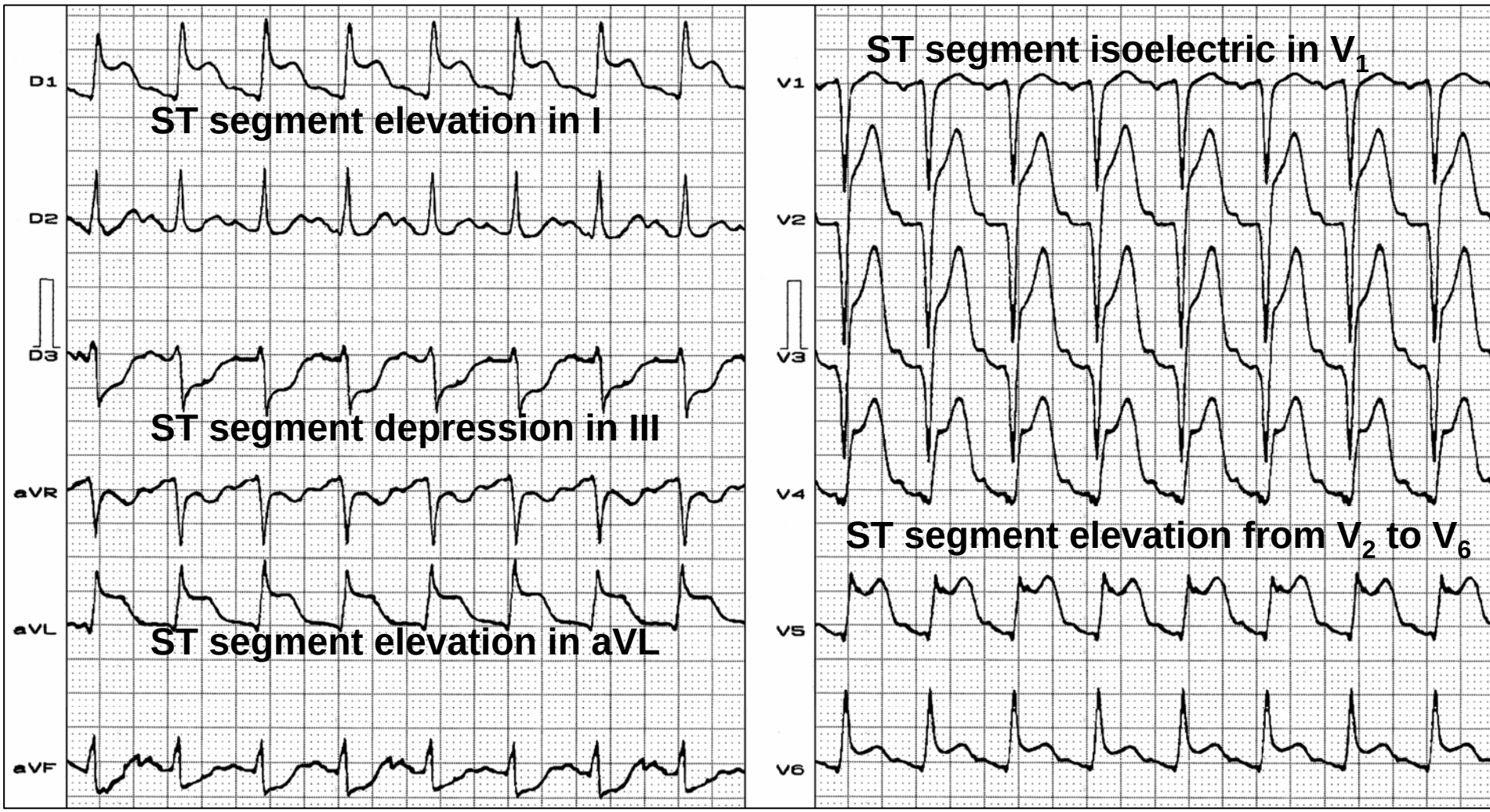
PART II

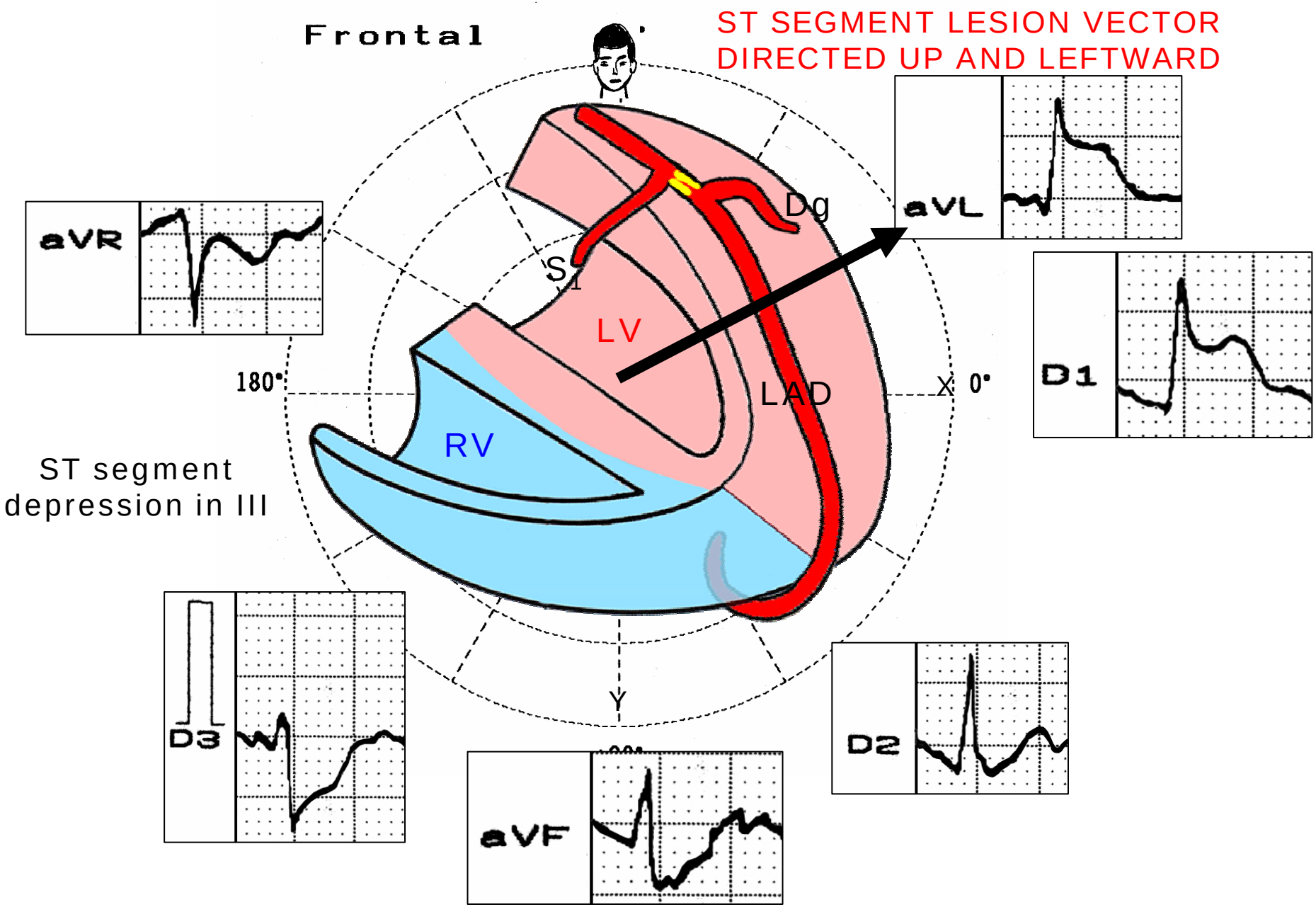
LEFT ANTERIOR DESCENDING ARTERY (LAD) OCCLUSION AFTER FIRST SEPTAL PERFORATOR AND BEFORE FIRST DIAGONAL BRANCH

AMI caused by occlusion of LAD after the first septal perforator and before the first diagonal branch

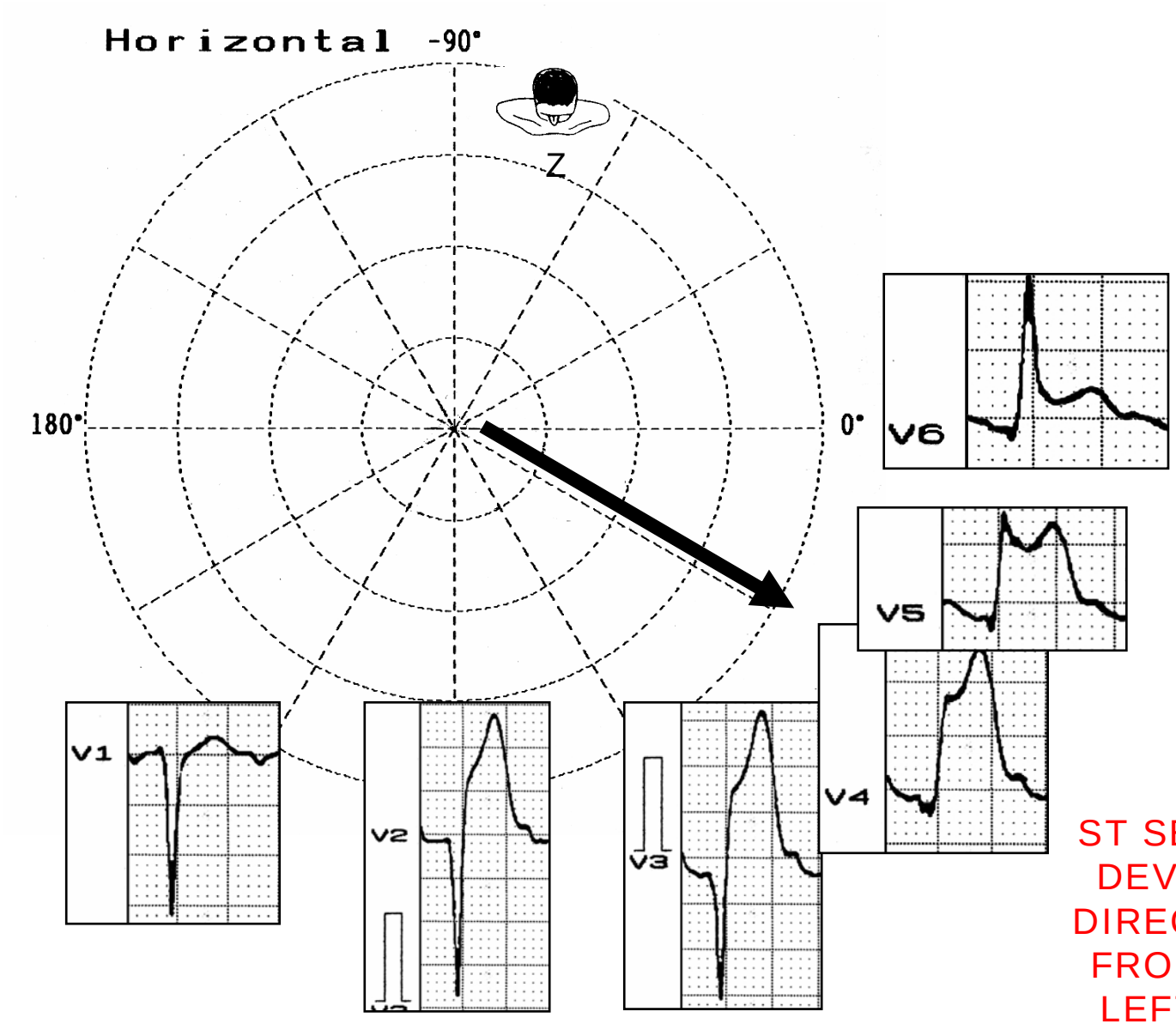


Why this pattern?

