CHIVA Combourg 2004

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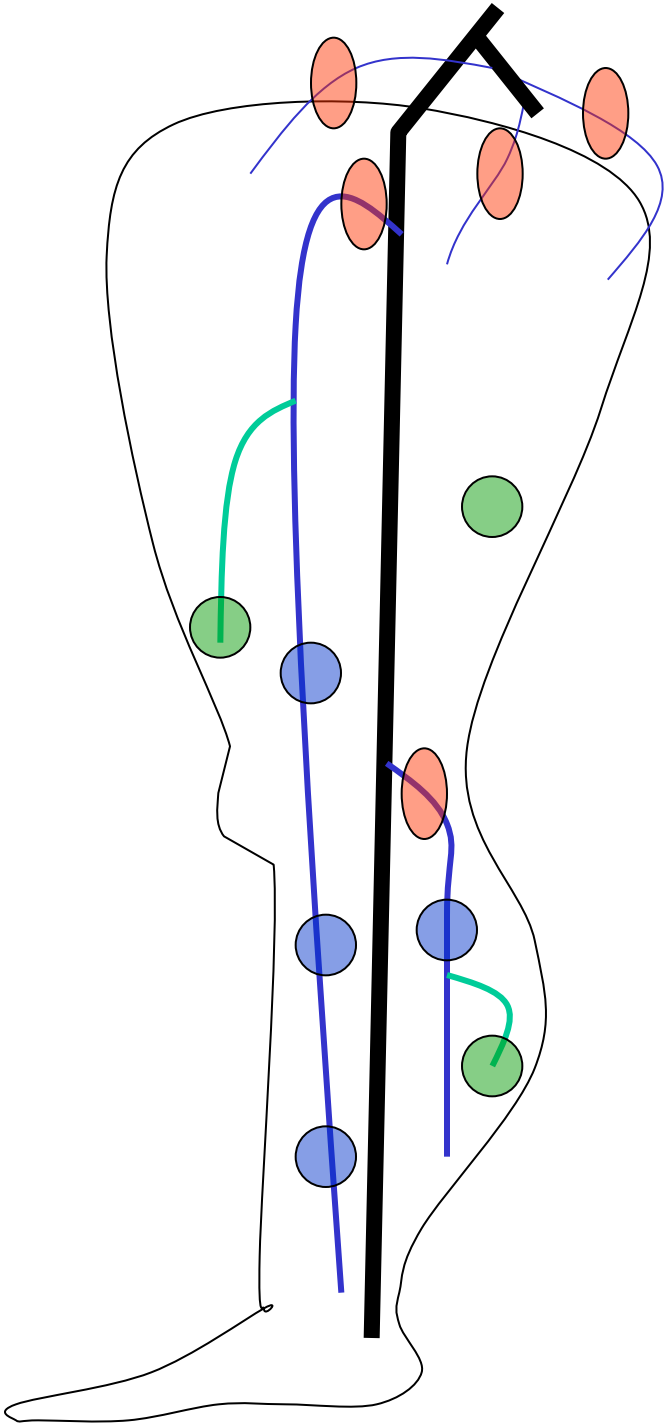
VEINES PERFORANTES

PERFORATORS

Anatomy: R is réseau in French, N is Network

Venous segments of variable number, topography and anatomical configuration, communicating the superficial network (R2 and R3) with the deep network (R1) by perforating fascia and aponeurosis, with the exception of the saphenofemoral and saphenopopliteal junctions of the saphenofemoral junction and the penetrations of the perineal veins, clitoral veins and round ligament into the pelvis.



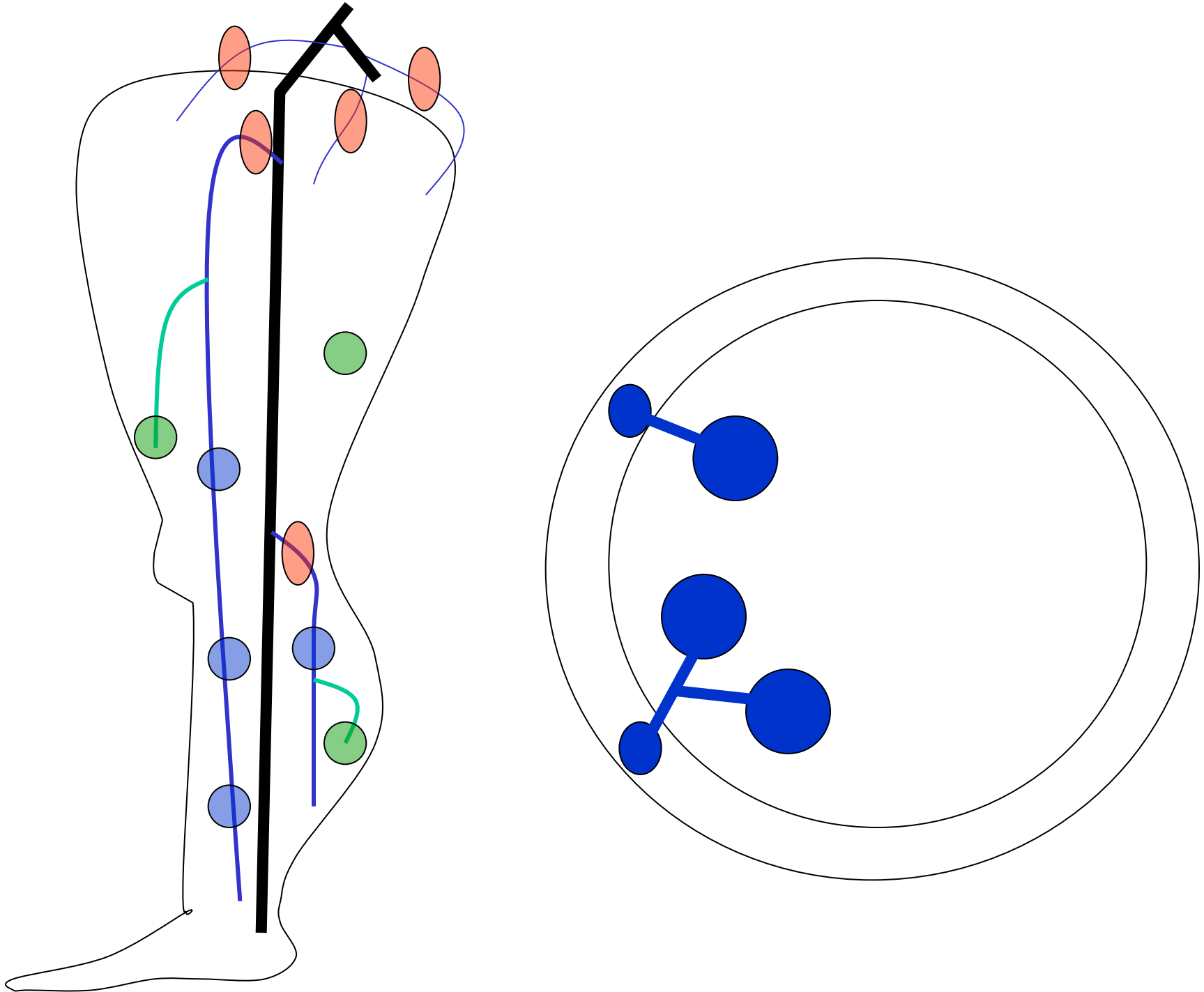
Main collectors R2, R3 extending to deep network R1 through aponeurosis:

sapheno-femoral and popliteal junctions

P,I,C, SG,IG, O points

Perforators linking R2 and R3 to deep network R1 through aponeurosis as accessory collectors

