
بسم الله الرحمن الرحيم

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Physiology of Microcirculation

Learning Objectives

Learning Outcomes

1. Components of microcirculation
2. Functional anatomy of capillaries.
3. The way in which blood flow into capillary bed is under local controls.
4. Mechanisms of exchange between blood and tissues

Components of Microcirculation

1. Metarterioles
2. Capillaries
3. Venules

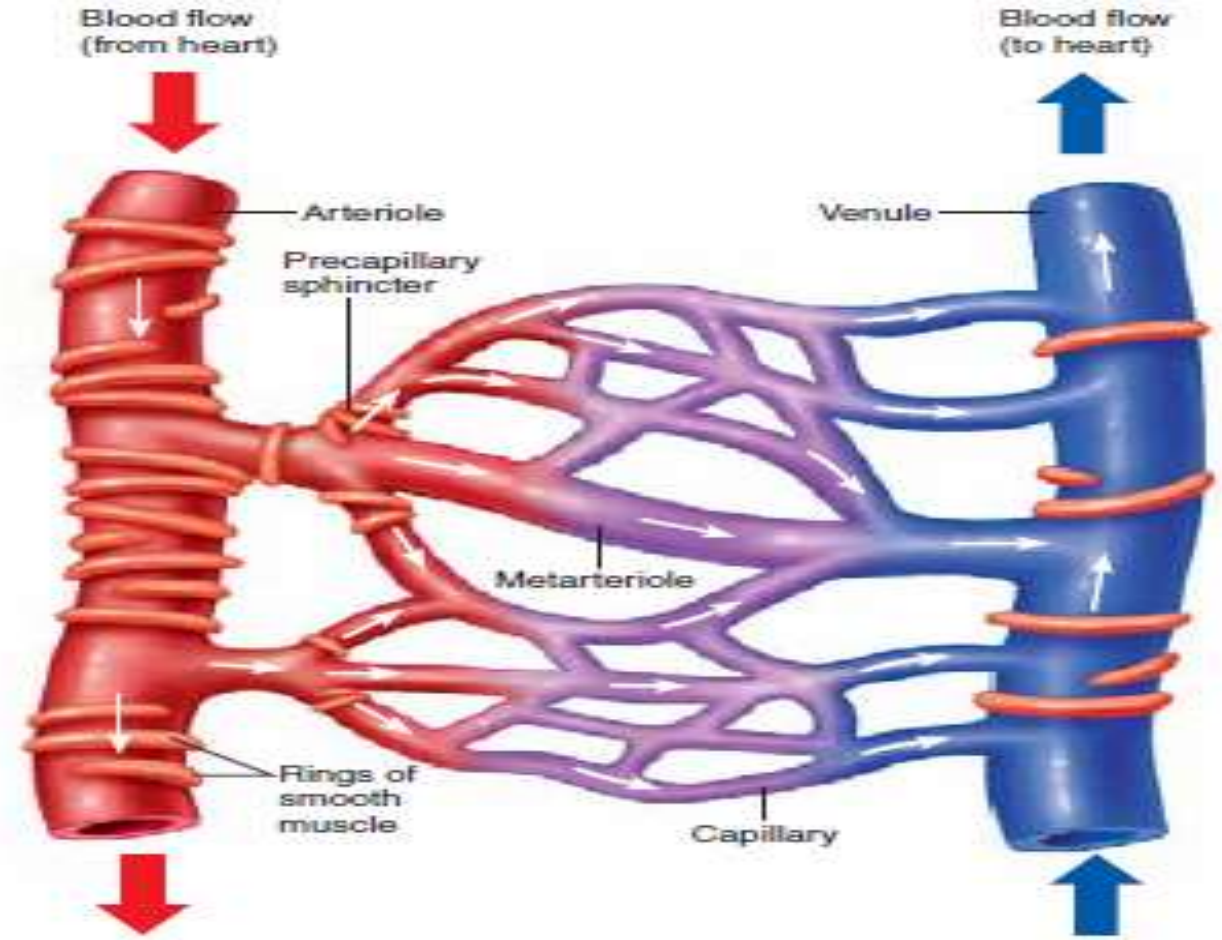


Figure 14.17 Microcirculation.

