积及体积增大，由心肌除极所产生的电压增高
  - 心壁增厚、心腔扩大以及心肌细胞变性所致心脏传导功能低下使心肌激动的总时间延长
  - 心室肥厚与劳损及相对性血液供应不足，致使心肌复极顺序发生改变，导致继发性ST-T改变

QRS低电压

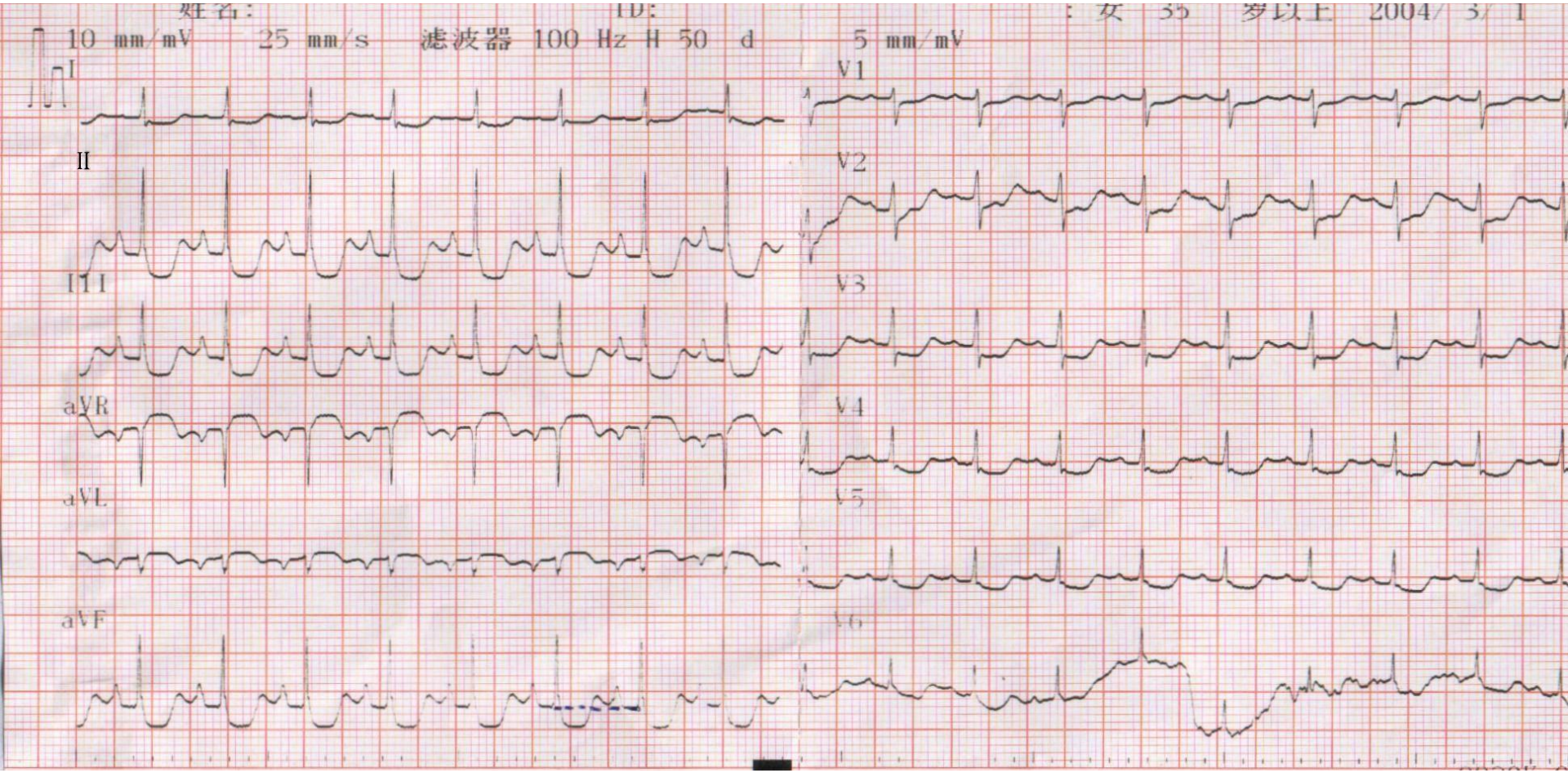



I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


V3R
速度:25mm/s 交流/肌电滤波 灵敏度:1
V4R
速度:25mm/s 交流/肌电滤波 灵敏度:1
V5R
速度:25mm/s 交流/肌电滤波 灵敏度:1
V6R

ST段压低


10 mm/mV
25 mm/s
滤波器 100 Hz H 50 d
5 mm/mV
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6

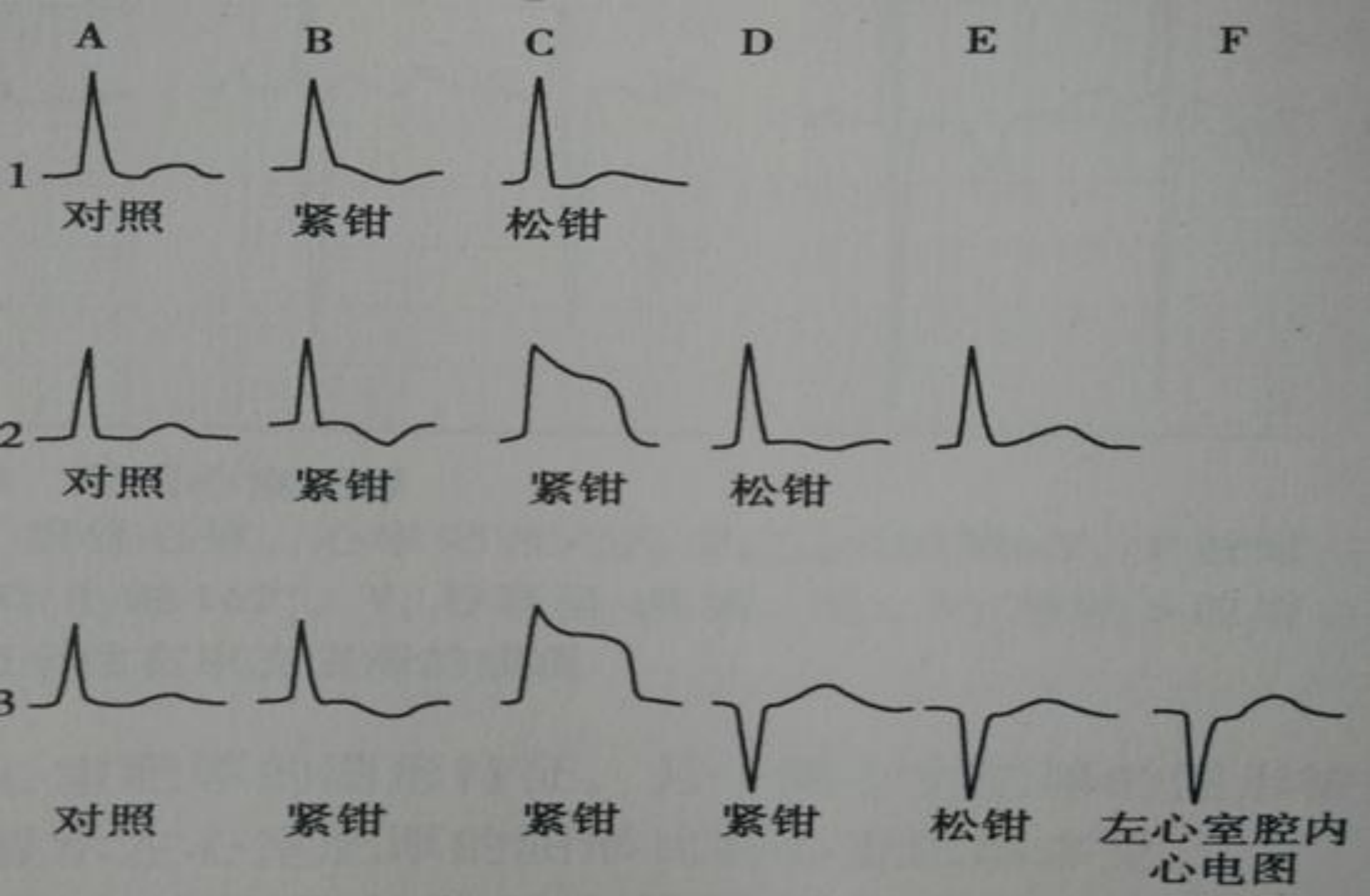
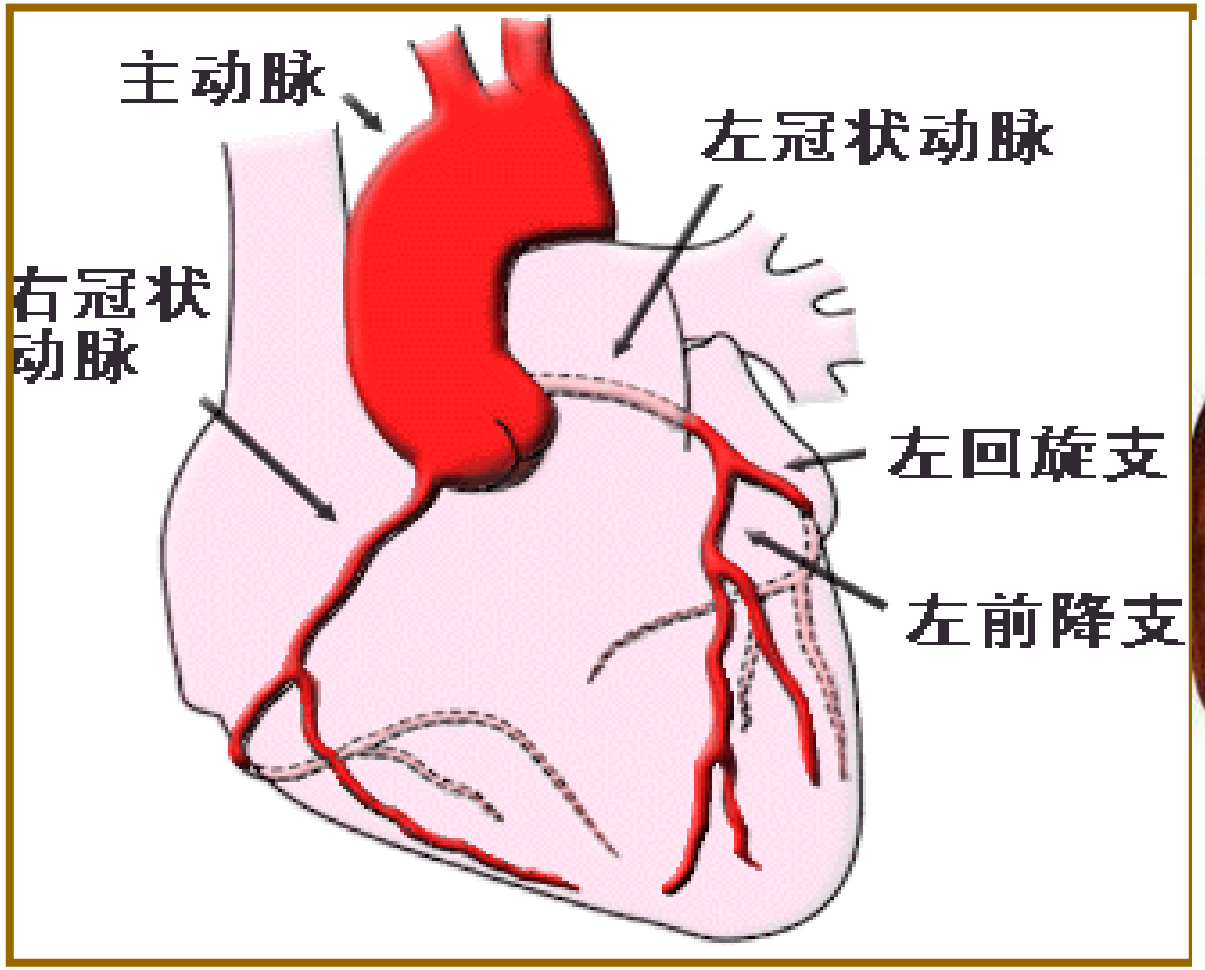
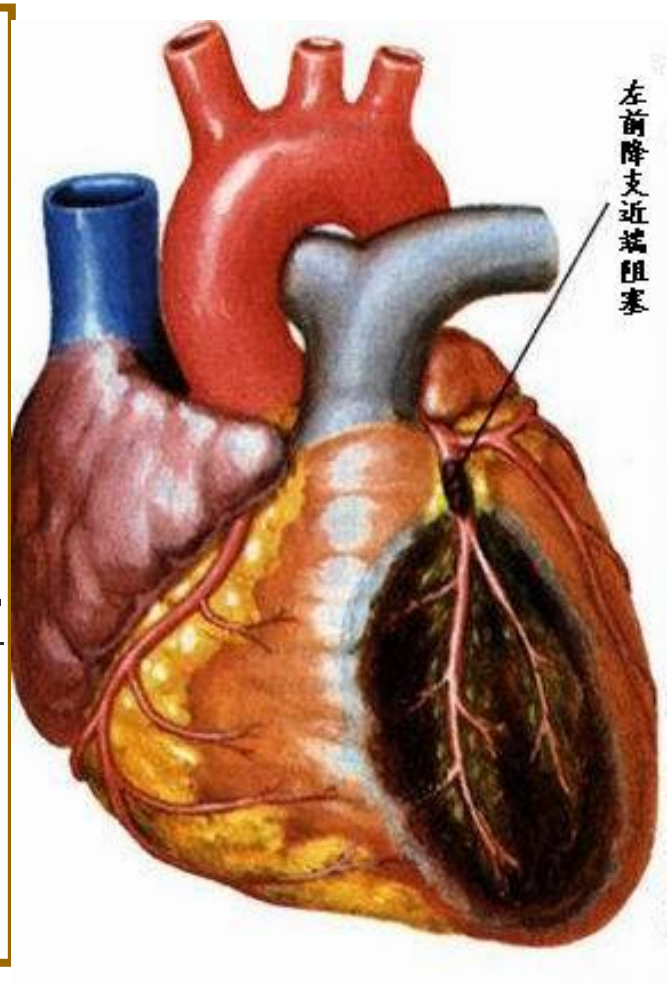
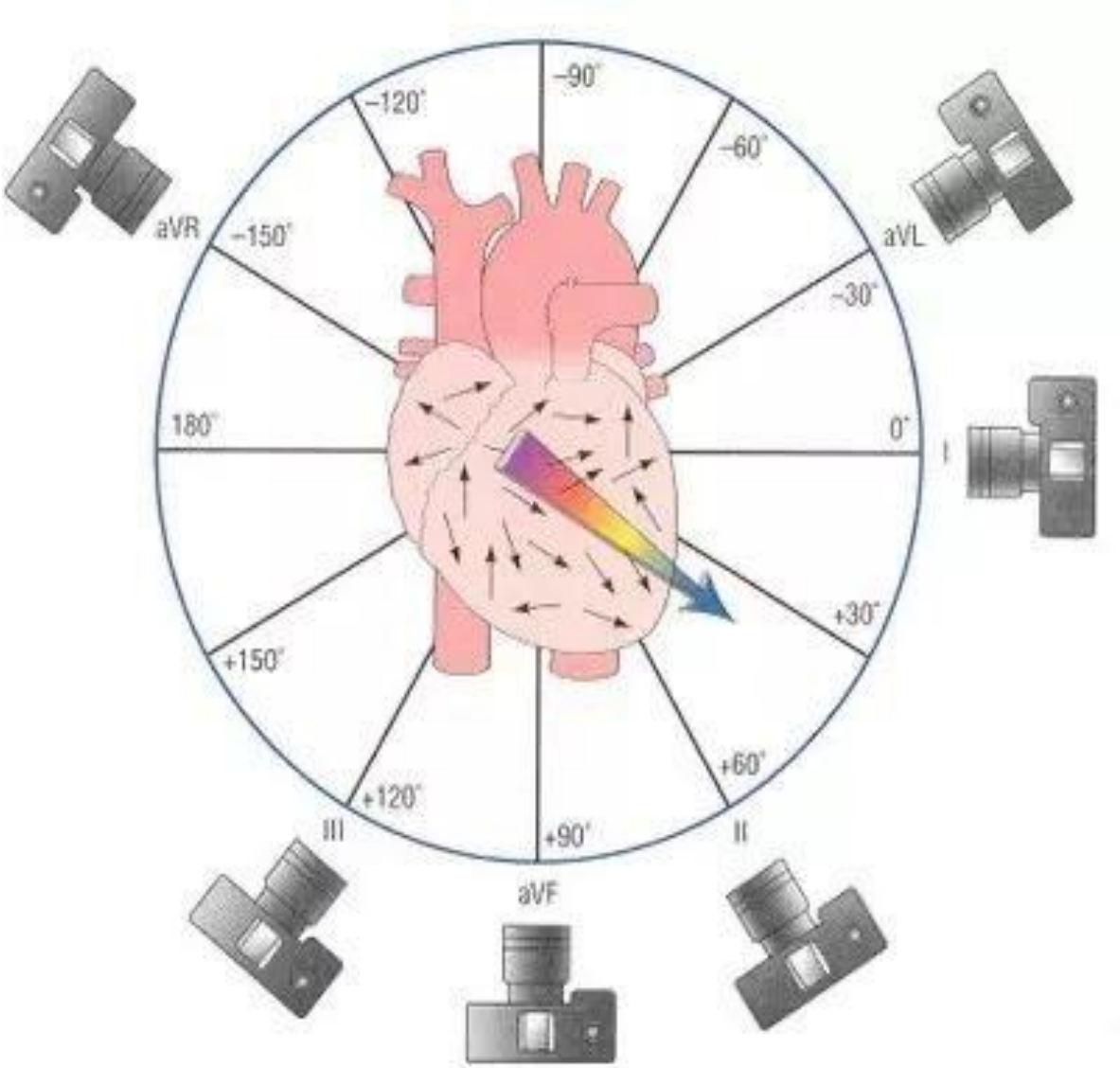


