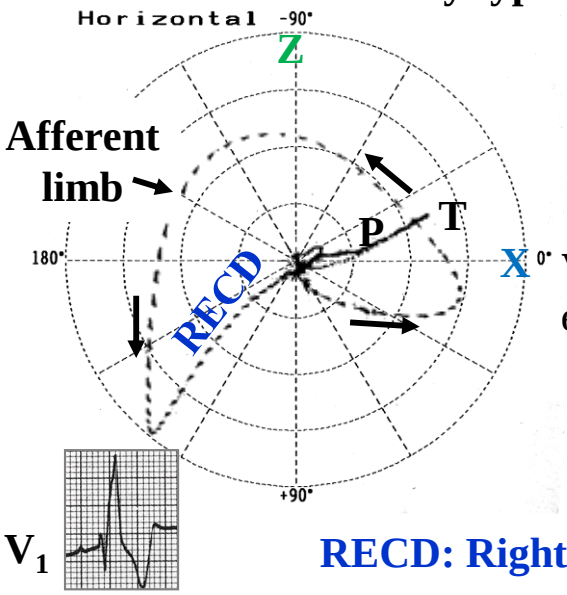
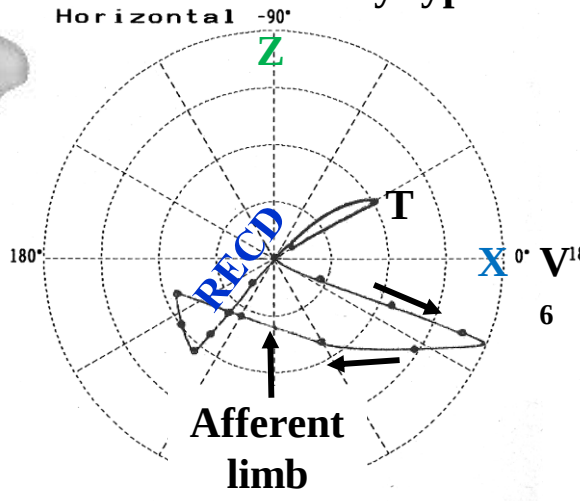
Complete Right Bundle Branch Block associated to Right Ventricular Hypertrophy