- Centerd Perforators
- Off-Centerd Perforators



VEINES PERFORANTES

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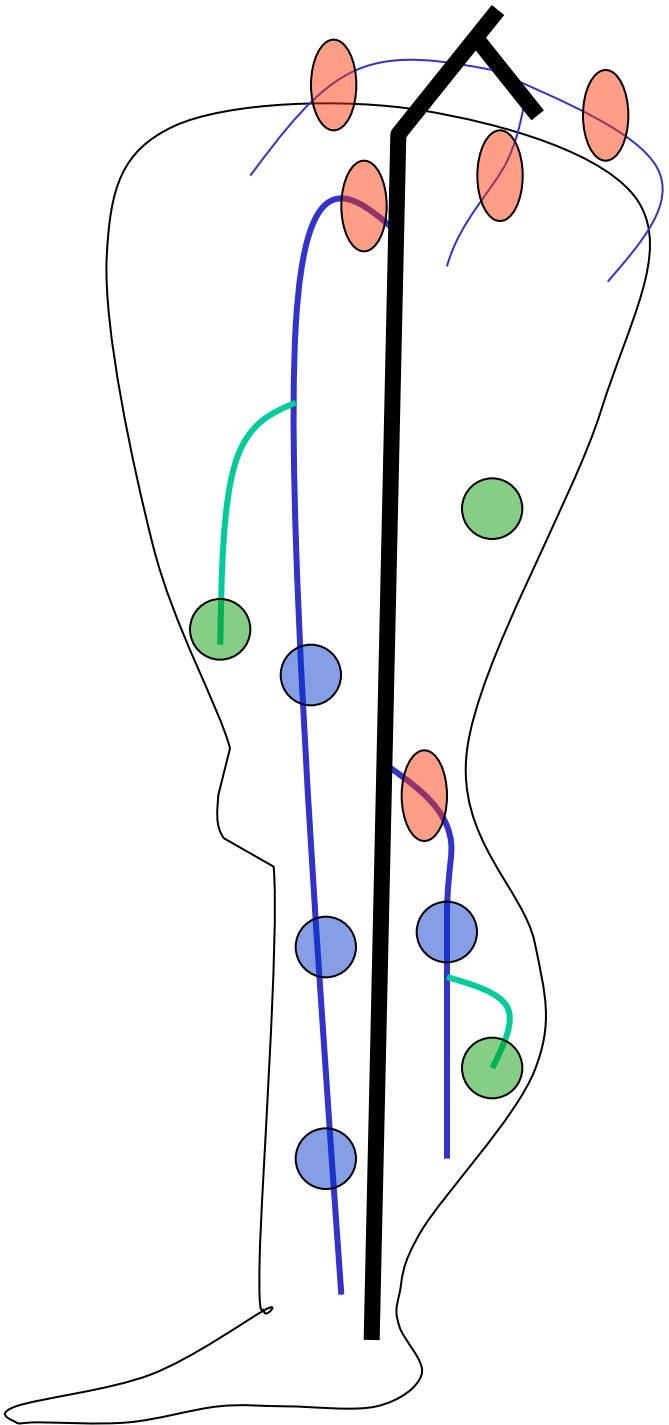
Physiology:

Accessory drainage routes from the superficial network (R2 and R3) with the deep network (R1). The saphenofemoral and saphenopopliteal junctions of the saphenofemoral crosses and the penetrations of the perineal, clitoral and round ligament veins into the pelvis are the main drainage routes.



Main collectors R2, R3 extending to deep network R1 through aponeurosis:

sapheno-femoral and popliteal junctions

P,I,C, SG,IG, O points

Perforators linking R2 and R3 to deep network R1 through aponeurosis as accessory collectors

Centerd Perforators

Off-Centerd Perforators

PERFORATORS

Hémodynamique:

Sens du flux: Le sens du flux est déterminé par les variations relatives des pressions latérales de part et d'autre des perforantes, à savoir du gradient de pression profond-superficiel et de la continence des valvules.

Sens physiologique: Antérograde ou Nul.

Le sens est *antérograde* quand la pression latérale profonde R1est inférieure à la pressions latérale superficielle R2 ou R3.

L'inversion du gradient de pression tend à inverser le sens du flux mais il entraîne la fermeture des valvules qui à leur tour empêchent le reflux (flux *nul*).

PERFORATORS

Hemodynamics:

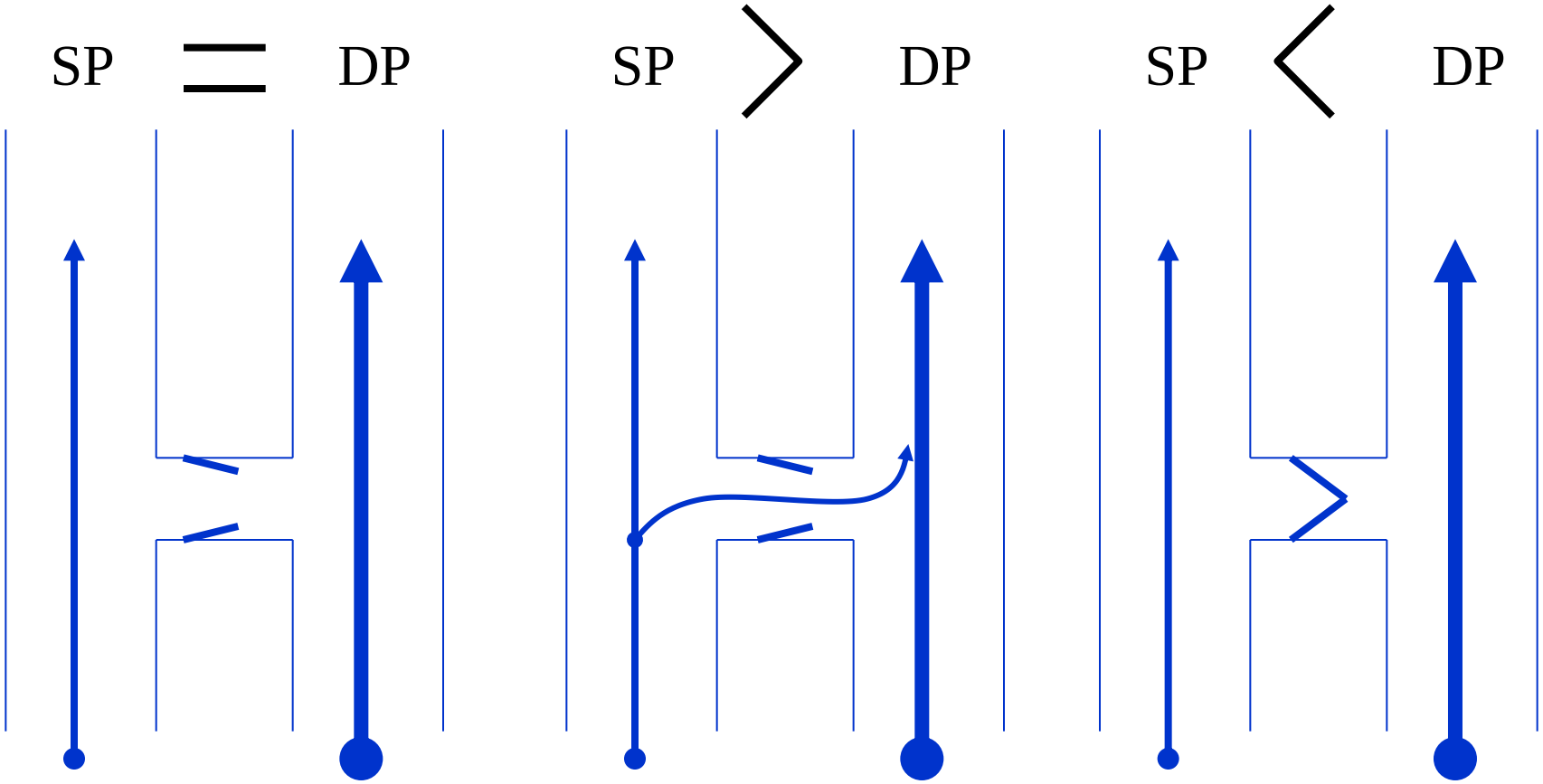
Direction of flow:

The direction of flow is determined by the relative variations in lateral pressures on either side of the perforators, namely the deep-superficial pressure gradient and valve continence.

