# MEDIÇÃO DE FLUXO DE SANGUE

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# INDICADOR DE CURVAS DE DILUIÇÃO

- Cardiogreen
- Débito cardíaco
- Shunts cardíacos

# CardioGreen

- Concentração zero
- Densitômetro
- Triângulo de Benchimol
- (área do tempo entre o início da curva para o ponto de deflexão pico determina débito cardíaco)

# Curva de Corante Normal

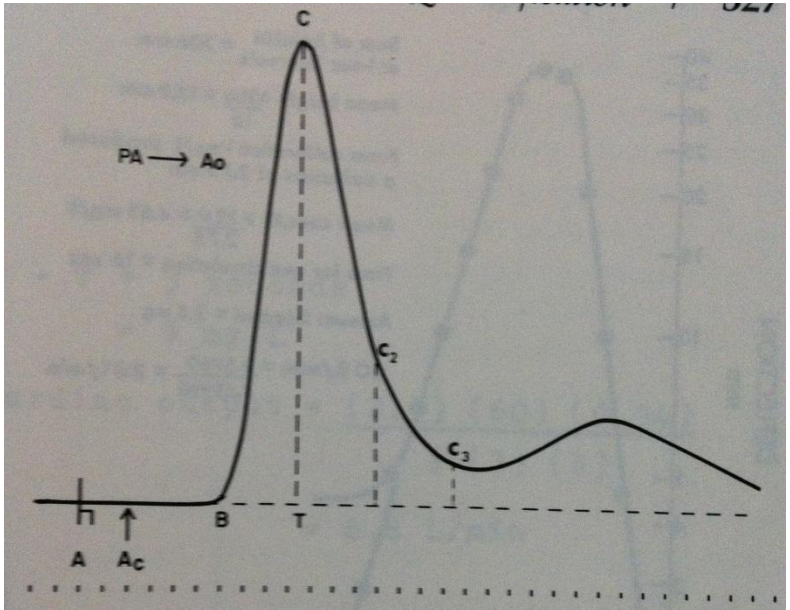



**Figure 20.2.** Normal dye curve recorded in the aorta (*Ao*) after injection into the pulmonary artery (*PA*). Note that because of recirculation the downslope does not reach the baseline. $A - B$, actual appearance time; $Ac - B$, corrected appearance time; $B - T$, buildup time; $C$, peak concentration; $C_2$, concentration at 2 BT; $C_3$, concentration at 3 BT.

# Fórmula Stewart e Hamilton

$$\frac{CO = I\,(mg) \times (60)}{C\,(mg/liter) \times (unit\ time)} = \text{liters per minute}$$

where I = mg dye injected, C = average concentration during one circulation period, and unit time = duration (in seconds) of one circulation period.