VCG classification of isolated Complete Right Bundle Branch Block in the HP

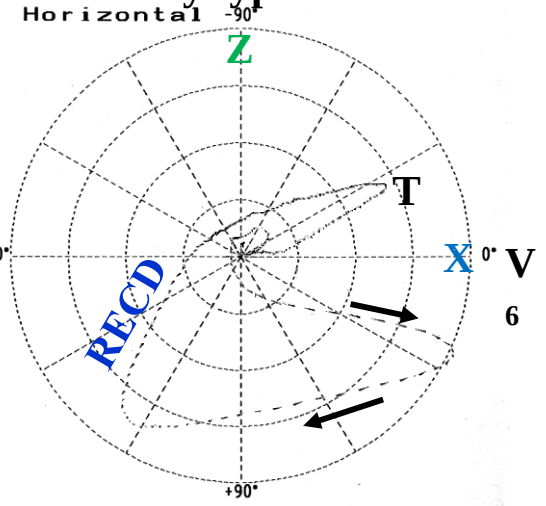
Grishman or Kennnedy type I



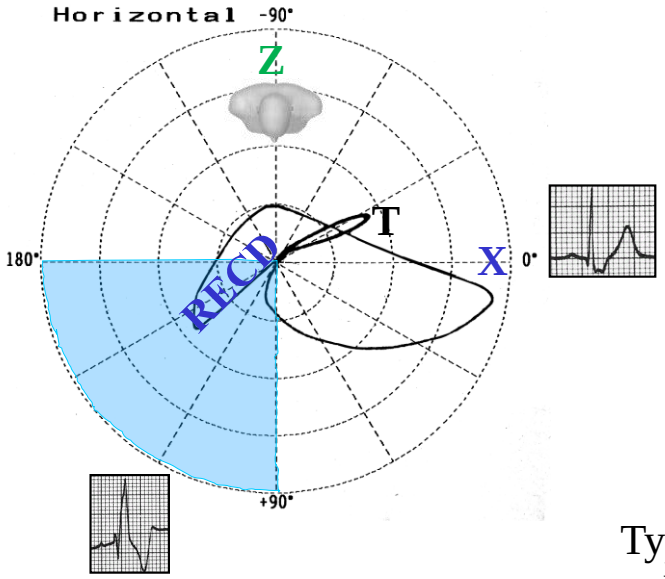
Cabrera or Kennedy type II



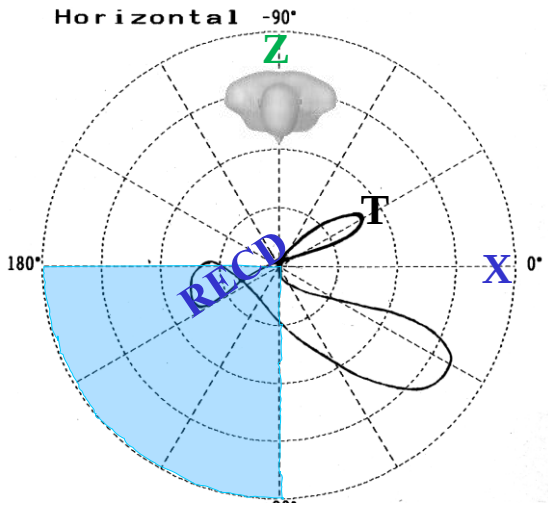
Kennedy type III or C



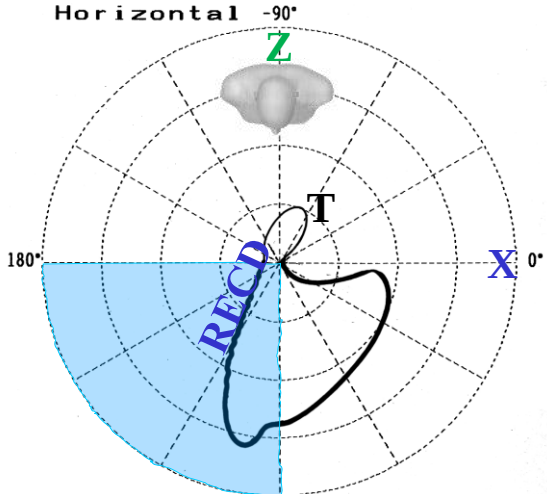
RECD: Right End Conduction Delay



Right Anterior Quadrant