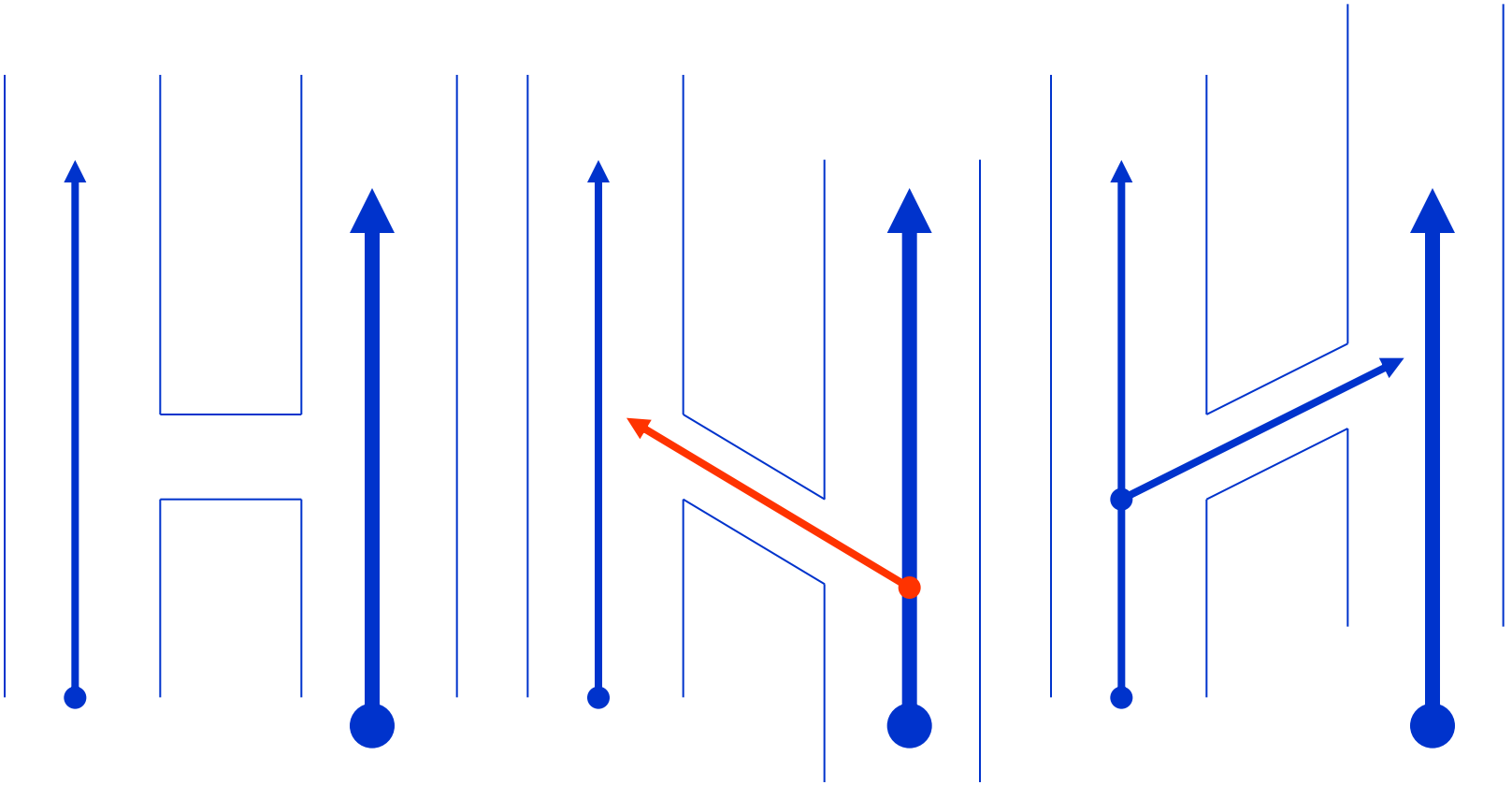
Physiological sense:

Anterograde or None. The direction is anterograde when the deep lateral pressure R1 is lower than the superficial lateral pressure R2 or R3. The reversal of the pressure gradient tends to reverse the direction of the flow but it causes the valves to close which in turn prevents reflux (zero flow).

Flow direction according to the pressure gradient between superficial SP and deep veins DP in competent perforators



Systolic Flow direction according to the connection angle



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Hemodynamics:

Direction of flow:

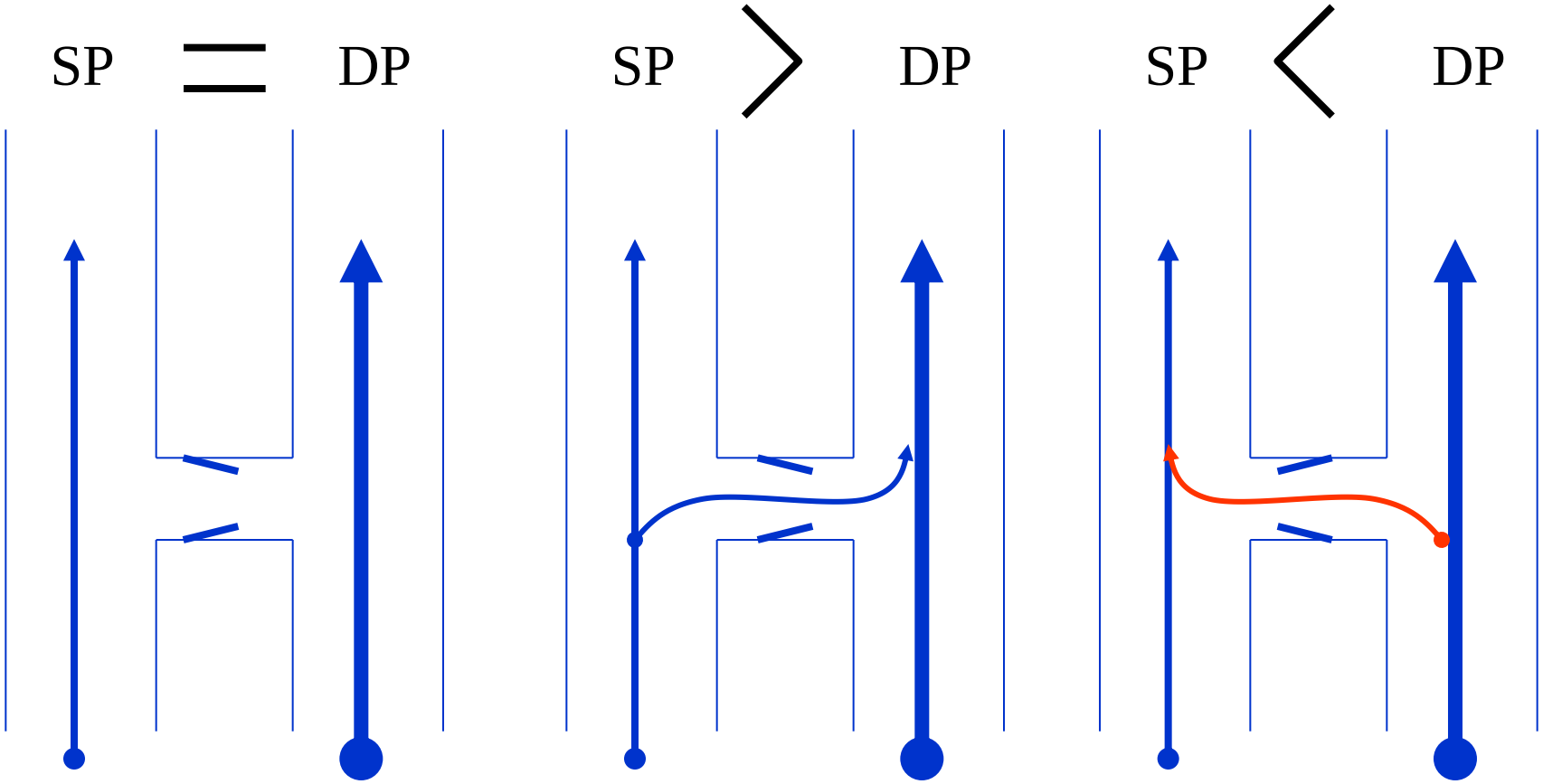
Retrograde direction NON-physiological:

The inversion of the pressure gradient reverses the direction of flow if the valves are absent or incontinent.