ST segment elevation in I and aVL. ST segment depression in III

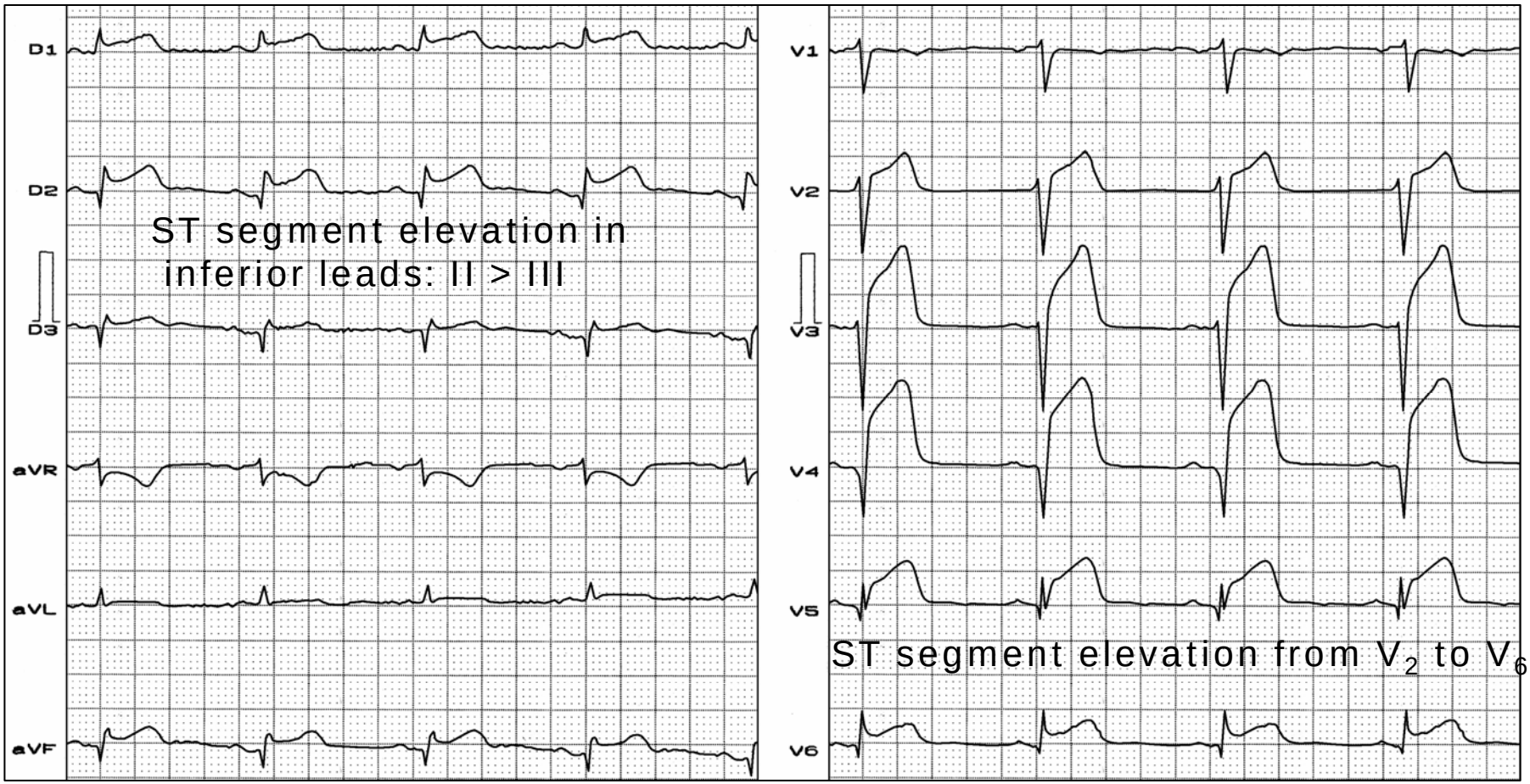


ST segment elevation from V_2 to V_6 and isoelectric in V_1

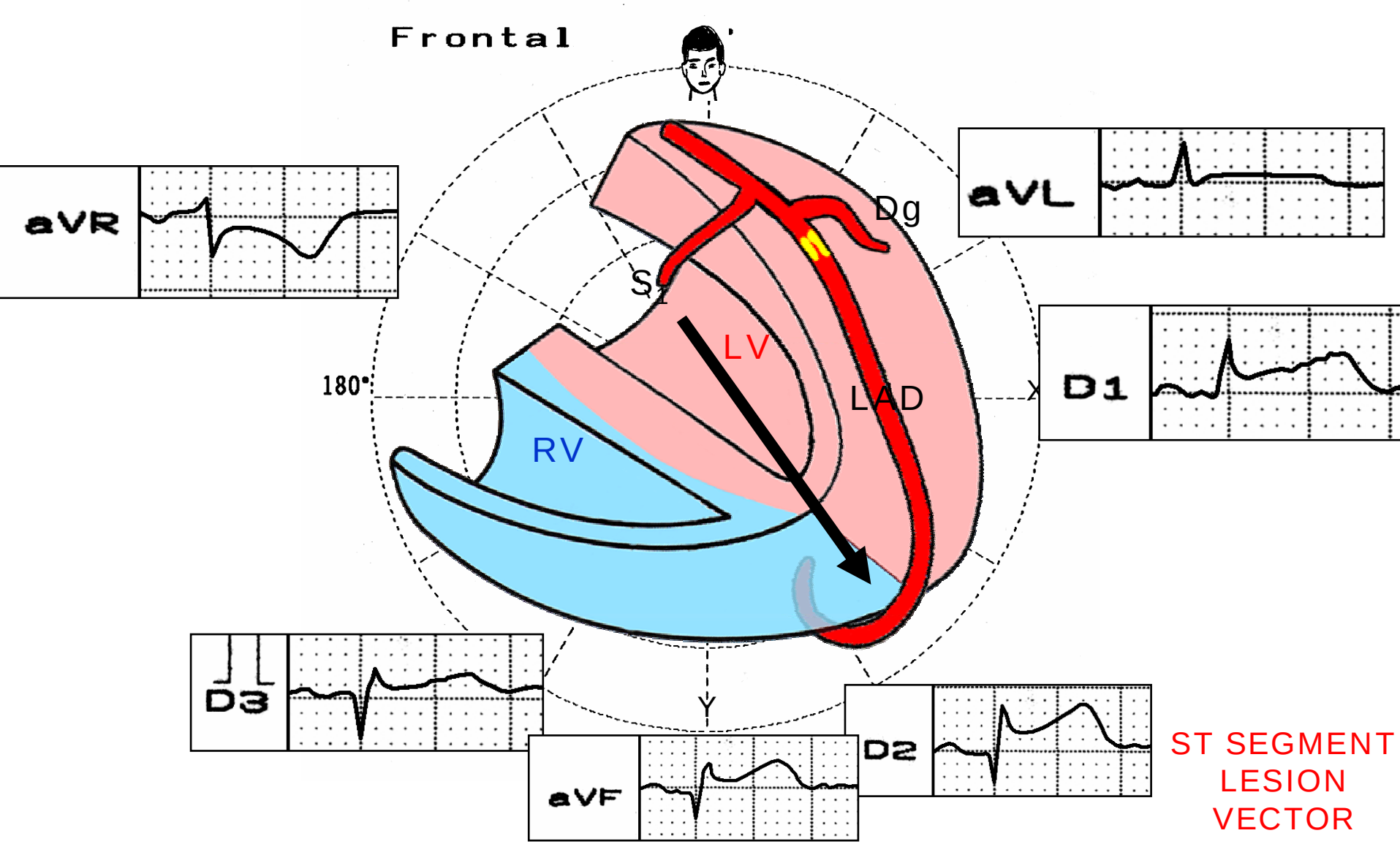


ST SEGMENT DEVIATION DIRECTED TO FRONT AND LEFTWARD

LEFT ANTERIOR DESCENDING ARTERY (LAD) OCCLUSION AFTER BOTH FIRST SEPTAL PERFORATOR AND FIRST DIAGONAL BRANCH (LAD DISTAL OBSTRUCTION)

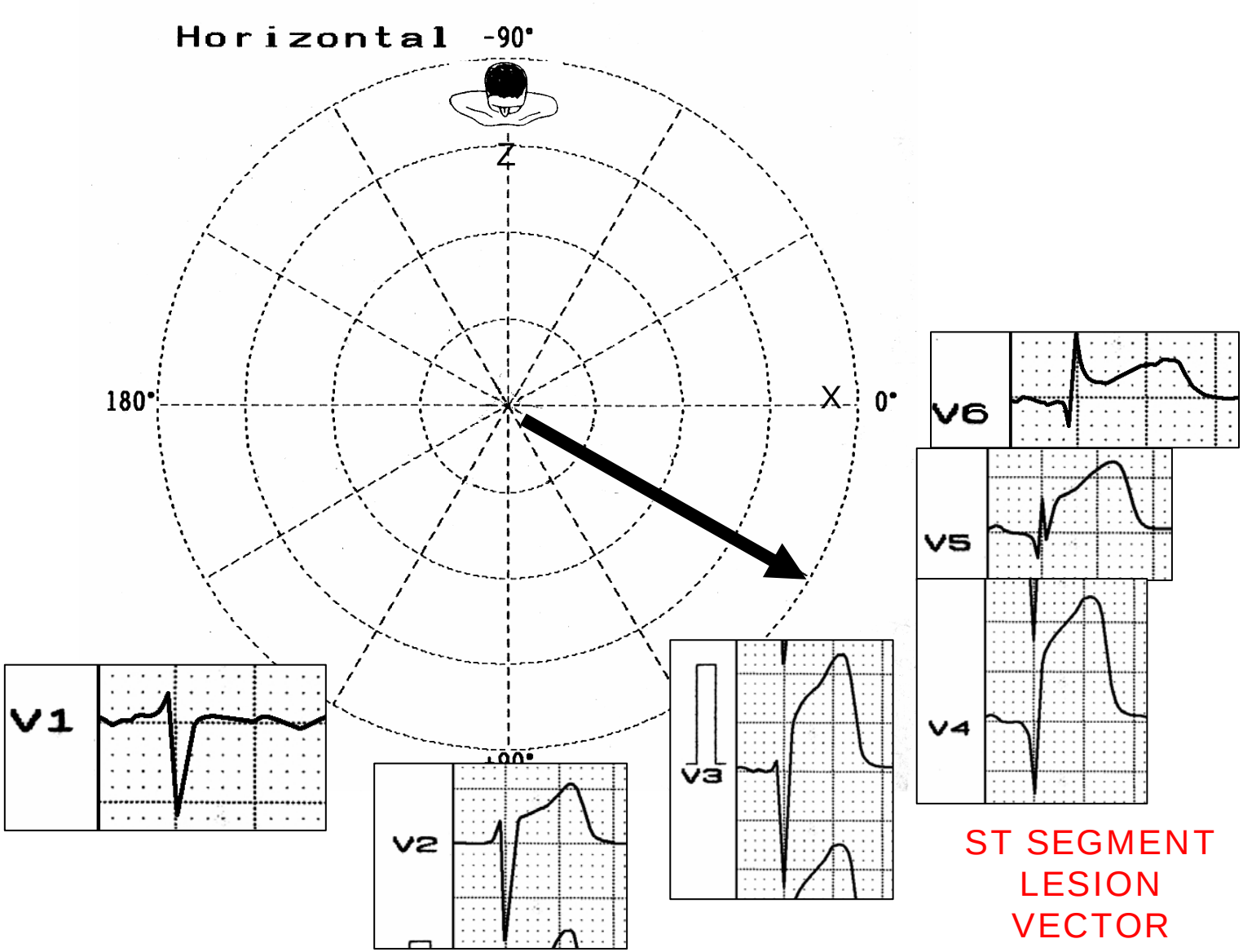


Why this pattern ?



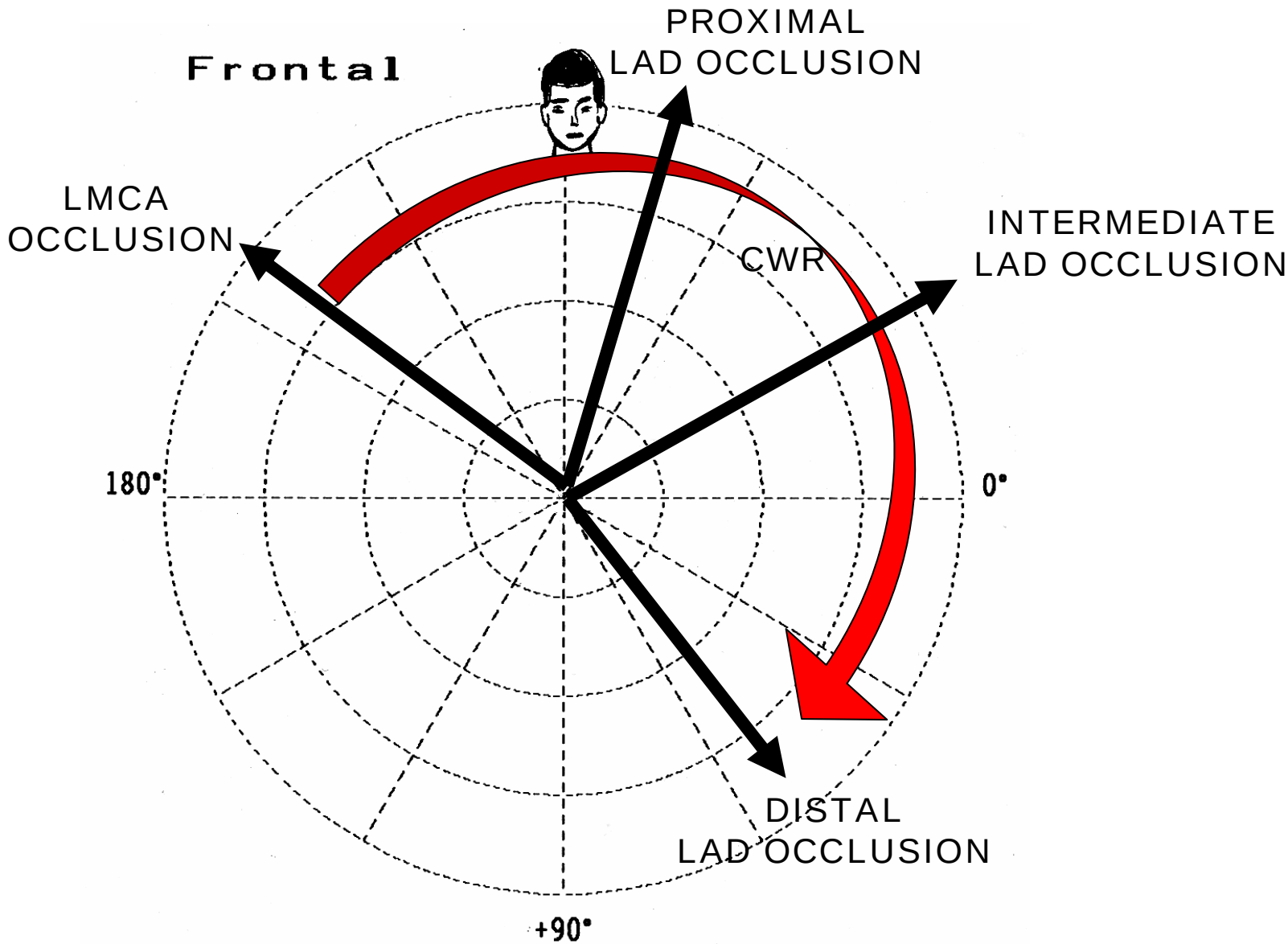
ST segment elevation in inferior leads, II > III

