

Estimating Tissue Oxygenation

Using the O₂ Dissociation Curve for Non-
Invasive Estimates of P_vO₂

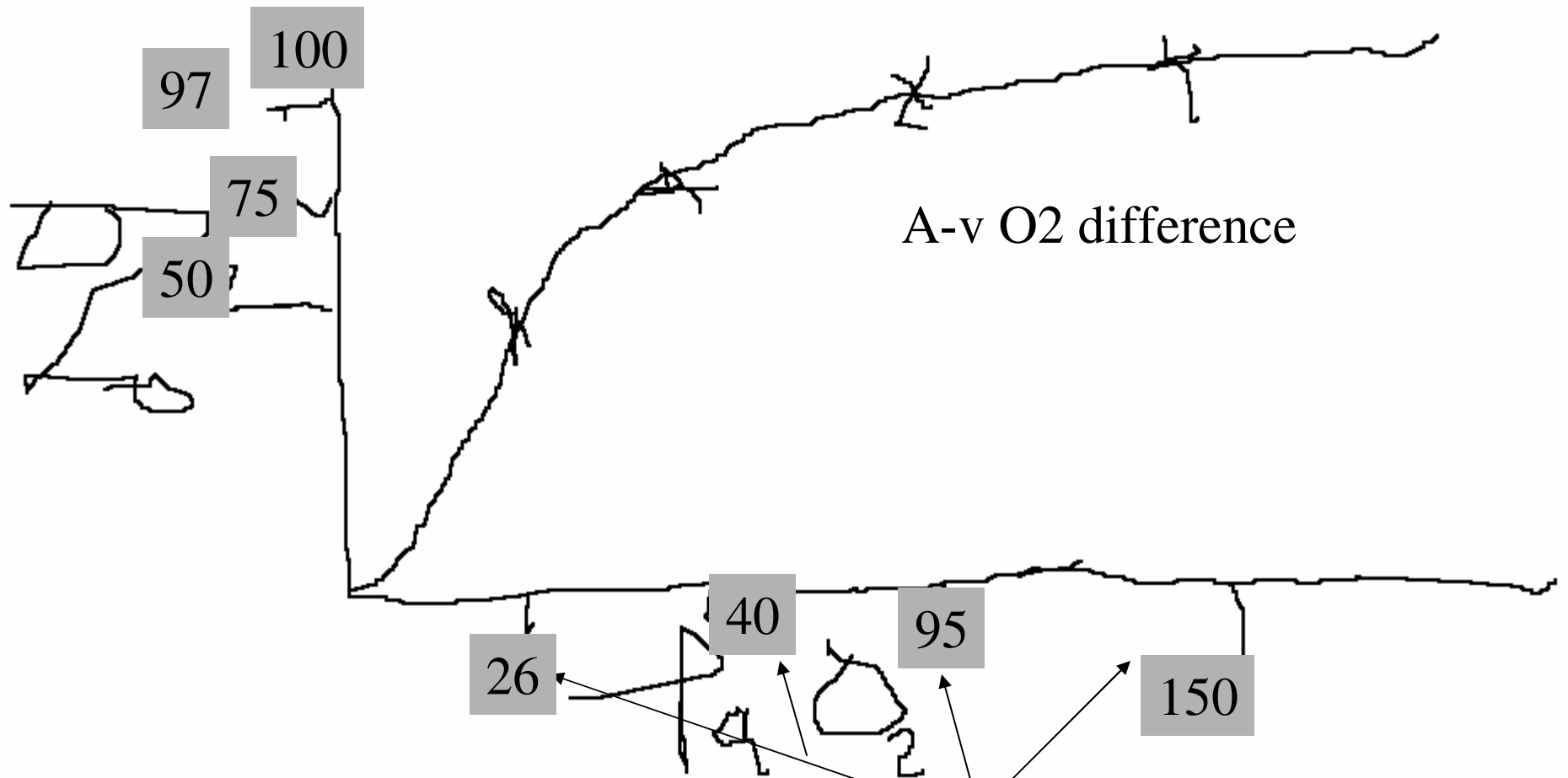
A Review of the Oxygen Transport
Physiology

O2 Facts

- Carrying capacity
- Amount of HB x 1.34cc(capacity for 1gm)
- O2 Content= amount of Hb x 1.34 x Sat.%
- Volumes percent= per 100 ml of Blood
- Cardiac Output= 5 liters per minute
- Fick equations

$$- \text{CO} = \frac{\text{O2 consumption} \quad 250}{\text{a-v O2 difference} \quad 5\text{cc}}$$