The variations in direction are zero, anterograde and retrograde in the case of perforating incontinence according to the variations and inversions of the pressure gradients.

The size does not prejudge the direction of the flow

Flow direction according to the pressure gradient between superficial SP and deep veins DP in incompetent perforators



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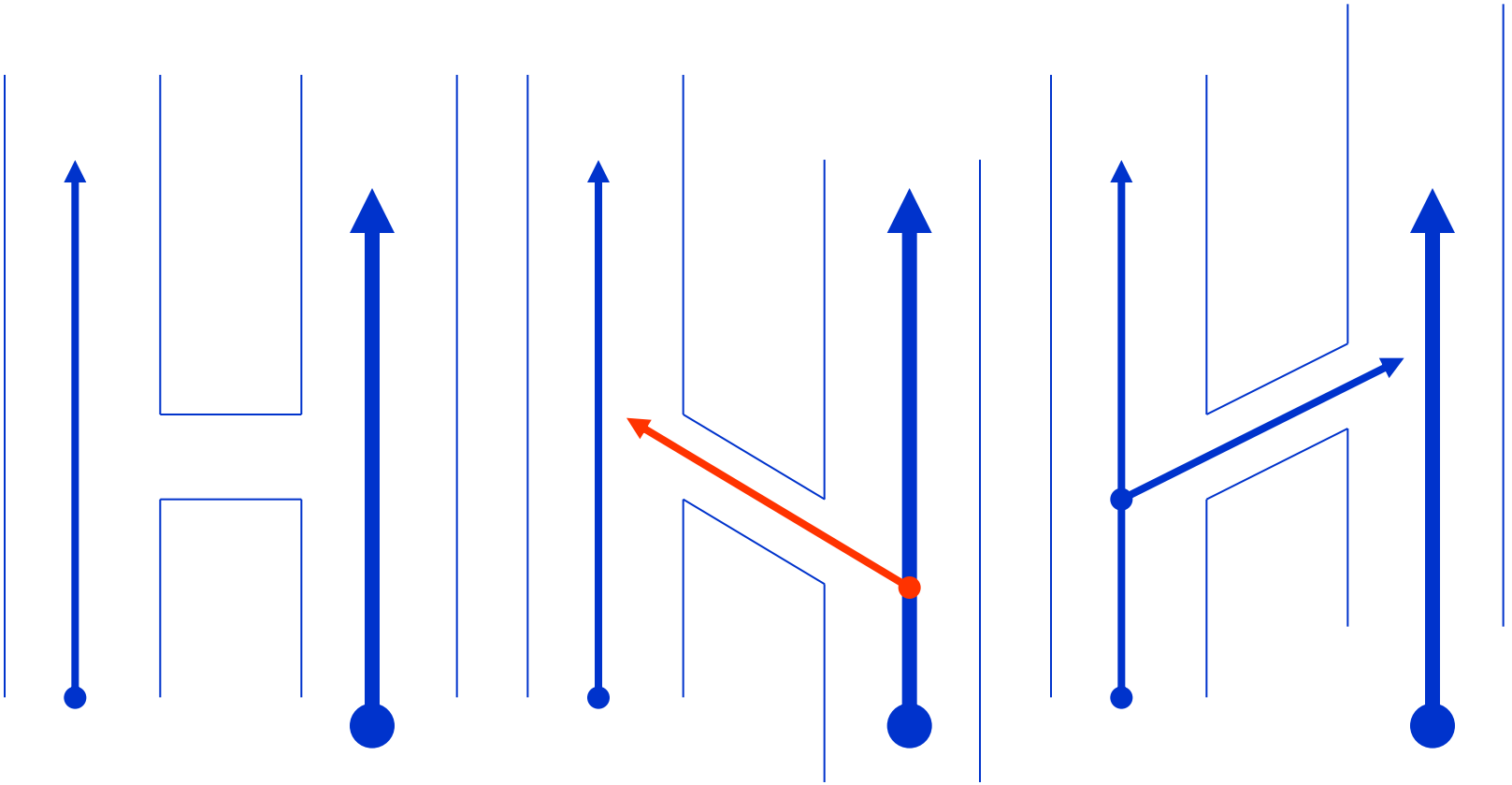

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Hemodynamics:

Amount of flow:

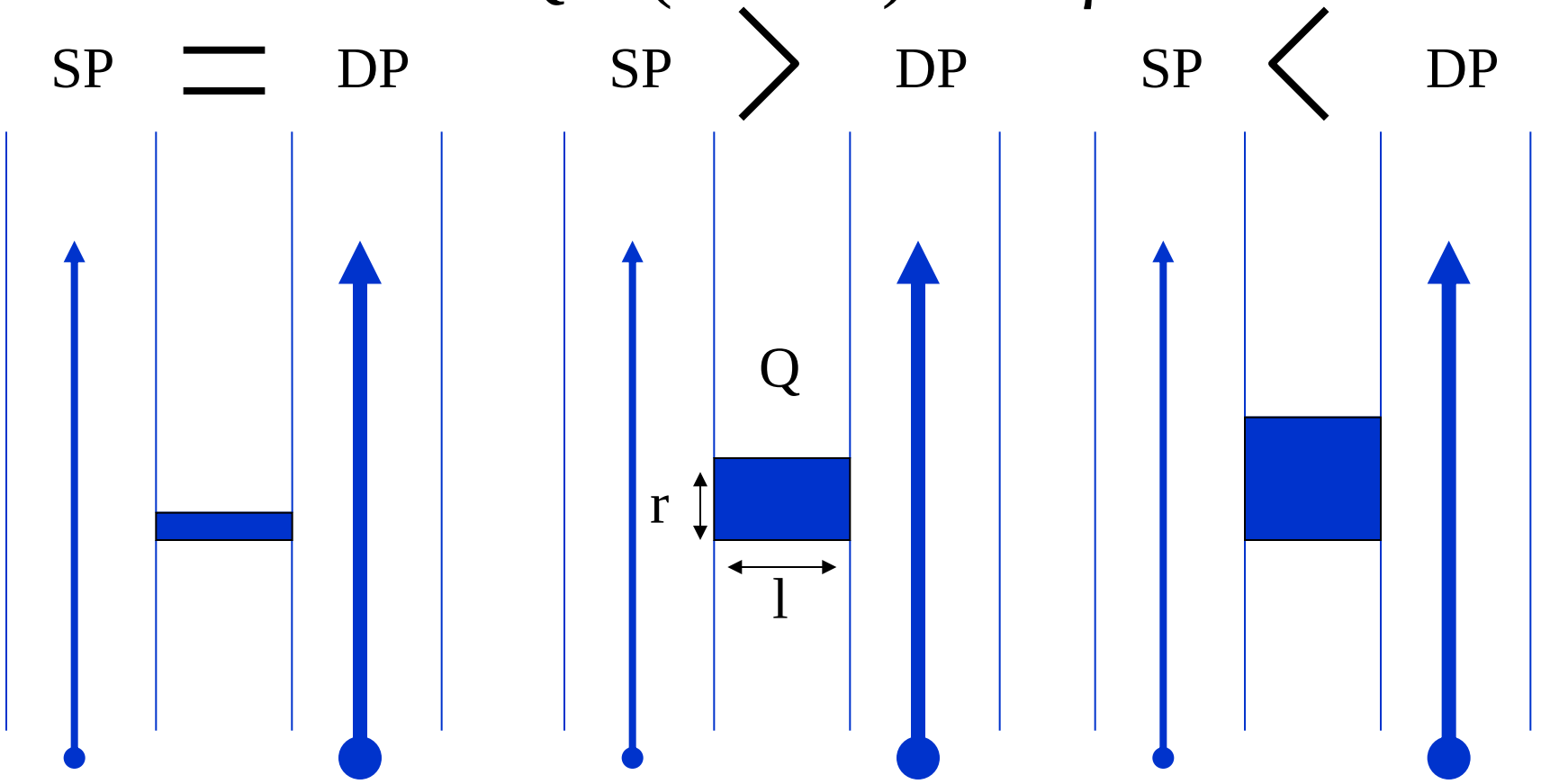
Regardless of the direction, the amount of flux increases with the value of the pressure gradient but decreases with the caliber (resistance).