Type II in atrial septal defects, pulmonary stenosis, in COPD and in chronic Chagasic myocardits.



Initial vector to the front, QRS loop of CW rotation and main body located in anterior quadrants. Severe RVH.

The diagnosis of RVH in the presence of CRBBB by ECG criteria

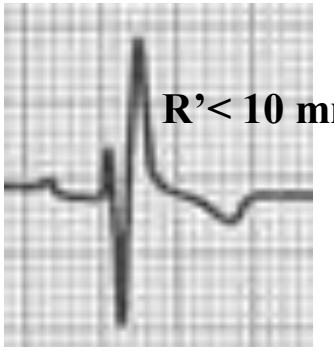
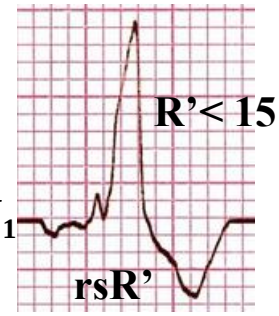
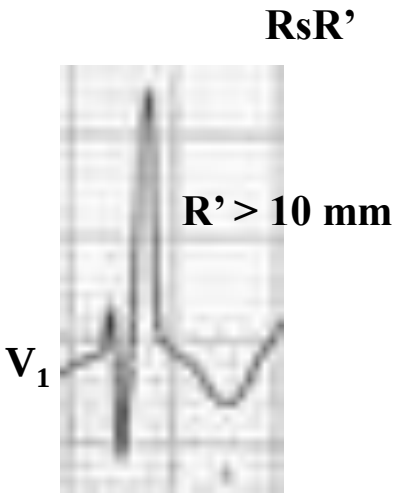
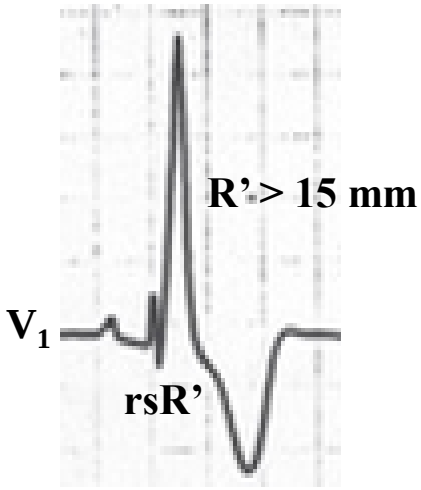
ECG in the Frontal Plane