ST SEGMENT LESION VECTOR DIRECTED DOWNWARD AND LEFTWARD



ST SEGMENT LESION VECTOR DIRECTED TO FRONT AND LEFTWARD

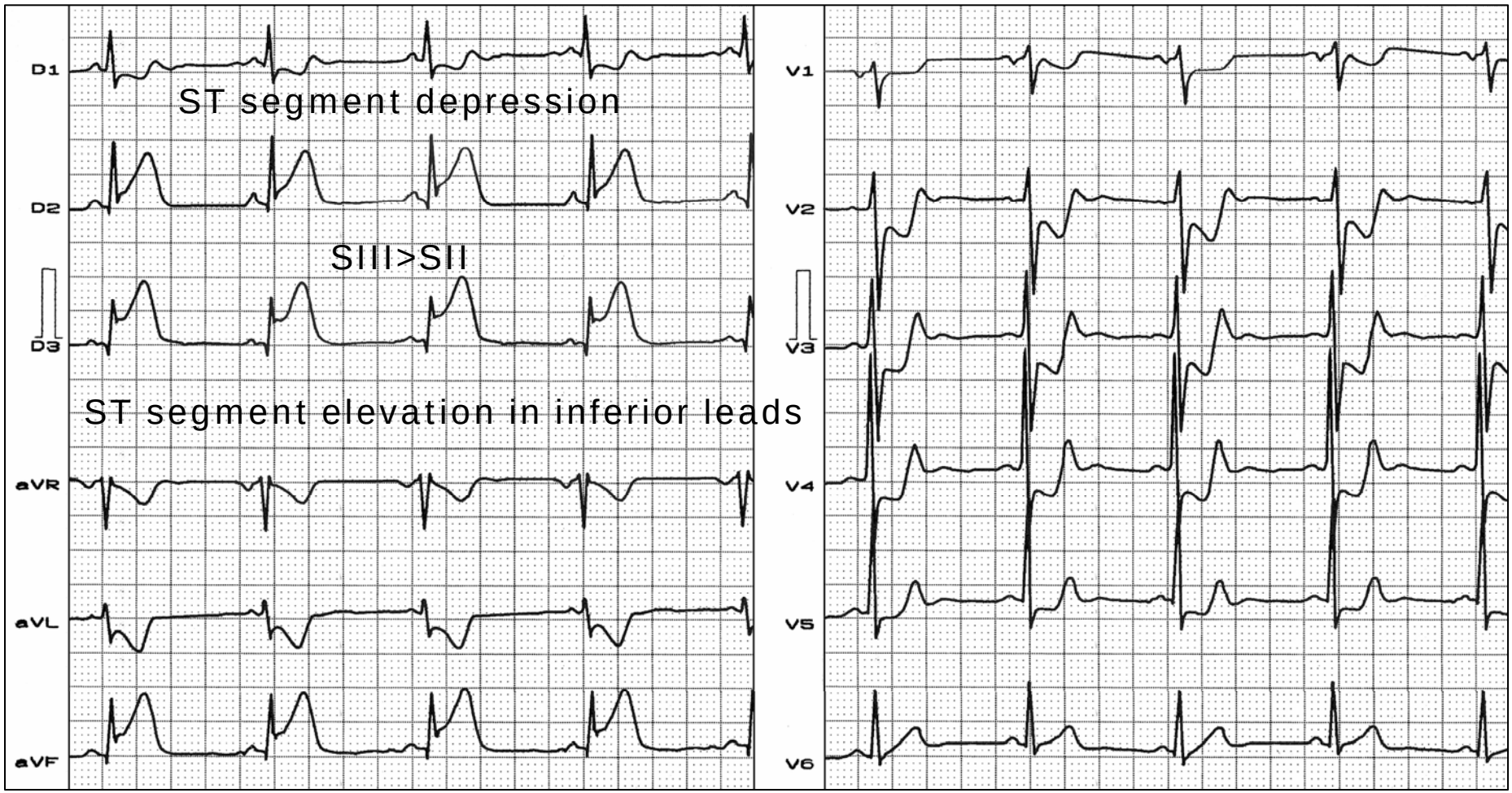
SUMMARY OF ST LESION VECTOR DIRECTION ON FP



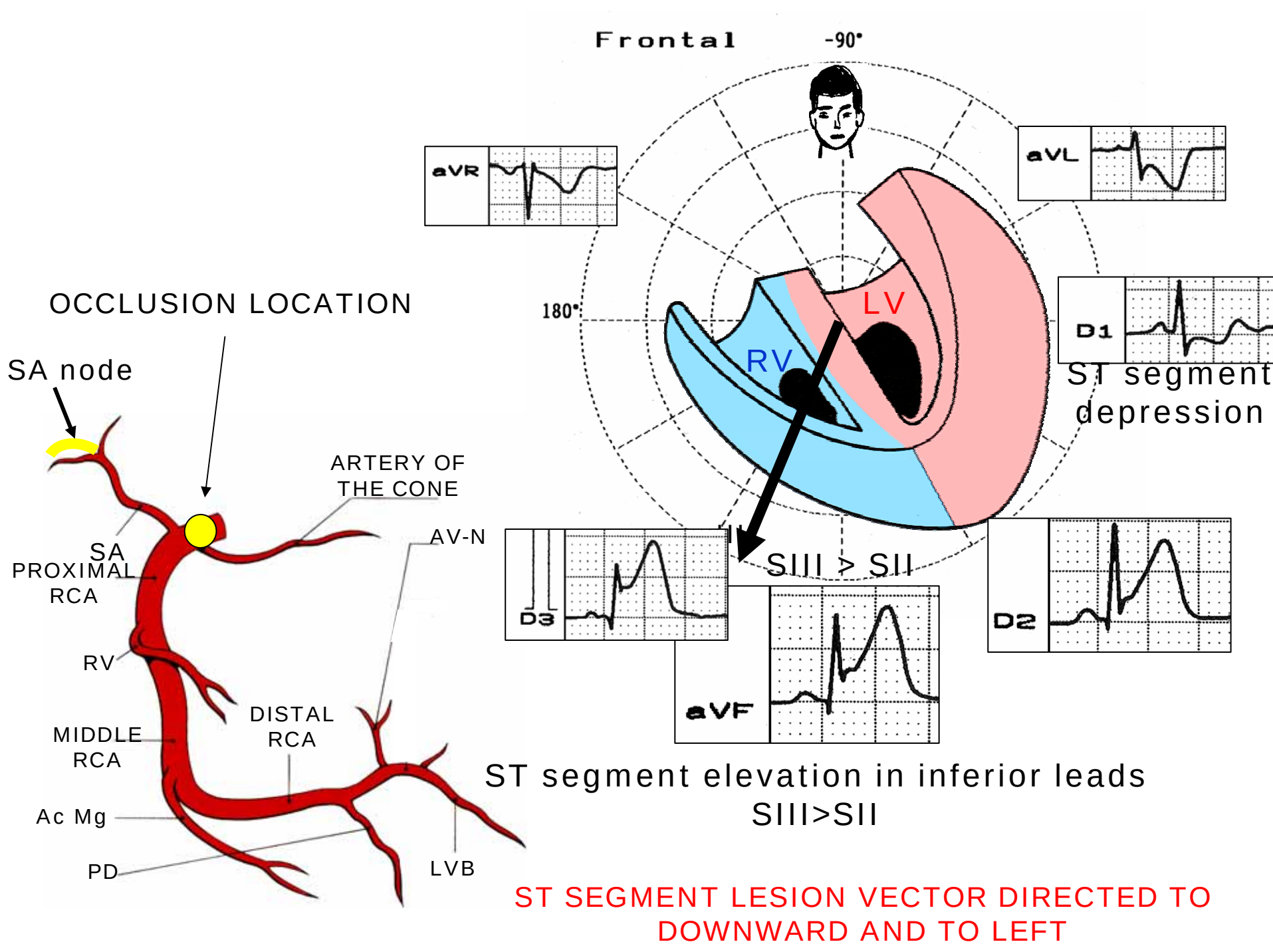
CWR: CLOCKWISE ROTATION

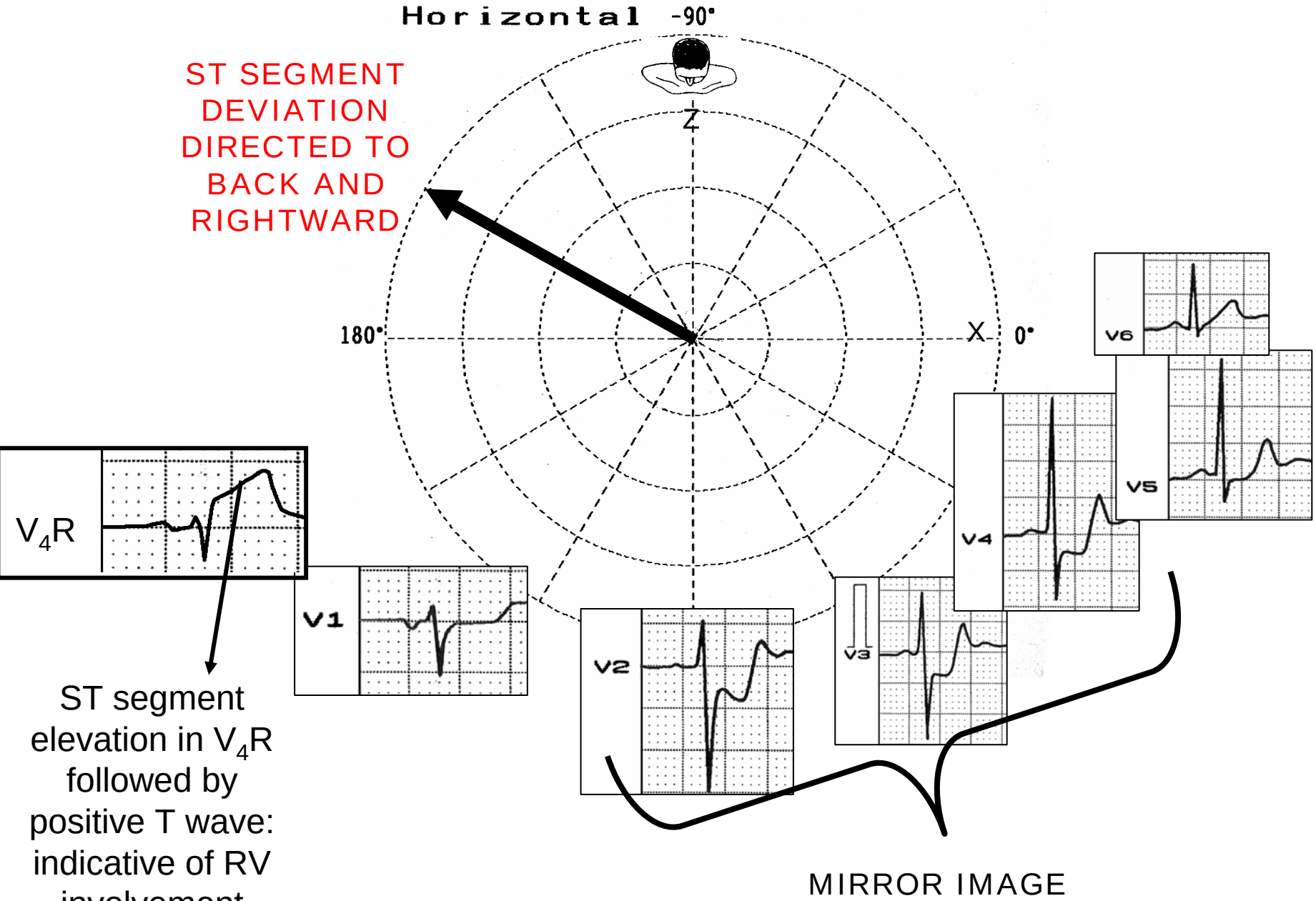
PROXIMAL OCCLUSION
RIGHT CORONARY ARTERY (RCA)

PROXIMAL RCA OCCLUSION



MIRROR IMAGE OF V_7, V_8 AND V_9


OCCLUSION LOCATION
SA node
ARTERY OF THE CONE
AV-N
SA PROXIMAL RCA
RV
MIDDLE RCA
DISTAL RCA
Ac Mg
PD
LVB
Frontal
-90°
180°
aVR
aVL
D1
D3
D2
aVF
LV
RV
SIII > SII
ST segment depression
ST segment elevation in inferior leads
SIII>SII
ST SEGMENT LESION VECTOR DIRECTED TO DOWNWARD AND TO LEFT


Horizontal
-90°
Z
180°
X
0°
ST SEGMENT DEVIATION DIRECTED TO BACK AND RIGHTWARD
V6
V5
V4
V3
V2
V1
V4R
ST segment elevation in V4R followed by positive T wave: indicative of RV involvement
MIRROR IMAGE

RIGHT VENTRICULAR ACUTE MI

Right Ventricle irrigation[1]

1. Inferior and posterior walls: The PDA of the RCA.
2. Lateral wall: A. Mg
3. Anterior wall: Conus artery of the RCA and the moderator branch artery form LAD

Proximal RCA occlusions result in larger RV infarctions[2]
LCX occlusion eventually RV infarction

The classic clinical triad of RV acute MI includes[3]

1) Distended neck veins
2) Clear lung fields
3) Hypotension

1. **Forman MB, Goodin J, Phelan B. Electrocardiographic changes associated with isolated right ventricular infarction. *J Am Coll Cardiol*. Sep 1984;4(3):640-643.**
2. **Giannitsis E, Potratz J, Wiegand U. Impact of early accelerated dose tissue plasminogen activator on in- hospital patency of the infarcted vessel in patients with acute right ventricular infarction. *Heart*. Jun 1997;77:512-516.**
3. **Mavric Z, Zaputovic L, Matana A. Prognostic significance of complete atrioventricular block in patients with acute inferior myocardial infarction with and without right ventricular involvement. *Am Heart J*. Apr 1990;119:823-828.**