The flux may remain negligible or non-existent if the gradient is low and/or if the perforator is long and/or of small caliber.

The caliber may increase with the effect of the pressure gradient, but gradually.

Flow quantity according to the gradient pressure and the perforator width-length

$$Q = (SP\text{-}DP).r^4/8l.\mu$$



PERFORATORS

Hemodynamics:

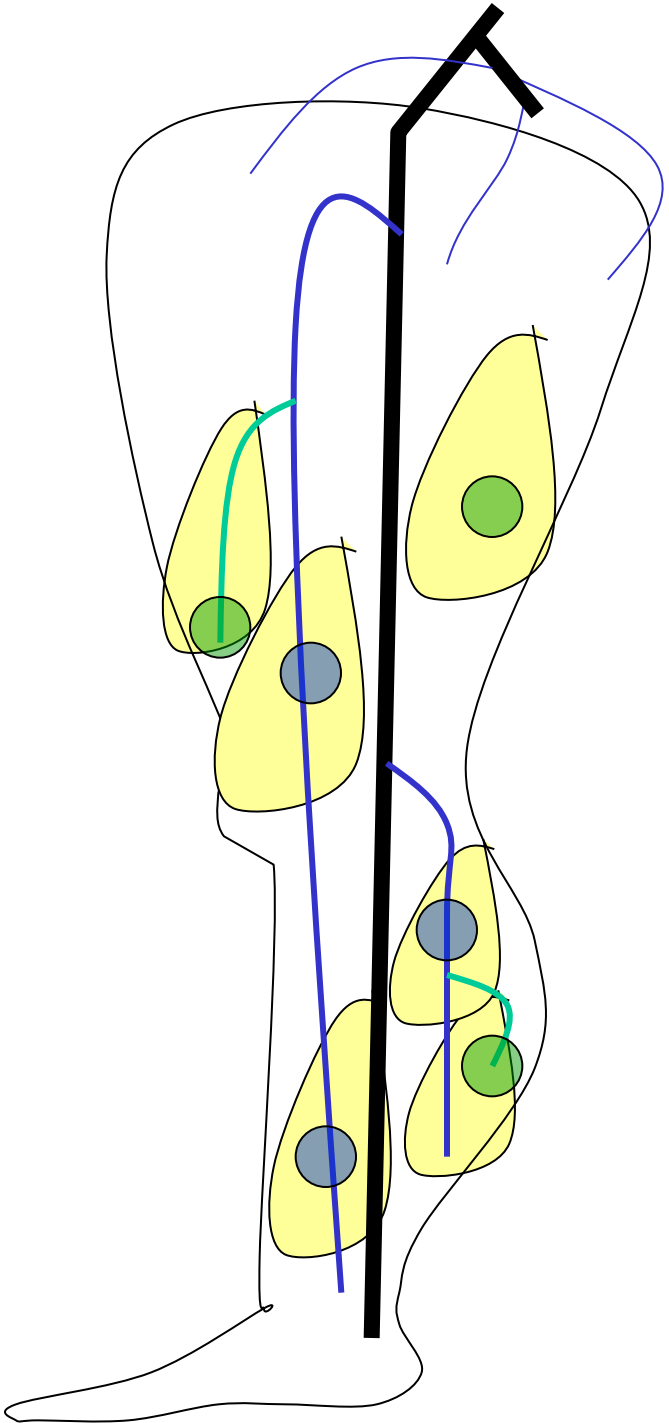
Flow composition:

Physiological:

The flow through the perforator consists of blood from superficial tissues corresponding to its physiological drainage territory.

NON-physiological:

The physiological flow may be overloaded by flows from other origins and destinations.



Flow components

Physiologic: flow from Its own superficial drained territory.

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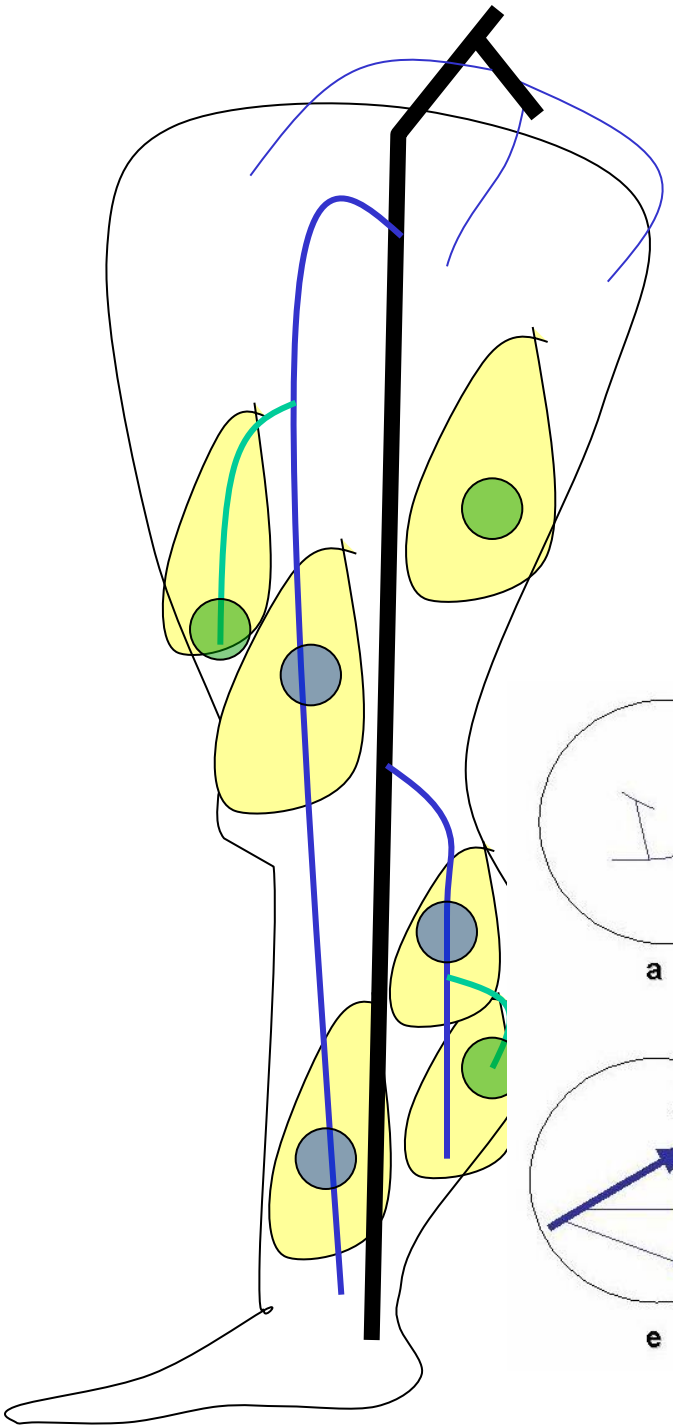
Hemodynamics:

Flow Composition:

NON-Physiological: Physiological flow may be overloaded by flows from other sources and destinations.