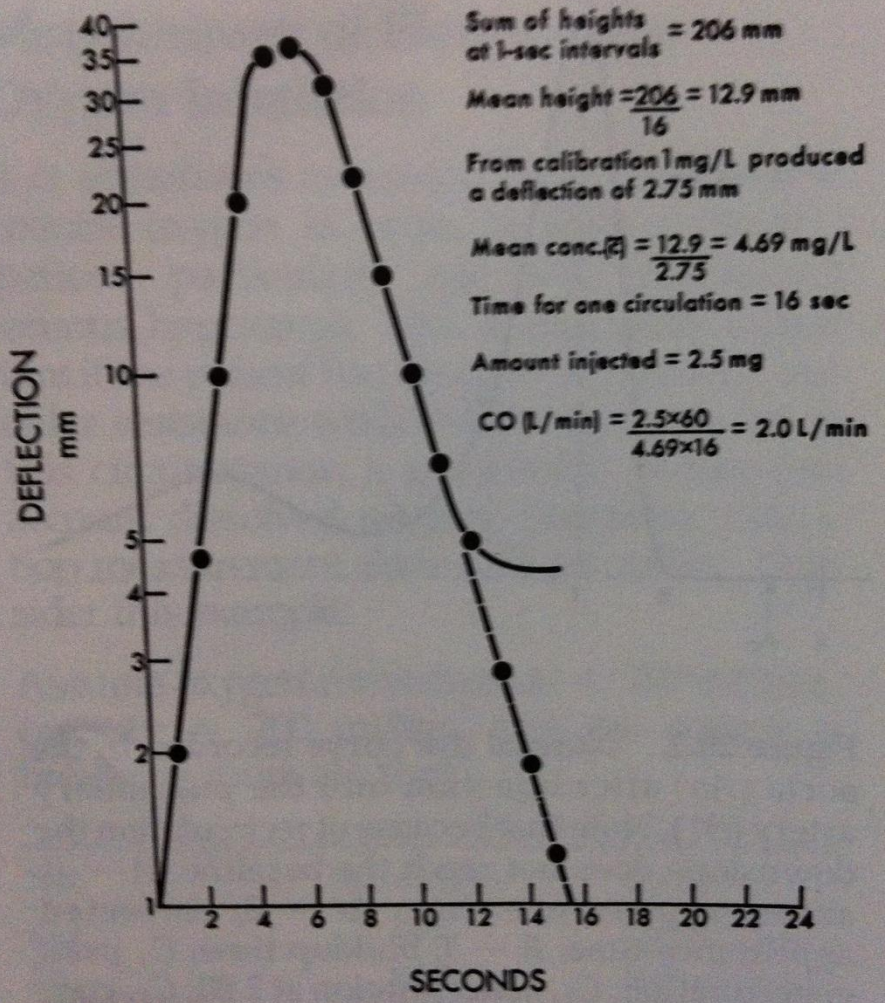



**Figure 20.3.** Stewart-Hamilton method for calculating cardiac output from a standard indicator dilution curve. (From Rudolph AM. Congenital diseases of the heart. Chicago: Year Book Medical Publishers, 1974.)