ELECTROCARDIOGRAPHY

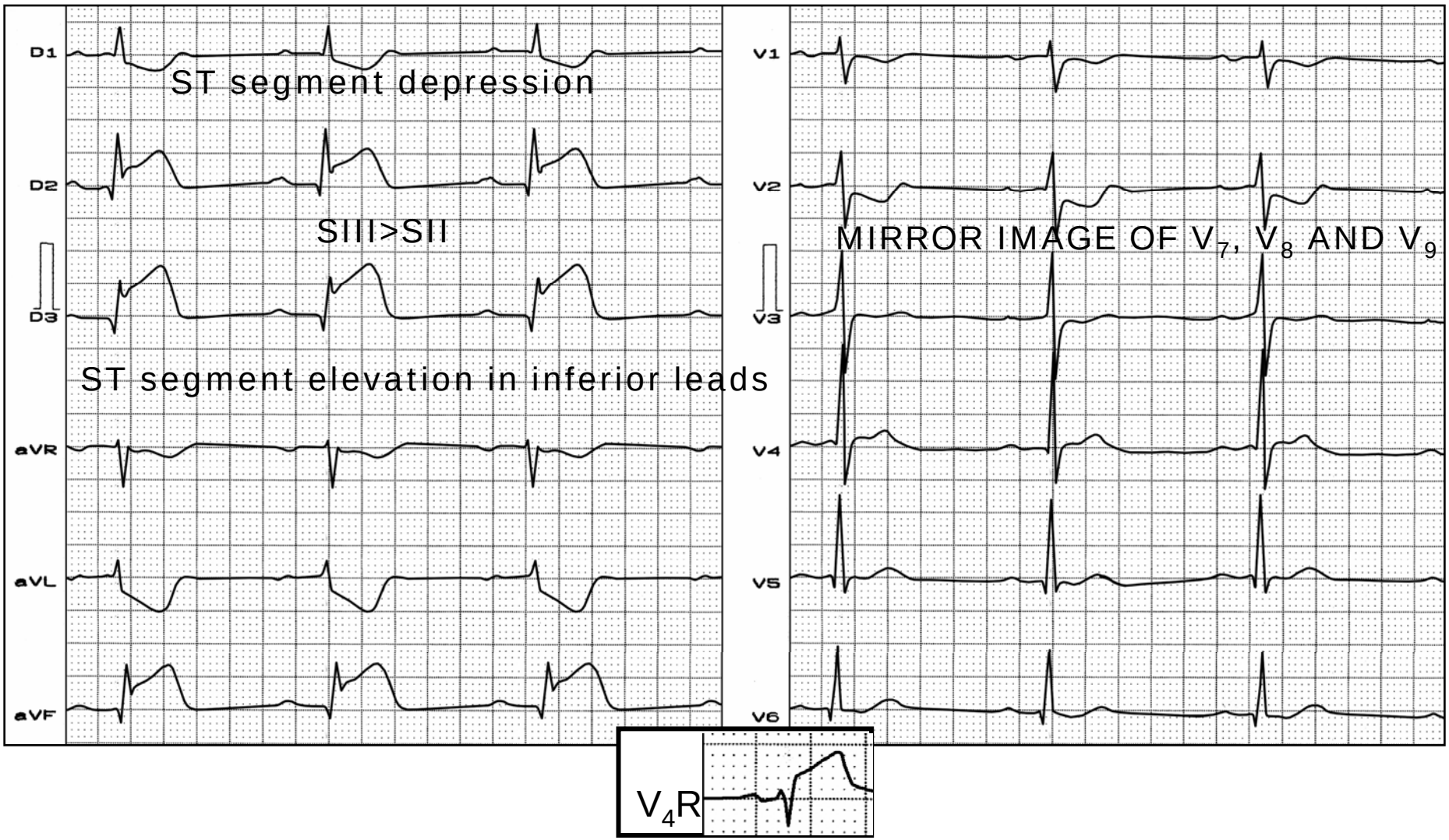
All patients with inferior wall MI should have a right-sided precordial leads.
ST-segment elevation in lead V_4R is the single most powerful predictor of RVMI, The ST-segment elevation is transient, disappearing in < 10 hours following its onset in half of patients. The following table demonstrates the sensitivity and specificity of > 1 mm of ST-segment elevation in V_1, V_3R, and V_4 R[1].

LEADS	SENSITIVITY(%)	SPECIFICITY(%)
V1	28	92
V3R	69	97
V4R	93	95

Isolated RVMI is extremely rare and may be interpreted erroneously as LV anteroseptal infarction on ECG because of ST-segment elevation in leads V_1 -V_4[2;3].
The mean ST-segment lesion vector in RVMI usually is directed anteriorly and to the right: >100°.

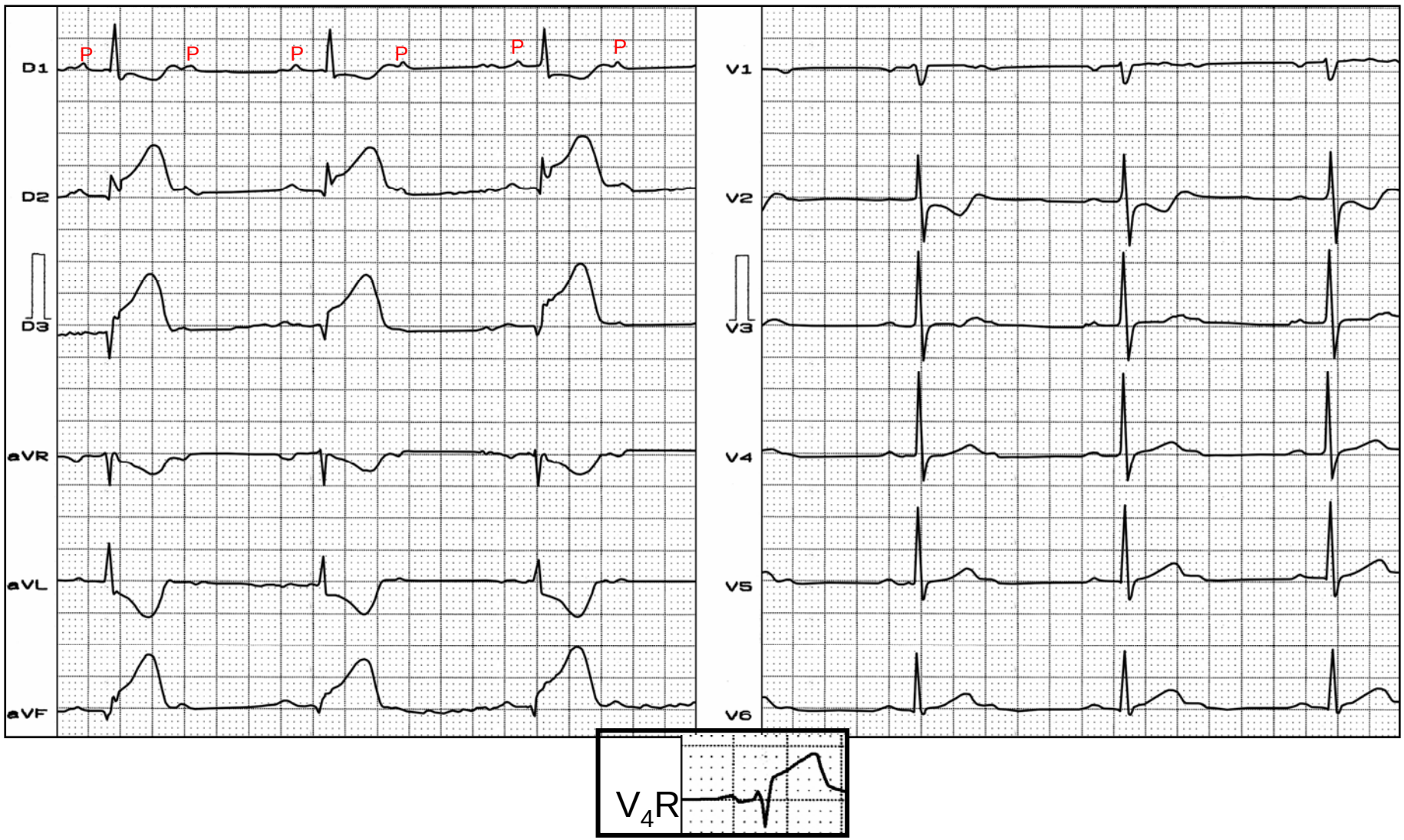
1. **Roth A, Miller HI, Kaluski E. Early thrombolytic therapy does not enhance the recovery of the right ventricle in patients with acute inferior myocardial infarction and predominant right ventricular involvement. *Cardiology*. 1990;77(1):40-9.**
2. **Schuler G, Hofmann M, Schwarz F. Effect of successful thrombolytic therapy on right ventricular function in acute inferior wall myocardial infarction. *Am J Cardiol*. Nov 1 1984;54:951-957.**
3. **Sharpe DN, Botvinick EH, Shames DM. The noninvasive diagnosis of right ventricular infarction. *Circulation*. Mar 1978;57:483-490.**

AMI consequence of proximal RCA occlusion complicated with sinus bradicardia, first-degree AV block and RV envolvement: ST segment elevation followed by positive T wave in V_4R