1- Flow draining from other territories, superficial and/or deep (vicarious open shunts or by bypass)

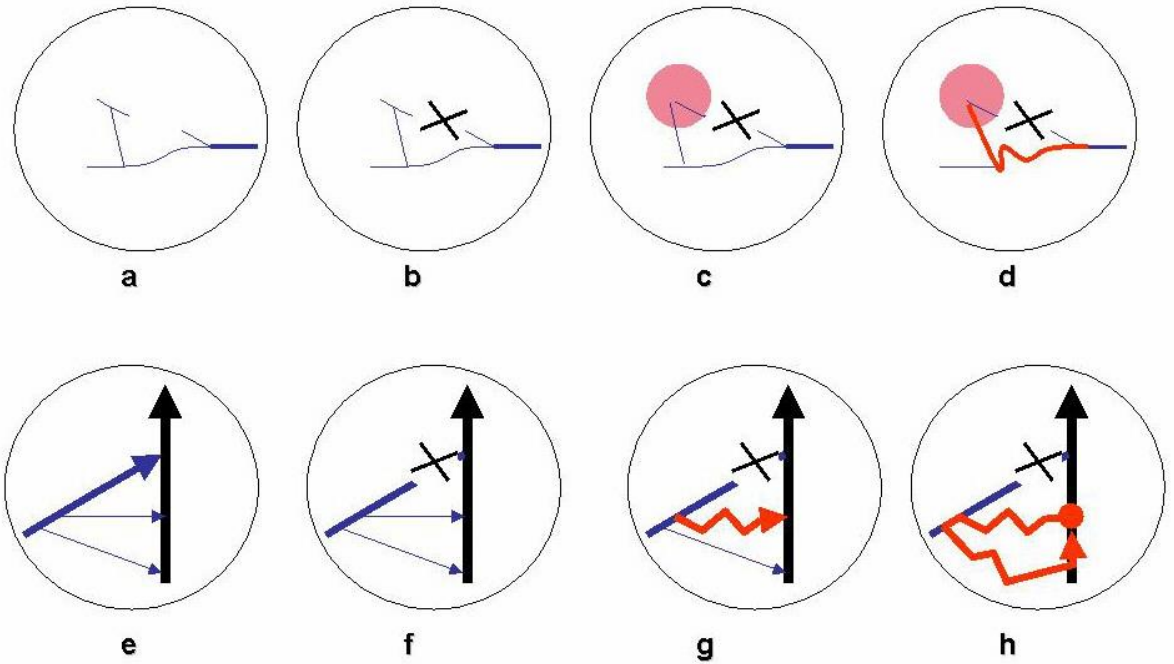
2-Recirculation flow (closed circuit) of closed shunts.

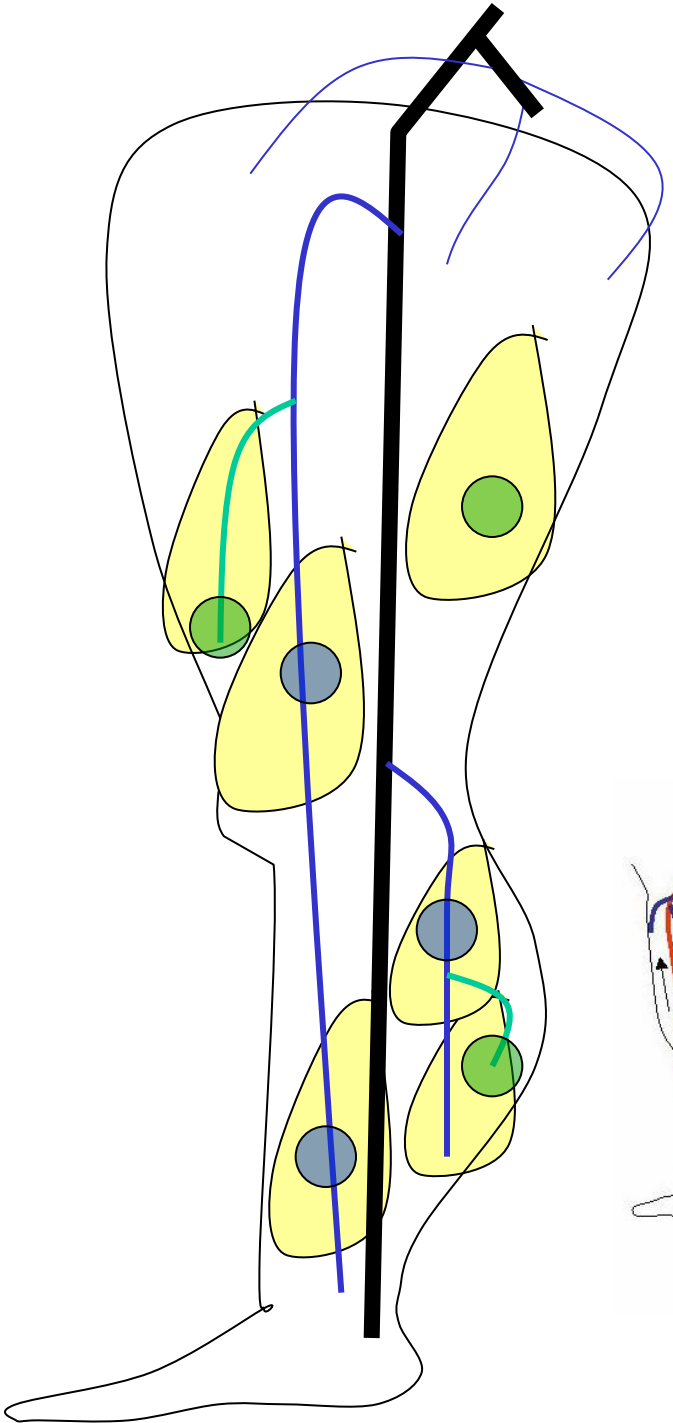


Flow components

NOT Physiologic: flow from other territories in addition to Its own superficial drained territory.