	Isolated CRBBB	CRBBB associated to RVH
I and aVL	qRS	rS
II- III- aVF	Variable.	QR; R or qR

ECG in the precordial leads

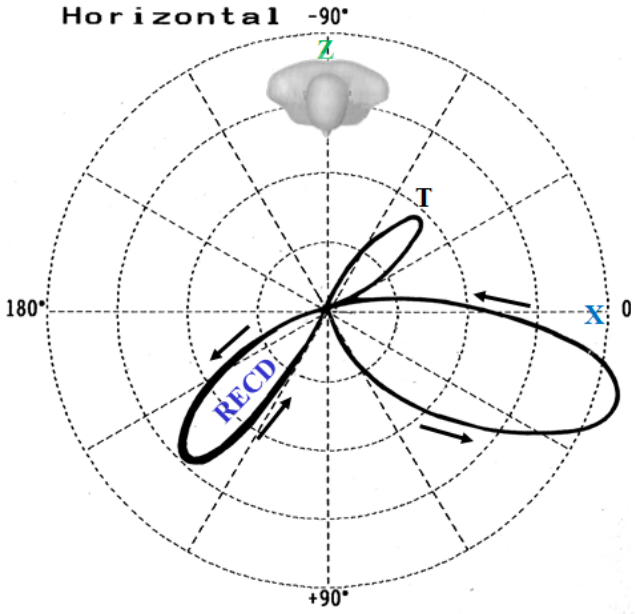
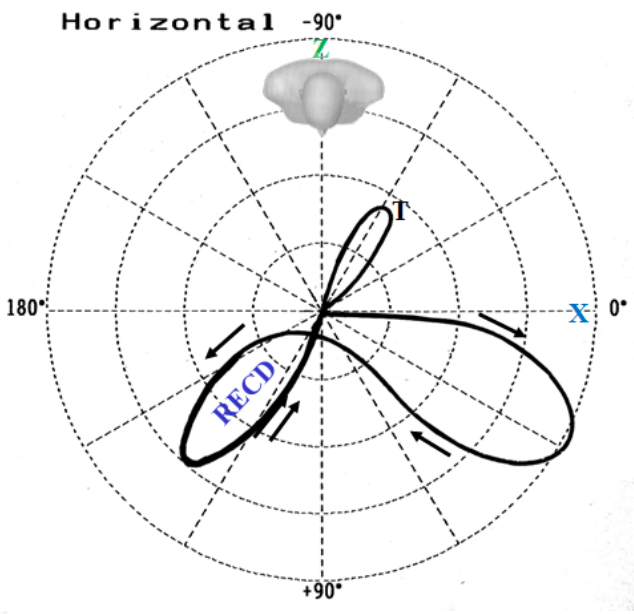
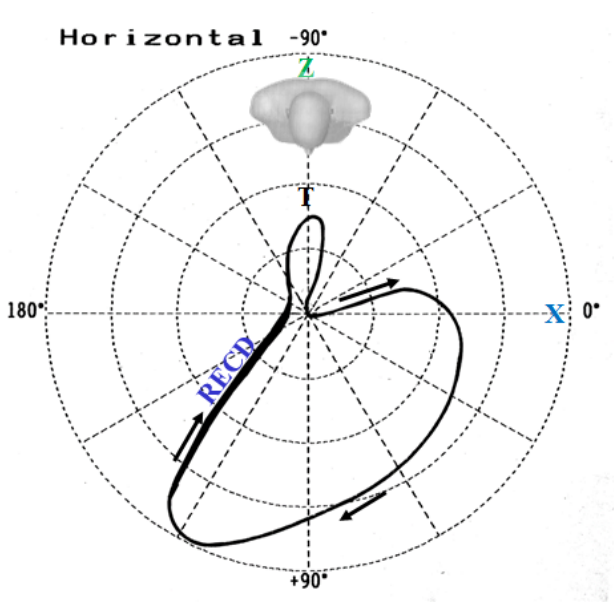
- Voltage of R' wave of V_1 (rsR') of 15 mm of height or greater in the presence of CRBBB;
- Voltage of R' wave of V_1 (rSR') of 10 mm of height or greater in the presence of IRBBB;
- R' wave of great voltage is more likely to correspond to RVH in children than in adults;
- Persistence of triphasic morphology (rSR') in intermediary precordial leads (V_3 and V_4). This sign suggests hypertrophy of RV free wall;
- qR pattern in V_1 may be an indirect sign of RAE and this of RVH;
- 6) Tetraphasic pattern (rsr's') in V_2, V_3 and up to V_4 suggests hypertrophy of trabecular region of the RV;
- Complex of the R/S type with negative T waves, beyond V_4, suggests hypertrophy of the low right paraseptal region of the RV;
- Initial q wave disappears, decrease of R voltage and increase of S depth in V_5 and V_6 are observed in Complete RBBB associated to great RVH;
- Pattern of Incomplete RBBB or Complete RBBB of sudden onset, suggests acute RVH by pulmonary embolism;
- Presence of P wave criteria of RAE associated to Complete RBBB suggests RVH, except for Ebstein's anomaly and tricuspid atresia.