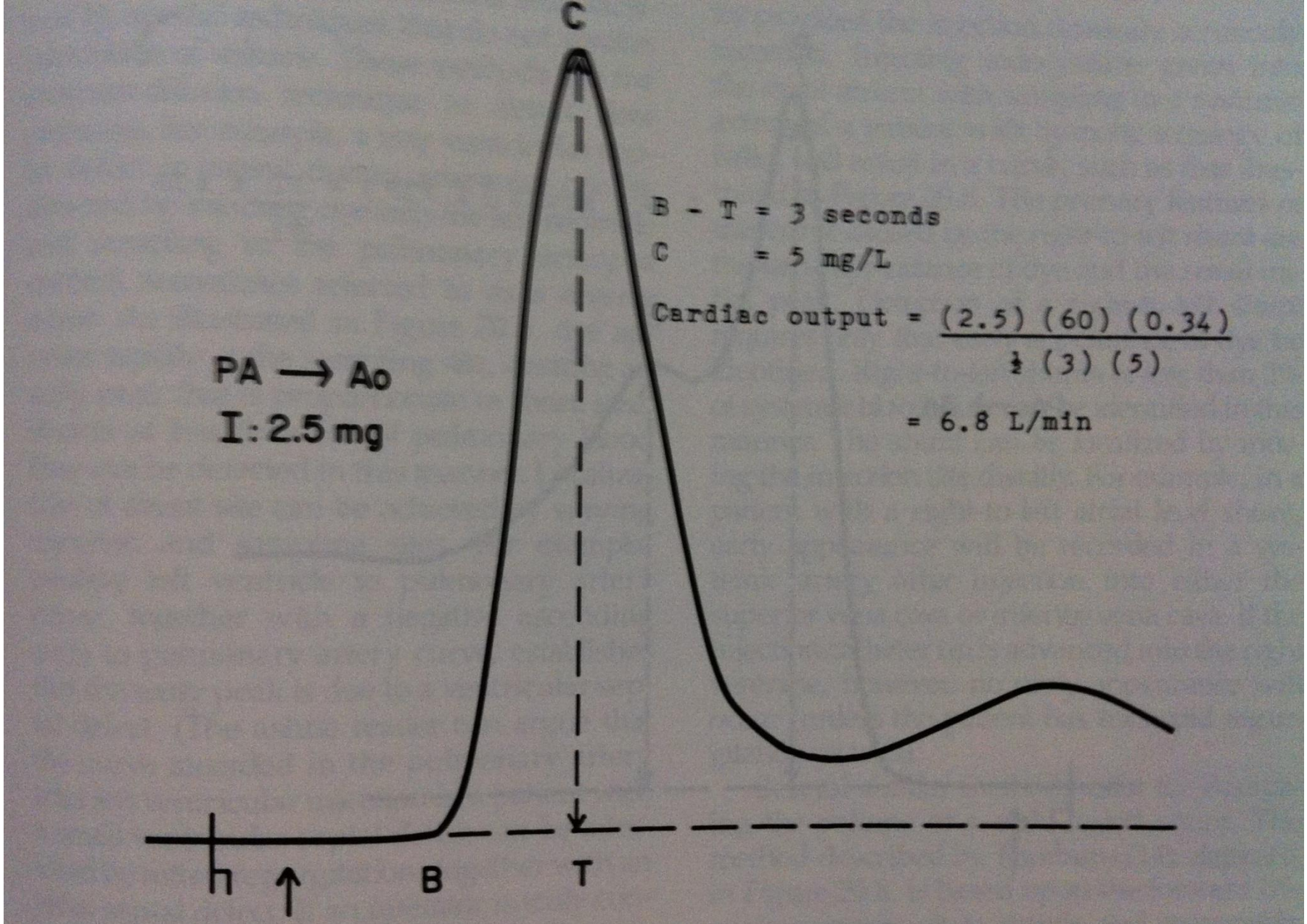



**Figure 20.4.** Forward triangle method for calculation of cardiac output from an indicator-dilution curve. *B - T*, buildup time in seconds; *C*, peak concentration in milligrams per liter; *I*, amount of dye injected; *arrow*, corrected injection time.

# Técnicas de detecção e quantificação de Shunts

- Caso anormalidades se utiliza 2 catéteres
- - artéria pulmonar e veia cava superior

# Shunt Esquerda-Direita

- 3 injeções ( análise de curvas de VD com amostra de artéria radial)
- Regurgitações valvares causam resultados questionáveis