OPEN VICARIOUS SHUNTS





Flow components

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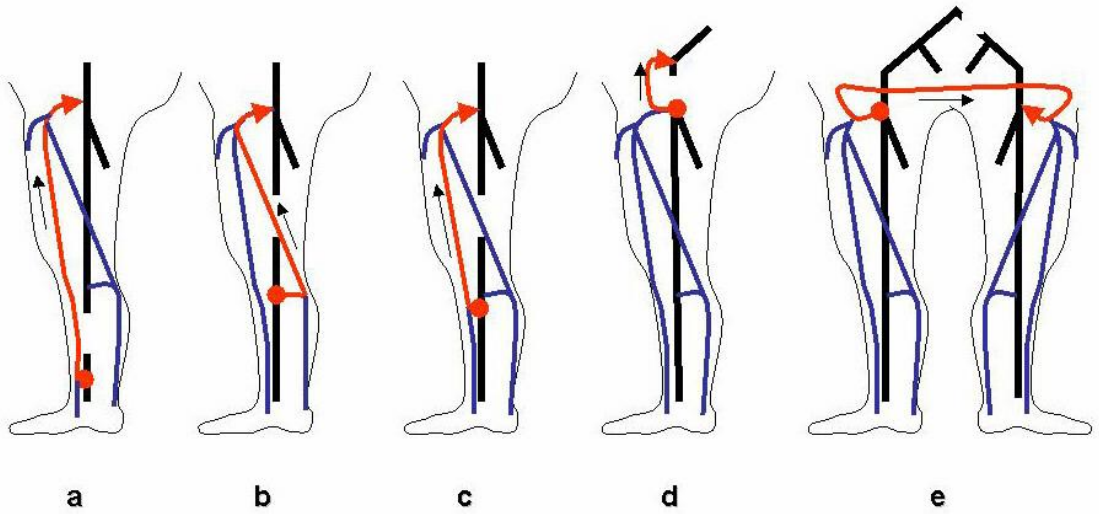
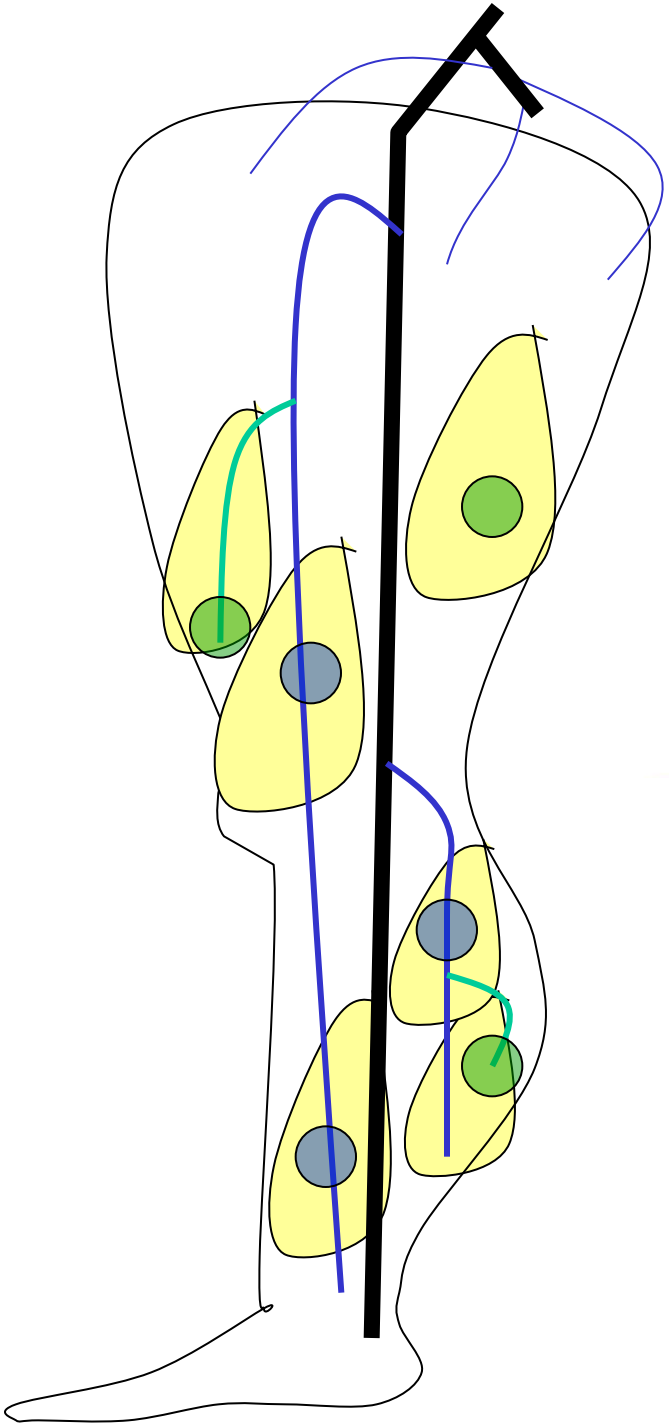
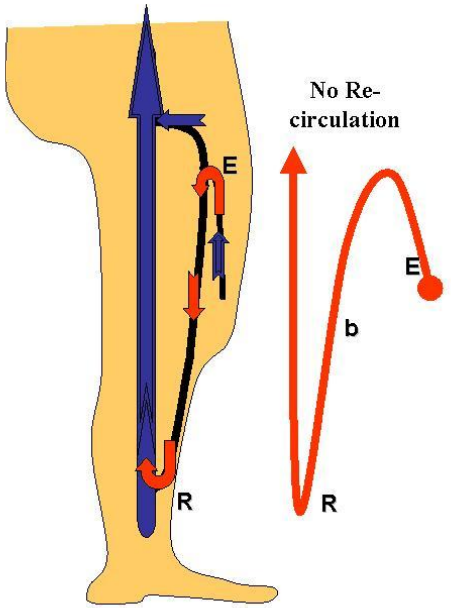




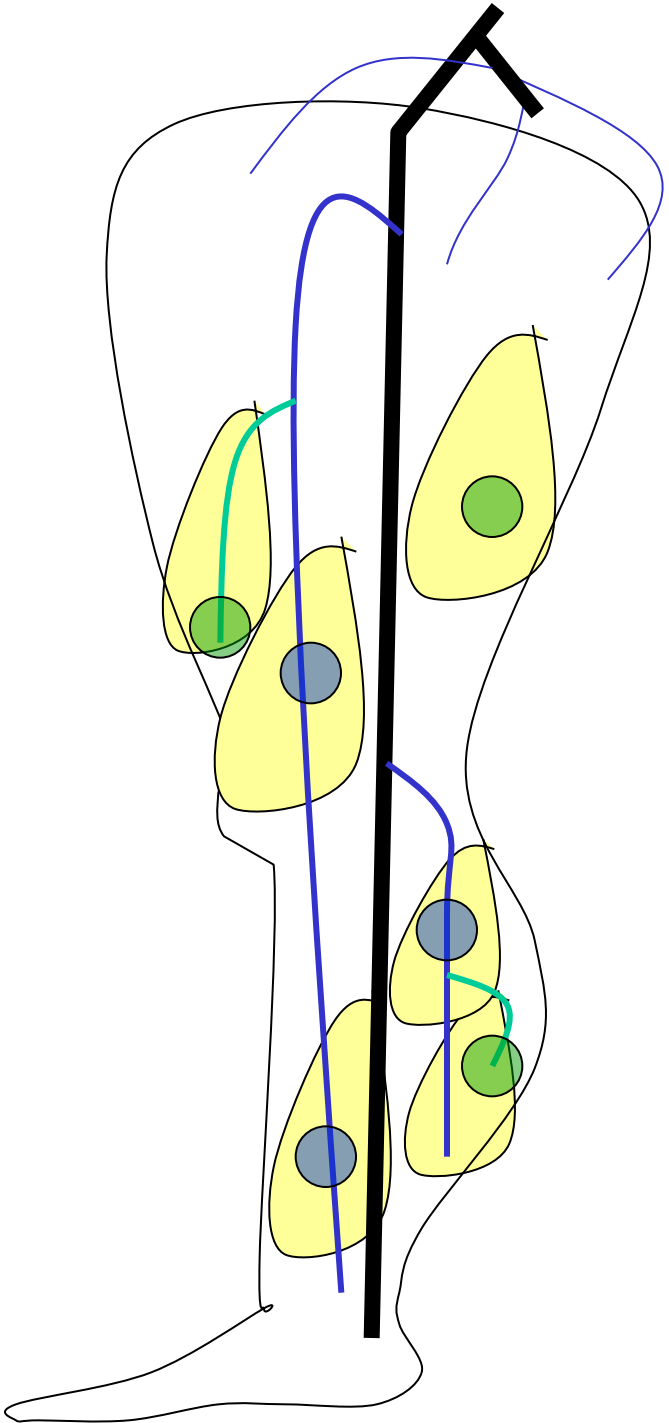
Flow components

NOT Physiologic: flow from other territories in addition to Its own superficial drained territory.