Elements that suggest RVH in V_1 in the presence of IRBBB and CRBBB

IRBBB QRS duration < 120 ms	CRBBB QRS duration ≥ 120 ms
Isolated IRBBB V_1 	Isolated CRBBB 
IRBBB + RVH 	CRBBB + RVH R' > 15 mm 

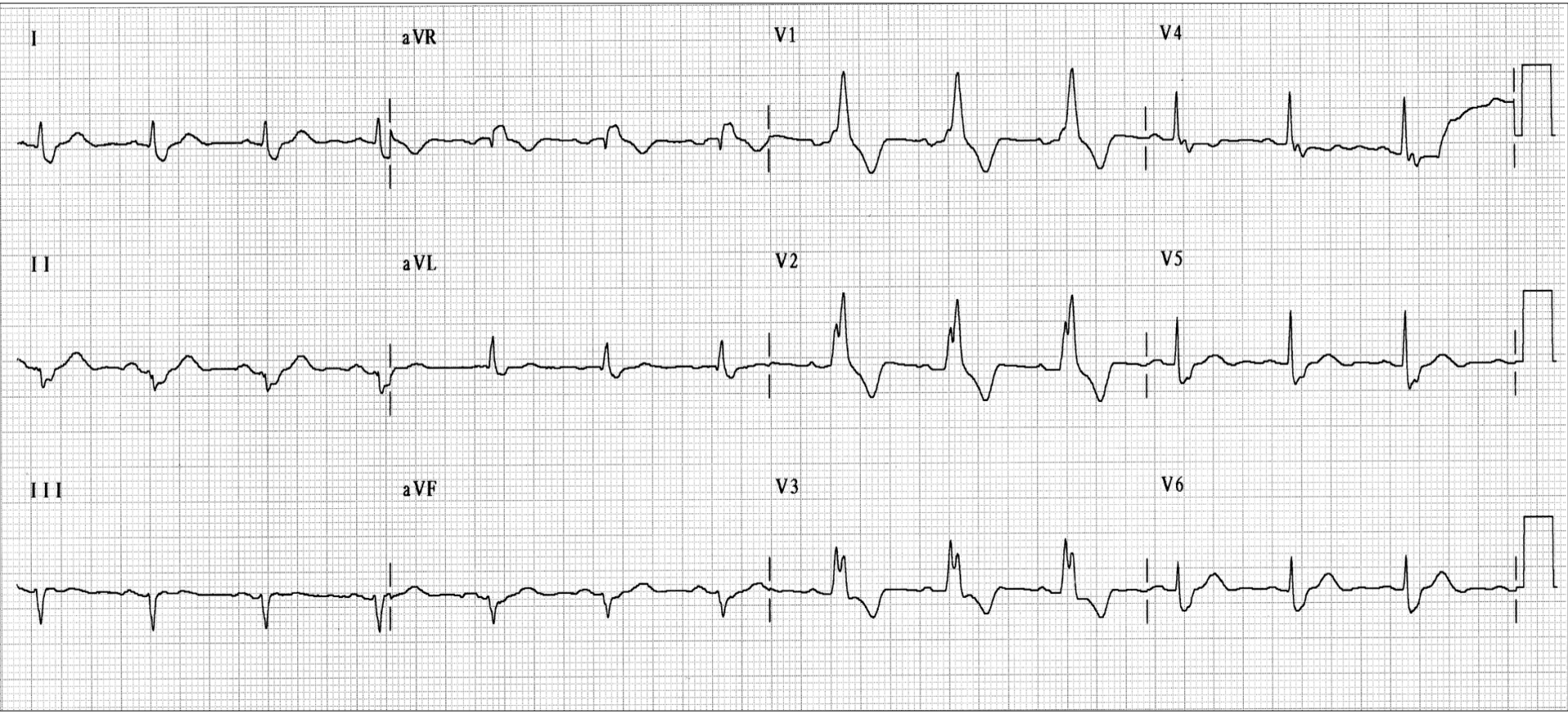
Voltage criteria of R' in V1 > 10 mm for IRBBB and > 15 mm for CRBBB that indicates associated RVH.

