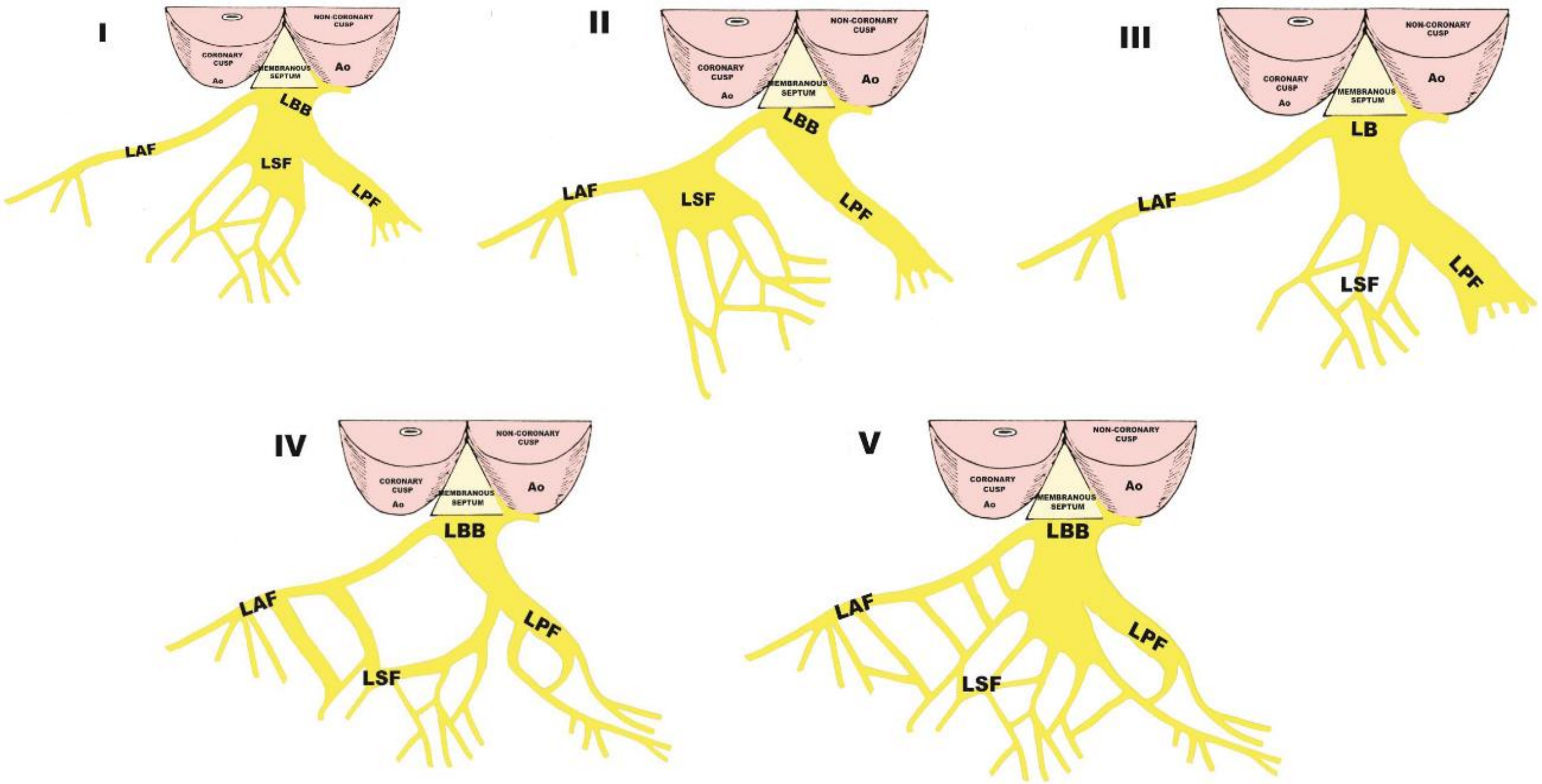
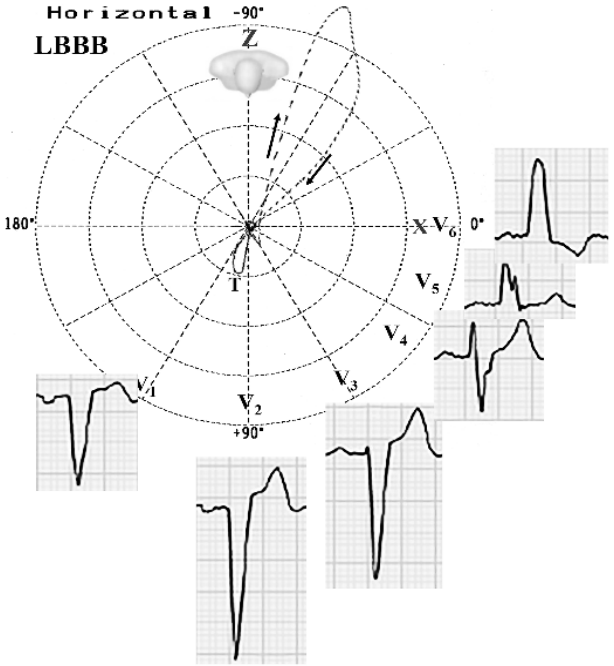
The tetrafascicular nature of the intraventricular conduction system