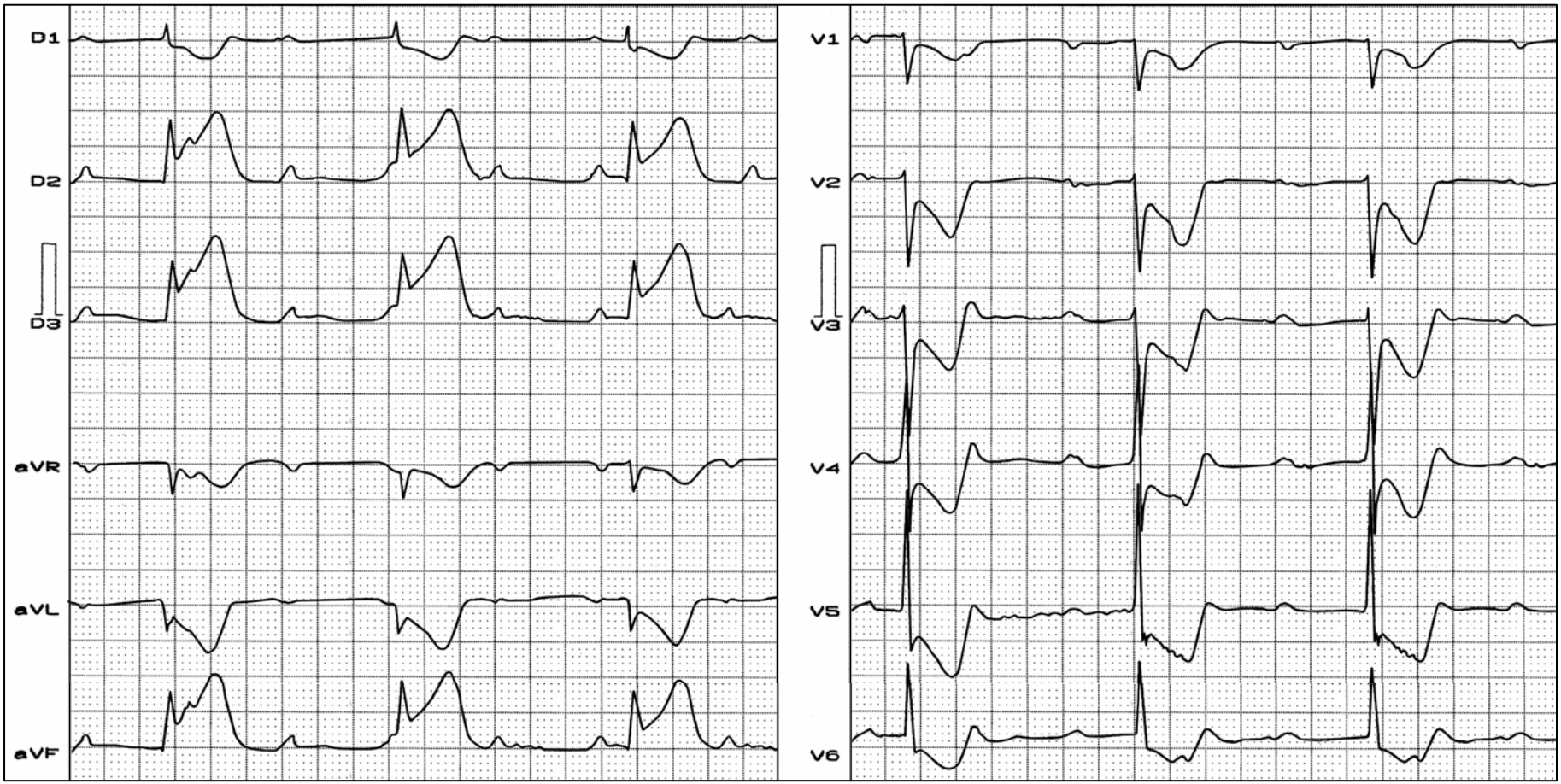


ST-segment elevation in lead V_4R is the single most powerful predictor of RVMI

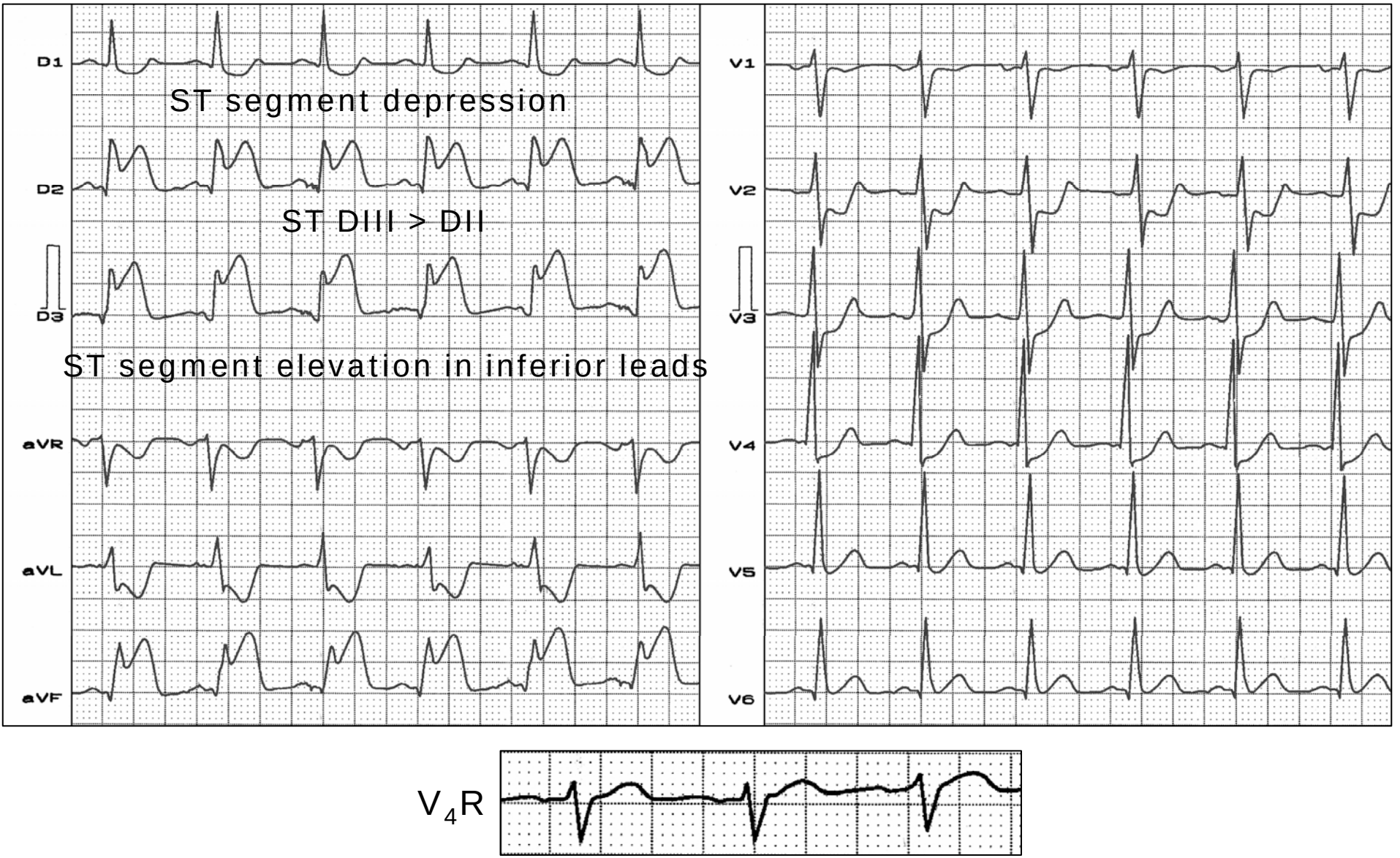
AMI consequence of proximal occlusion RCA complicated with 2:1 AV block and right ventricular envolvement: ST segment elevation in V4R followed by positive T wave



Third degree AV block consequence of AMI by obstruction of RCA. QRS complexes are narrow indicating suprahisian block.

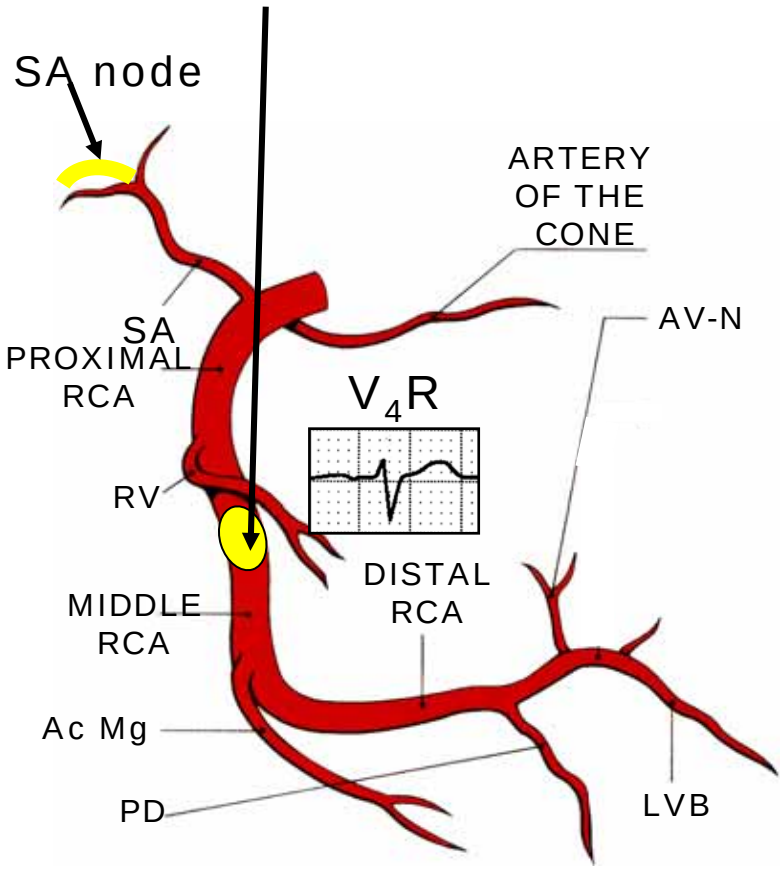


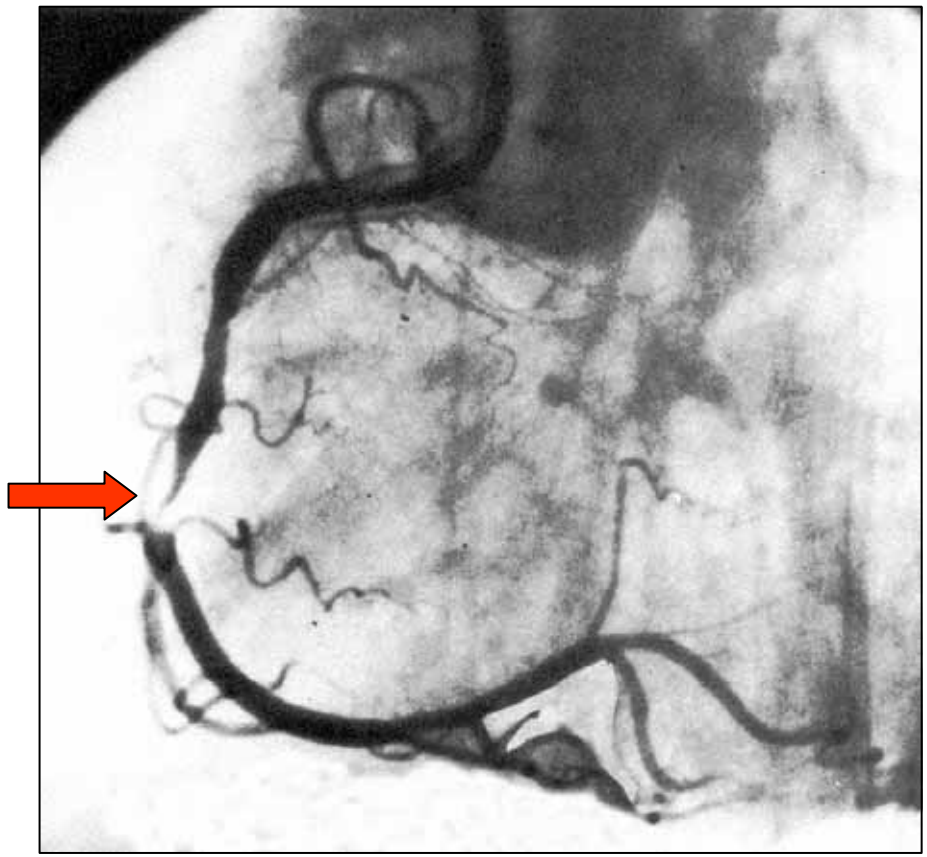
MIDDLE PORTION OCCLUSION
RIGHT CORONARY ARTERY (RCA)


D1
D2
D3
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
ST segment depression
ST DIII > DII
ST segment elevation in inferior leads

V_4R

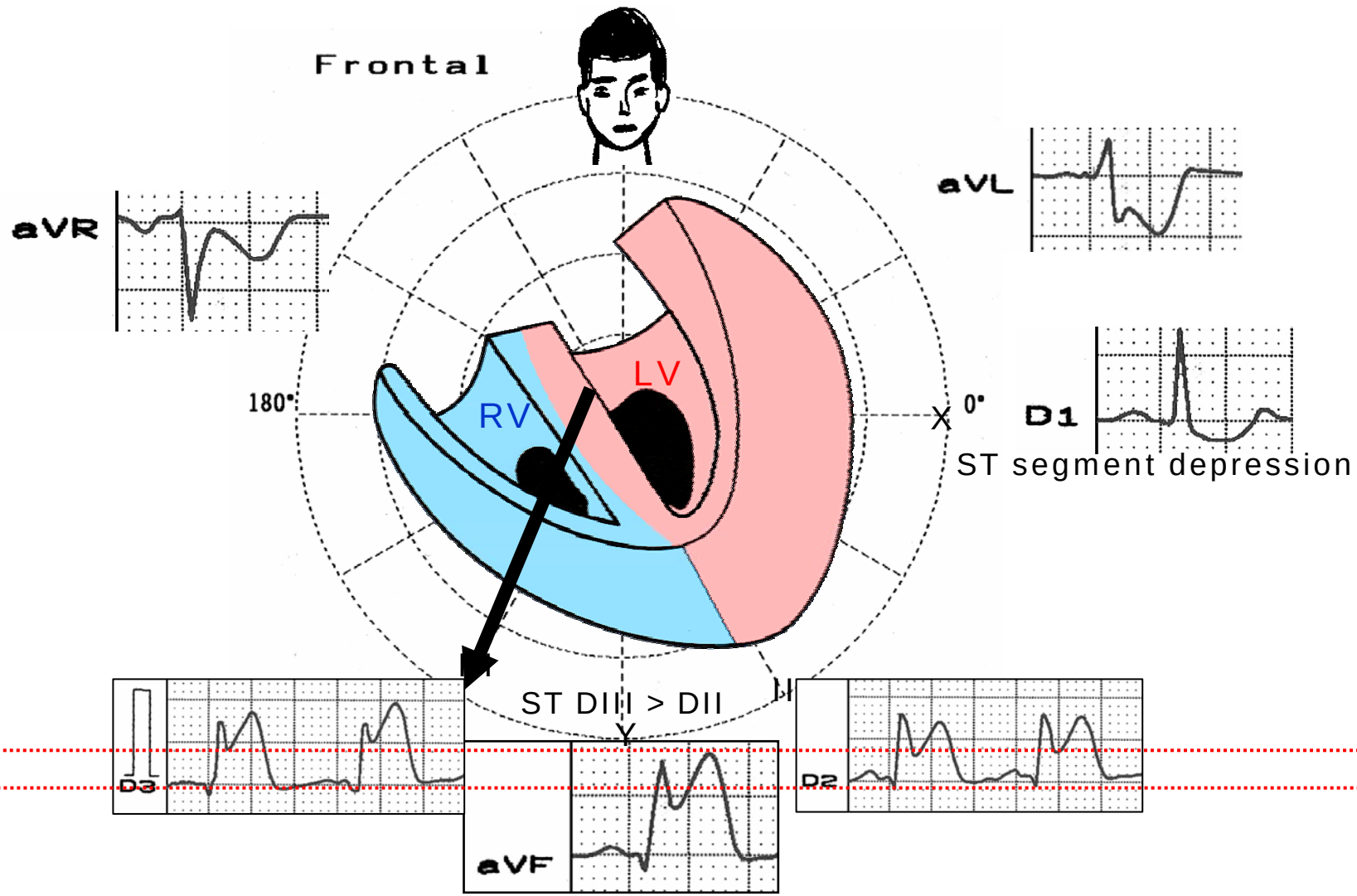
OCCLUSION LOCATION



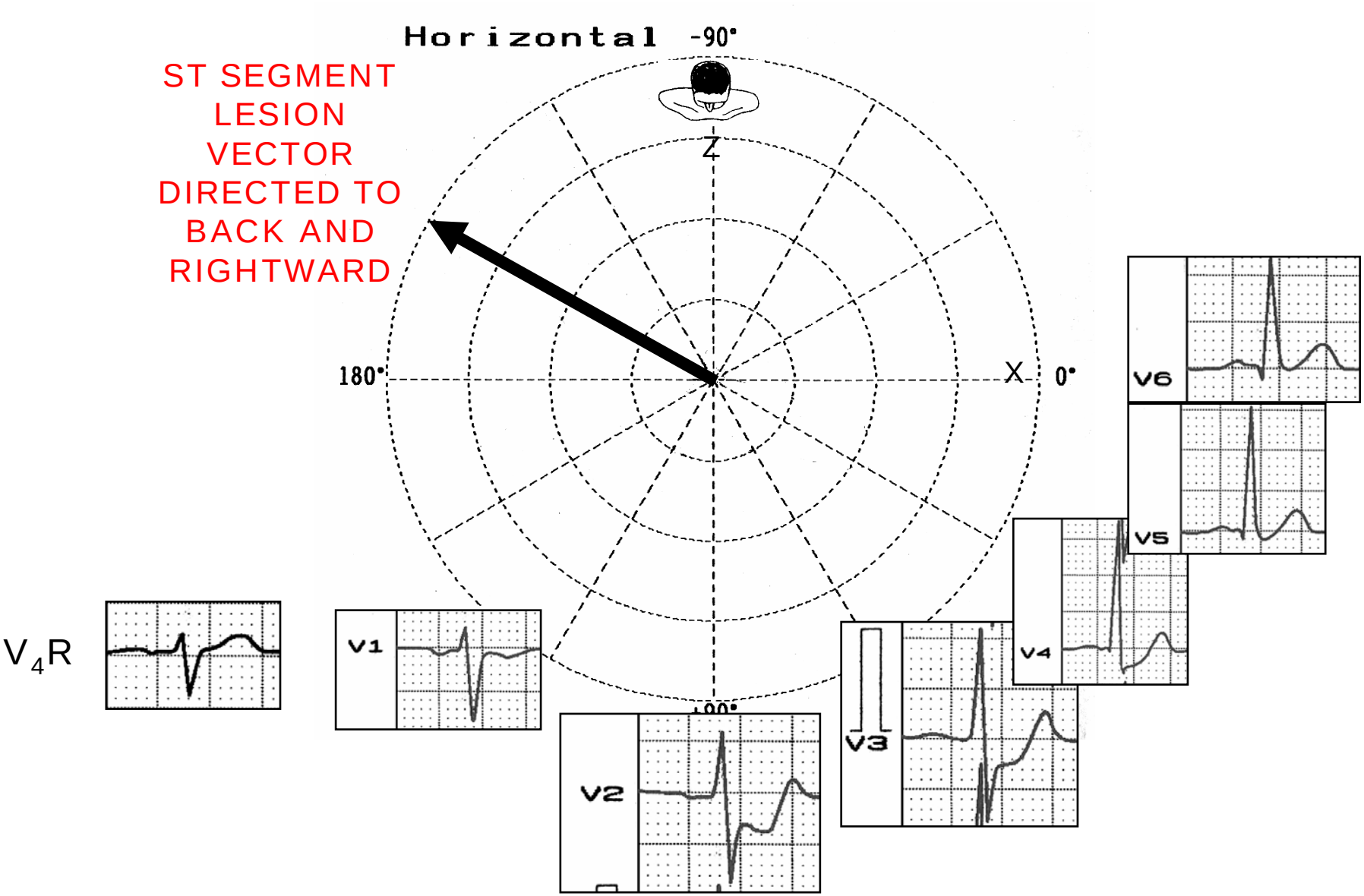


Cineangiography of the previous patient. The red arrow points out the total obstruction in the middle portion of the RCA. The accessory V_4R lead has a isoelectric ST segment, because the RCA obstruction is located distal related to RV artery (without RV Infarction).