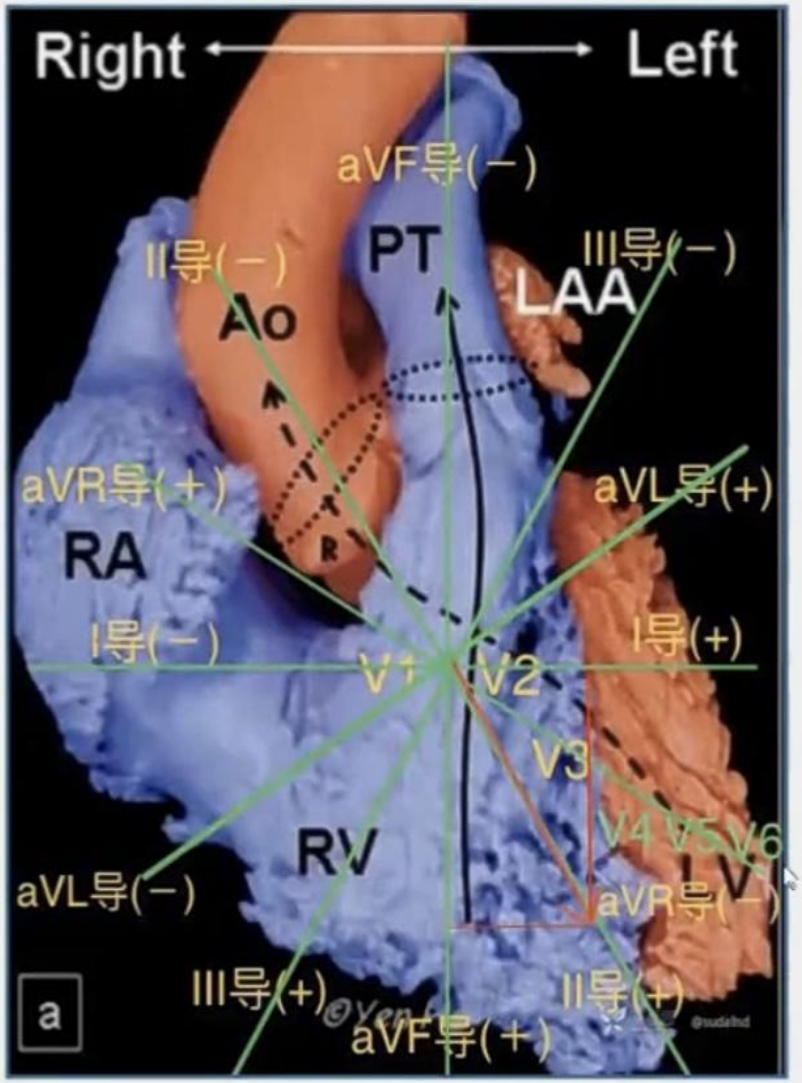
图 4-1　犬冠状动脉急性阻塞后不同程度心肌缺血的心电图改变模式

心肌梗死的定位诊断

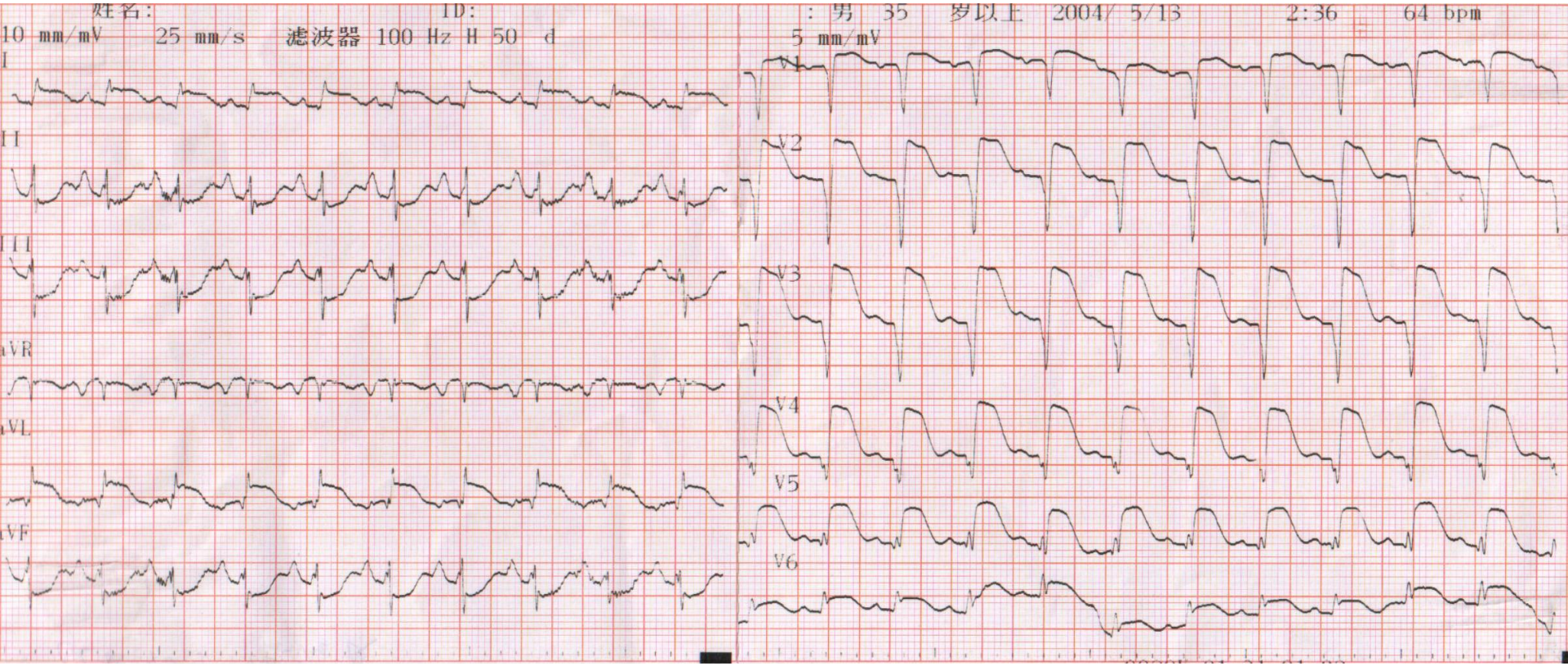




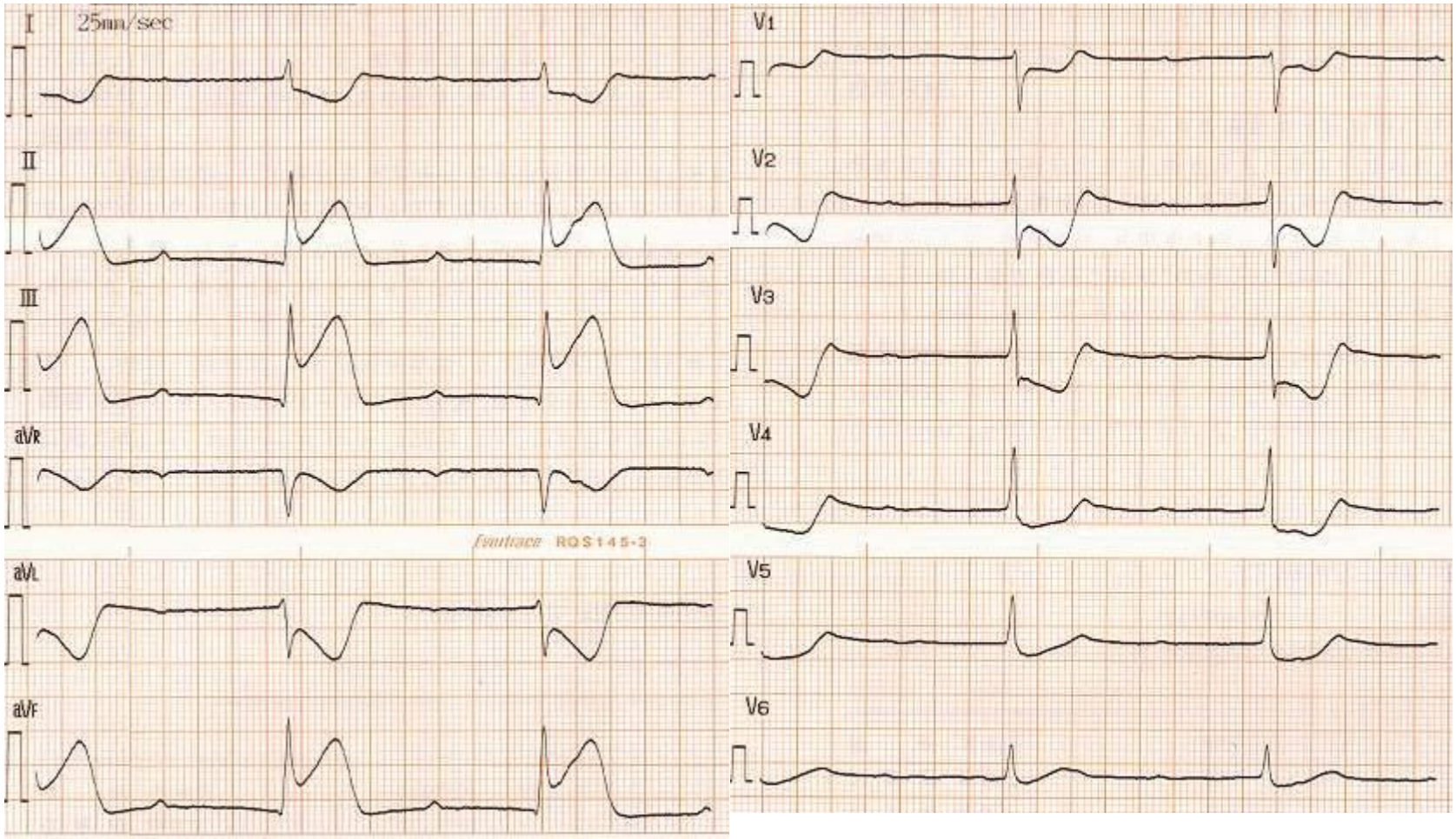

-90°
-120°
-60°
aVR
-150°
aVL
-30°
180°
0°
I
+30°
+150°
+60°
+120°
III
+90°
II
aVF


Right
Left
aVF导(−)
II导(−)
PT
III导(−)
Ao
LAA
aVR导(+)
aVL导(+)
RA
I导(−)
I导(+)
V1
V2
V3
V4 V5 V6
RV
LV
aVL导(−)
aVR导(−)
III导(+)
II导(+)
aVF导(+)
a