Functional anatomy of capillaries

1. Smallest blood vessls1mm long 5-10 micrmm diameter
2. Thin walls 0.5 micro meter thick
3. Provide small diffusion distances
4. Large surface area about 600 square meters
5. Suitable for their primary exchange function

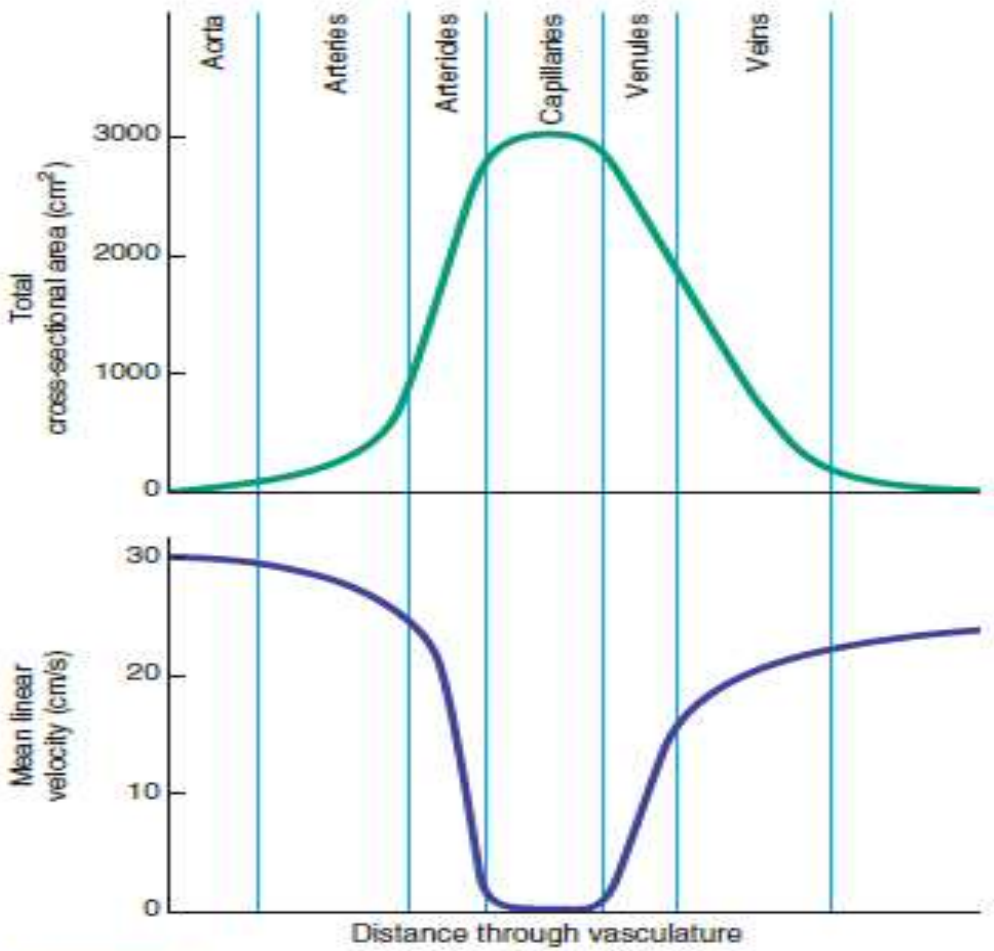


Figure 14.15 Total cross-sectional area and velocity of blood flow through the vasculature.