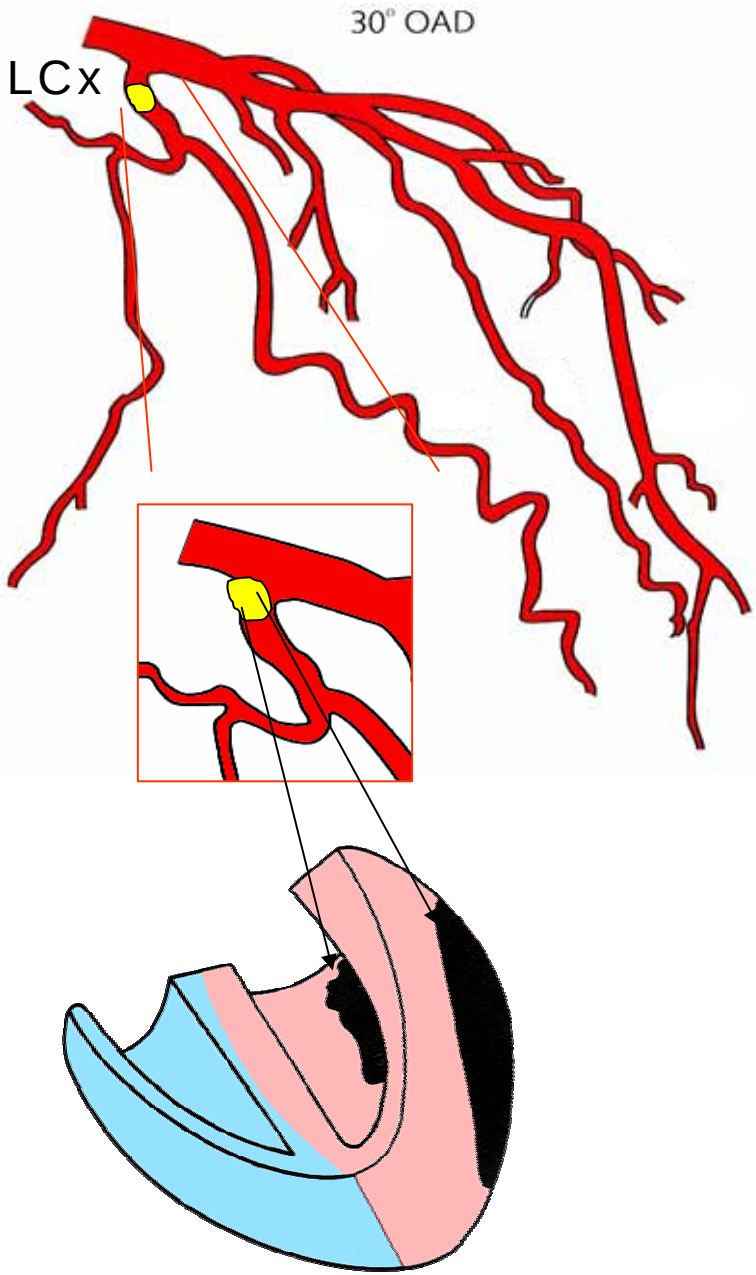
ST segment elevation in inferior leads. III>II because the ST deviation vector pointed to III

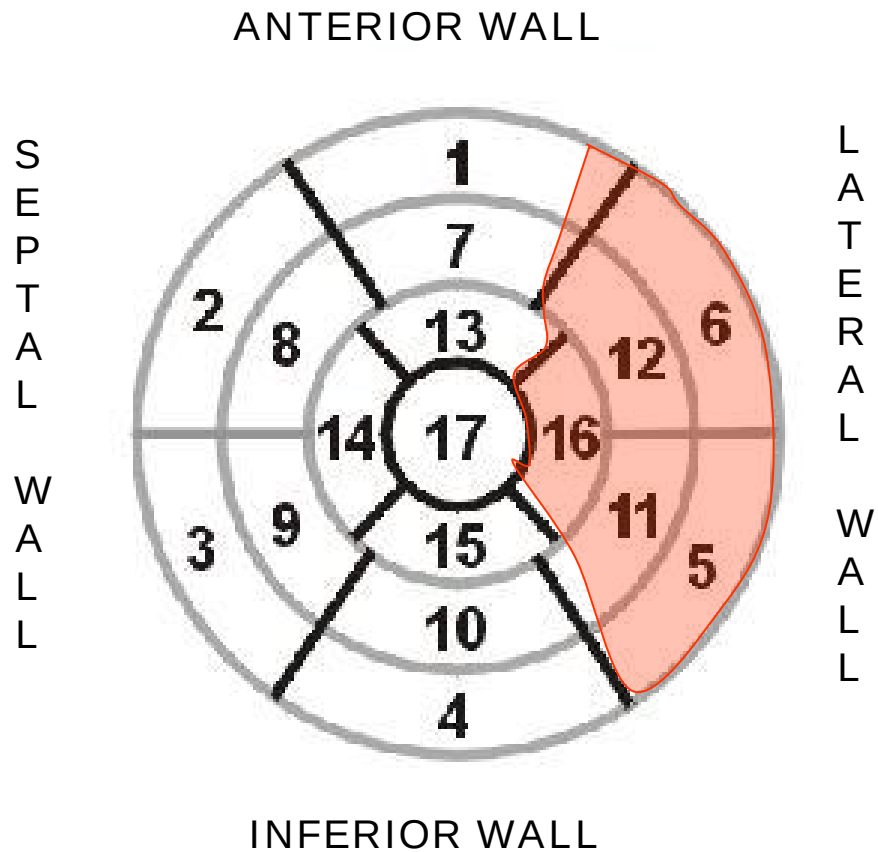


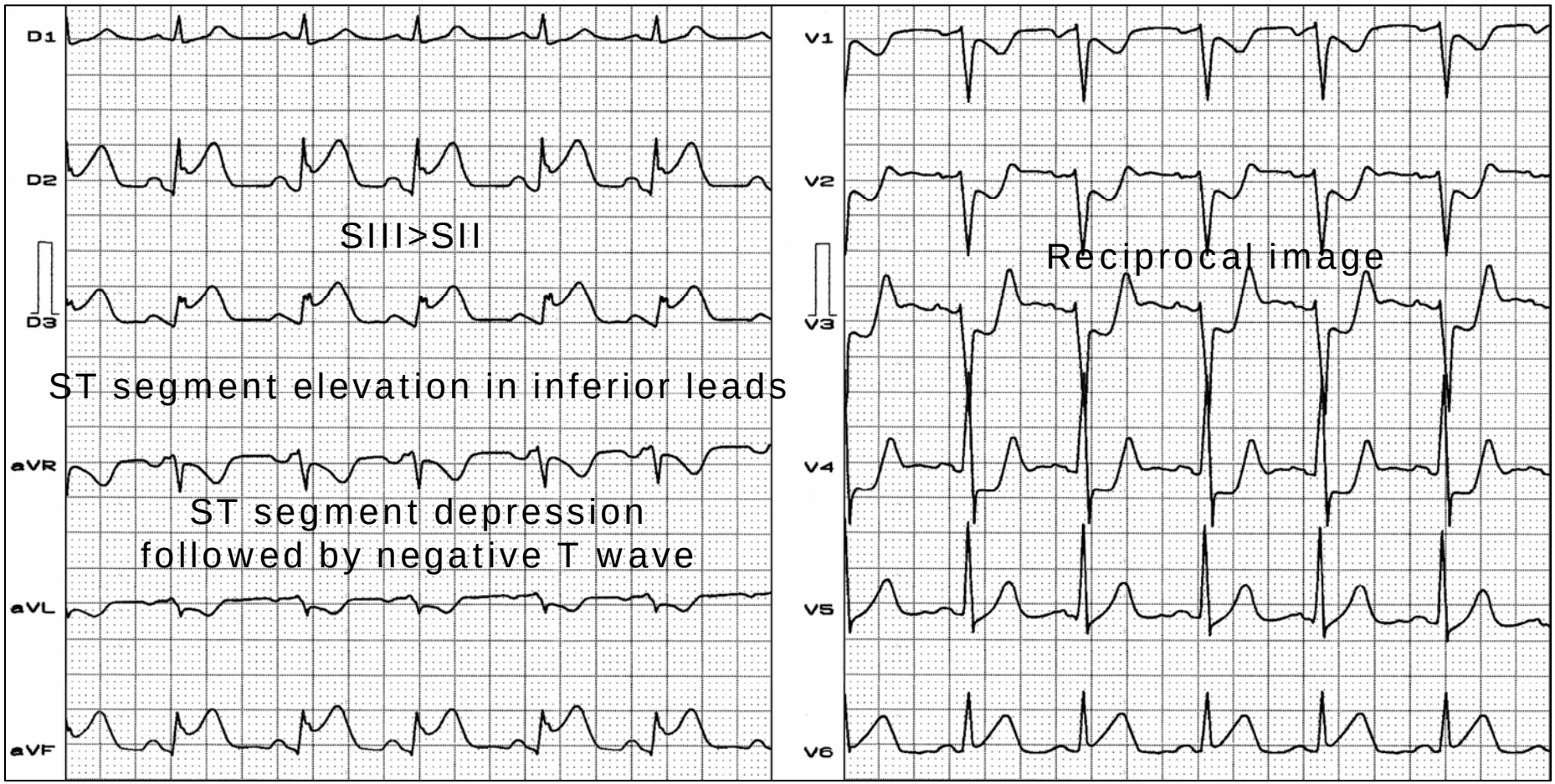
ST SEGMENT LESION VECTOR DIRECTED TO DOWNWARD AND TO RIGHT


ST SEGMENT
LESION
VECTOR
DIRECTED TO
BACK AND
RIGHTWARD
Horizontal
-90°
Z
180°
X
0°
+90°
V6
V5
V4
V3
V2
V1
V4R

OCCLUSION OF
LEFT CIRCUNFLEX ARTERY (LCx)