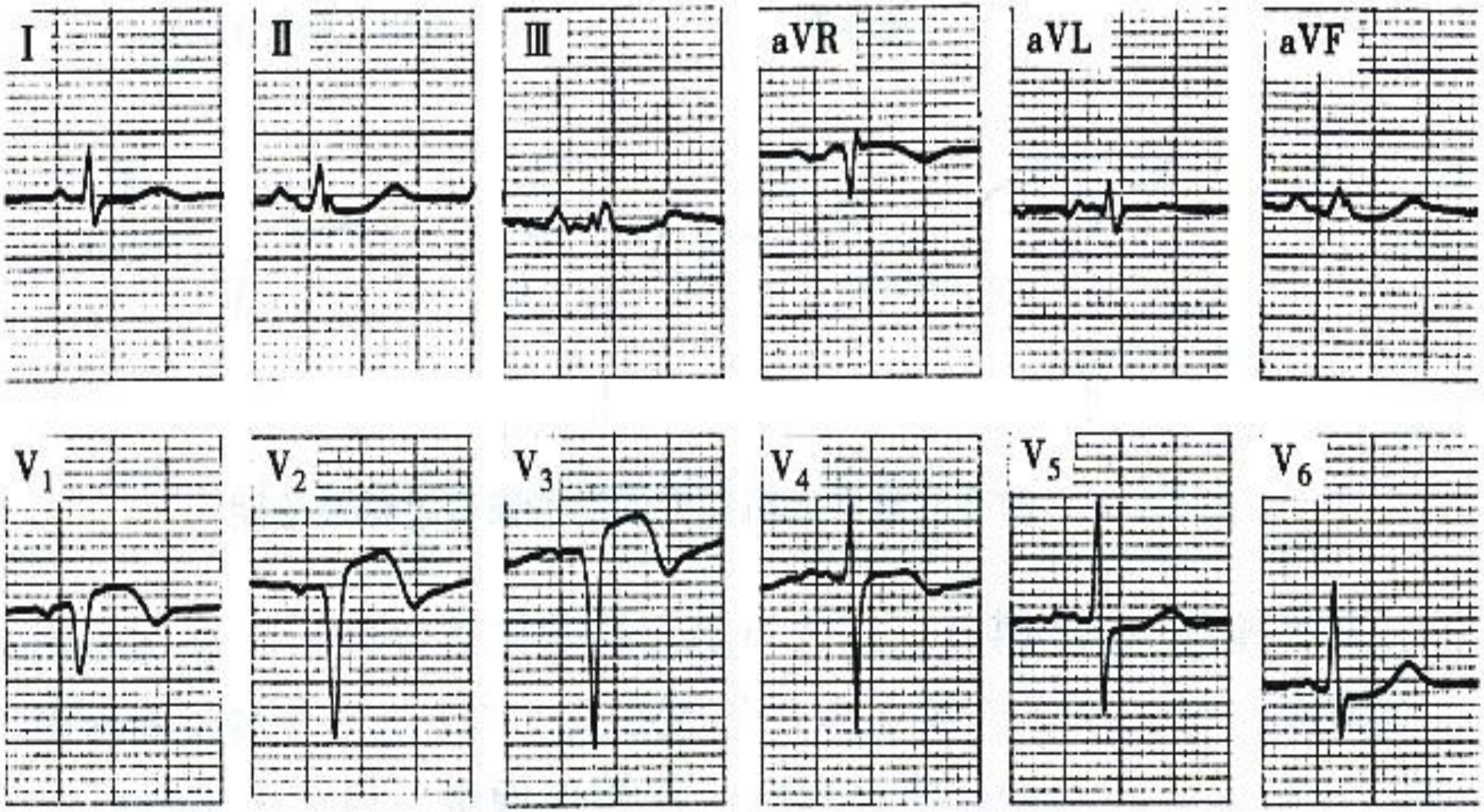
广泛前壁心肌梗死急性期



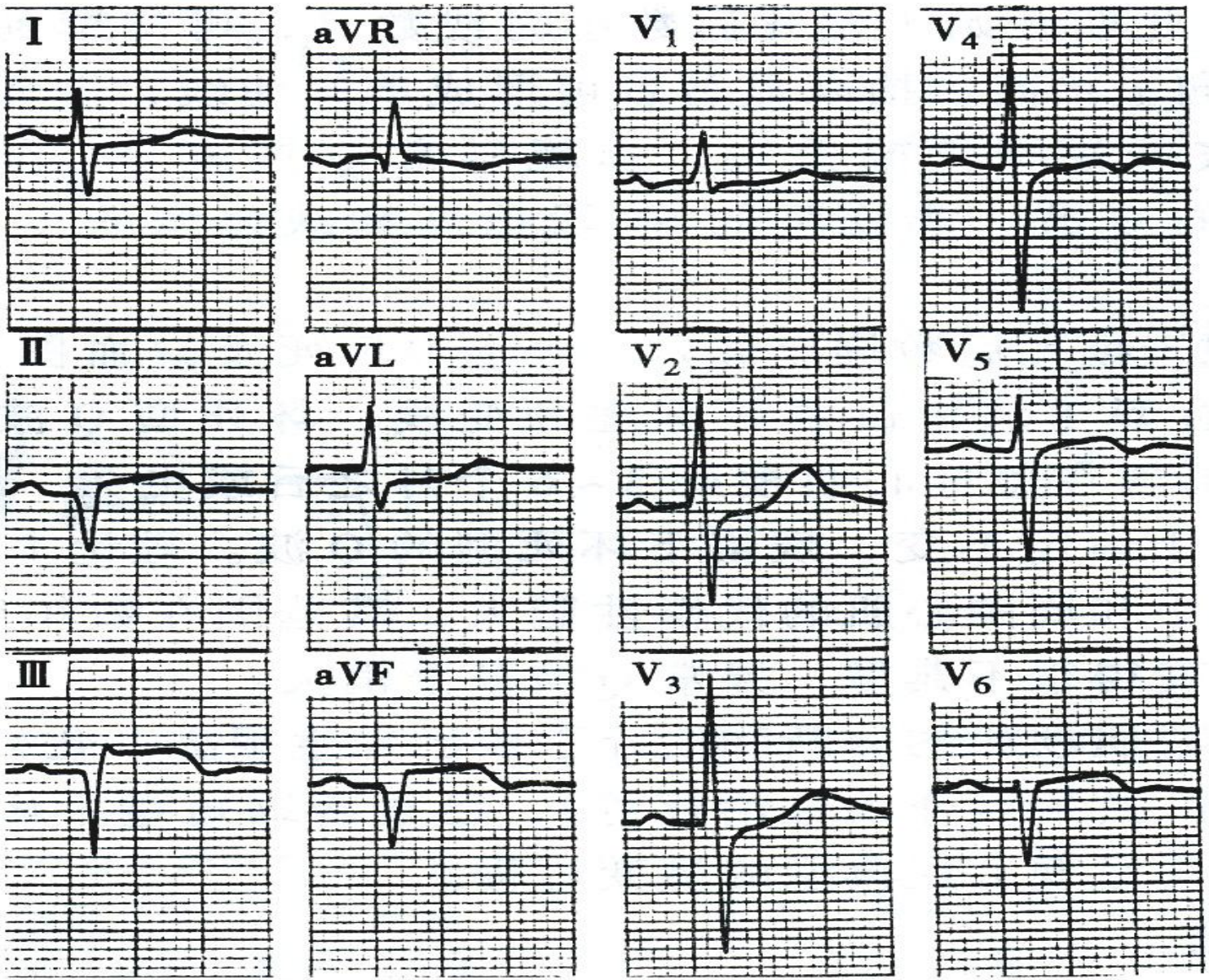
超急性下壁心肌梗塞



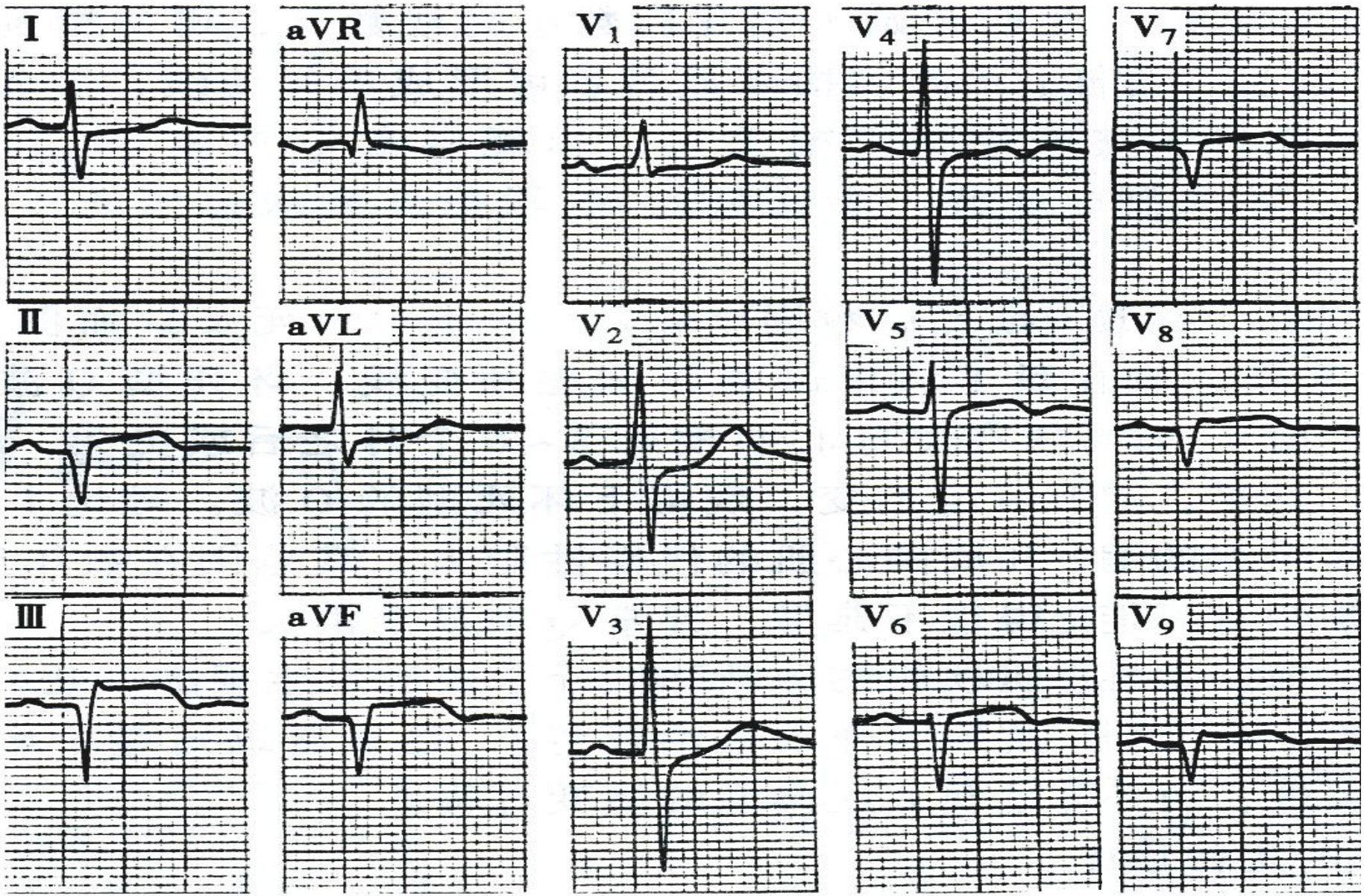
前间壁心肌梗死急性期



急性下壁心肌梗死



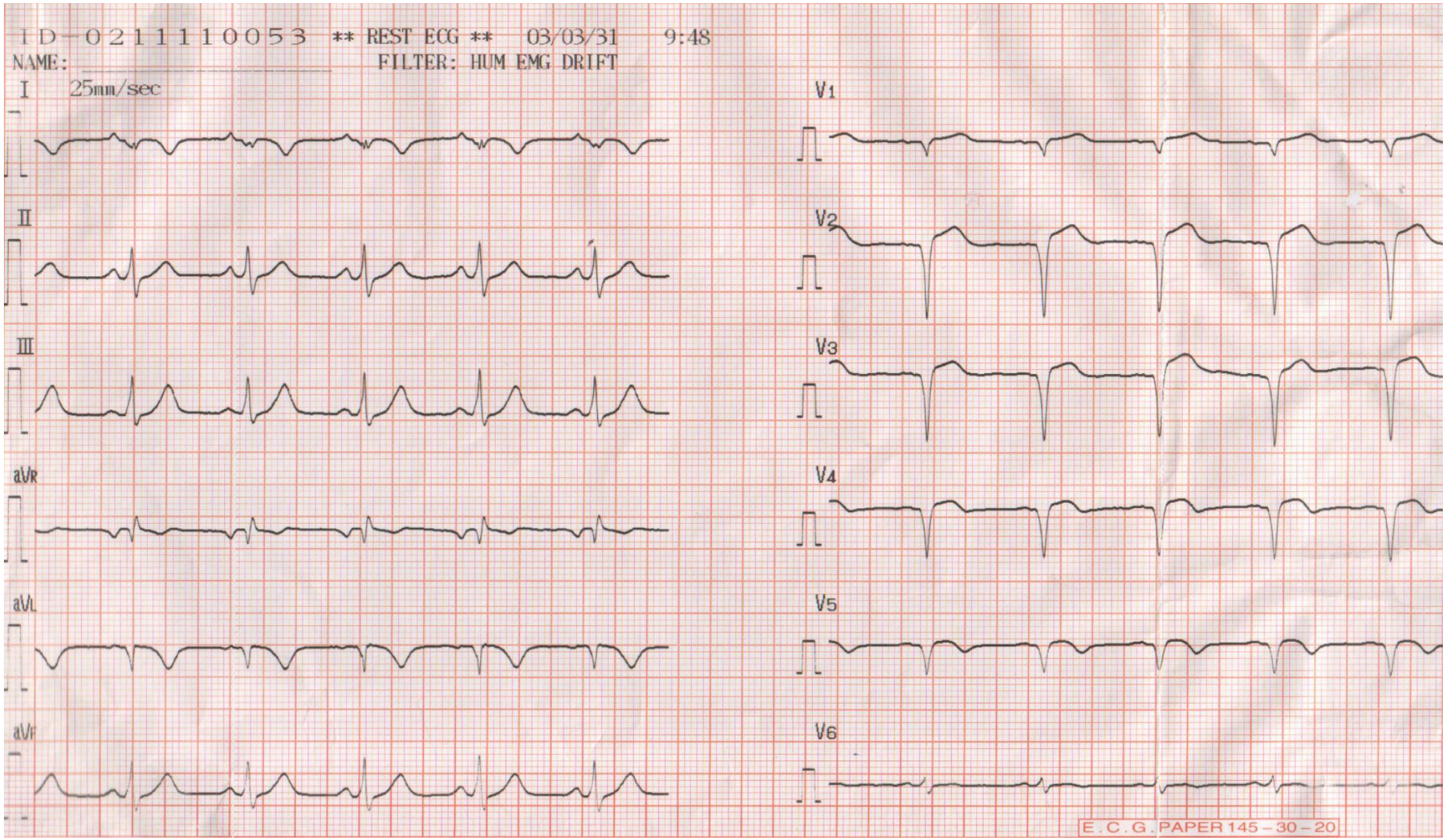
急性下壁后壁心肌梗死



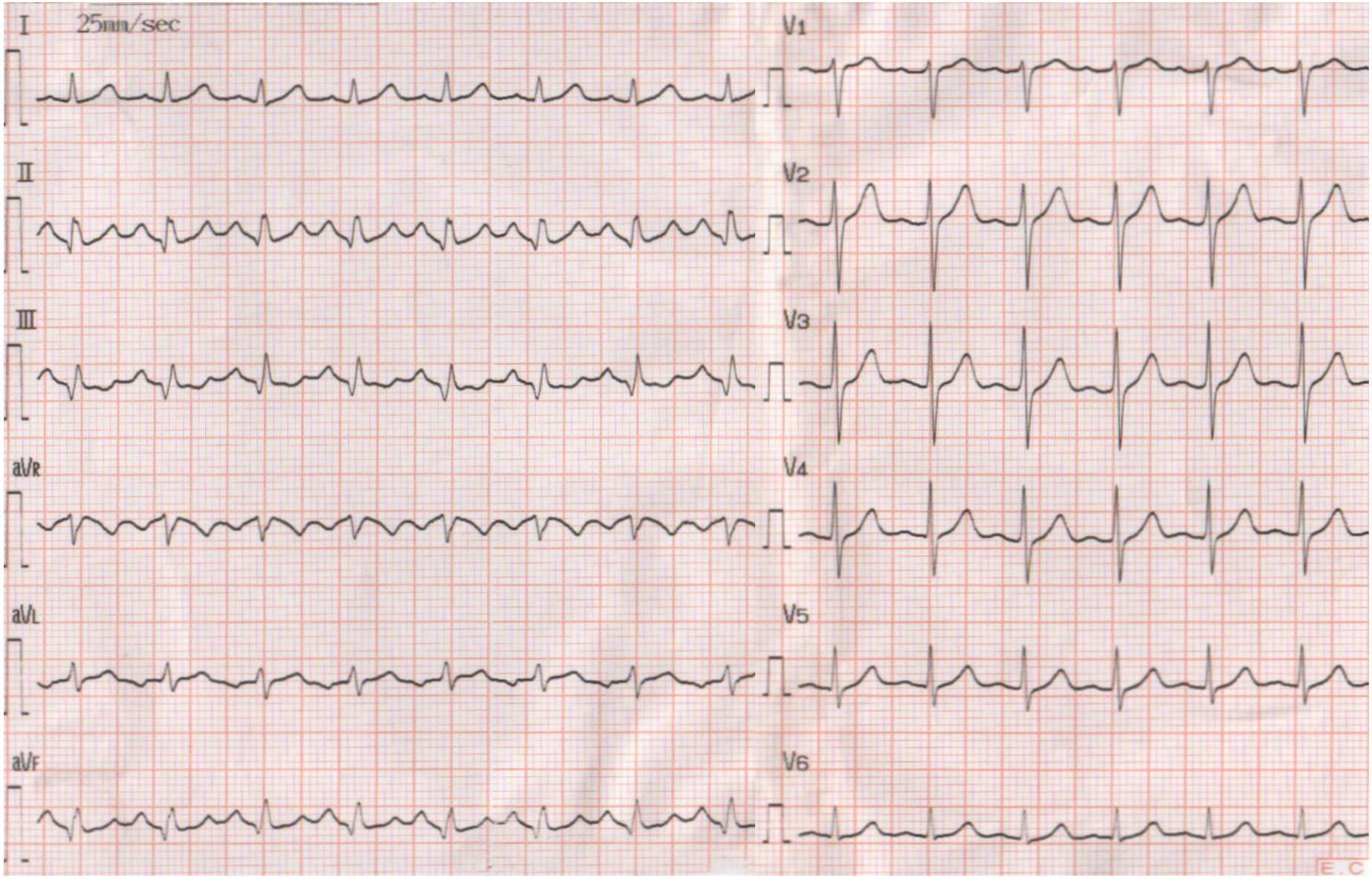
侧壁下壁后壁心肌梗死急性期


20mm/mv
V7
V8
V9

广泛前壁心肌梗死亚急性期



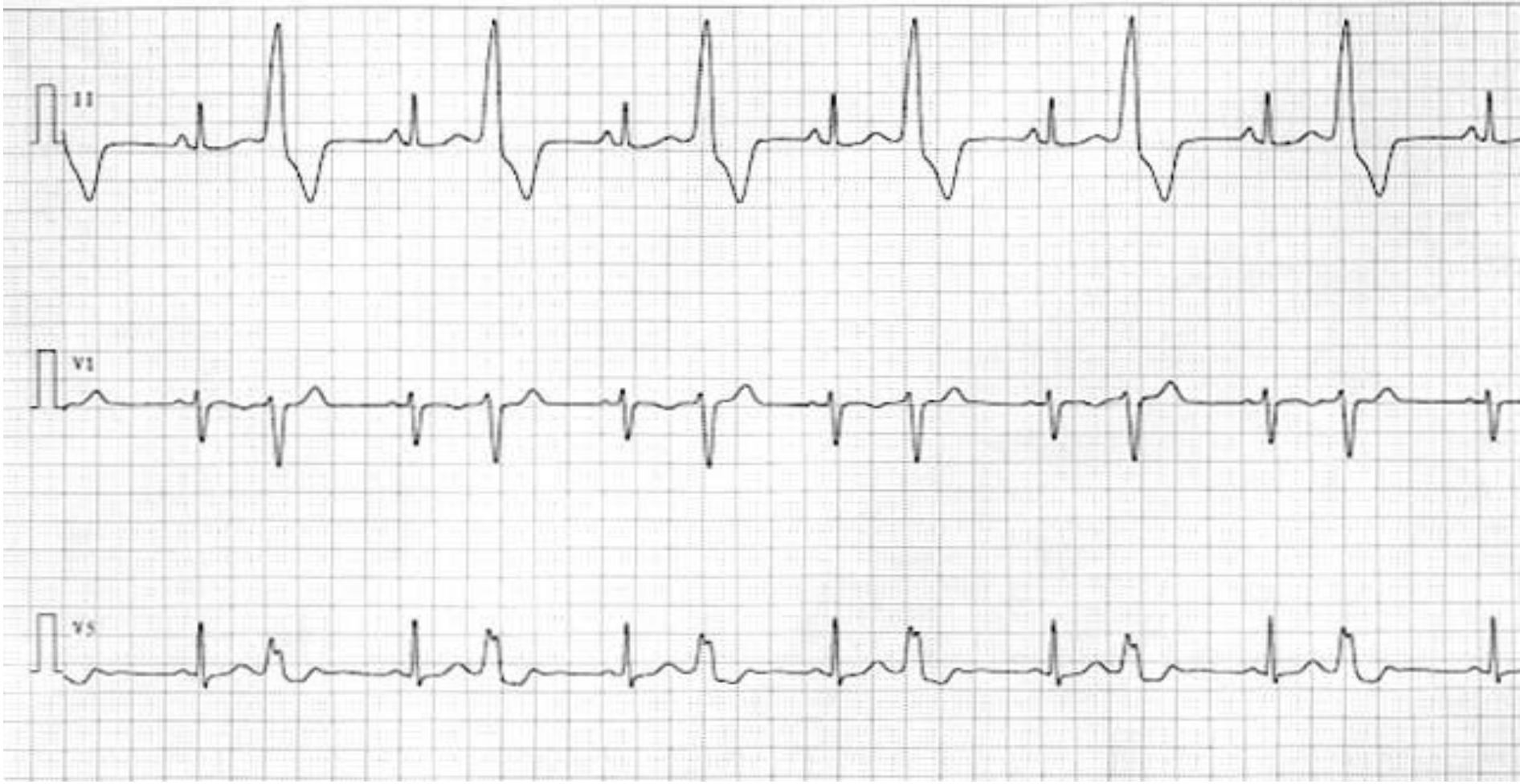
陈旧性下壁心肌梗死

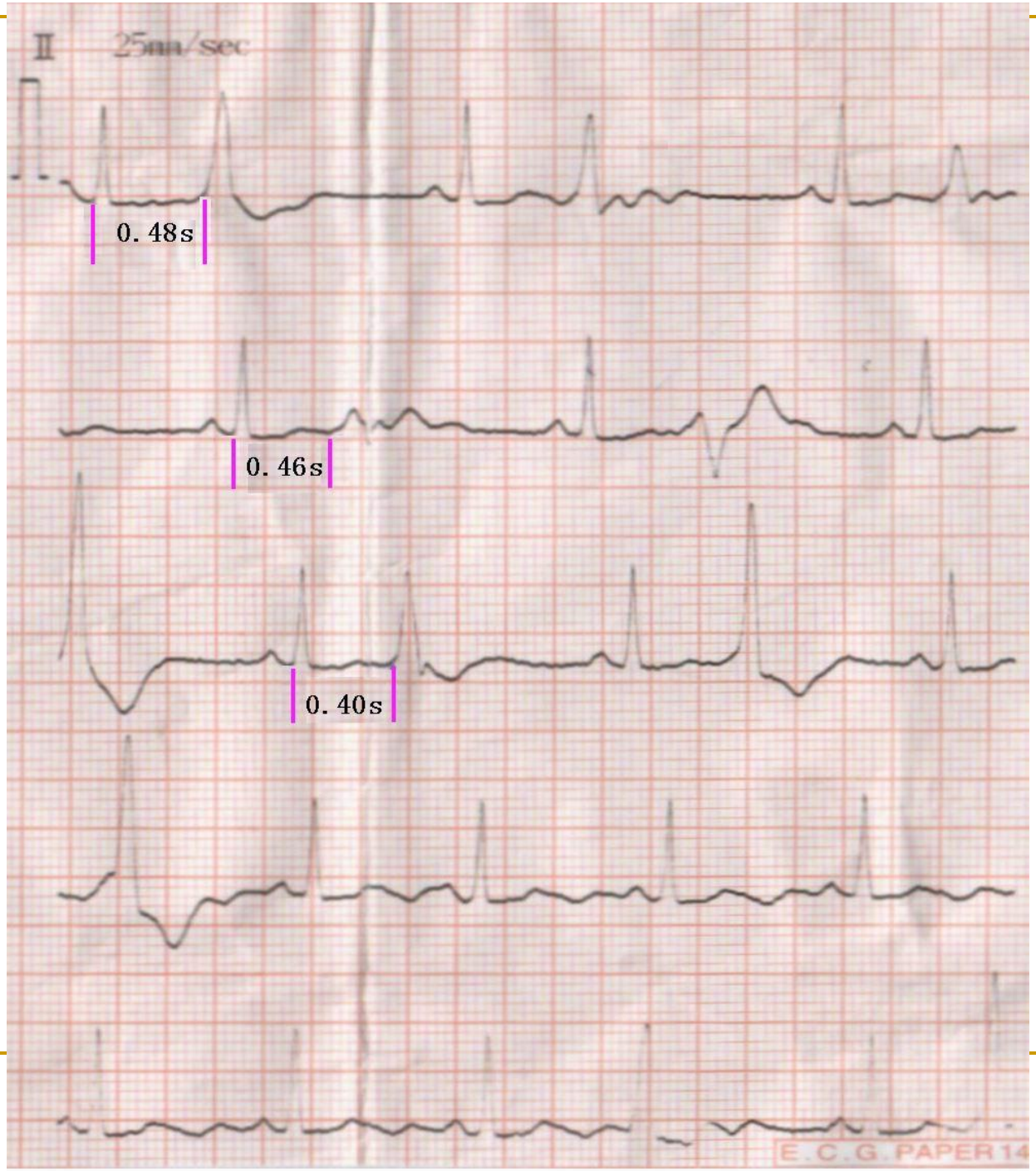


室早（二联律）

周晓勤　科别：内科	心电图号：2000-40　门诊号：990451	临床诊断：心律失常原因待查
女 35 岁 身高：　cm 体重：　kg	住院号：　病区：　病床：	心血管用药：

心率：94 b/m　QRS时限：0.09 ″　**心电图诊断：**
P-R间期：0.12 ″Q-T间期：0.39 ″
QTc：0.49　电轴：50 度

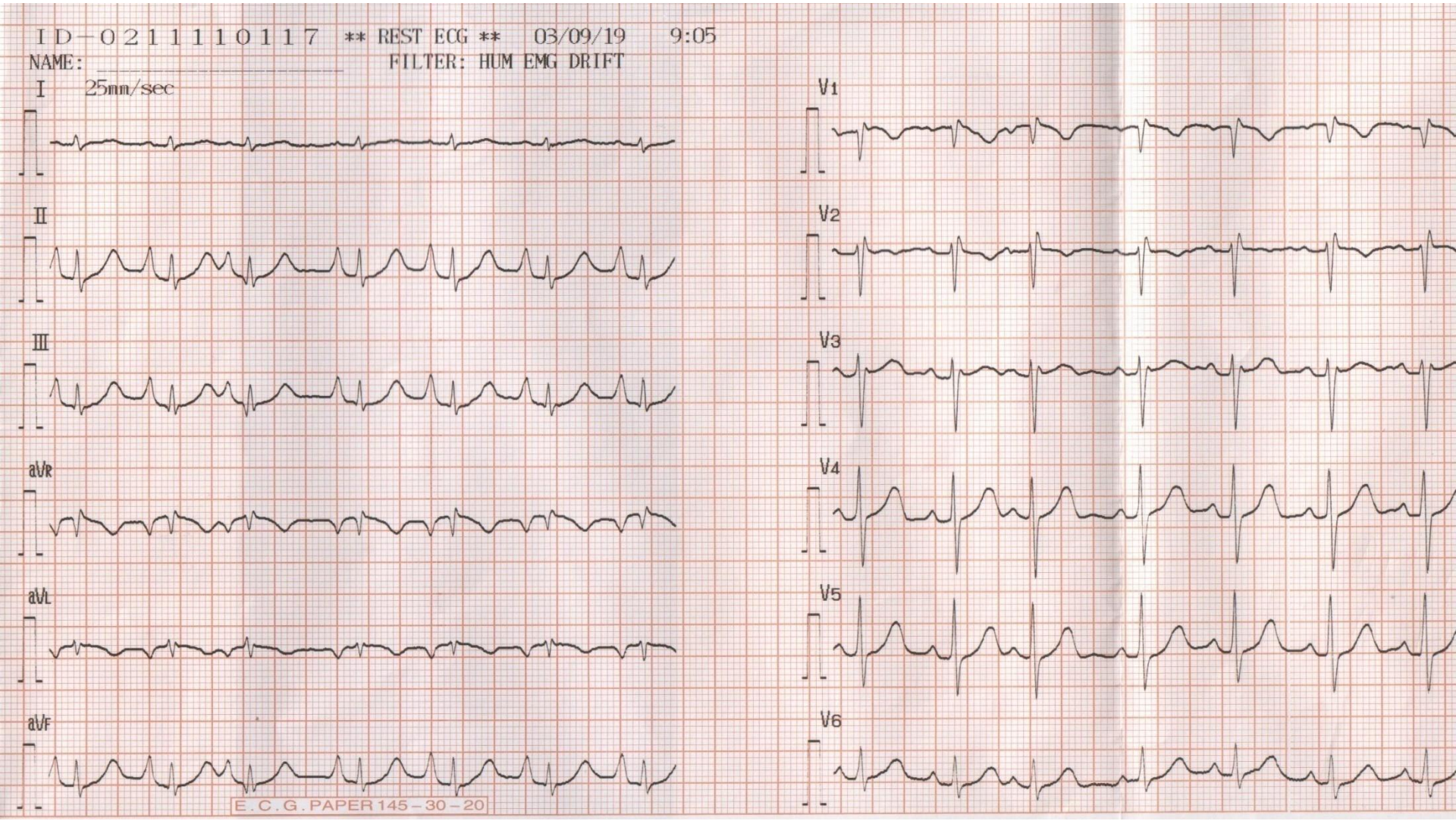


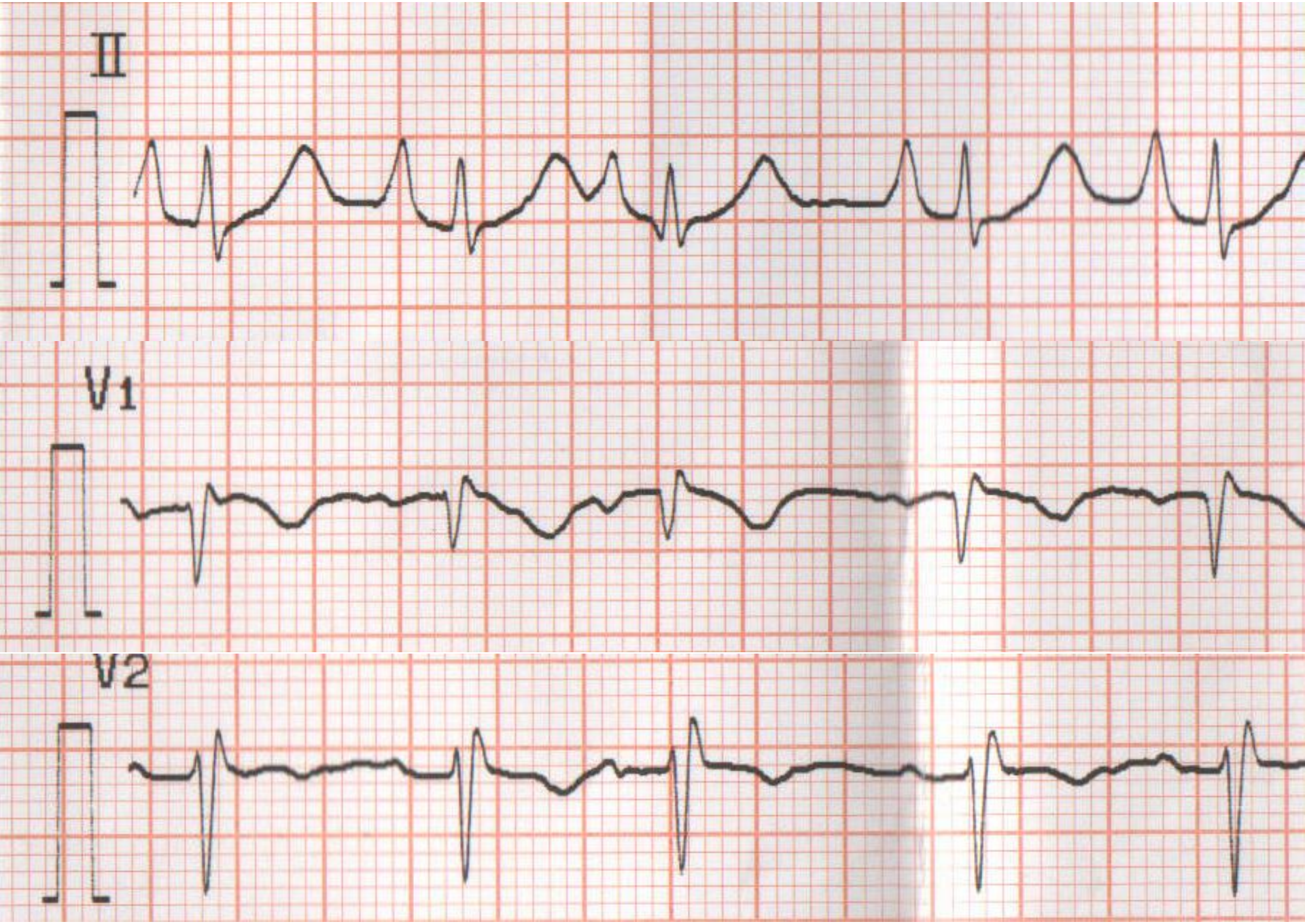


多源性室早二联律

插入性期前收缩

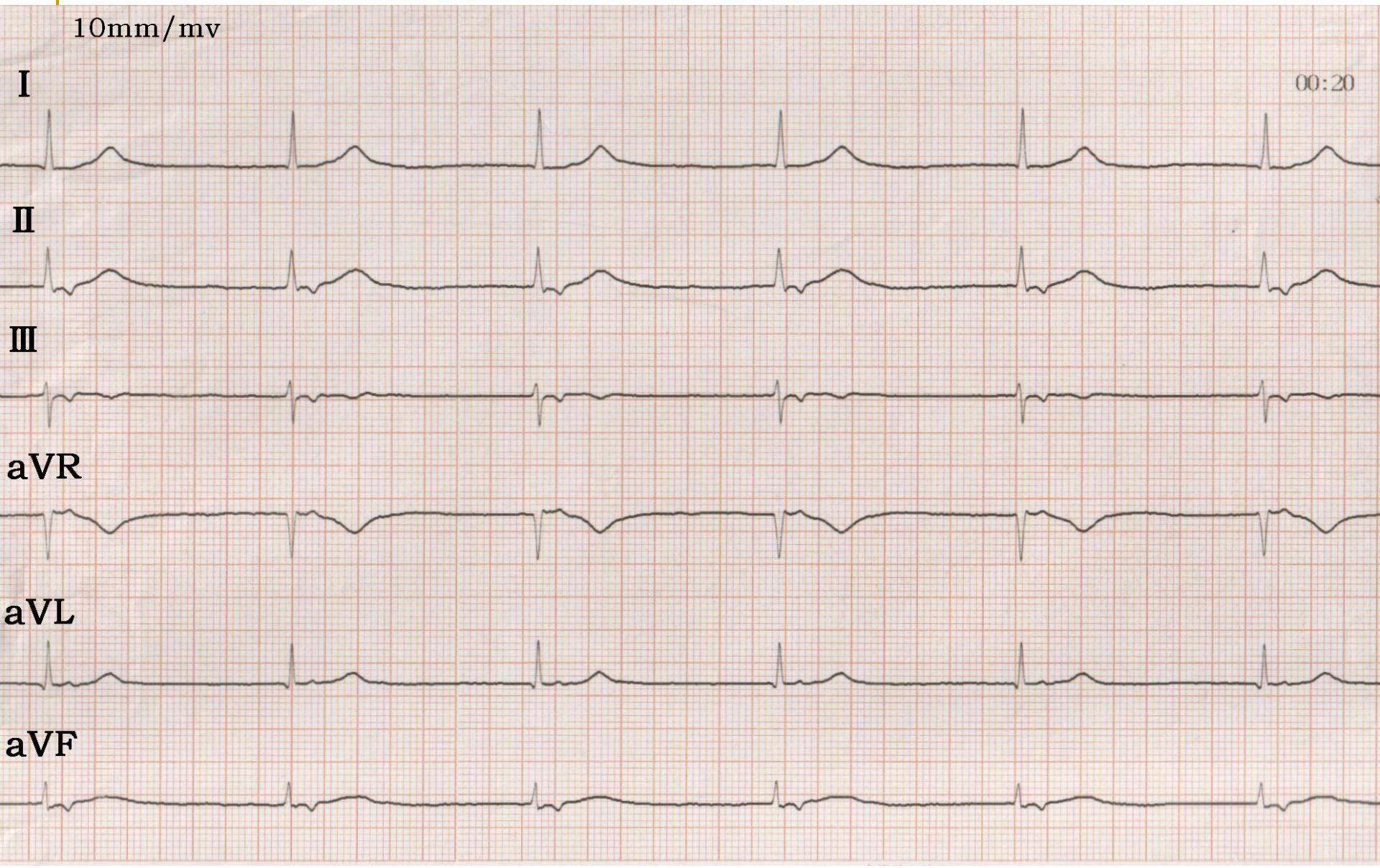
房性期前收缩


ID-0211110117 ** REST ECG ** 03/09/19 9:05
NAME:
FILTER: HUM EMG DRIFT
I 25mm/sec
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
E.C.G.PAPER 145-30-20