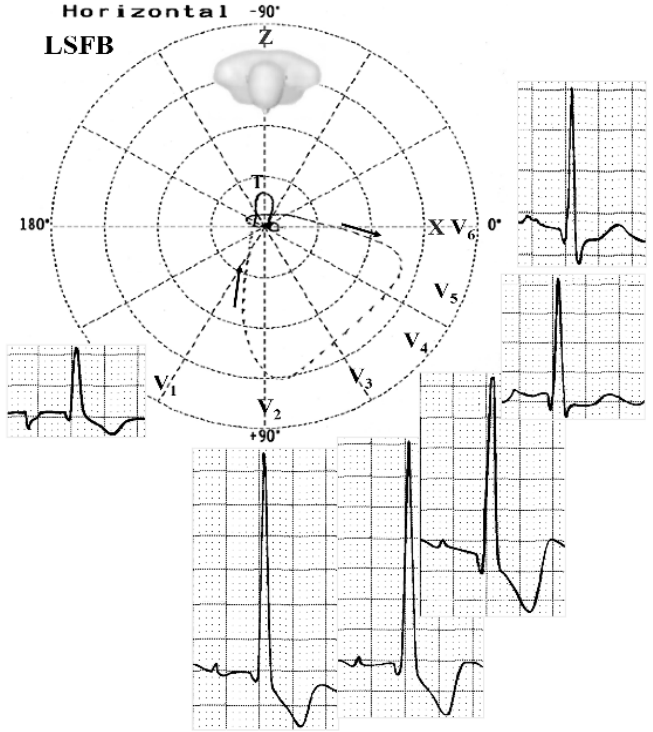
Andrés Ricardo **Pérez-Riera** MD, PhD[1]; Raimundo **Barbosa-Barros** MD[2]

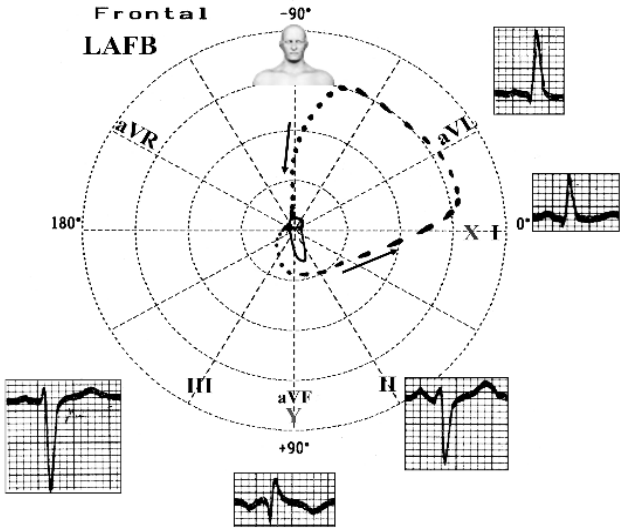
,[1]Design of Studies and Scientific Writing Laboratory in the ABC Faculty of Medicine, Santo André, São Paulo, Brazil.
[2]Coronary Center of the Hospital de Messejana Dr. Carlos Alberto Studart Gomes, Fortaleza, Ceará, Brazil.