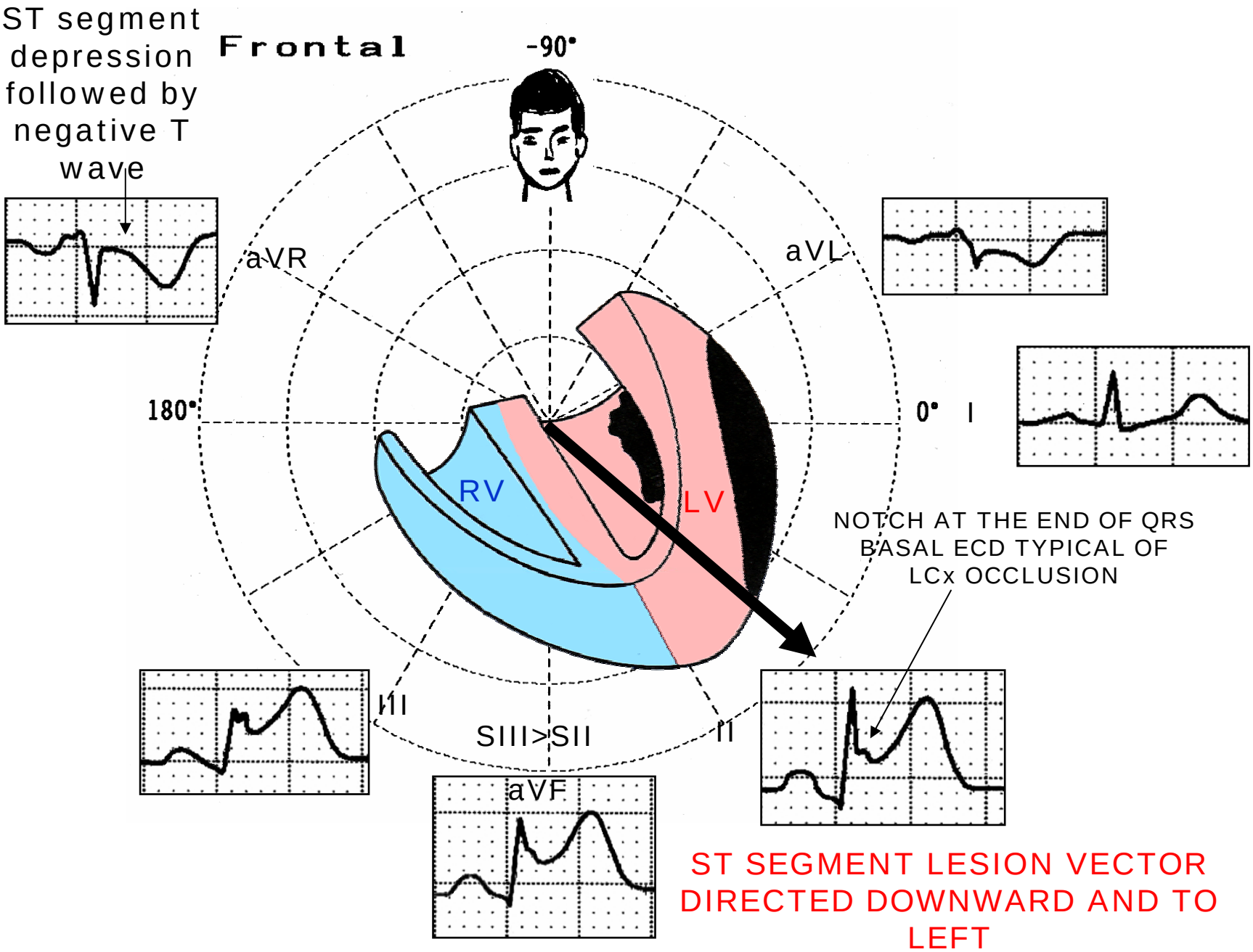

30° OAD
LCx


ANTERIOR WALL
SEPTAL WALL
LATERAL WALL
INFERIOR WALL
1
7
2
8
13
6
12
14
17
16
3
9
15
11
5
10
4



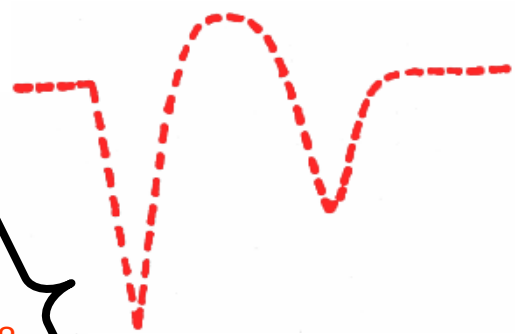
V_4R

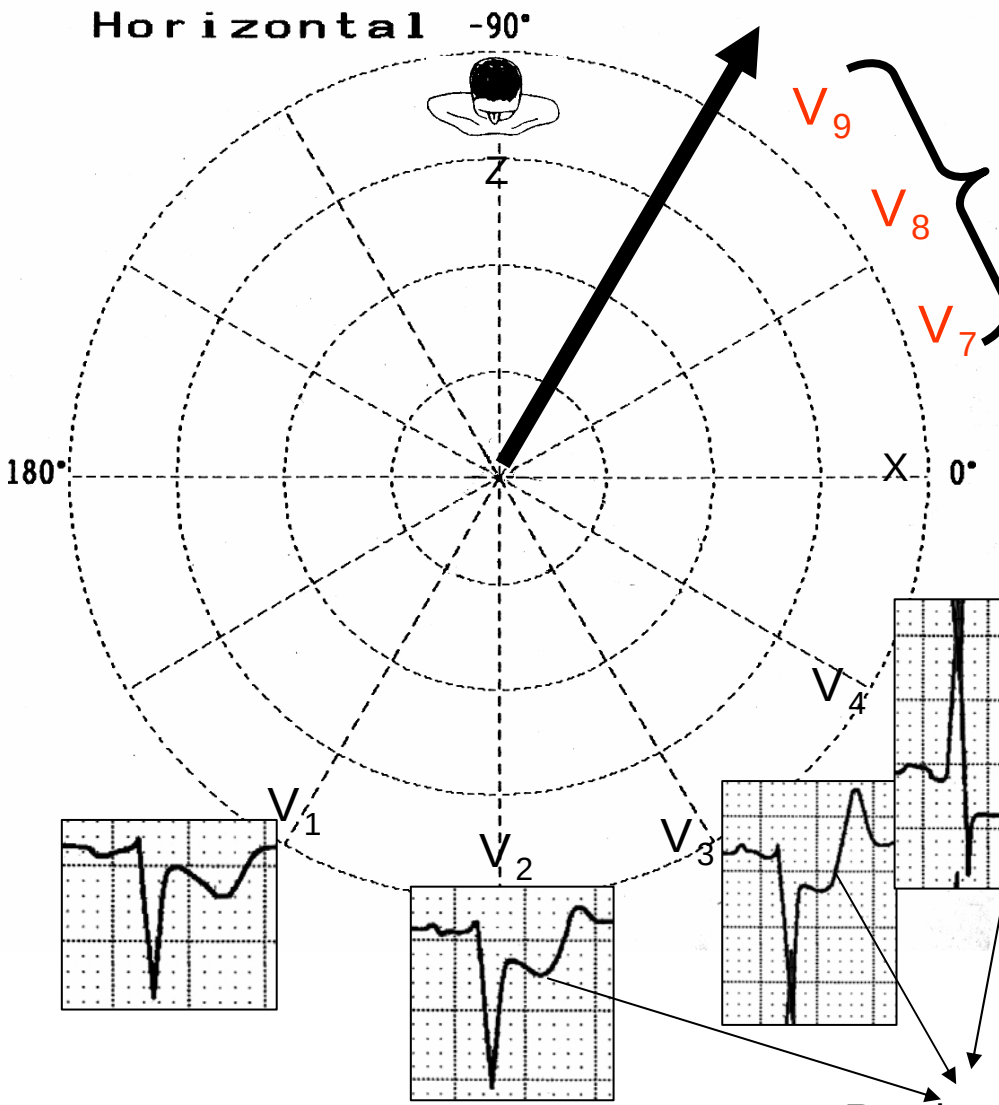
ST segment depression in V_4R followed by negative T wave


ST segment depression followed by negative T wave
Frontal
-90°
aVR
aVL
180°
0°
I
RV
LV
NOTCH AT THE END OF QRS
BASAL ECD TYPICAL OF
LCx OCCLUSION
III
SIII>SII
II
aVF
ST SEGMENT LESION VECTOR
DIRECTED DOWNWARD AND TO
LEFT

ST SEGMENT LESION
VECTOR DIRECTED TO BACK AND LEFTWARD

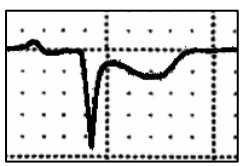
ST segment elevation from V_7 to V_9





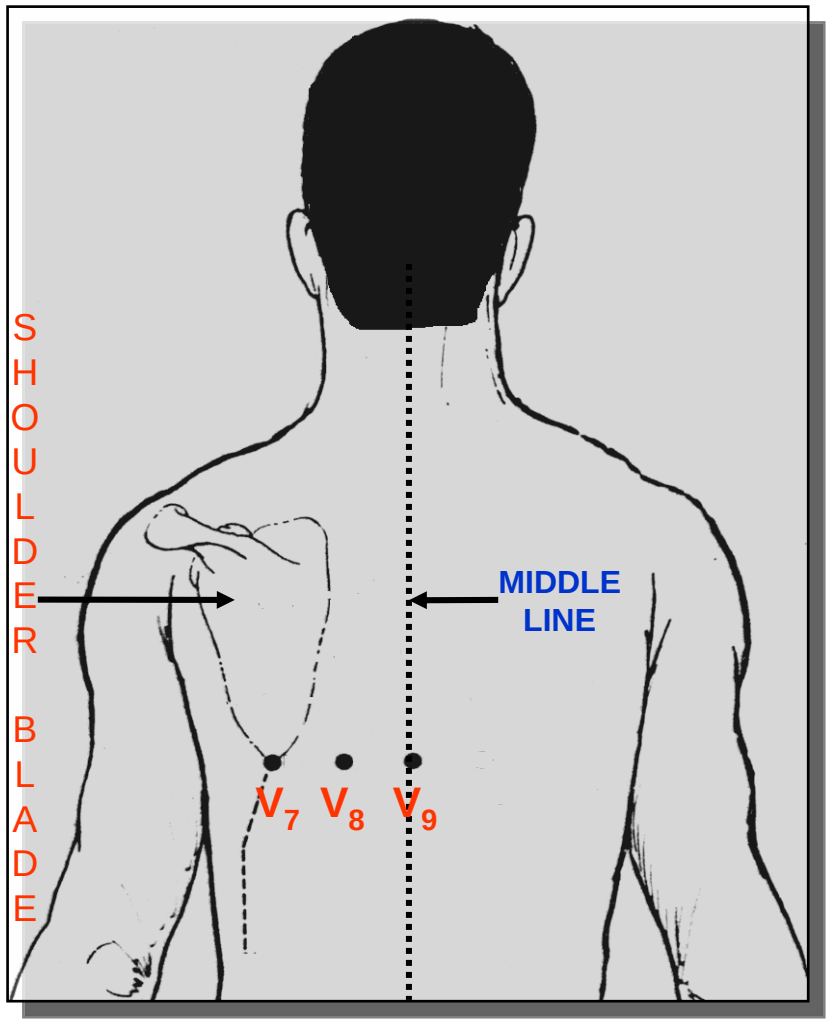
ST segment depression followed by negative T wave indicative of LCx occlusion

V_4R



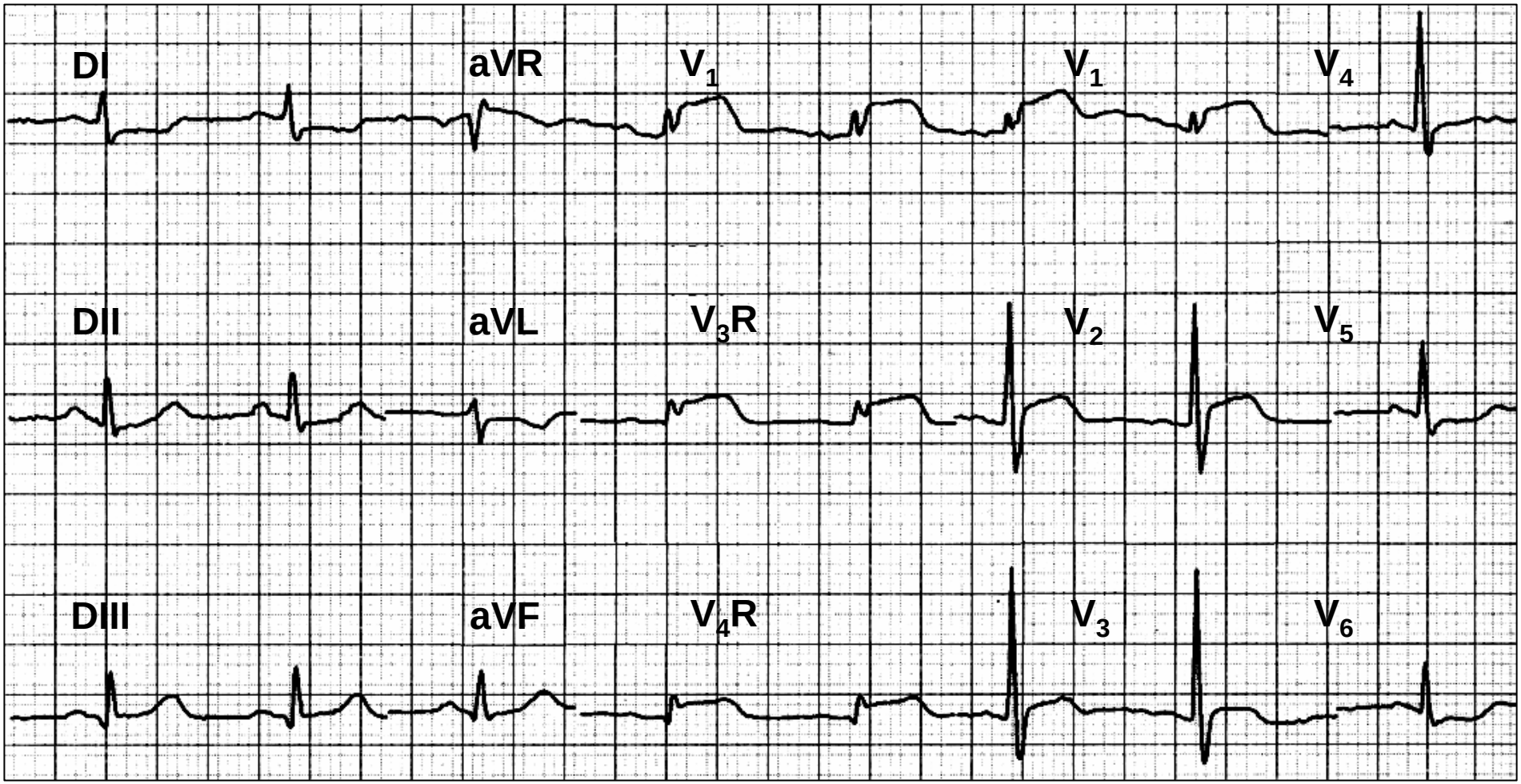
Reciprocal image of basal features

ACCESSORY DORSAL LEADS



The accessory leads are located between the left shoulder blade and the spine V_7, V_8 and V_9 leads.