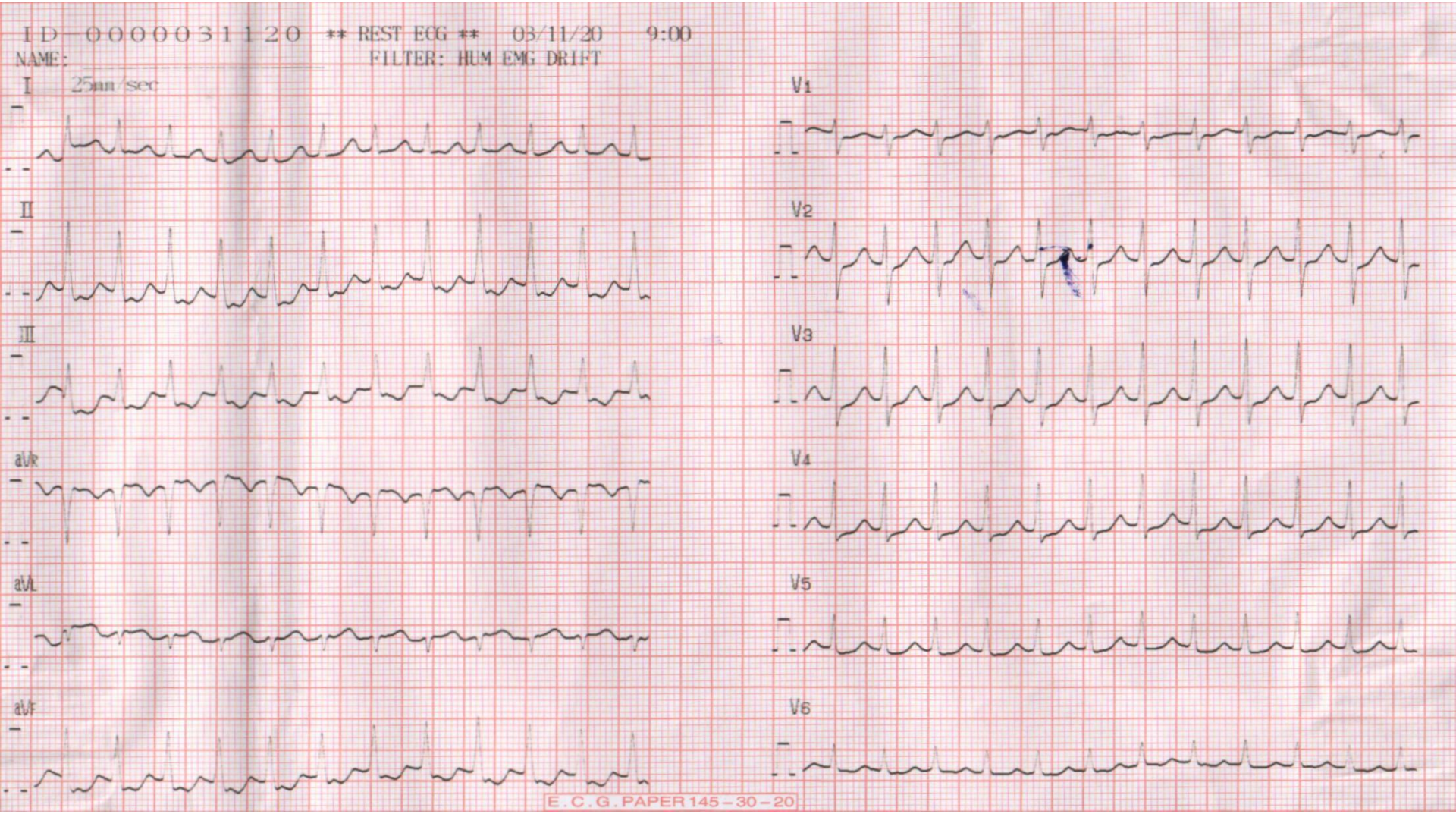

II
V1
V2

房室交界性期前收缩

房室交界性逸搏心律



阵发性室上性心动过速


ID 0000031120 ** REST ECG ** 03/11/20 9:00
NAME:
FILTER: HUM EMG DRIFT
I 25mm/sec
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
E.C.G.PAPER 145-30-20

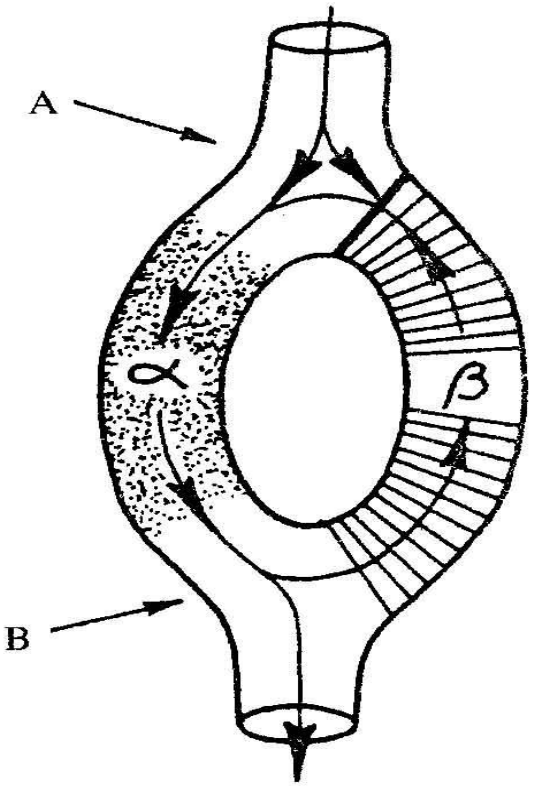
发生机制

★房室结折返性心动过速(AVNRT)

慢径路(α)：传导速度慢，不应期短

快径路(β)：传导速度快，不应期长

★房室折返性心动过速(AVRT)：房室旁路(AP)参与折返



AP 蔡江花 女 67歲

安靜時心電圖 847498 (3.50) 2017年 12月26日 21時54分

濾波器:干擾,漂移

運動負荷試驗:可（需小心）

標識號 =
年齡/性別 = 歲/
身高/體重 = cm/ kg
血壓 = / mmHg
心率 = 132/分(0.453秒)
PR = 0.112秒
QRS = 0.090秒
心軸 = 48度
QT/QTc = 0.330秒/0.488
RV5 = 2.42mV
SV1 = 0.46mV
藥物 =

＊＊＊ 臨界線異常 ＊＊＊ 代表心搏波形

428:可疑ＳＴ－Ｔ異常（側下壁）
812:賣性心動過速

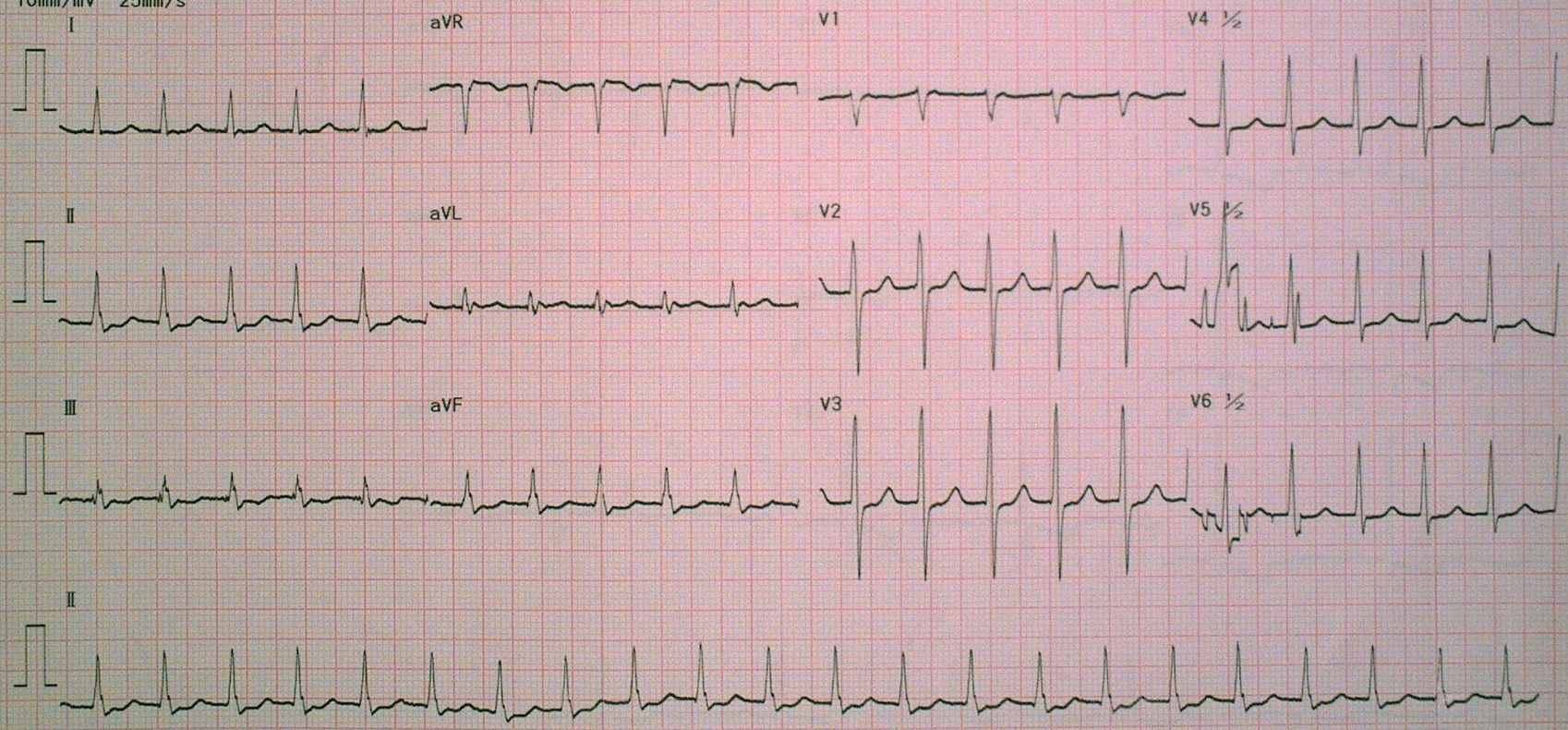
有干擾混入或基線漂移．
(V5,V6)
請確認測量值有無錯誤．

因Ｐ波不明顯．請確認．

V6) -ST = 0.09mV
II) -ST = 0.08mV

******* 請醫師總合分析診斷． *******
醫師名：
4-2 5-5 6-5 8-7-3

10mm/mV 25mm/s



14床 韓正義 女 61岁 8414098

日本光电 9130P/K SPECIAL PAPER

*靜時心電圖 (3.50)

2017年 12月27日 07時34分

濾波器:干擾,漂移

運動負荷試驗:不可

標識號	=	
年齡/性別	=	歲/
身高/體重	=	cm/ kg
血壓	=	/ mmHg
心率	=	47/分(1.269秒)
PR	=	0.242秒
QRS	=	0.088秒
心軸	=	43度
QT/QTc	=	0.480秒/0.424
RV5	=	2.51mV
SV1	=	0.53mV
藥物	=	

*** 異常心電圖 ***

611:Ⅰ度房室阻滯

436:ＳＴ－Ｔ異常（前側壁）

425:可疑ＳＴ－Ｔ異常（下壁）

141:逆鐘向轉動

有時反映心肌缺血、心室肥厚等，需要注意．

建議進行24小時動態心電圖監測、心臟超聲波檢查等．

代表心搏波形

822:賣性心動過緩

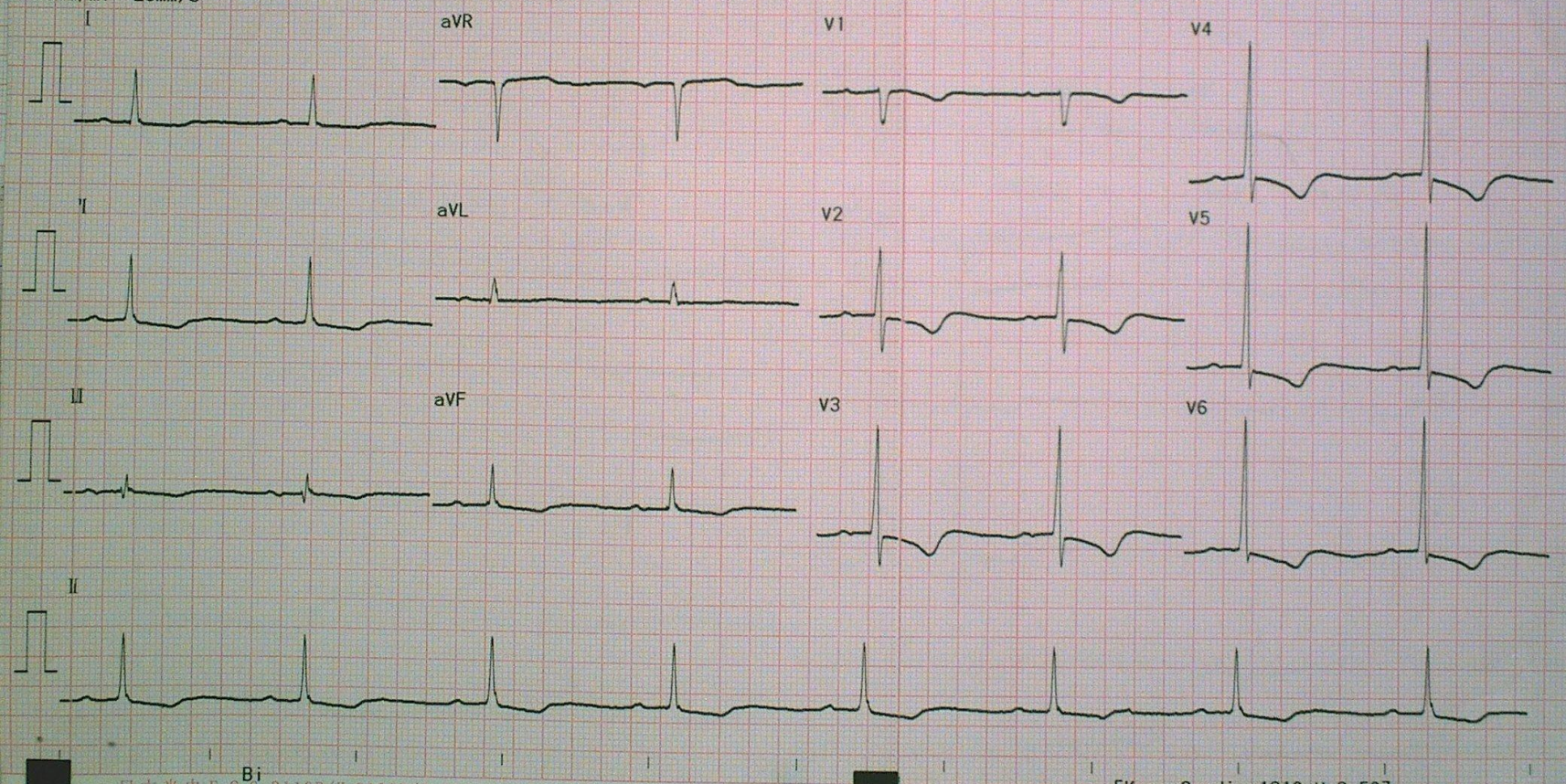
- PR = 0.242s
- V4) -T = 0.42mV
  V5) -T = 0.31mV
- II) -ST = 0.03mV
- V2) R = 1.14mV, S = 0.58mV

******* 請醫師總合分析診斷． *******

醫師名：

4-1 5-2-1 6-3 8-8-3 9-4-1

10mm/mV 25mm/s



日本光电 E.C.G 9110P/K 9130P/K 1350P SPECIAL RECORDING PAPER

[Kenz Cardico1210 V-3.50]