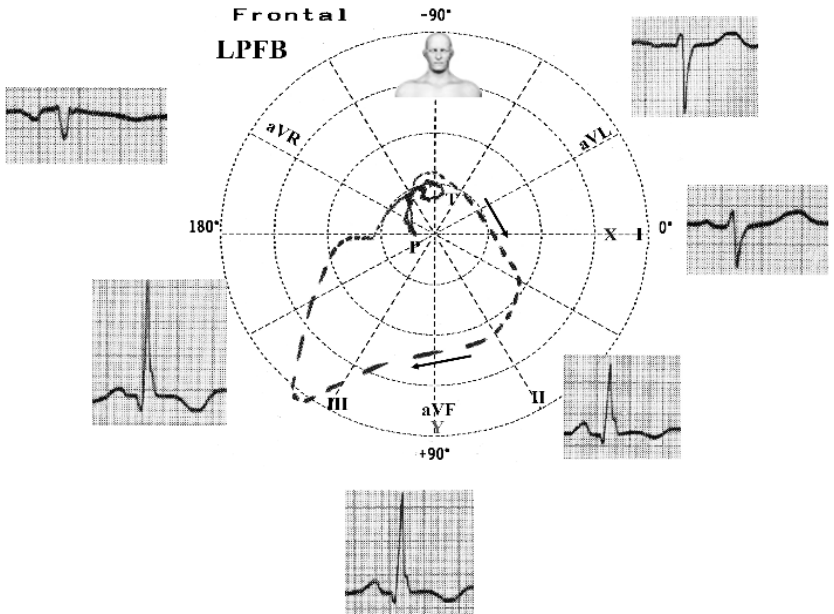


Variation in LBB anatomy. I: LSF originates from the main LBB; II: LSF originates from the LAF; III: LSF originates from the LPF; IV: LSF originates concomitantly from the LAF and LPF; V: LSF is a “fan-like interconnecting network”.









LBBB and LSFB have their main ECG/VCG features in the horizontal plane, on the other hand, LAFB and LPFB in the frontal plane.

Main ECG criteria of LBB, LSFB, LAFB and LPF

LBBB	Supraventricular command (if the rhythm is sinus, the PR interval is ≥120 ms); QRS duration ≥120ms in adults, ≥100 ms age 4–16 years, and ≥90 ms in children <4 years of age; QRS complexes in right precordial leads (V1 and V2) total or predominantly negative: rS, QS or qrS; monophasic, broad notched or slurred R wave, recorded slowly in the left leads: I, aVL, V5 and V6; prolonged ventricular activation time in left leads (≥50 ms); ST- segment and T-wave vectors are directed opposite to the mean QRS vector with QRS/ST-T angle near 180º
LSFB	Only in the precordial leads: normal QRS duration or with a minor increase (up to 110 ms); increased ventricular activation time in V1/V2 ≥35 ms; R wave voltage of V1 ≥ 5 mm; R/S ratio in V1 and V2 >2; S wave depth in V1 <5 mm; possible small (embryonic) q wave in V2 and V3 or V1 and V2; R wave of V2 >15 mm; R wave "in crescendo" from V1 through V3 and decreasing from V5 to V6; absence of q wave in left precordial leads V_5, V_6 and in lead I; intermittent PAF during a hyperacute phase of myocardial infarction, or during an exercise stress test in patients with severe myocardial ischemia (Uchida 2006), and during early atrial extrastimuli with some degree of ventricular aberration (Hoffman 1976); appearance of intermittent, rate-dependent q wave in V_1 and V_2.
LAFB	Extreme shift of SÂQRS in the left superior quadrant (beyond 30° up to -90°); QRS duration <120 ms; rS in II, III and aVF; SIII > SII; qR pattern in I and aVL; prolonged R-peak time in aVL (≥45 ms)
LPFB	QRS axis between +80º to +140º in adults; rS pattern in leads I and aVL; qR pattern in III, aVF and II; RIII > RII; prolonged ventricular activation time in aVF (≥35 ms).

Note: The diagnosis is always clinical-electrocardiographic because it is necessary to rule out right ventricular hypertrophy, a vertical heart in slender subjects and a large lateral infarction, QRS duration ≤110 ms, and broad QRS loop with clockwise rotation and maximal vector near +110º (+80º to +140º).