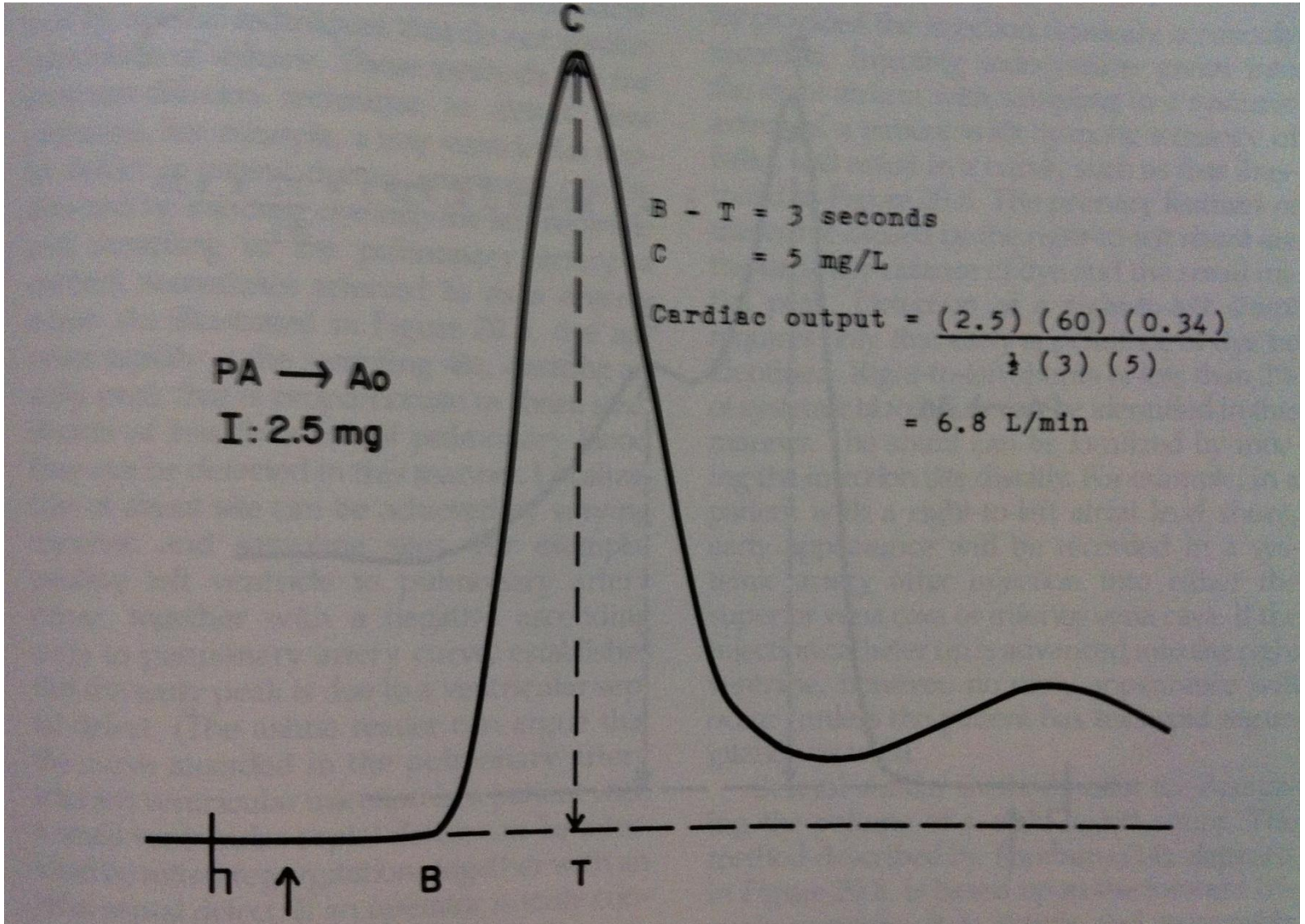



**Figure 20.4.** Forward triangle method for calculation of cardiac output from an indicator-dilution curve. *B - T*, buildup time in seconds; *C*, peak concentration in milligrams per liter; *I*, amount of dye injected; *arrow*, corrected injection time.

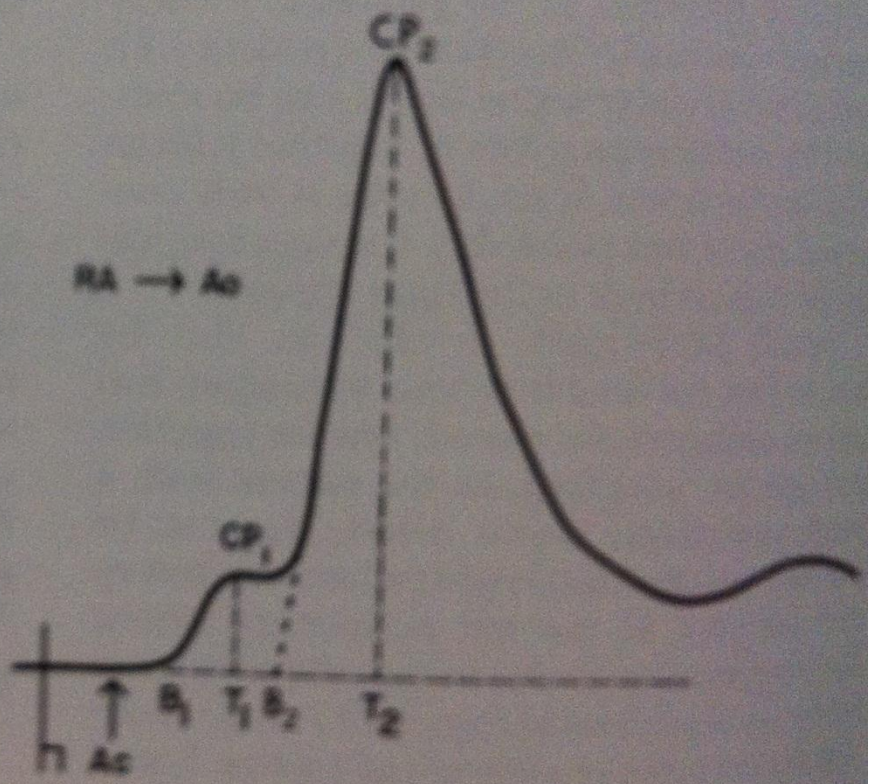
# Fórmula Victoria-Gessner

$$\text{Left-to-right shunt (\% PBF)} = \frac{P_2 \text{ concentration}}{P_1 \text{ concentration}} \times 100.$$