日本光电 E.C.G 9110P/K 9130P/K 1350P SPECIAL RECORDING PAPER

窦性心动过速

病态窦房结综合征

1 持续窦性心动过缓(HR<50bp

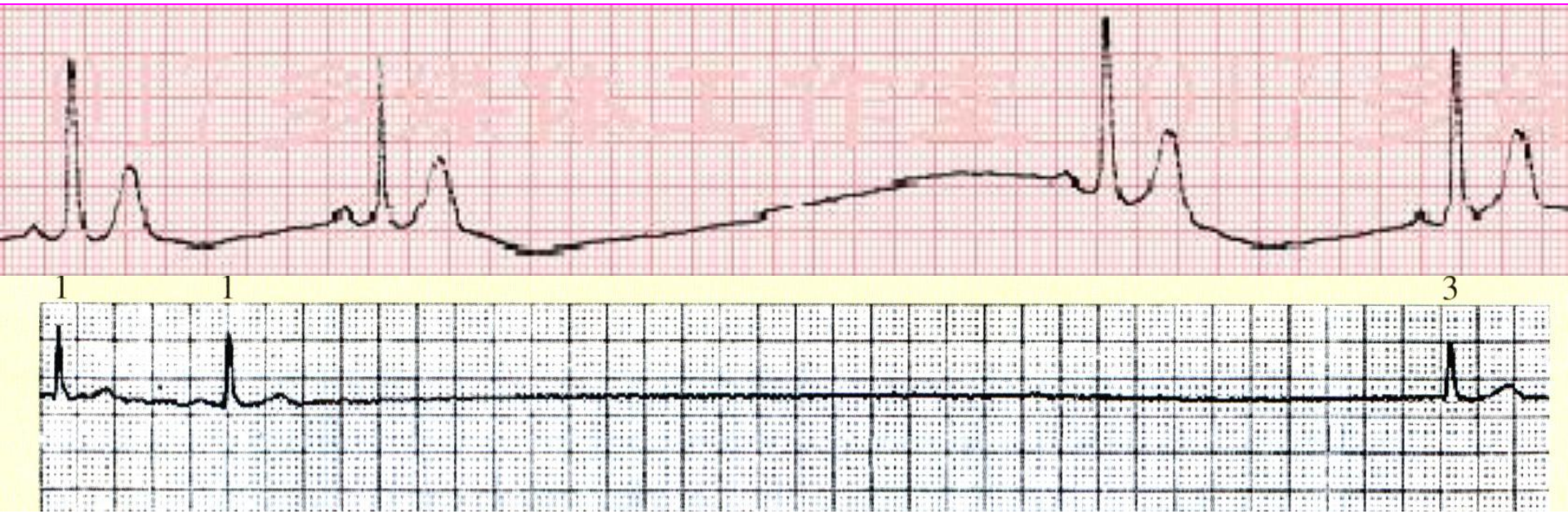
2 窦性停搏或窦房阻滞

3 慢-快综合征

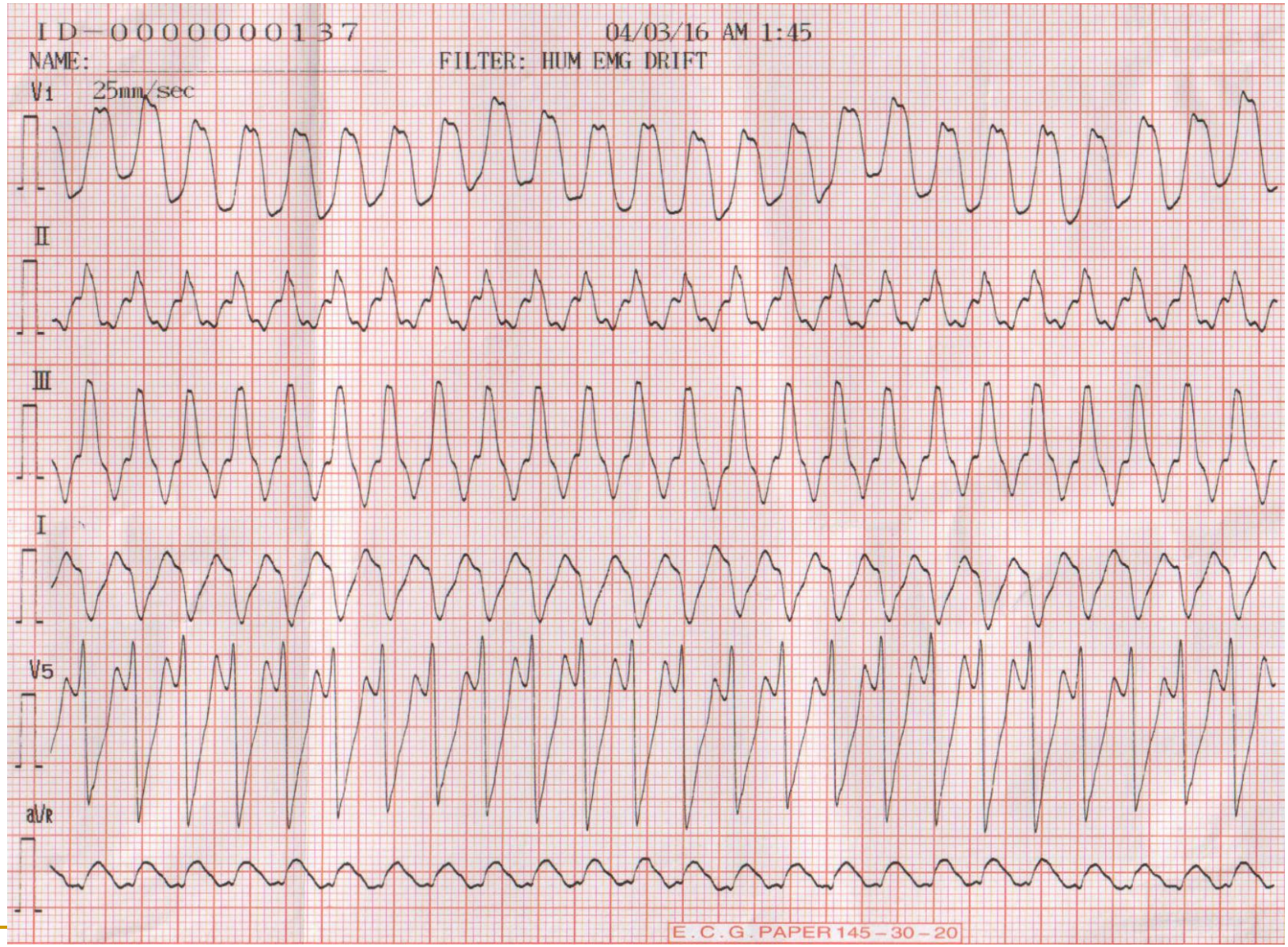
4 可累及AVN，称双结病变

- 临床意义

可见于冠心病、心肌炎、心肌病以及起搏传导系统退行性病变



室速


ID-0000000137
04/03/16 AM 1:45
NAME:
FILTER: HUM EMG DRIFT
V1
25mm/sec
II
III
I
V5
aVR
E.C.G.PAPER 145-30-20

阵发性室性心动过速

1.突然发生突然终止。

2.心率快而略不整齐(同导联中R-R间期相差＜0.03s)，一般为140～200次/分。以＜200次/分为多。

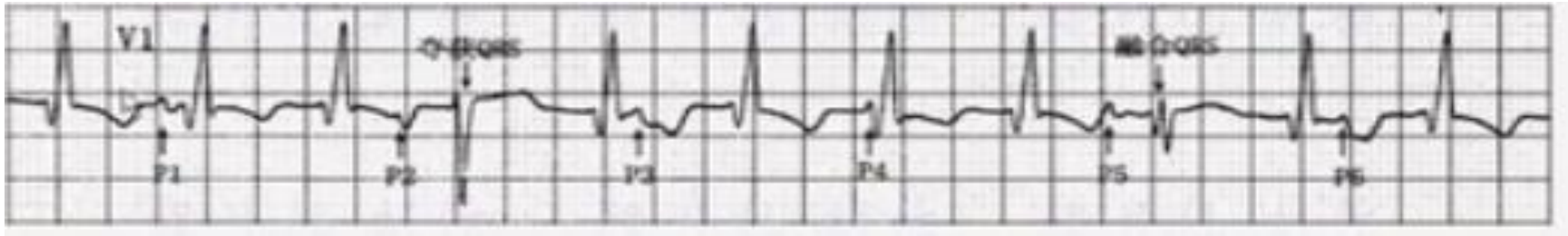
3.QRS波群形态宽大畸形，时限>0.12s。

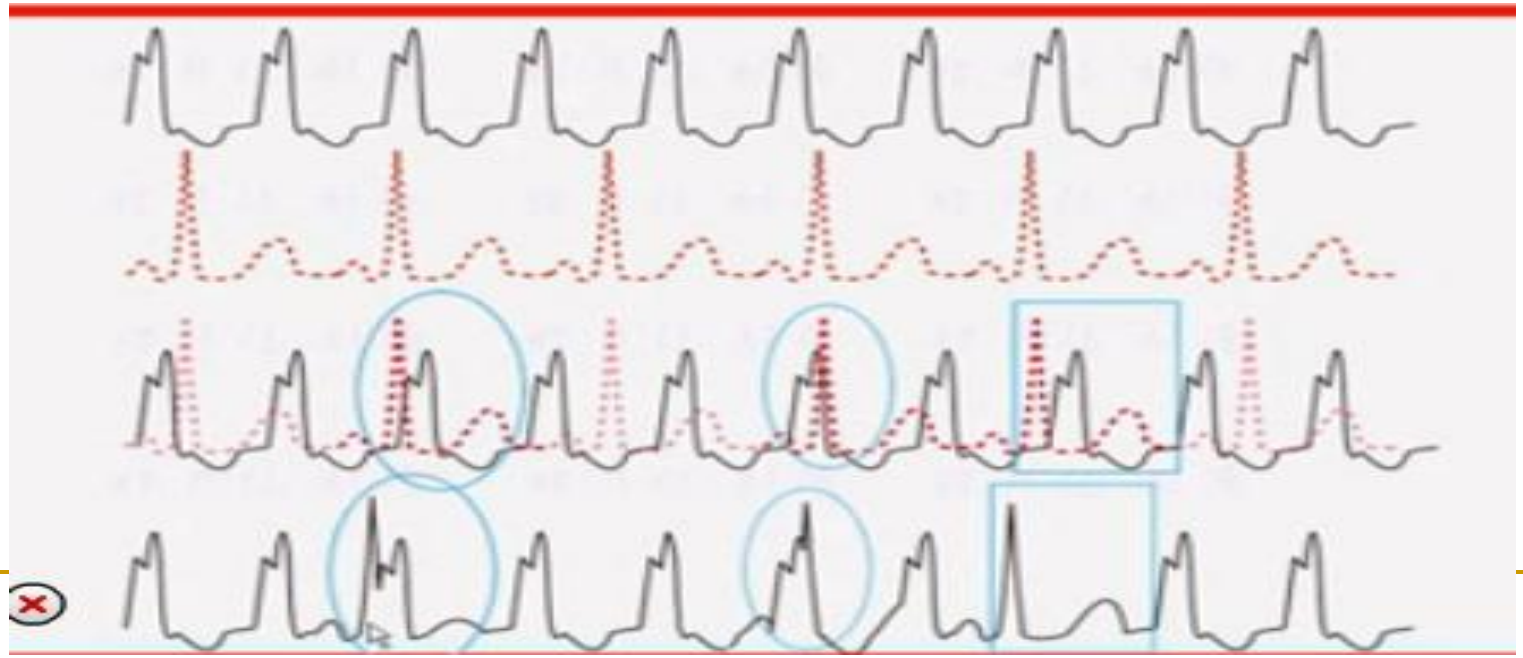
4.常见房室分离，心室夺获，室性融合波。

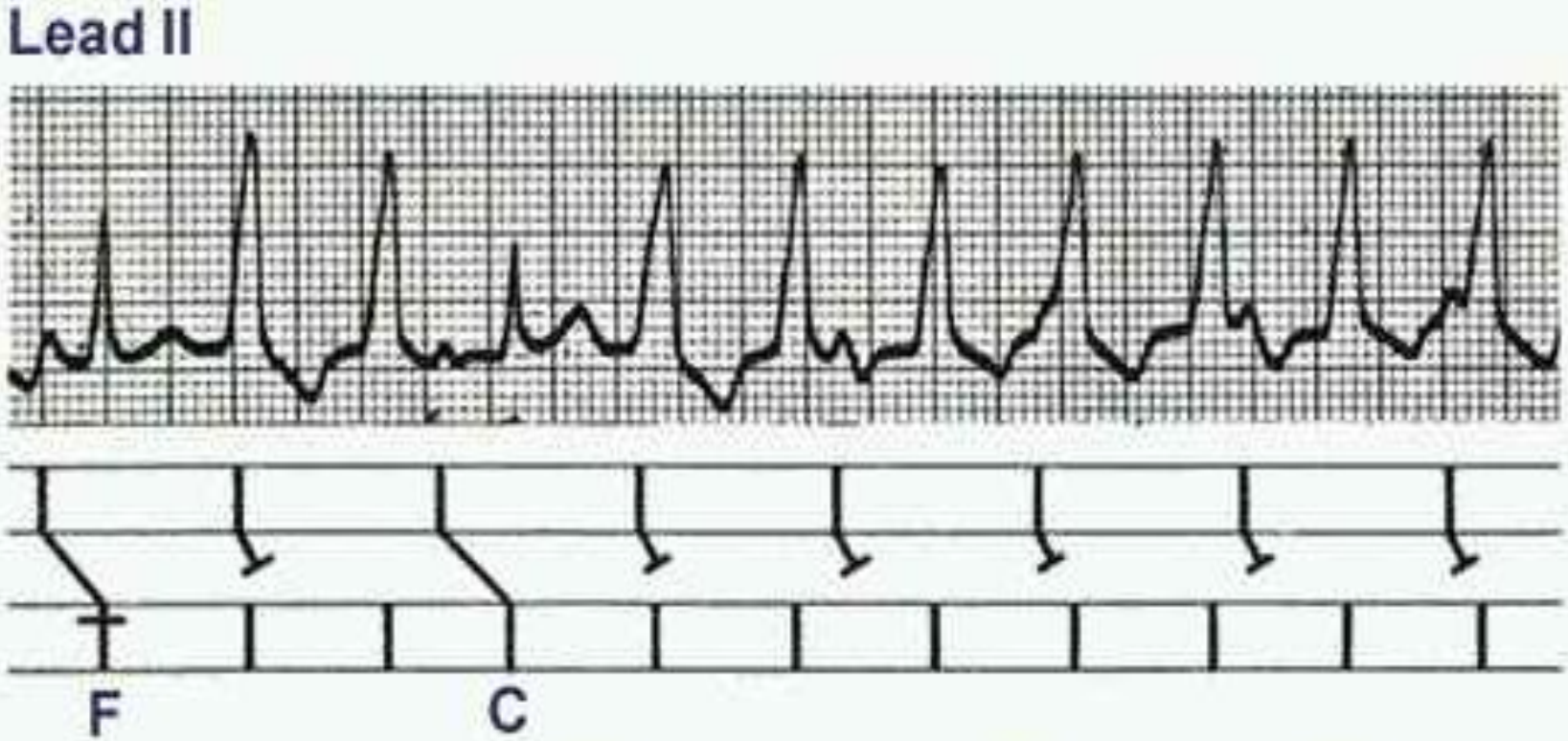
- 临床意义:

  阵发性室性心动过速多发生于严重的器质性心脏病，如冠心病、洋地黄过量。

室速时房室分离、心室夺获、室性融合波



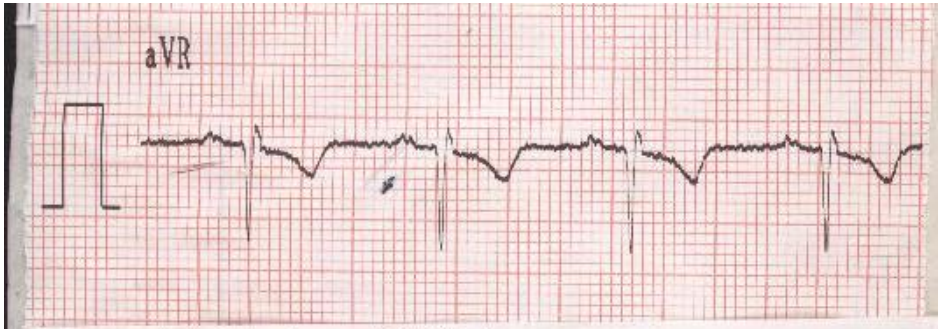




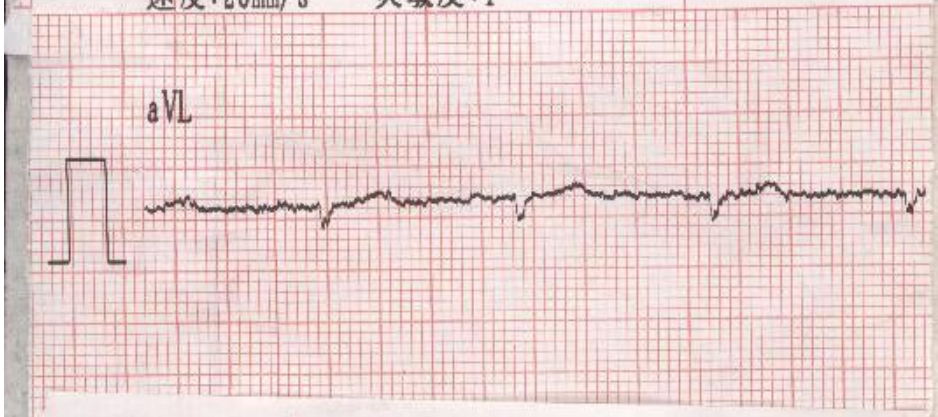
Ventricular Tachycardia with fusions (F) and captures (C)