VCG criteria of CRBBB associated to RVH on HP (1)

CRBBB + Mild RVH	CRBBB + Moderate RVH	CRBBB + Severe RVH
		
CRBBB VCG Grishman type or Kennedy type I	**CRBBB VCG Cabrera type or Kennedy type II**	**CRBBB VCG Kennedy type III or C**
CCW rotation	**In 8 rotation**	**CW rotation**

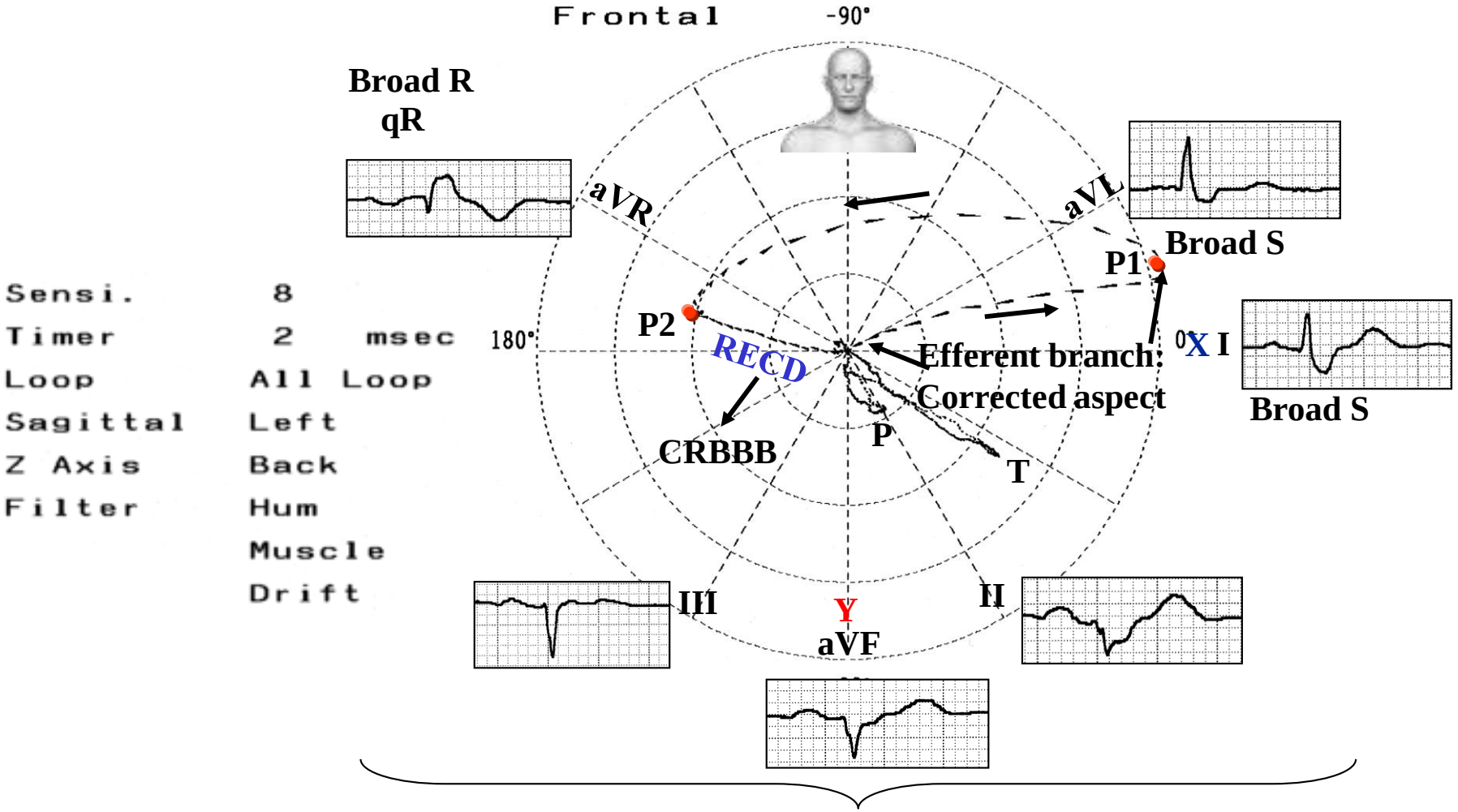
(1) a CW rotation of the QRS loop in the HP, (2) a ratio of the magnitude of the R wave to that of the S wave (R/S ratio) in lead X at less than 2.0, (3) a mean QRS vector in lead X more negative than--10 mv.msec, or (4) a maximal QRS vector located between 90º and -90º in the HP. In contrast, an R/S ratio in lead X that was ≥ 2.0 or an azimuth angle of the mean spatial QRS vector that was not between 90º and ± 180º would indicate that the right ventricular conduction defect is probably uncomplicated (2).