Functional classification of capillaries

1. Continuous capillaries
2. Fenestrated capillaries
3. Discontinuous capillaries

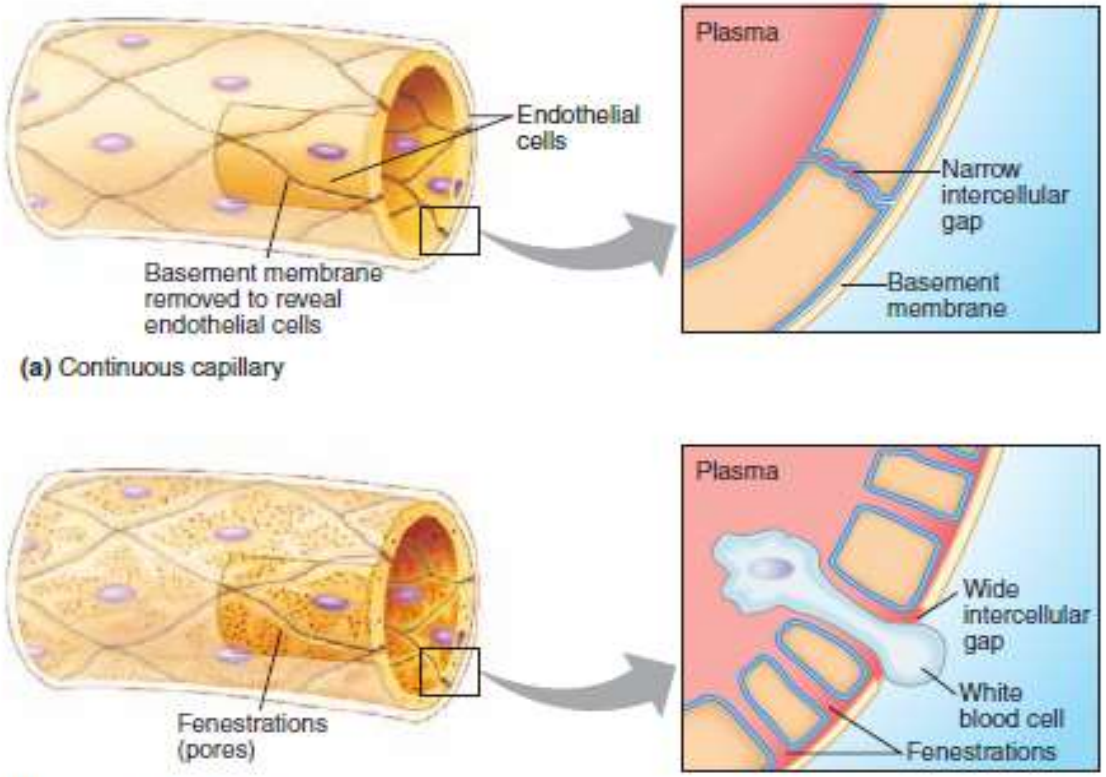


Figure 14.16 **Two types of capillaries.** (a) A continuous capillary, featuring narrow, water-filled gaps between endothelial cells. (b) A fenestrated capillary, which possesses pores (fenestrations) that penetrate through endothelial cells, in addition to intercellular gaps between endothelial cells.

Local control of Blood flow through capillary beds.

This occurs through local of smooth muscle in

1. Metarterioles
2. Capillary sphincters

Movement of material across capillary walls

This serves two purposes

1. Exchange of material between blood and tissues
2. Normal distribution of the extracelluar fluid (Bulk flow across capillary wall)