非阵发性交界性心动过速

非阵发性房性心动过速



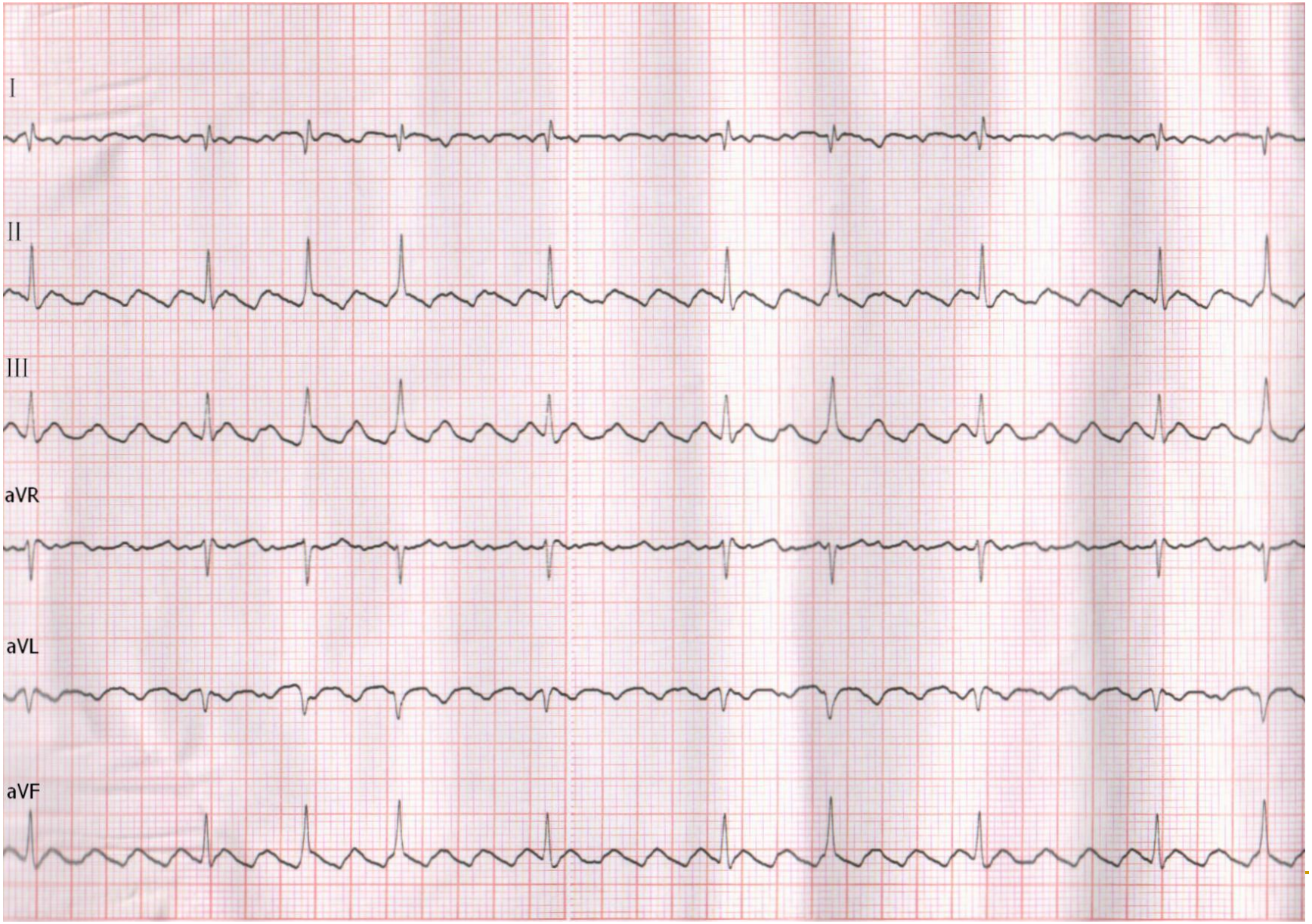
速度:25mm/s　　灵敏度:1



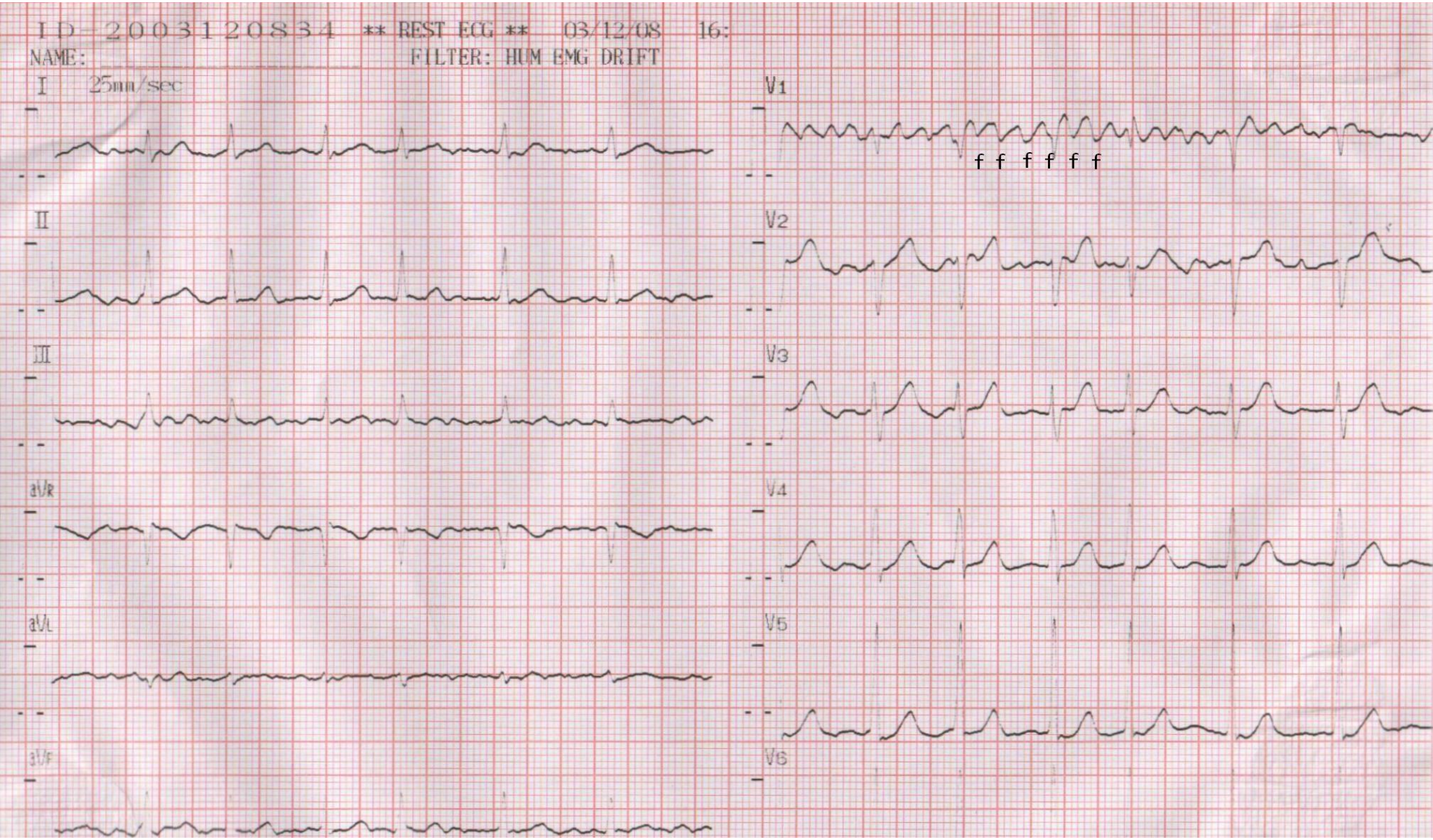
非阵发性心动过速

- 加速的房性、交界性（70-130bpm）、室性自主心律（ 60~100bpm）。机制是异位起搏点自律性增高

心房扑动

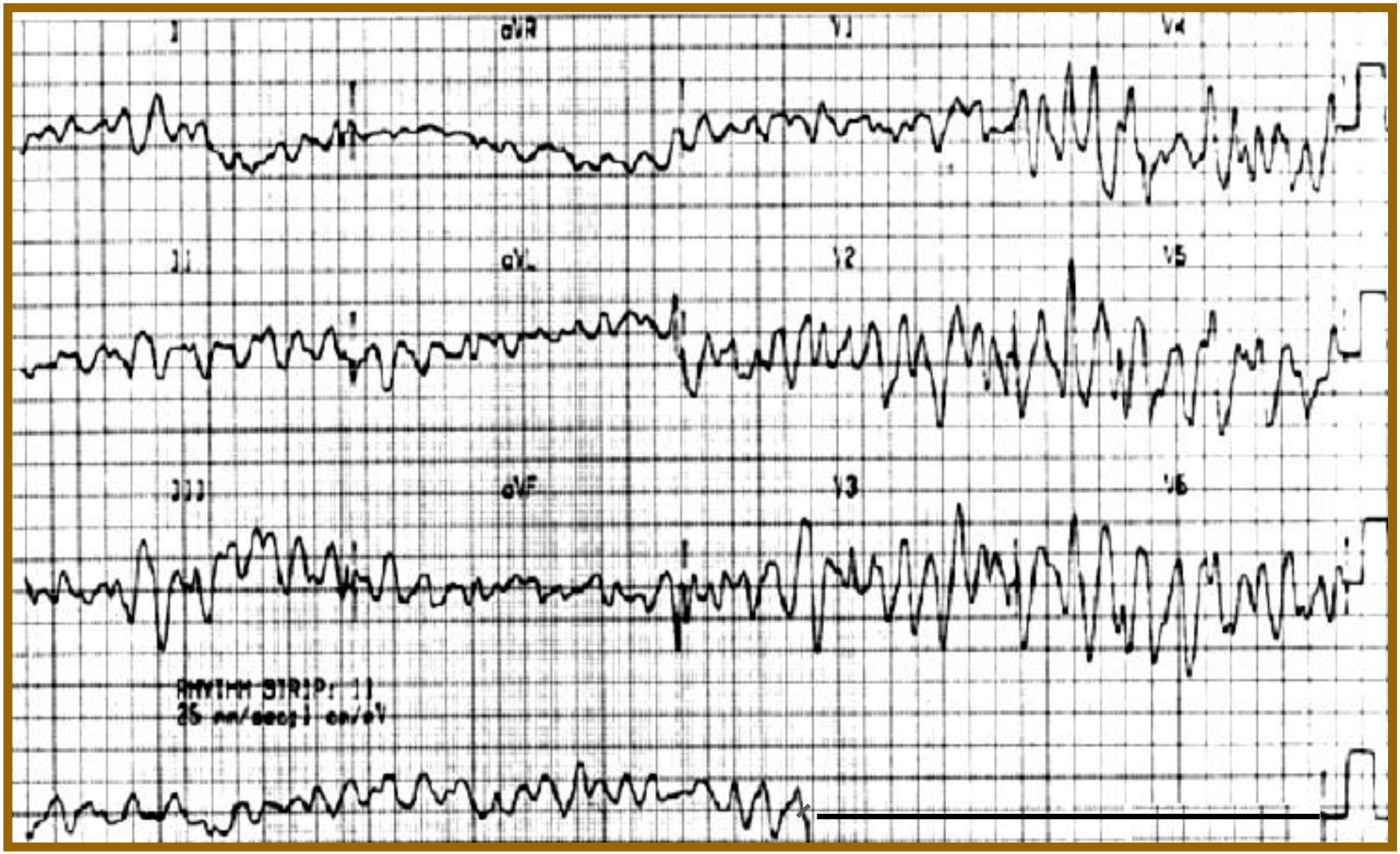


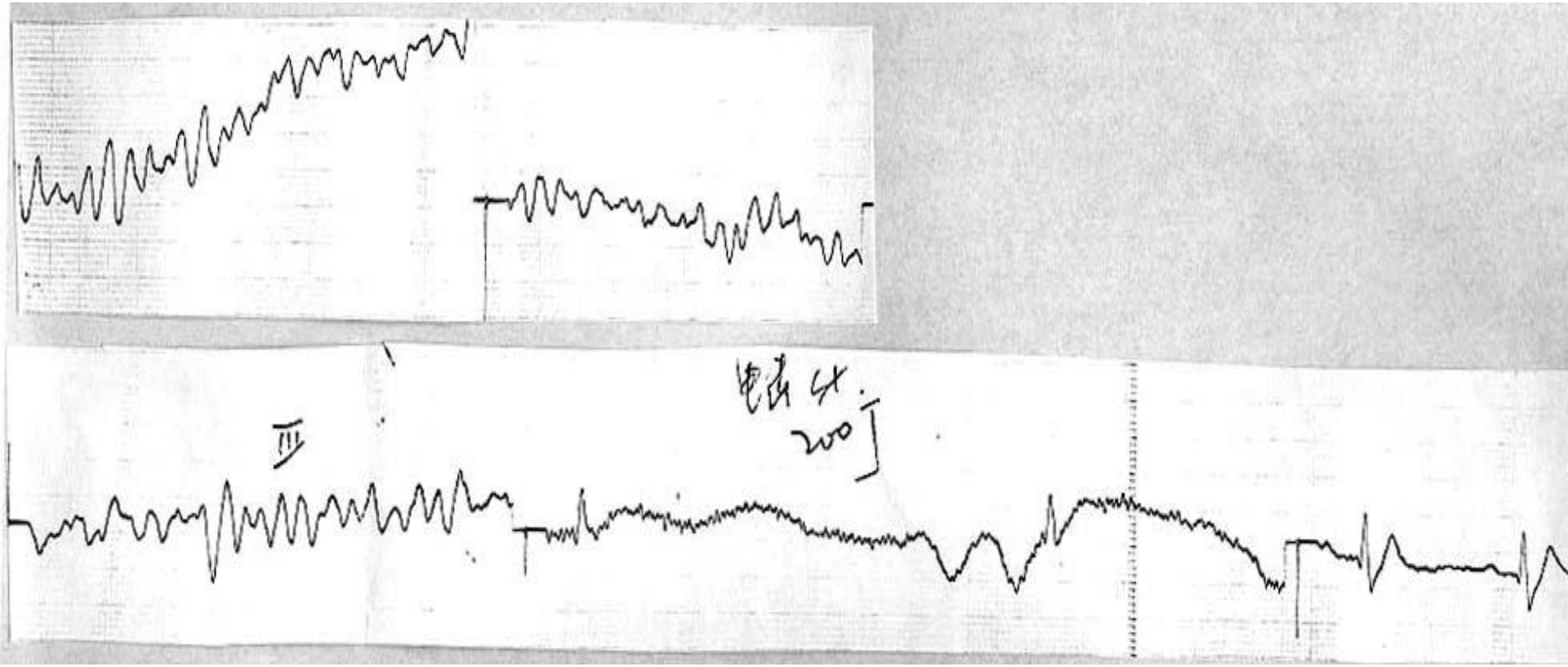
心房颤动


ID 200312083 4 ** REST ECG ** 03/12/08 16:
NAME:
FILTER: HUM EMG DRIFT
I 25mm/sec
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
f f f f f f

心室扑动

心室颤动


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
RHYTHM STRIP: II
25 mm/sec; 1 cm/mV


III
200

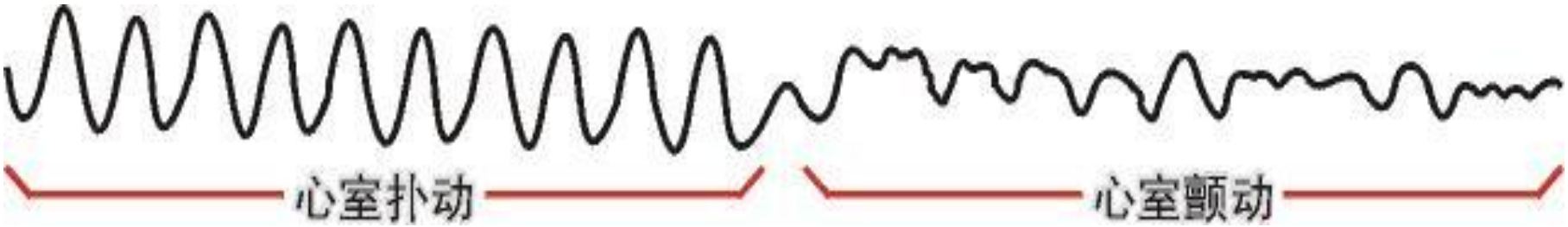
心室扑动与心室颤动

- 心室扑动(VF)简称室扑

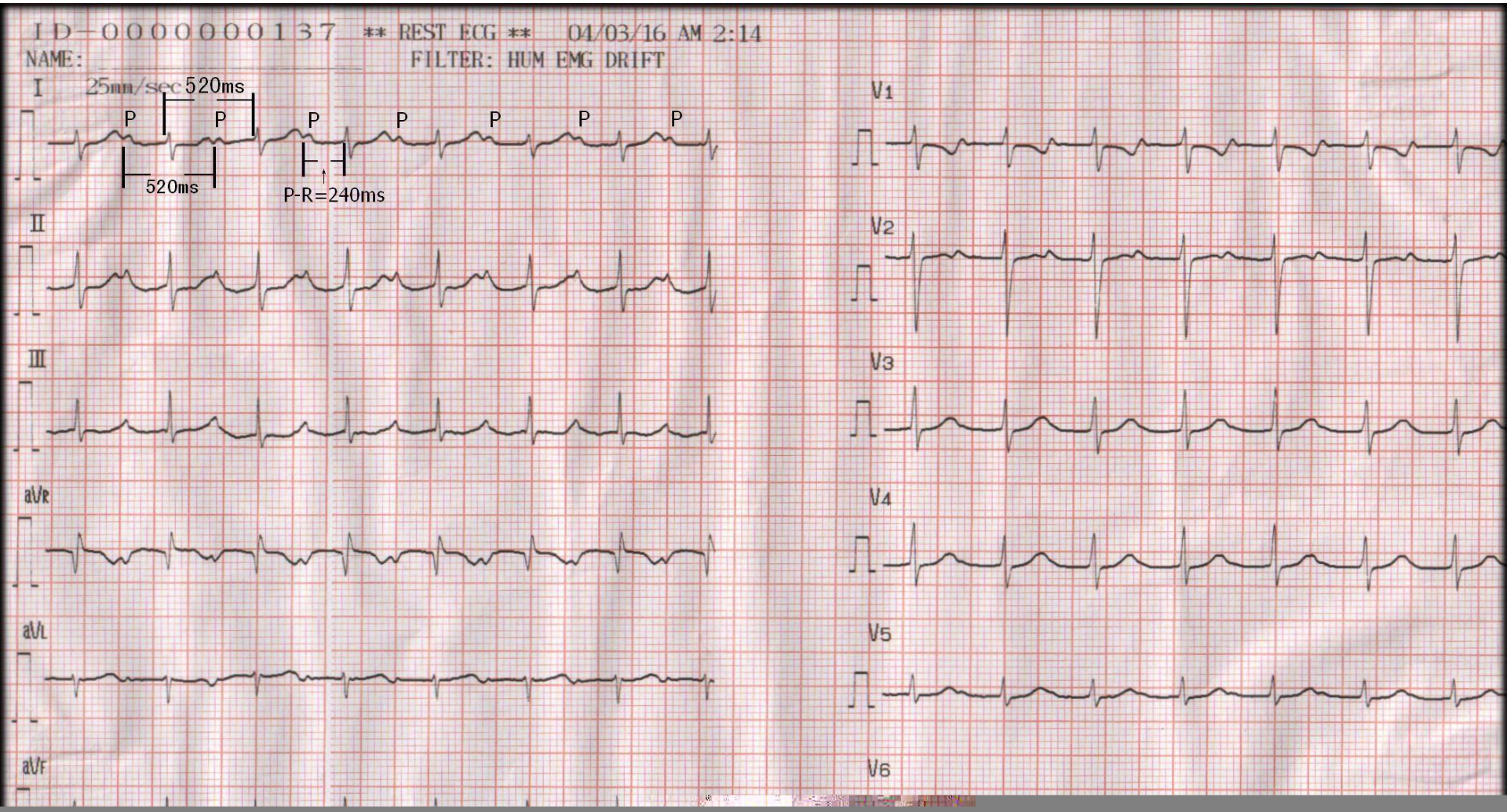
1. P-QRS-T波群消失，代以形态和间距相同、连续出现的规整大波动，不能辩认出QRS波群，为正弦曲线
2. 频率为150～250次/分

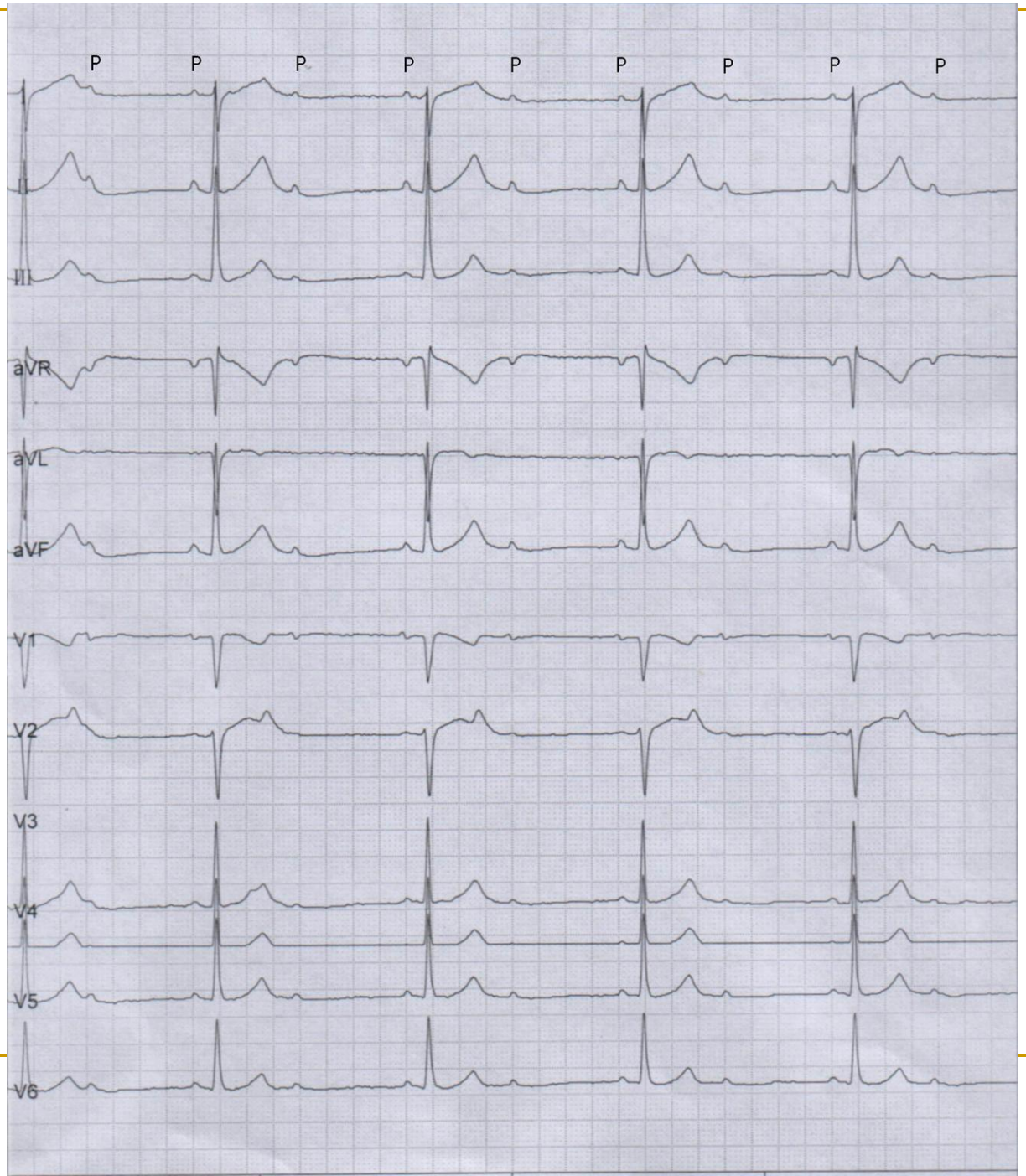
- 心室颤动(Vf)简称室颤

1. P-QRS-T波群消失，代以形态和间距不同、极不规整的波动
2. 频率为250～500次/分



I° 房室传导阻滞


ID-0000000137 ** REST ECG ** 04/03/16 AM 2:14
NAME:
FILTER: HUM EMG DRIFT
I
25mm/sec
520ms
P
520ms
P-R=240ms
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6



II°II型房室传导阻滞

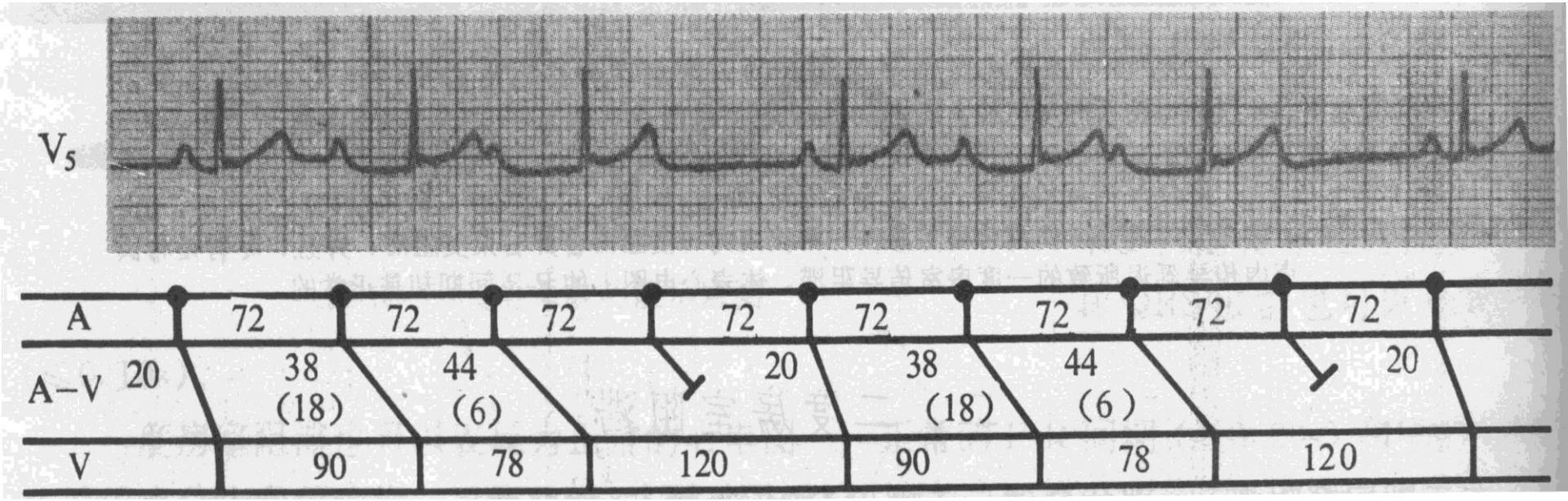
Ⅱ度Ⅰ型房室传导阻滞

二度Ⅰ型AVB

文氏现象

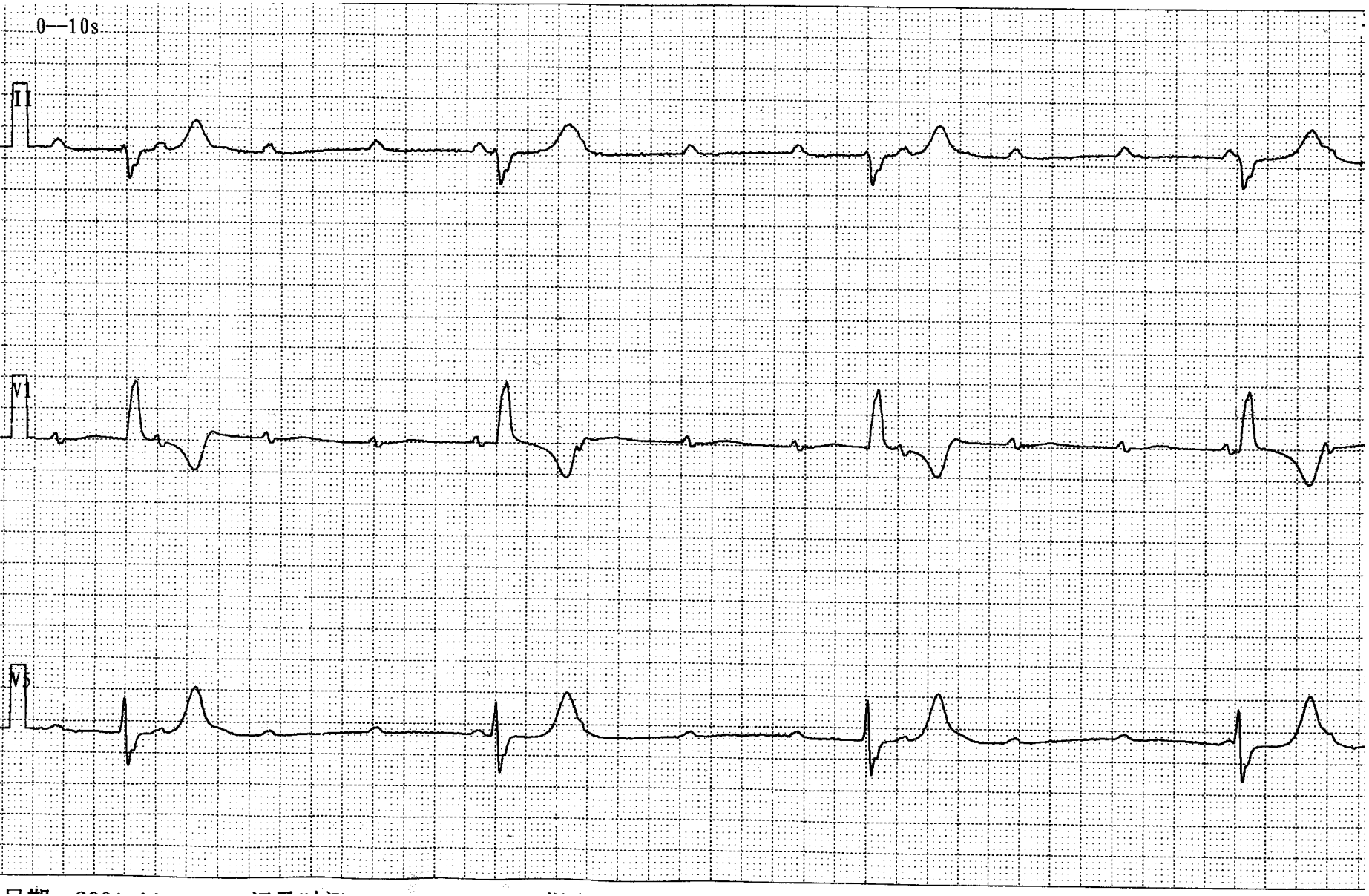
- P－R间期逐渐延长，直至发生QRS脱漏
- R－R间期逐渐缩短
- 长的RR间期短于两个短RR间期之和
- QRS波群时间、形态一般正常(除非合并室内传导异常)
- 房室传导比例一般>2：1
  - 比如3：2， 4：3等