OPEN DERIVATED SHUNTS



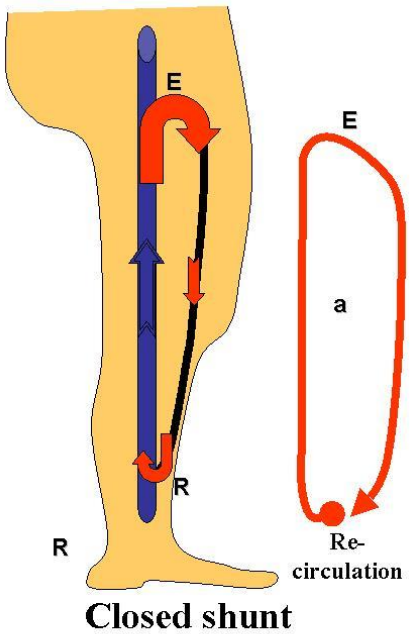
Derivated open shunt



Flow components

NOT Physiologic: flow from other territories in addition to Its own superficial drained territory.

CLOSED SHUNTS



Closed shunt

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Hemodynamics:

Flow energy:

Physiological: Flow rate provided by residual pressure: variations according to arterial and capillary resistance (thermoregulation: external heat, internal heat (walking, sport)

NON-physiological:

1-Excess residual pressure: vicarous open shunts

2-Valvulomuscular pump pressure: deep-superficial, open vicarious and closed shunts

Flow energy

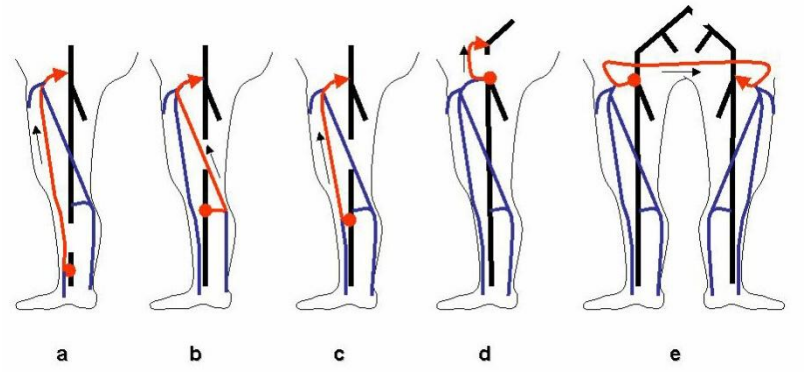
Physiologic:

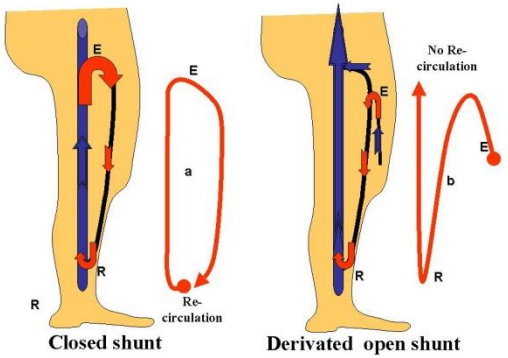
Drainage Residual pressure of its own territory increased by physiological micro-circulation resistances reduction: heat, walking, sport

NOT physiologic:

Excess of residual pressure : open vicarious shunts and systolic Valvulo-muscular pump energy

Diastolic Valvulo-muscular pump energy in open derivated shunts and vicarious closed shunts





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Functions

Physiologic:

Accessory physiologic Drainage when the flow increases because of arteriolo-capillary resistances réduction (thermoregulation: external heat, internal heat (walking, sport)

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NON-physiological functions:

1-Favorable: Partial or total correction of a functional or organic obstruction of the physiological drainage pathways by creating leakage and re-entry points of the vicarious open shunts.

2-Unfavourable: Decompensation of valve incontinence by creation of leakage and re-entry points of closed or open shunts by bypass, responsible for varicose veins and drainage disorders due to the lack of dynamic fractionation of hydrostatic pressure.

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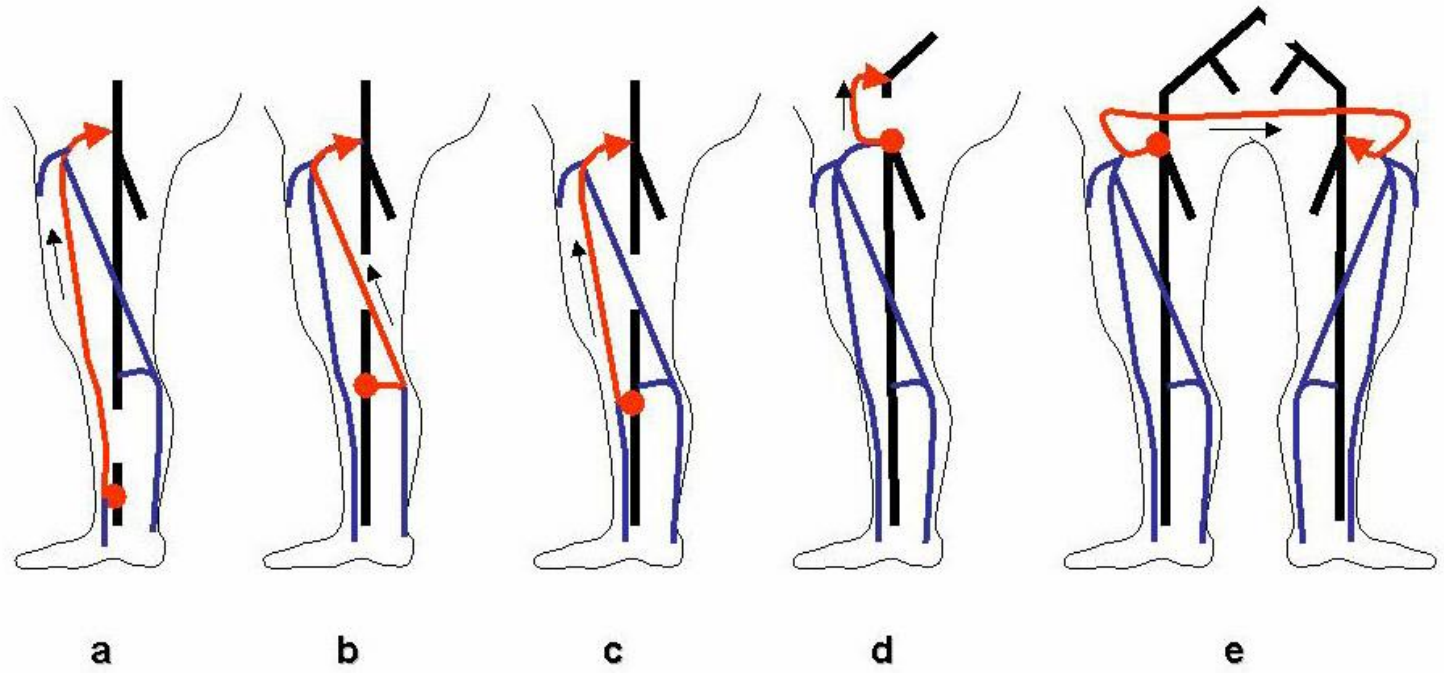
Fonctions

Not physiologic:

1-*Favourable*:Drainage improvement thanks to leak and re-entry points of vicarious shunts..



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Functions

Not physiologic:

2-*Unfavorable*: Escape and re-enty points of closed shunts or derivated open shunts leading to varices and trophic disorders