Exchange across capillary walls

This occurs through mechanisms

1. Diffusion
2. Transcytosis
3. Mediated transport

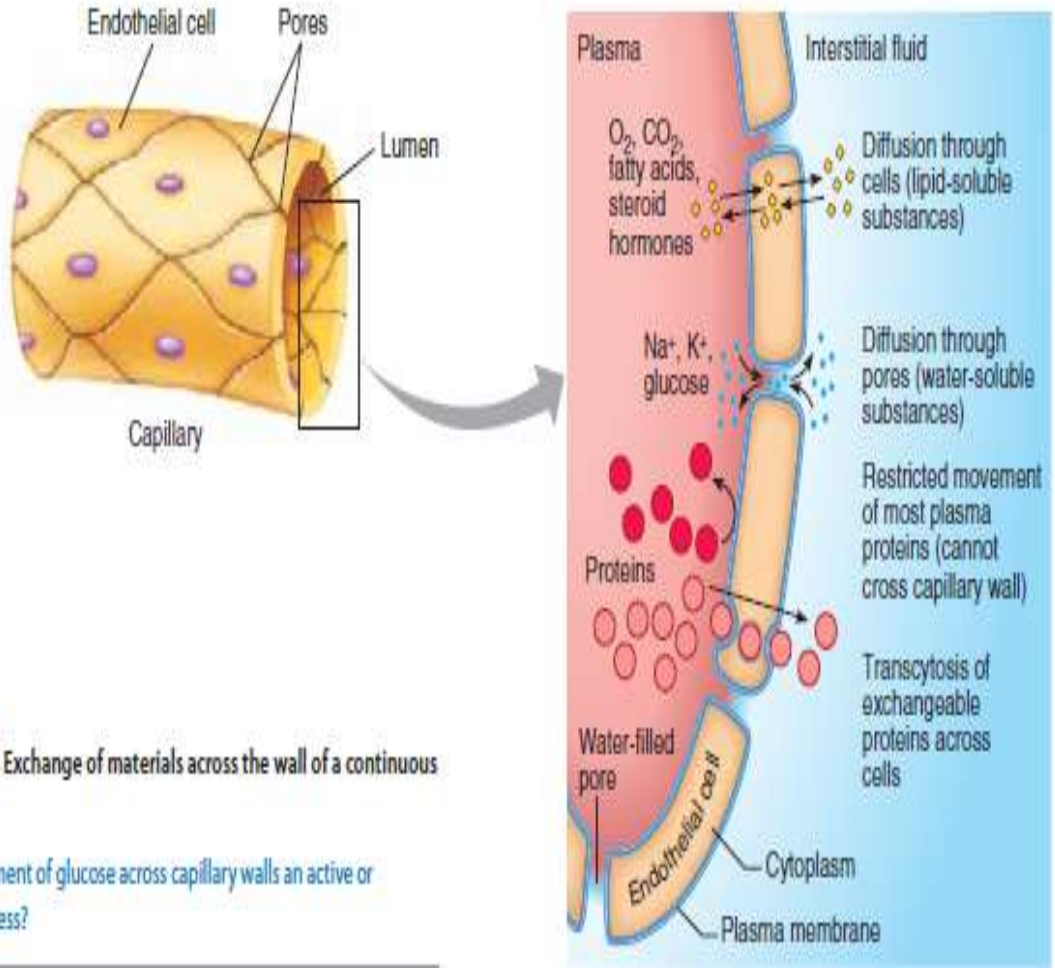


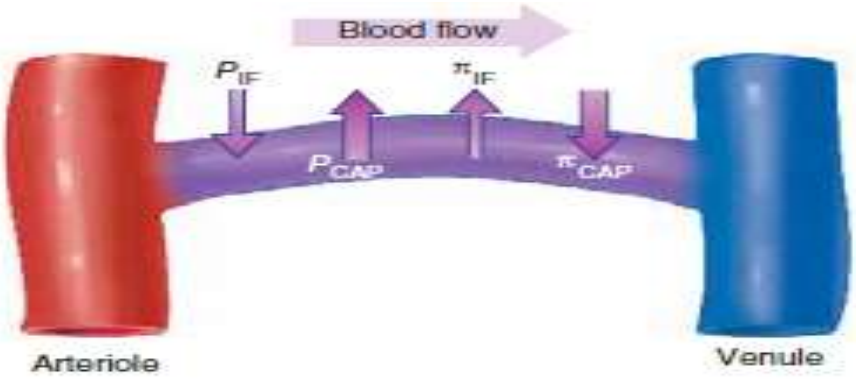
Figure 14.18 Exchange of materials across the wall of a continuous capillary.

Q Is the movement of glucose across capillary walls an active or passive process?