Name: PAG; **Gender:** male; **Age:** 75 yo.; **Race:** white; **Weight:** 80 Kg; **Height:** 1.70 m; **Date:** 16/12/2003
Medication in use: Enalapril 20 mg; Prednisteroids 20 mg per day; Salbutamol 2 per day.



Clinical diagnosis:. Emphysema and systemic hypertension
Echocardiogram: mild concentric hypertrophy. Mitral ring calcification. Mild RV dilatation.
ECG diagnosis: SR, HR: 78 bpm P wave: SÂP: +63°; duration: 80 ms; Voltage: 1 mm. PR: 172 ms. QRS: SÂQRS: with extreme deviation in the right superior quadrant; -120°; QRSD: 140 ms; SAT: +50° and to the back; QT: 430 ms; QTc: 490 ms.
Conclusion: Complete Right Bundle Branch Block + PAF (Prominent Anterior Forces). Cause? RVH? SFB? Extreme deviation of SÂQRS in the right superior quadrant: LAFB? Electrically inactive inferior area? Association of both?

ECG/VCG correlation on FP



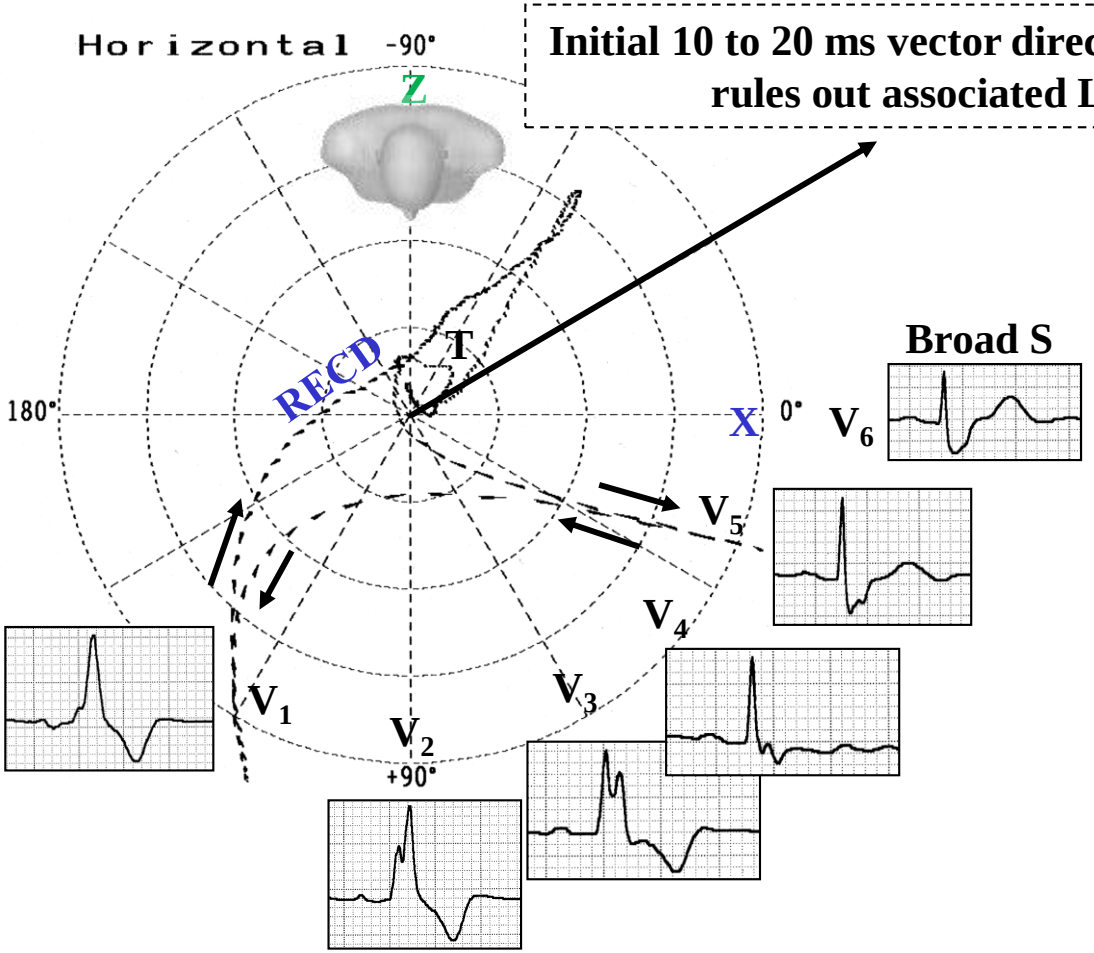
rS. Small initial r wave: pseudo inferior electrically inactive area

Note: The diagnosis of LAFB and/or inferior electrically inactive area is not configured. The initial forces are directed to left and upward. The greatest part of QRS loop located in the right superior quadrant rules out LAFB (in spite of its CCW rotation). The fast recording of QRS loop onset in the FP and the corrected aspect of the efferent branch rule out the diagnosis of inferior Myocardial Infarction. In spite of the extreme deviation of the QRS axis in the superior quadrants, associated LAFB is not configured, even with a CCW rotation. RECD is indicative of CRBBB,