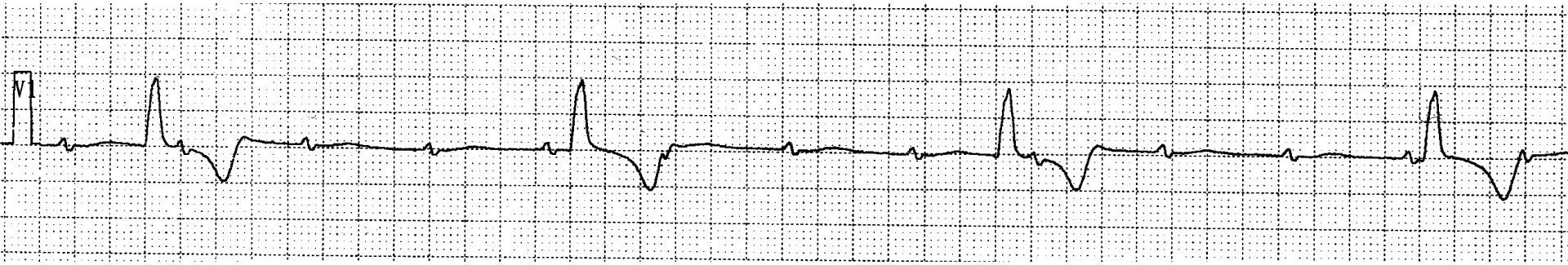
二度Ⅰ型房室传导阻滞

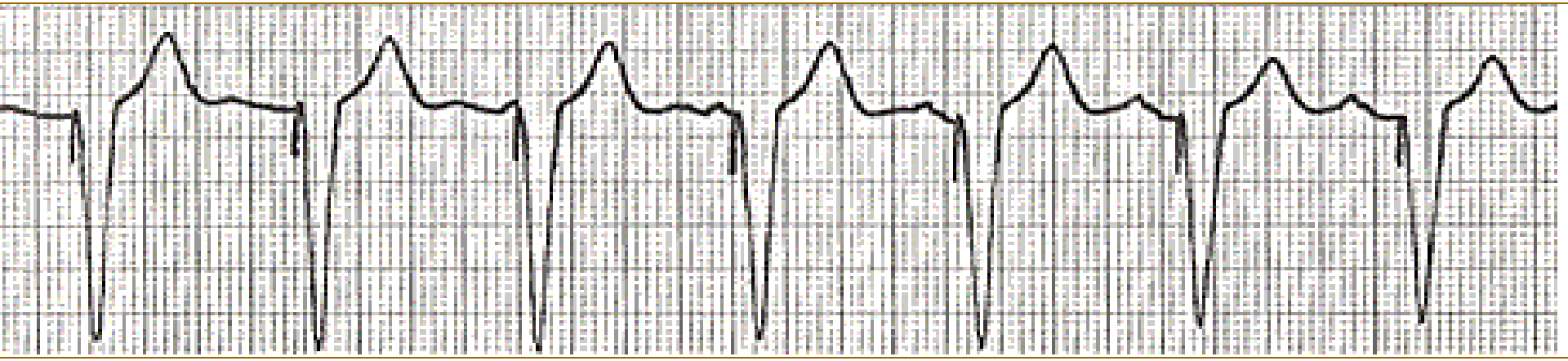


4：3传导

III度房室传导阻滞伴室性逸搏心律

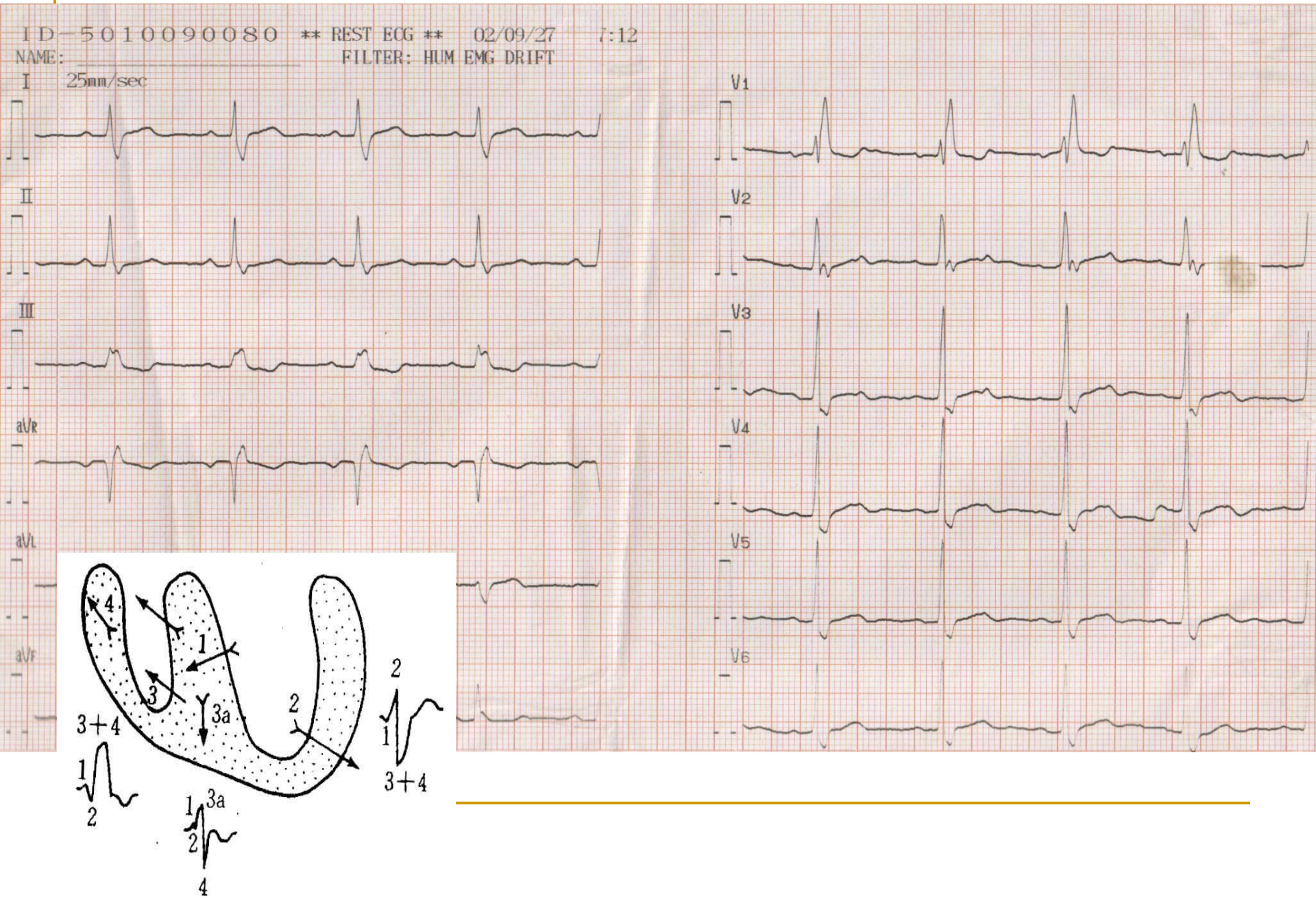




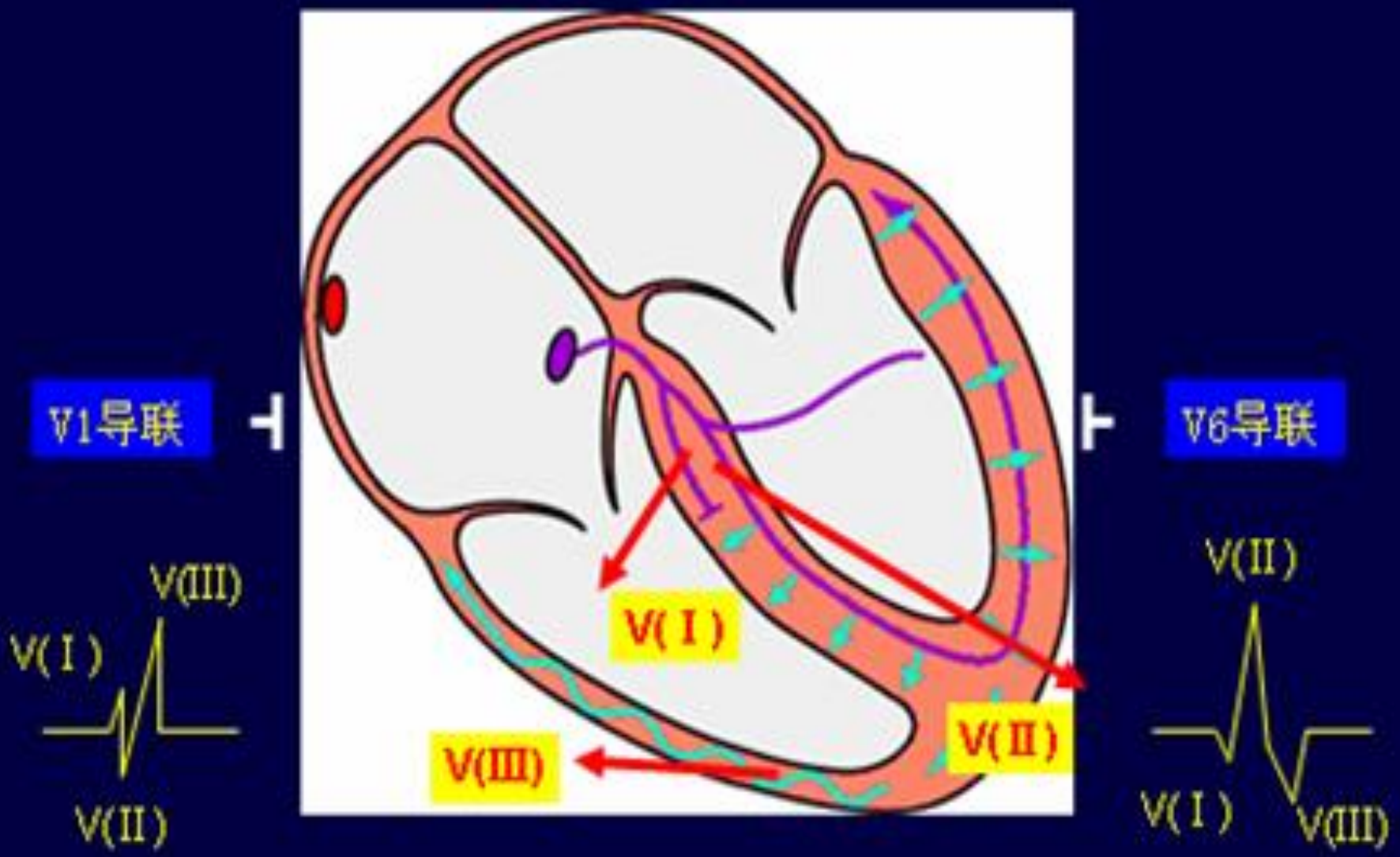


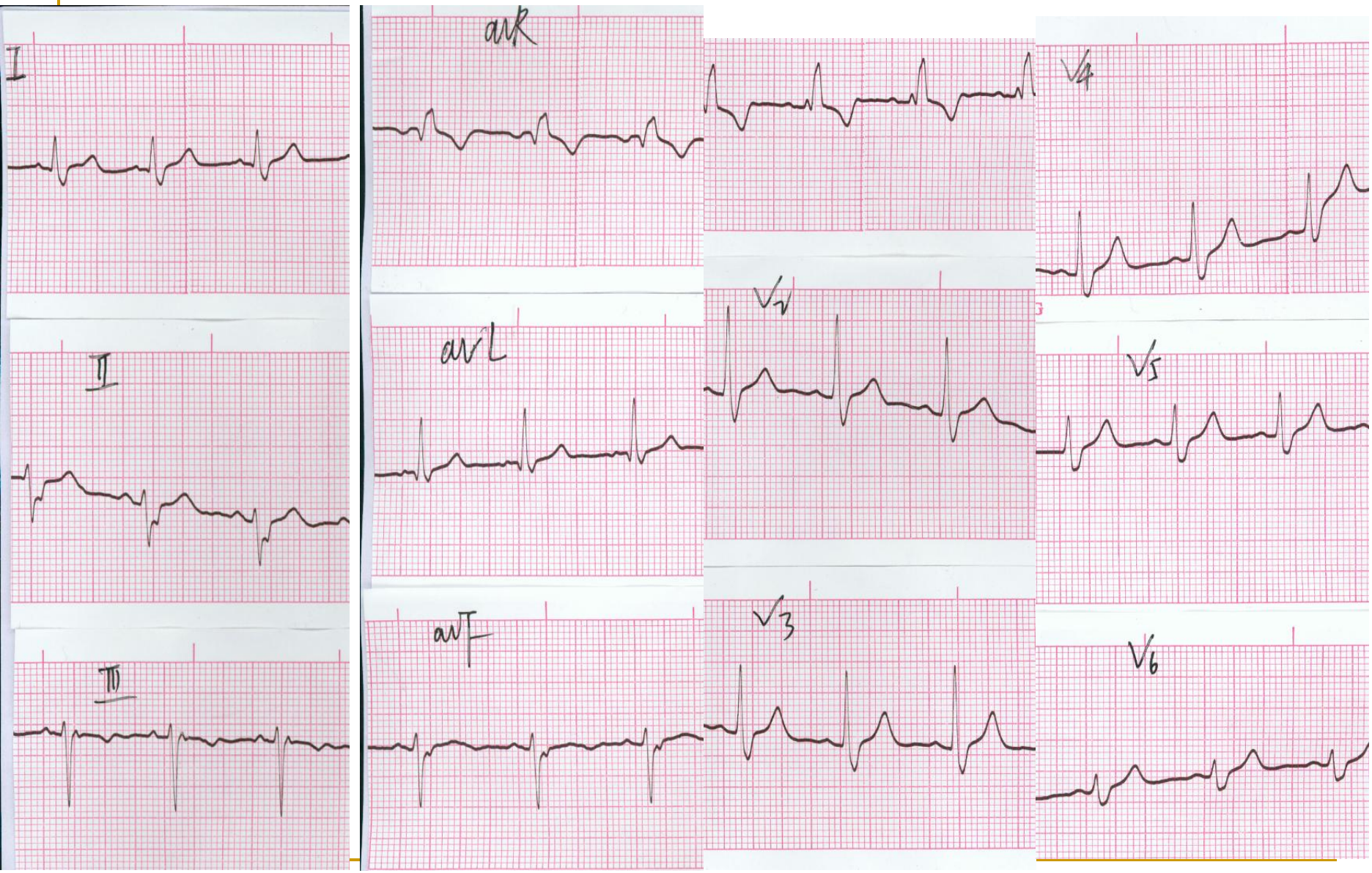
置入起搏器

完全性右束支传导阻滞

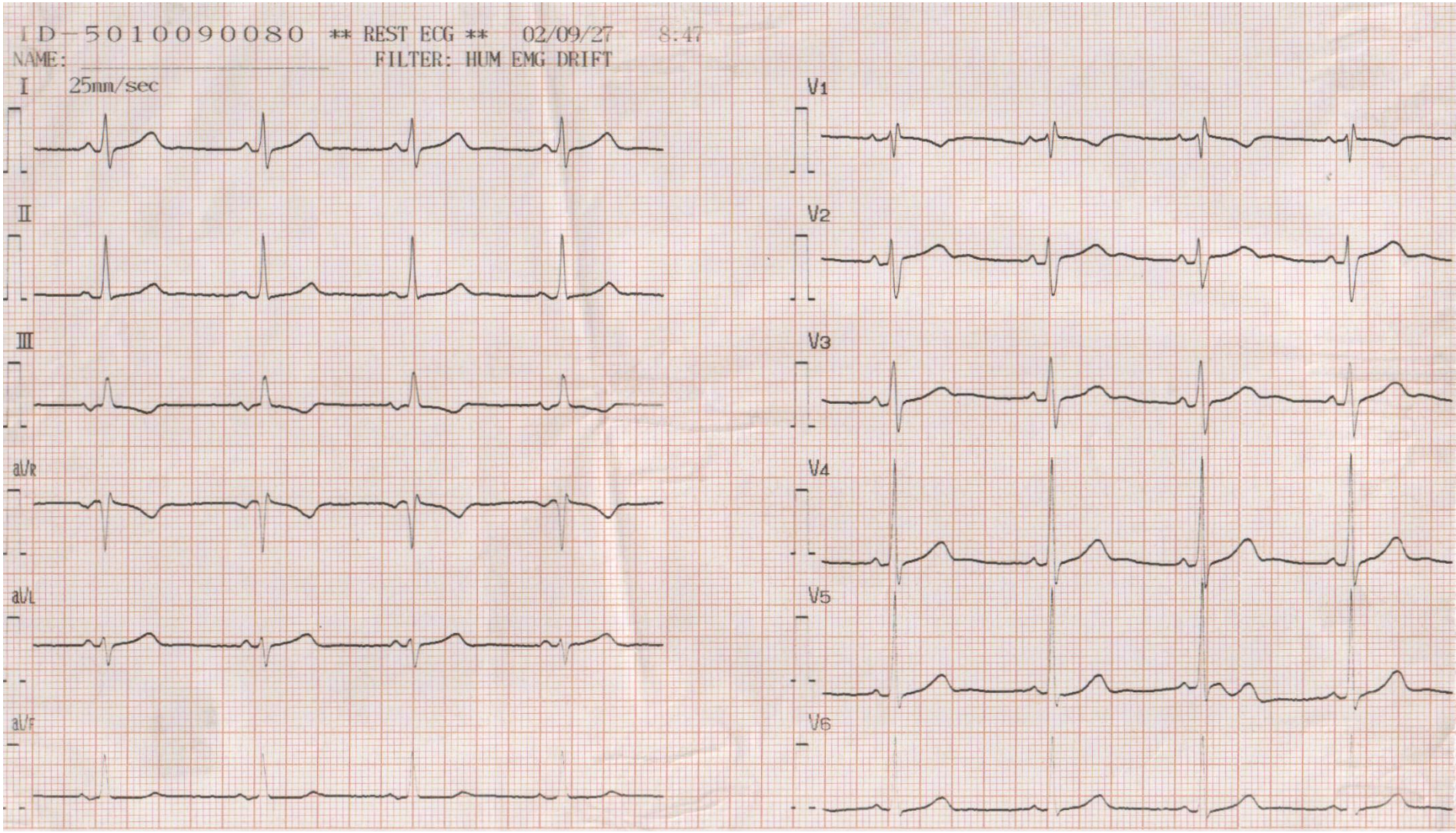

ID-5010090080 ** REST ECG ** 02/09/27 7:12
NAME:
FILTER: HUM EMG DRIFT
I 25mm/sec
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
4
1
3
3a
2
3+4
1
2
1
3a
2
4
2
1
3+4