Reinforce flatness of curve after PaO₂ of ~60



Reinforce these PaO₂s and Sat. %

Steps to solving problem

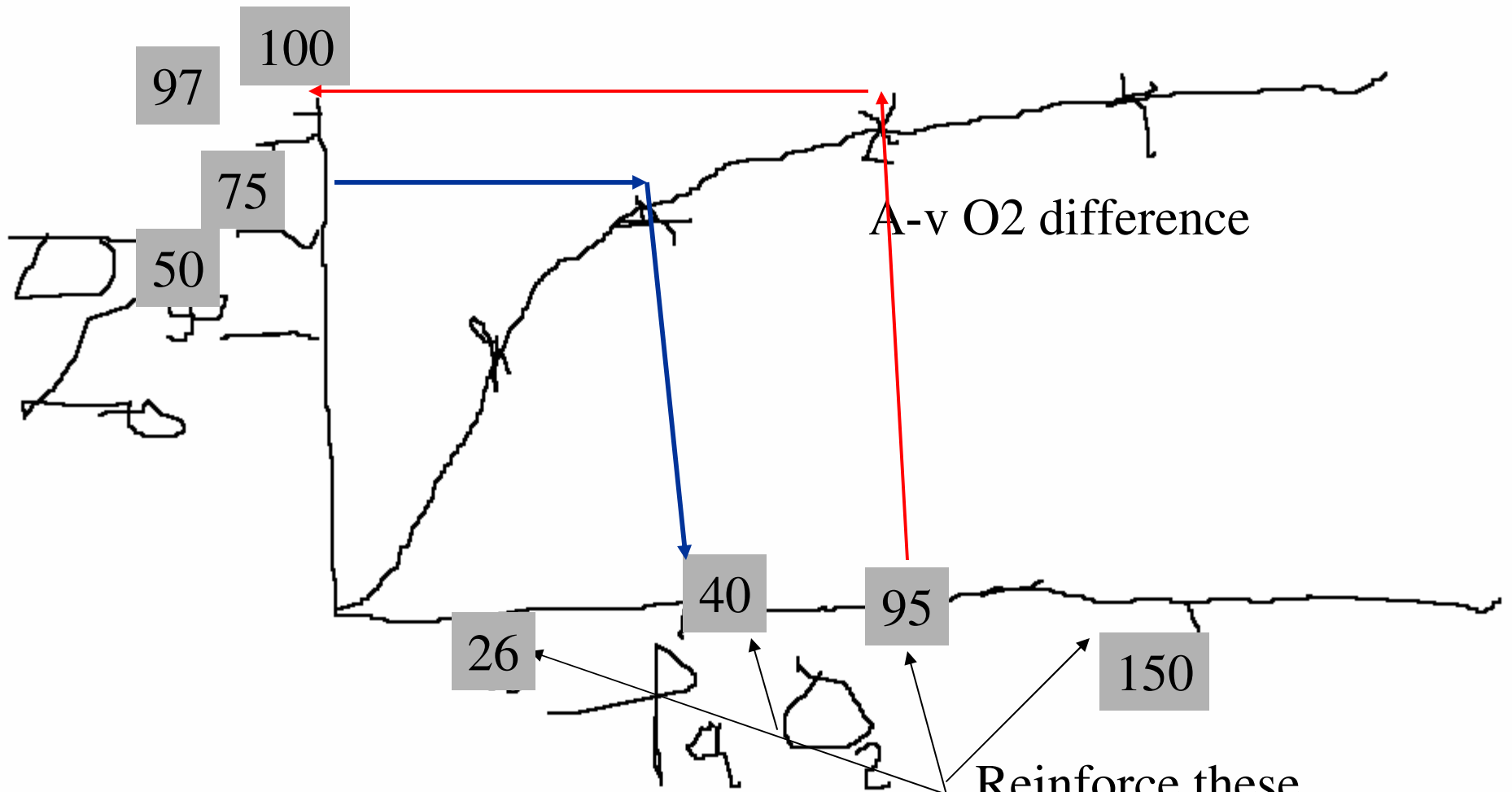
- Find O₂ Content of arterial blood at its Sat and hemoglobin level.
 - $O_2 \text{ sat} \times Hb(\text{gms}) \times 1.34$
- Determine a-vO₂ difference
 - 5 cc if normal 3.5 if critically ill
- Determine Venous Saturation
 - Venous Content after a-vO₂ difference from arterial.
 - Divide by capacity, that equals saturation.
- Find PvO₂
 - Follow Sat. line to curve and down to PaO₂

Let's Apply Normal's

- PaO₂ is 95
- O₂ sat.% = 97%
- Hb = 15grams
 - Can you apply above rules & come up with:
 - Arterial O₂ Content
 - Apply a-vO₂ difference rule
 - Venous O₂ content
 - Apply to O₂ curve to locate venous Sat.%
 - Follow curve from venous Sat.% to PvO₂ estimate

venous

arterial



A-v O₂ difference

26

40

95

150

Reinforce these
PaO₂s and Sat. %

Normal's using rules...

- O₂ capacity = 20.1
- O₂ Sat.% = 97(see previous Red line)
- O₂ content of arterial = 19.5
- A-vO₂ difference = 5cc
- Venous content = 14.5 cc
- Venous Saturation = 72%(14.5/20.1)
- Thus, PvO₂ = ~40(see previous green line)

Class Problem 1

- Patient's arterial Sat is 90%
- Hemoglobin is 10 grams
- Estimate Patient's
 - PvO₂
 - Tissue Oxygenation quality
- What can we do?

First Problem steps & answers..

- Find O2 Content of arterial blood at its Sat and hemoglobin level.

- O2 sat x Hb(gms)x 1.34

$$.9 \times 10 \times 1.34 = 12.06$$

- Determine a-vO2 difference

- 5 cc if normal 3.5 if critically ill

5cc

- Determine Venous Saturation

- Venous Content after a-vO2 difference from arterial.

- Divide by O2 Capacity, that equals saturation.

- Find PvO2

$$7.06 / 13.4 = .57$$

- Follow Sat. line to curve and down to PaO2

- Tissue Oxygenation, Rx?

Class Problem 2

- Patient is critically ill & arterial PaO₂ is 55.
- Hemoglobin is 12 grams
- Estimate Patient's
 - PvO₂
 - Tissue Oxygenation quality
- What can we do?

Second Problem steps, solve in class..record answers...

- Find O2 Content of arterial blood at its Sat and hemoglobin level. Must trace PaO₂ to on Curve to find saturation first.
 - O₂ sat x Hb(gms)x 1.34
- Determine a-vO₂ difference
 - 5 cc if normal 3.5 if critically ill
- Determine Venous Saturation
 - Venous Content after a-vO₂ difference from arterial.
 - Divide by O₂ Capacity, that equals saturation.
- Find PvO₂
 - Follow Sat. line to curve and down to PaO₂
 - Tissue Oxygenation ?, Rx?