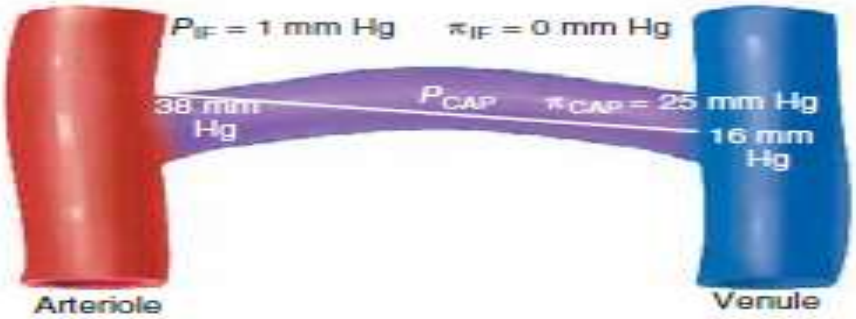
Bulk flow across capillary walls

This is governed by Starling forces they include

1. Capillary hydrostatic pressure
2. Interstitial fluid hydrostatic pressure
3. Capillary osmotic pressure
4. Interstitial fluid osmotic pressure



(a)



Arteriole end

Filtration pressure:		Absorption pressure:	
P_{CAP}	= 38 mm Hg	π_{CAP}	= 25 mm Hg
π_{IF}	= 0 mm Hg	P_{IF}	= 1 mm Hg
	38 mm Hg		26 mm Hg

NFP = Filtration pressure − Absorption pressure

= 38 mm Hg − 26 mm Hg = 12 mm Hg

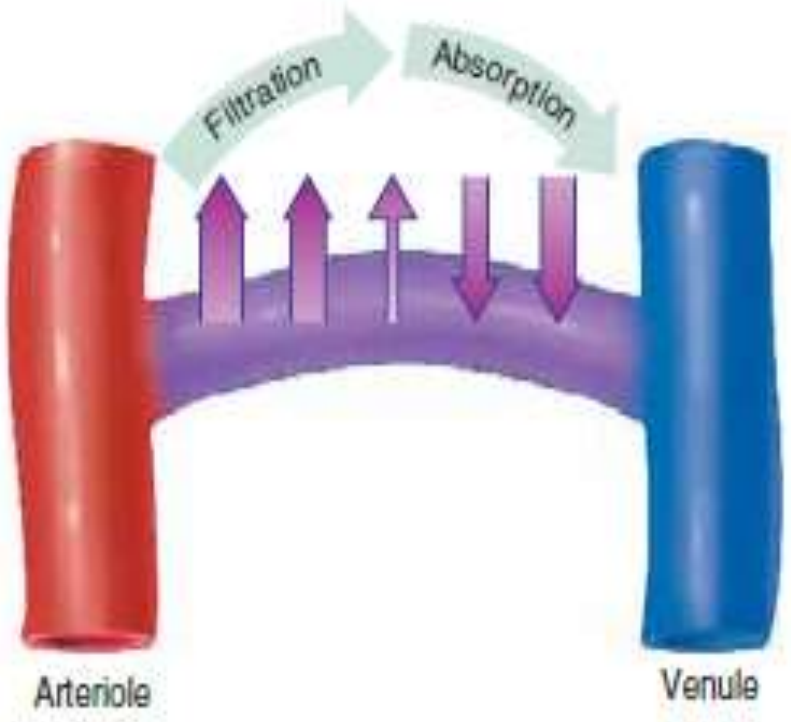
Venule end

Filtration pressure:		Absorption pressure:	
P_{CAP}	= 16 mm Hg	π_{CAP}	= 25 mm Hg
π_{IF}	= 0 mm Hg	P_{IF}	= 1 mm Hg
	16 mm Hg		26 mm Hg

NFP = Filtration pressure − Absorption pressure

= 16 mm Hg − 26 mm Hg = −10 mm Hg

(b)



(c)

Thank you

References

Principals of Human Physiology 6th Edition

By Cindy L. Stanfield.