右束支传导阻滞向量变化




I
II
III
avR
avL
avF
V1
V2
V3
V4
V5
V6

不完全性右束支传导阻滞



- 图形与完全性右束支传导阻滞相同，**QRS**波群时限＜**0.12s**

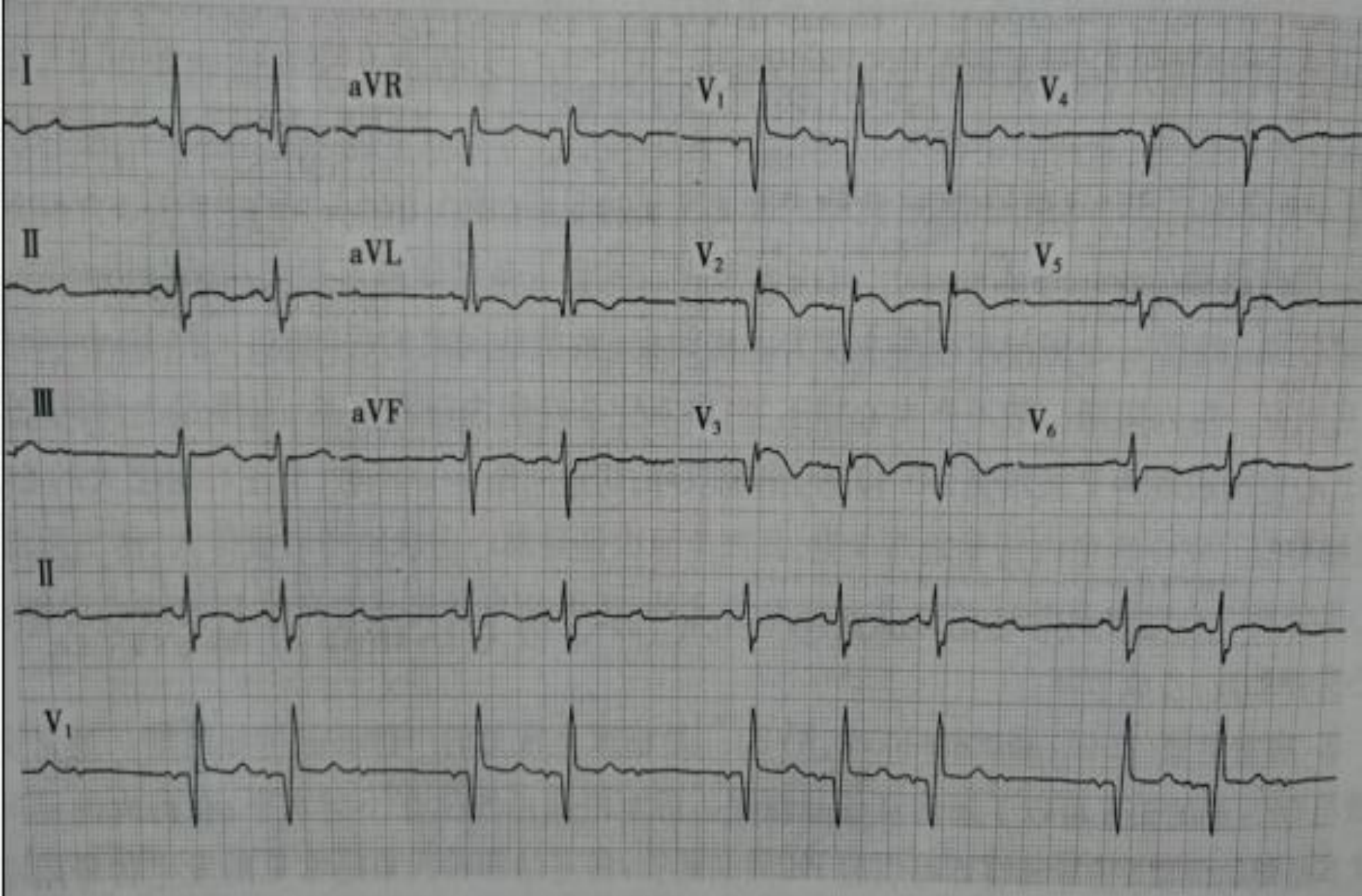
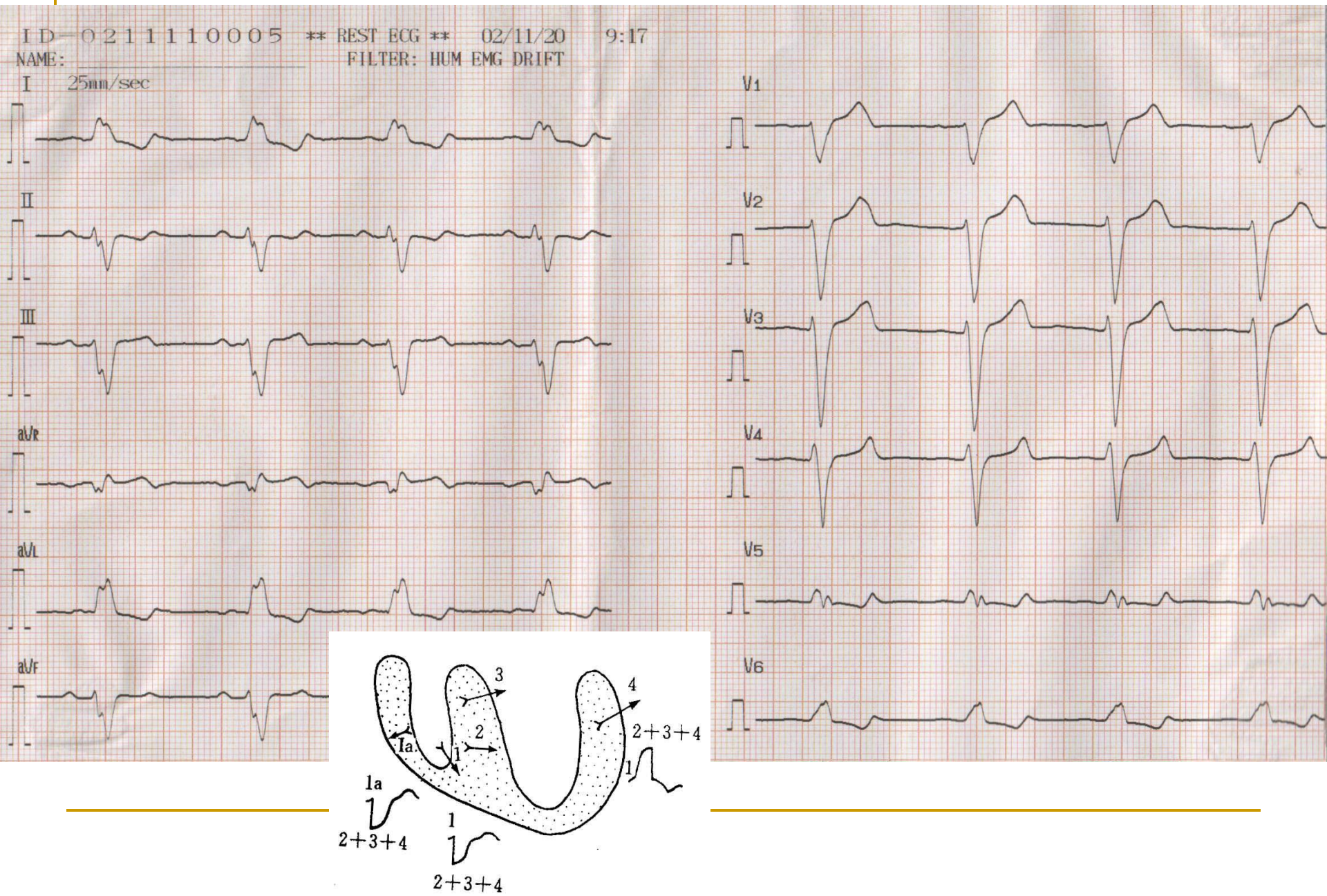
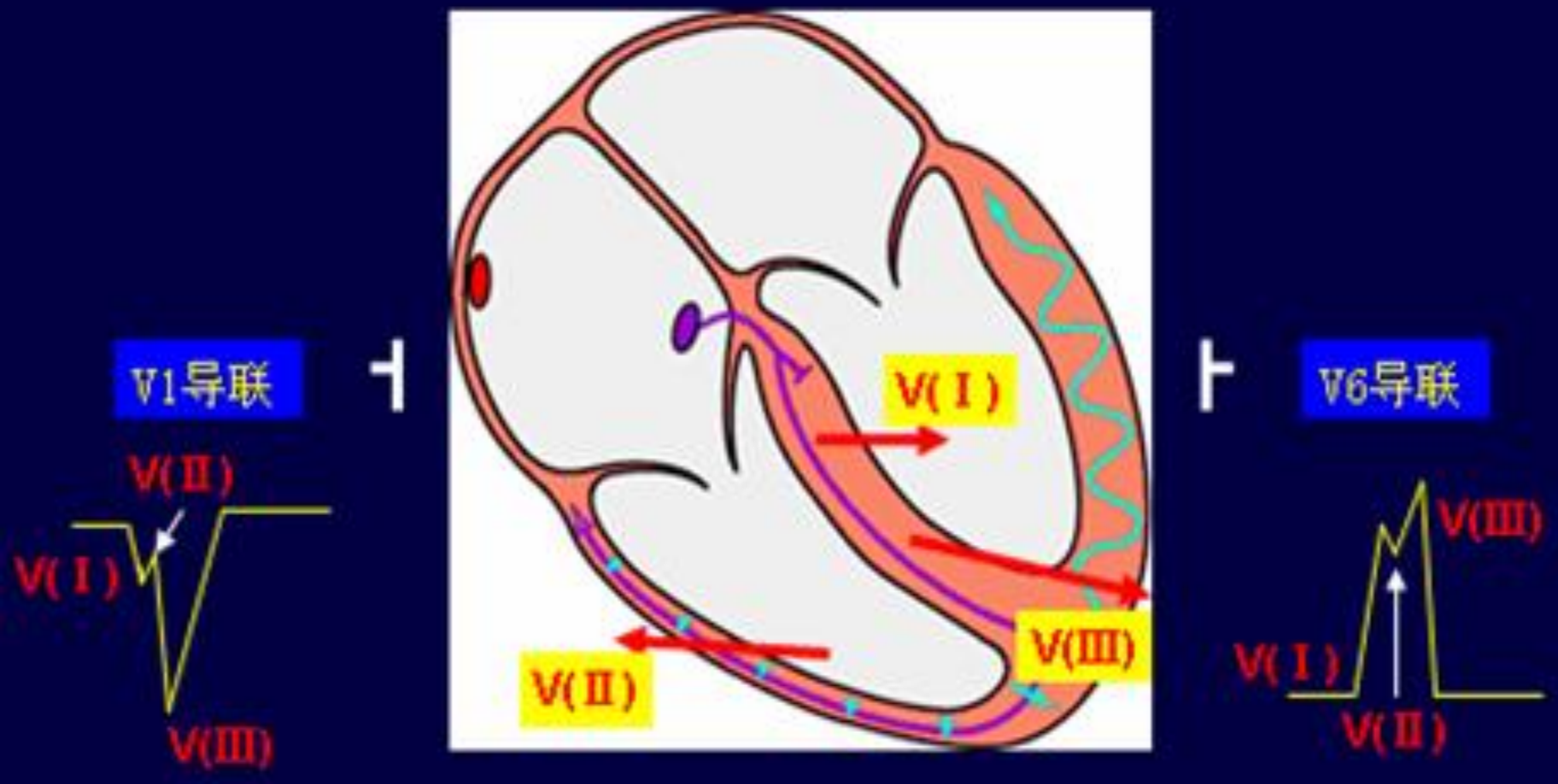


图 5-1-69　急性前壁心肌梗死、右束支阻滞、二度Ⅱ型房室阻滞
（3∶2、4∶3传导）

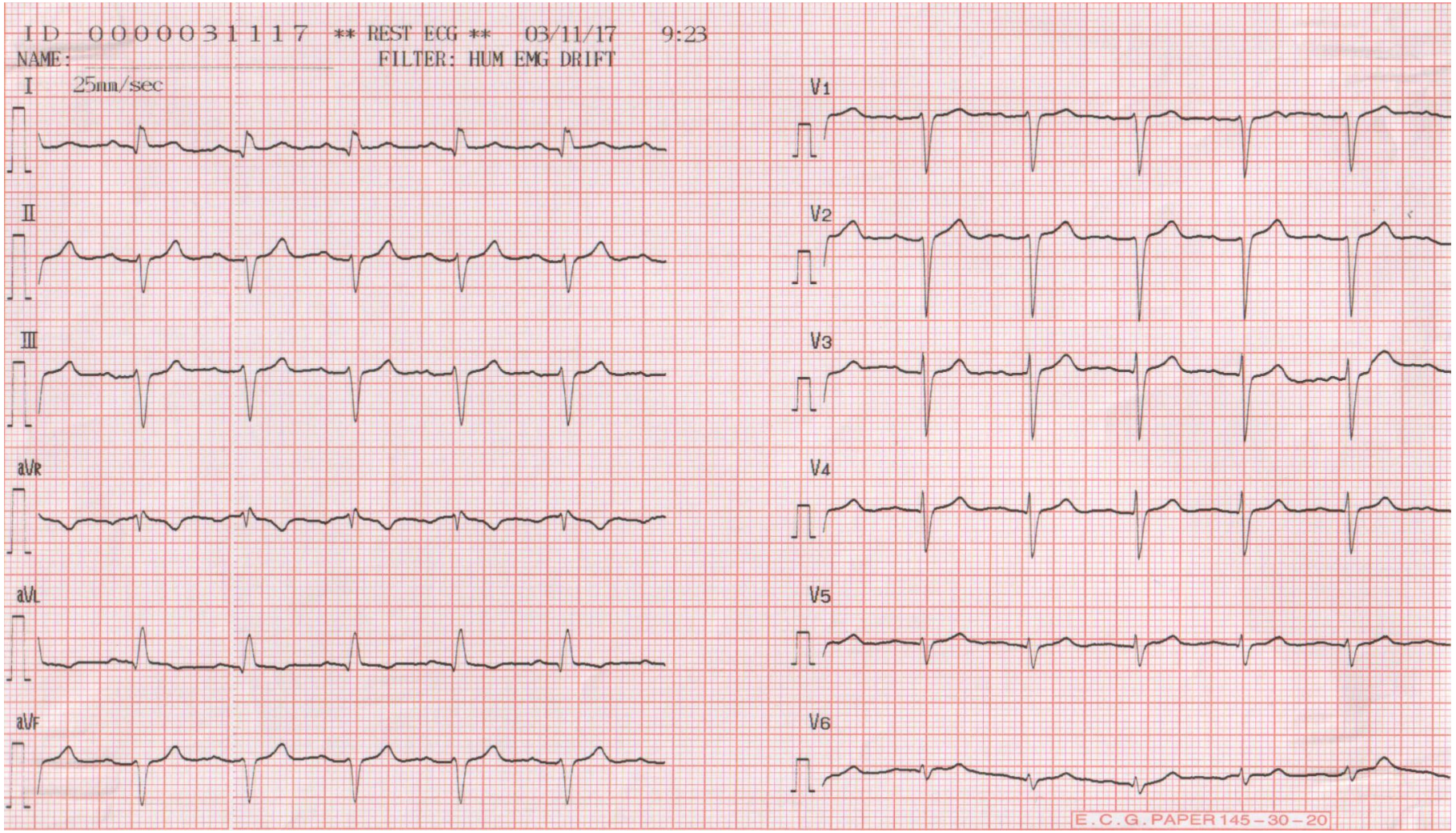
完全性左束支传导阻滞


ID-0211110005 ** REST ECG ** 02/11/20 9:17
NAME:
FILTER: HUM EMG DRIFT
I 25mm/sec
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
3
4
2
Ia
1
2+3+4
1
Ia
2+3+4
1
2+3+4

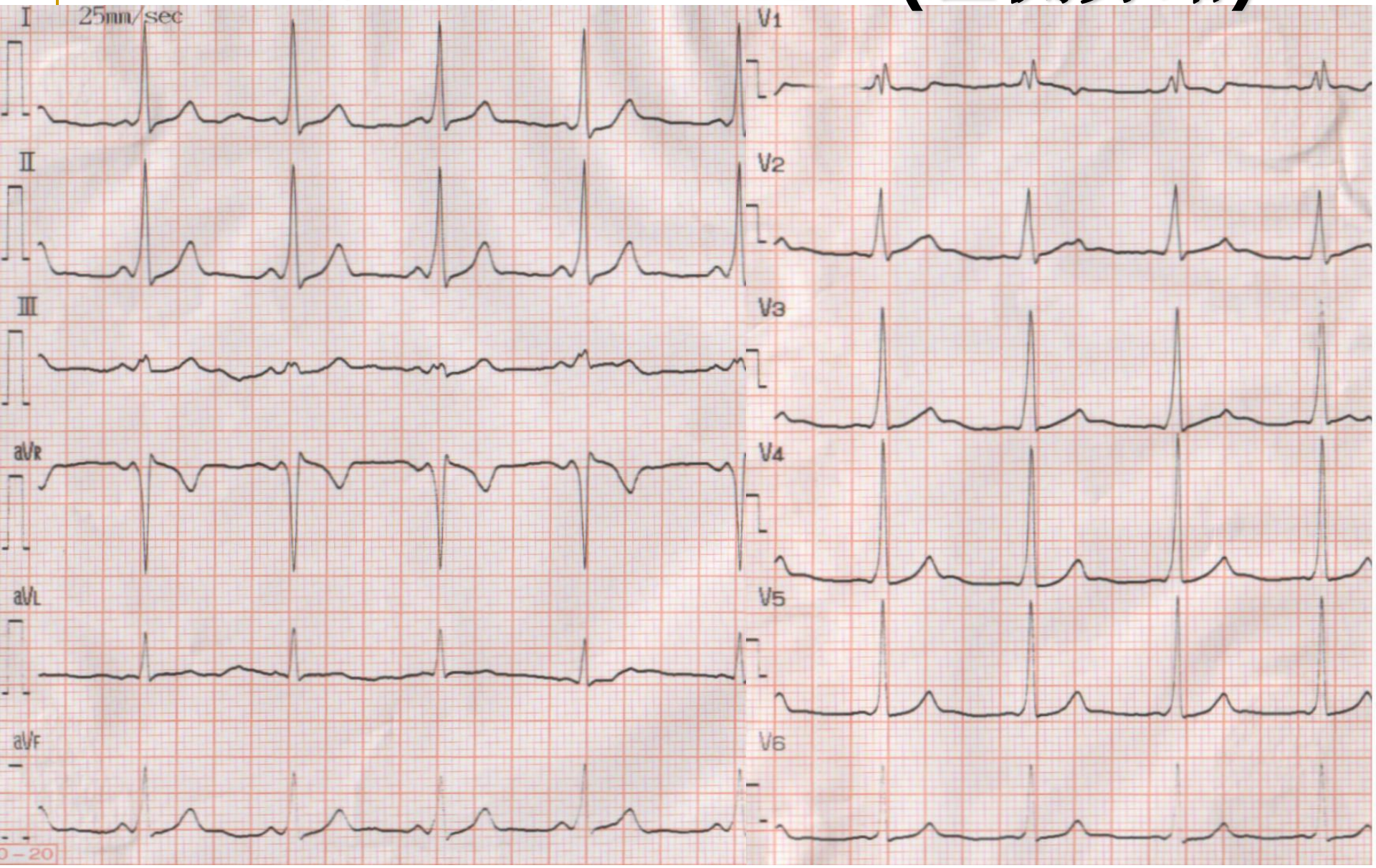
左束支传导阻滞向量变化



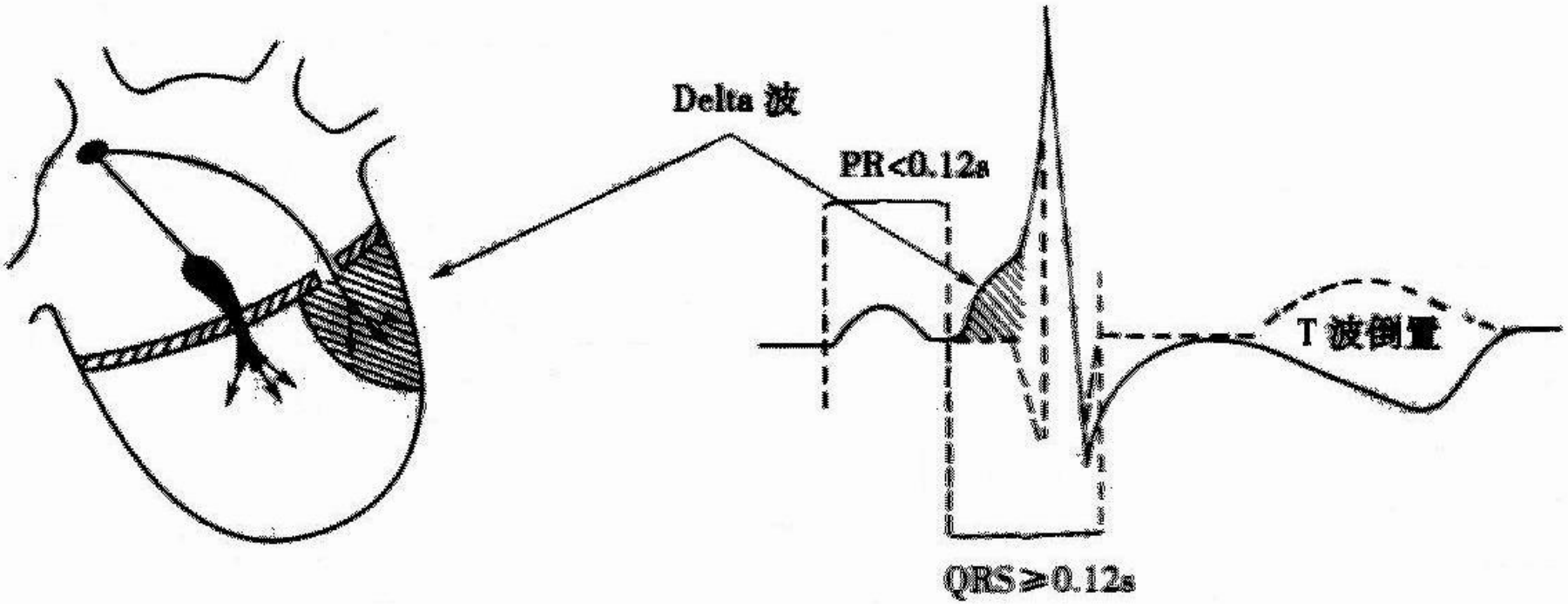
左前分支传导阻滞


ID 0000031117 ** REST ECG ** 03/11/17 9:23
NAME:
FILTER: HUM EMG DRIFT
I 25mm/sec
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
E.C.G.PAPER 145-30-20

W-P-W ~A (左侧旁路)



WPW示意图



WPW综合征特殊的心电图特征

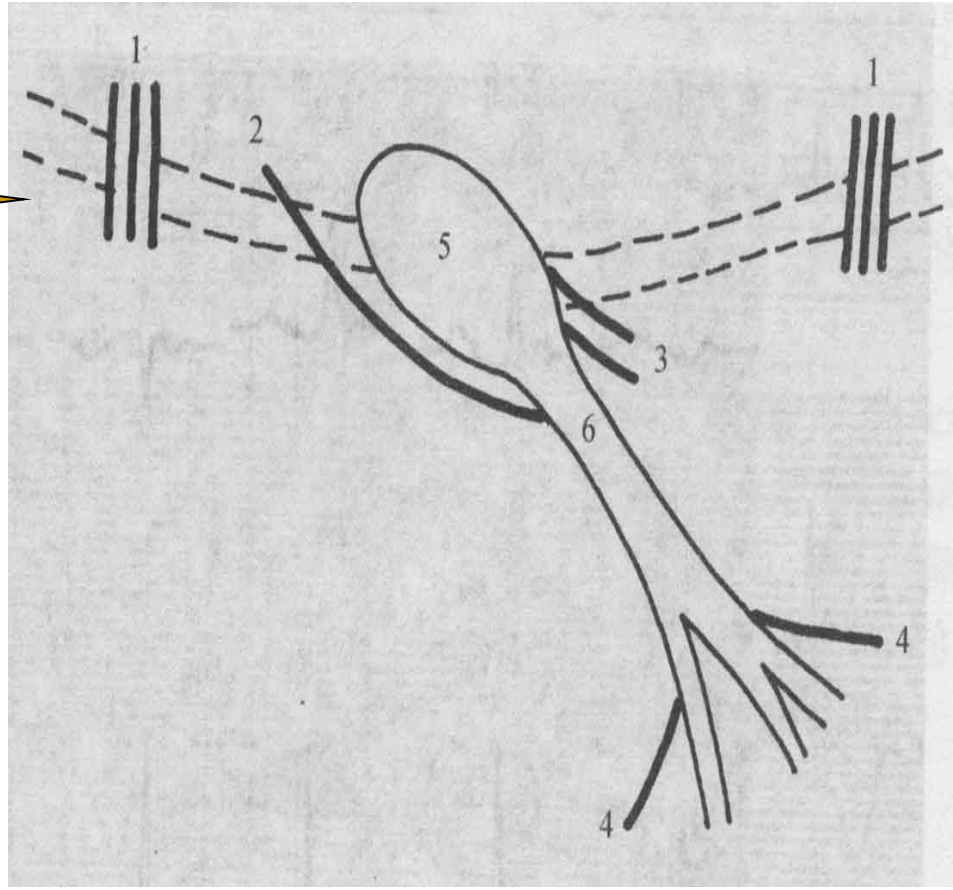
W-P-W　　~B　(右侧旁路)

wpw定位

- 按照胸导联δ波及QRS波群主波方向提出的分型
- A型：V1～V6导联δ波均为正向，QRS波群主波向上，提示为左侧房室旁路
- B型：V1～V3导联δ波为负向或正向，QRS波群主波向下，V4～V6导联δ波正向、QRS波群主波向上。提示为右侧房室旁路

短P-R综合征

旁路示意图



1-kent束， 2- James束

3- Mahaim，

4-分支纤维

谢谢聆听