# Shunt Direita-Esquerda

**Figure 20.8.** Indicator-dilution curve recorded in the aorta (*Ao*) after injection into the right atrium (*RA*) in a patient with a small right-to-left shunt. Ac, corrected time of injection; $B_1 - T_1$, buildup time of shunt curve; $CP_1$, peak concentration of shunt curve; $B_2 - T_2$, buildup time of primary curve; $CP_2$, peak concentration of primary curve; right to left shunt (%SRF) =

$$\frac{\frac{1}{2}[CP_1 \times (B_1 - T_1)]}{\frac{1}{2}[CP_1 \times (B_1 - T_1)] \times \frac{1}{2}[CP_2 \times (B_2 - T_2)]}$$



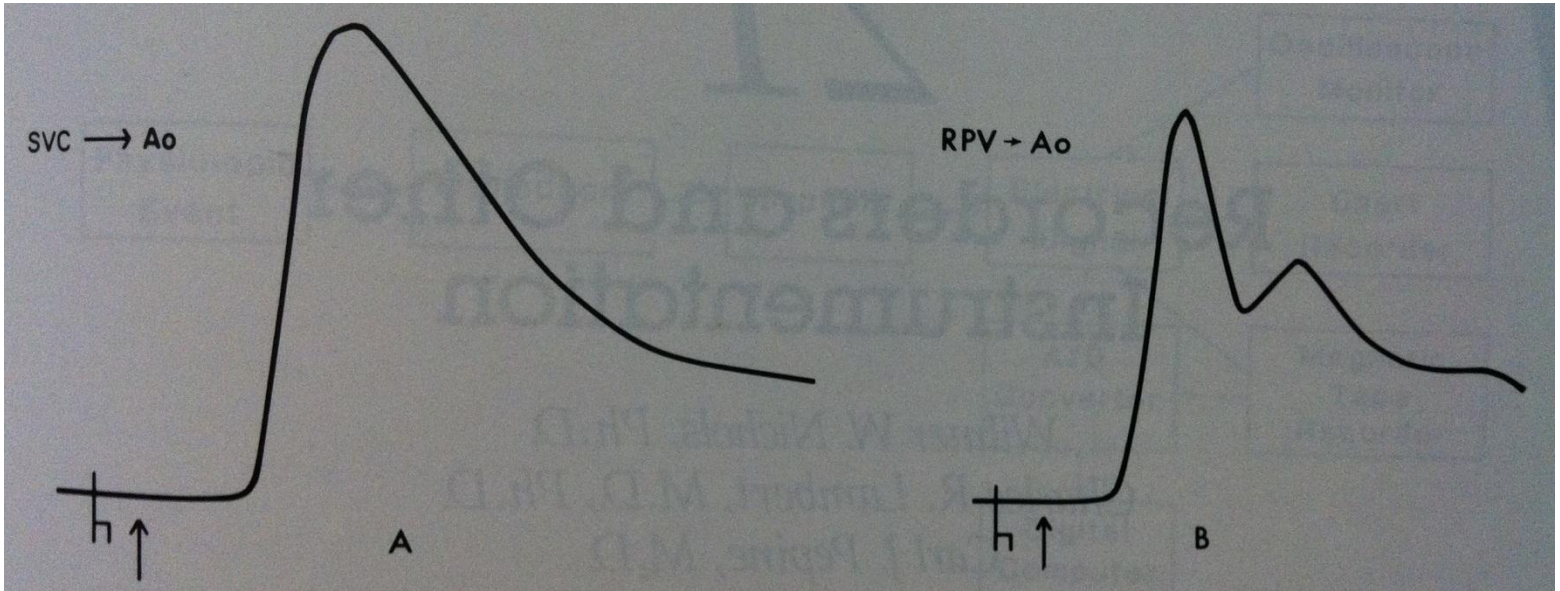



**Figure 20.9.** Indicator-dilution curves recorded in aorta (*Ao*) after injection into superior vena cava (*SVC*, curve *A*), and right pulmonary vein (*RPV*, curve *B*). Normal appearance time in curve *A* confirms absence of a right-to-left shunt. Rapid appearance of the initial peak in curve *B* establishes that the pulmonary vein injected drains into the left atrium. If it had drained anomalously into the right atrium, appearance time would not have been rapid and would have been equal to that of curve *A*.