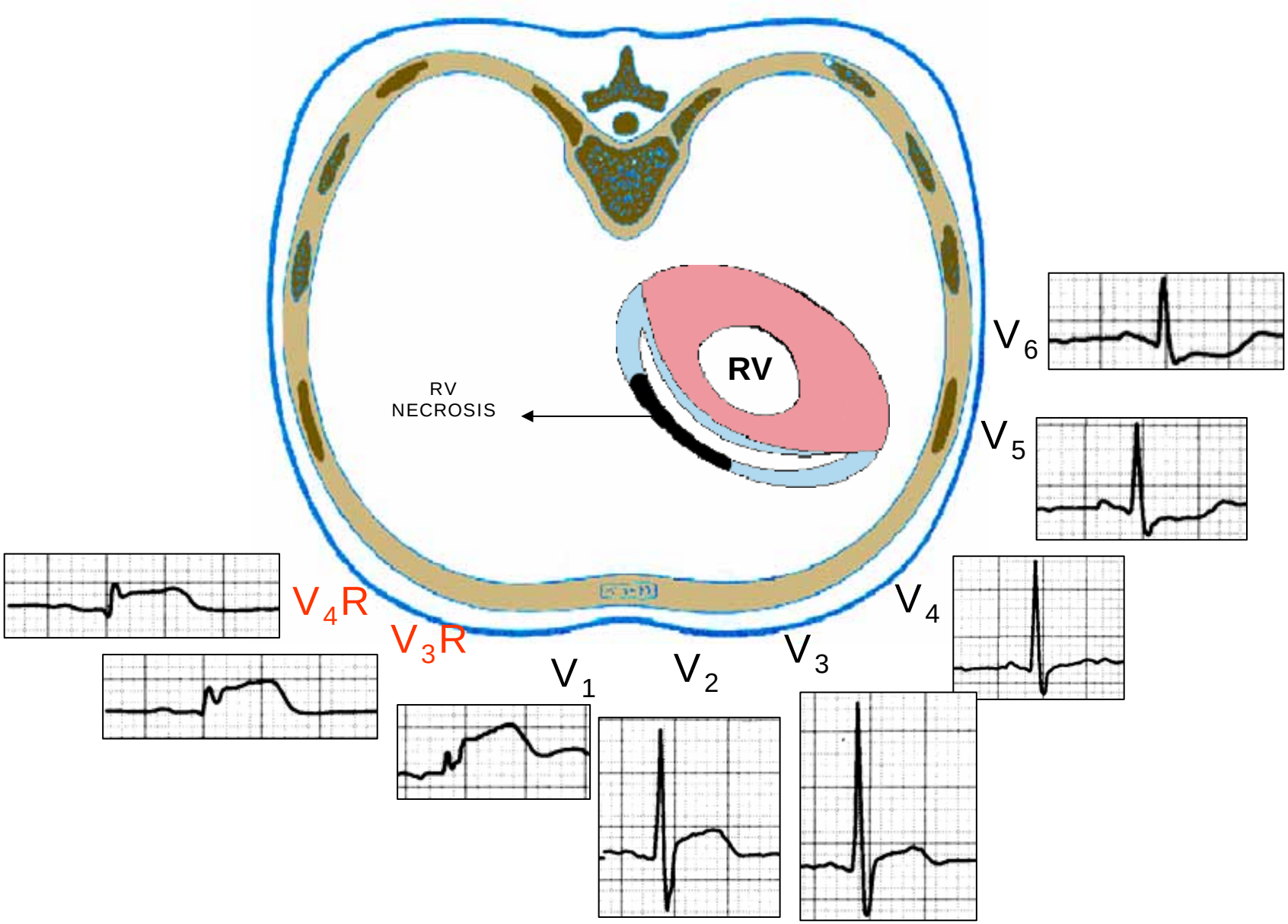
ISOLATED RIGHT VENTRICULAR INFARCTION



Isolated right ventricular infarction without left ventricle involvement, subepicardial injury current recorded in V_1,V_3R and V_4R.

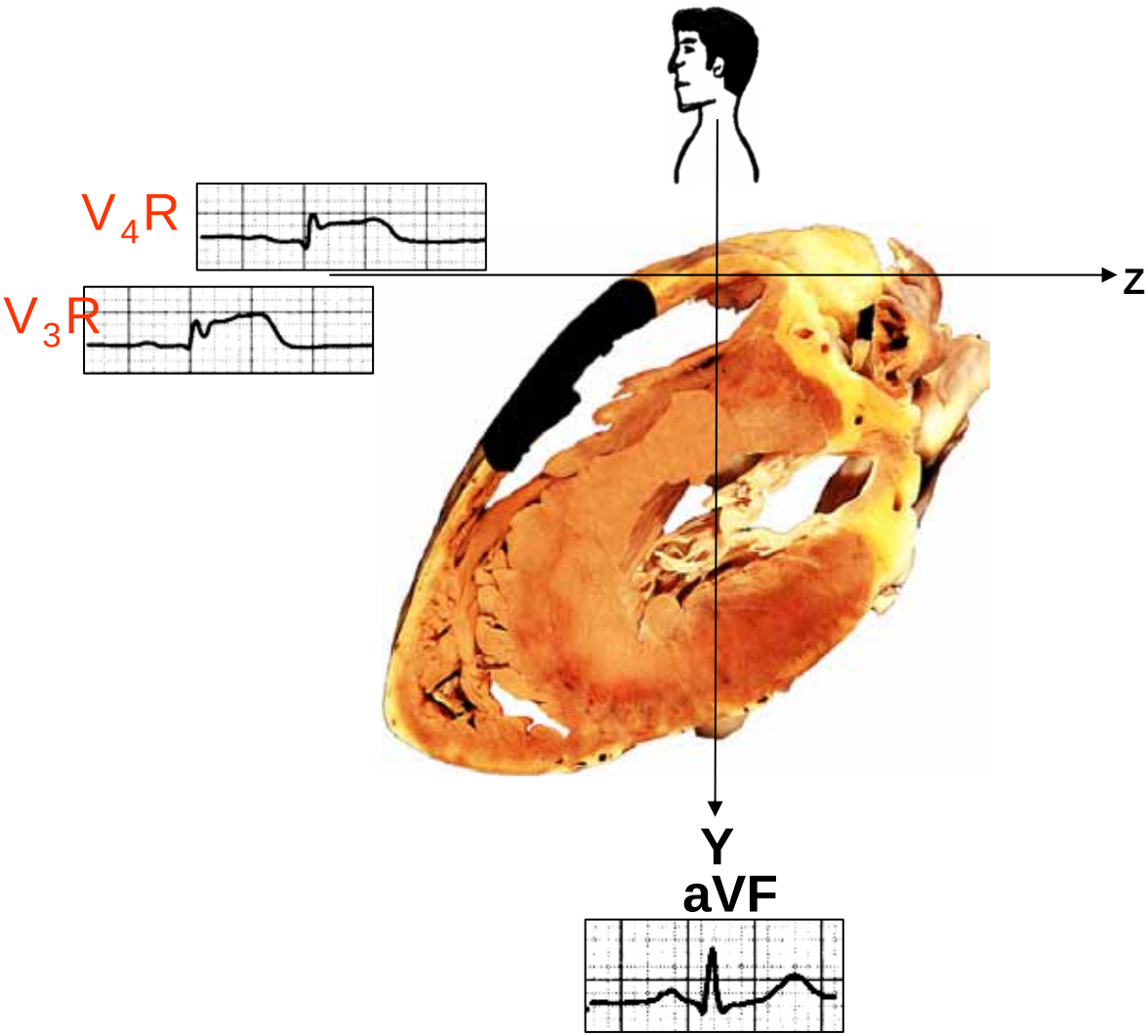
ISOLATED RIGHT VENTRICULAR INFARCTION

MODIFICATIONS IN ACCESSORY RIGHT PRECORDIAL LEADS



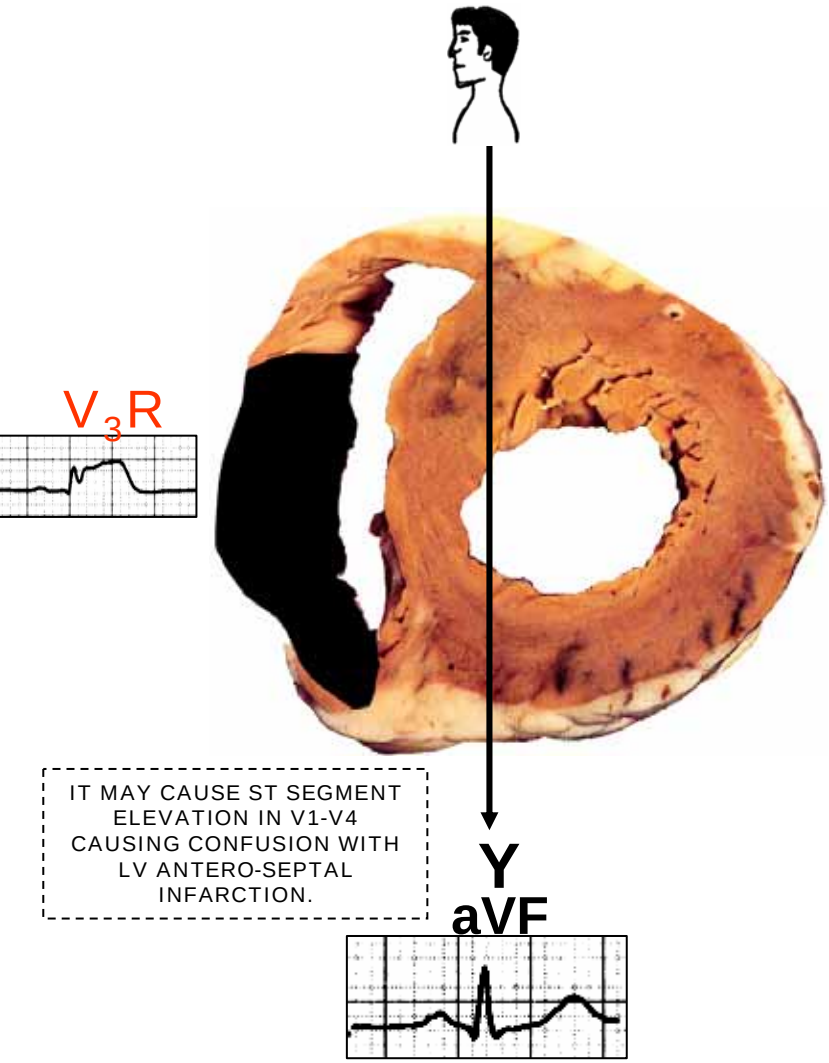
ISOLATED RIGHT VENTRICULAR INFARCTION

LEFT SAGITTAL VIEW



ISOLATED RV INFARCTION (EXCEPTIONAL)

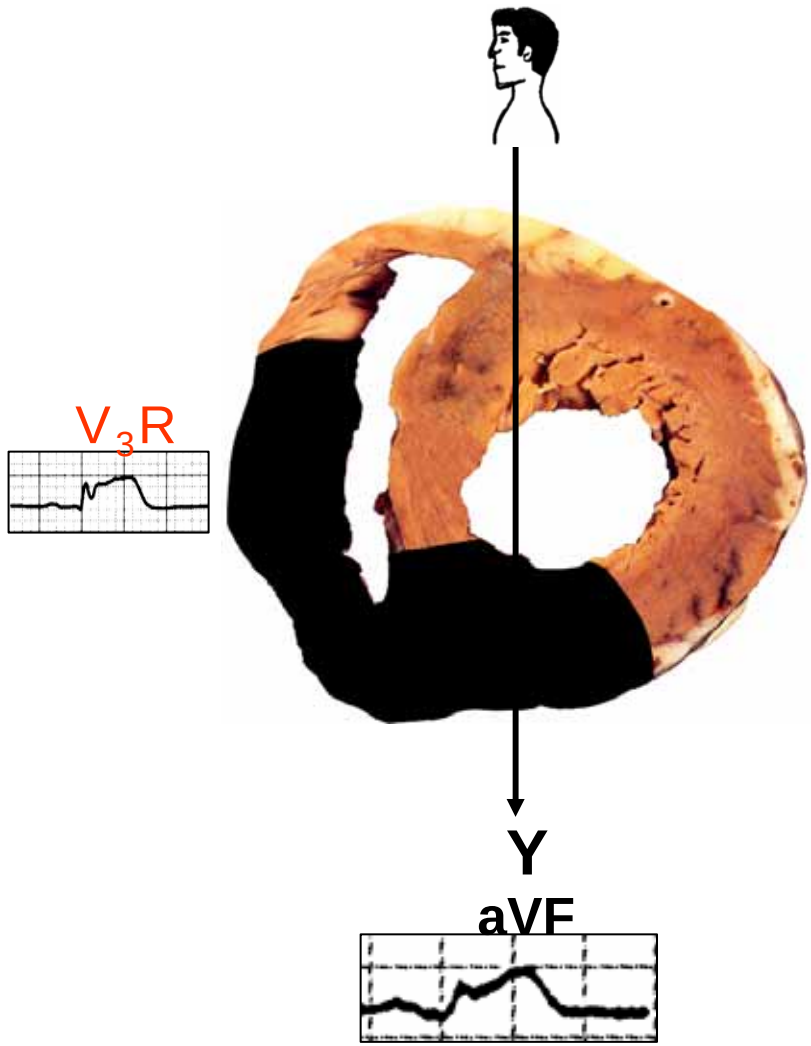
VIEW IN THE MINOR AXIS



IT MAY CAUSE ST SEGMENT ELEVATION IN V1-V4 CAUSING CONFUSION WITH LV ANTERO-SEPTAL INFARCTION.

RV INFARCTION ASSOCIATED TO INFERIOR INFARCTION

VIEW IN THE MINOR AXIS



LIMITATIONS OF THE ST INJURY VECTOR AND THE LOCATION OF MYOCARDIAL ISCHEMIA

Specificity: high[1]
Predictive accuracy: high
Sensitivity: quite low

Clinical situations where the deviation of the ST segment is limited

1. Presence of a previous infarction
2. Preexisting abnormalities of the ST segment
3. Left Bundle Brach Block/Right Bundle Branch Block
4. Ventricular Preexcitation
5. Multivessel disease
6. Abnormal site of origin of a coronary artery
7. Dominance or underdevelopment of the coronary arteries.

1. Andersen MP, Terkelsen CJ, Sørensen JT, Kaltoft AK, Nielsen SS, Struijk JJ, The ST injury vector: electrocardiogram-based estimation of location and extent of myocardial ischemia. J Electrocardiol. 2010 Mar-Apr;43:121-131.