ECG/VCG correlation on HP

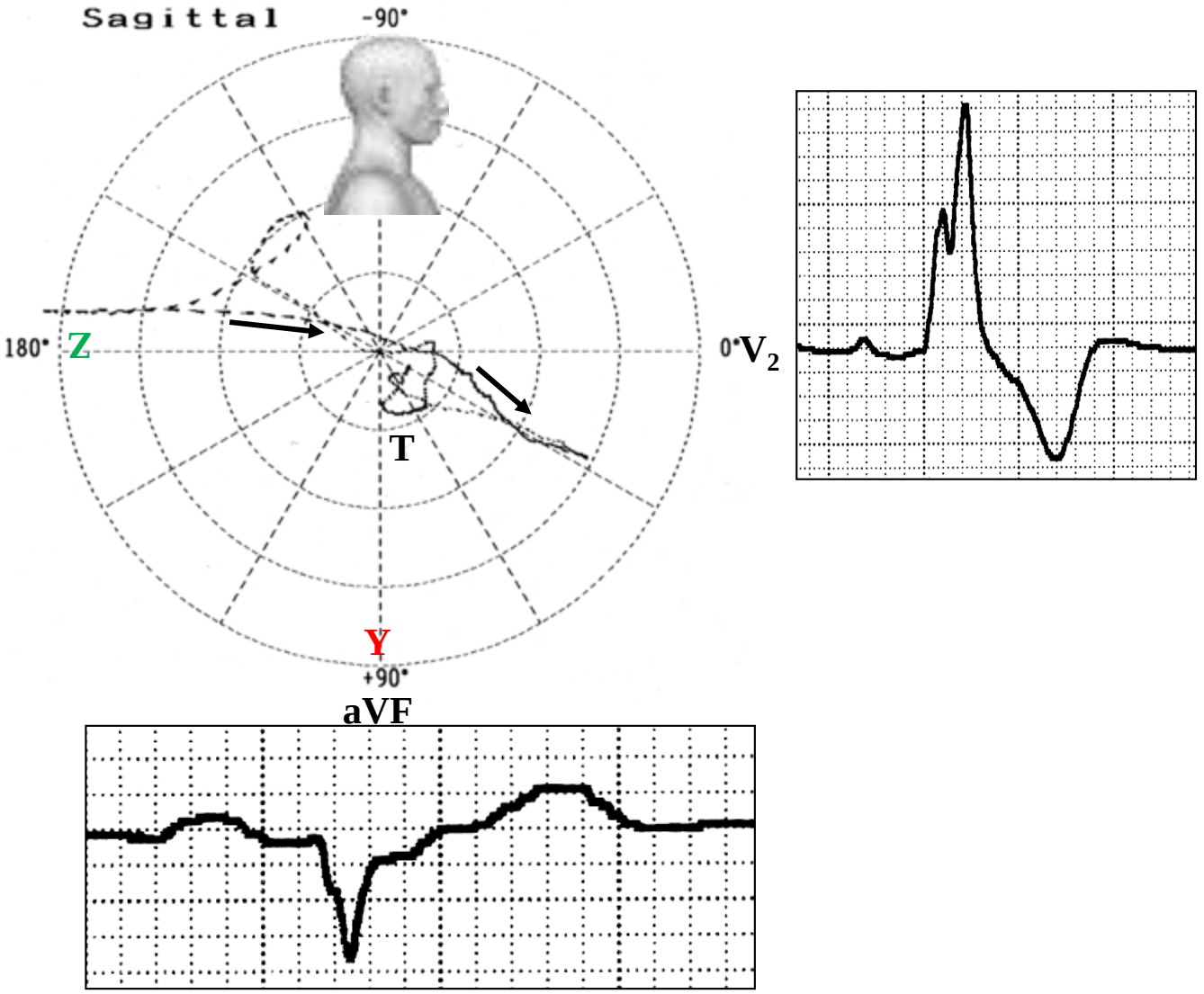
CRBBB
Kennedy
Type III VCG type: anterior dislocation of QRS loop with CW rotation
+
PAF

RVH



Monophasic R waves with notch from V1 to V3: CRBBB + PAF (Prominent Anterior Forces).

ECG/VCG correlation on RSP



Diagnostic conclusion: ECG/VCG

1) CRBBB VCG Kennedy type III;
2) RVH;
3) Prominent Anterior Forces (PAF).

Comment: by VCG in the HP, CRBBB may be:

1) Kennedy type I or Grishman (afferent branch behind the X line);
2) Kennedy type II or Cabrera (afferent branch in front of the X line with loop in 8);
3) Kennedy type III (QRS loop of clockwise rotation and completely located in anterior quadrants in the HP).

References

1. Miquel C, Sodi-Pallares D, Cisneros F, et al. Right bundle branch block and right ventricular hypertrophy; electrocardiographic and vectorcardiographic diagnosis. Am J Cardiol. 1958 Jan;1(1):57-67.
2. Brohet CR, Styns M, Arnaud P, et al. Vectorcardiographic diagnosis of right ventricular hypertrophy in the presence of right bundle branch block in young subjects. Am J Cardiol. 1978 Oct;42(4):602-12.