

Disorders of blood vessels and lymphatics

Neira Puizina-Ivić, Ph.D., Prof.

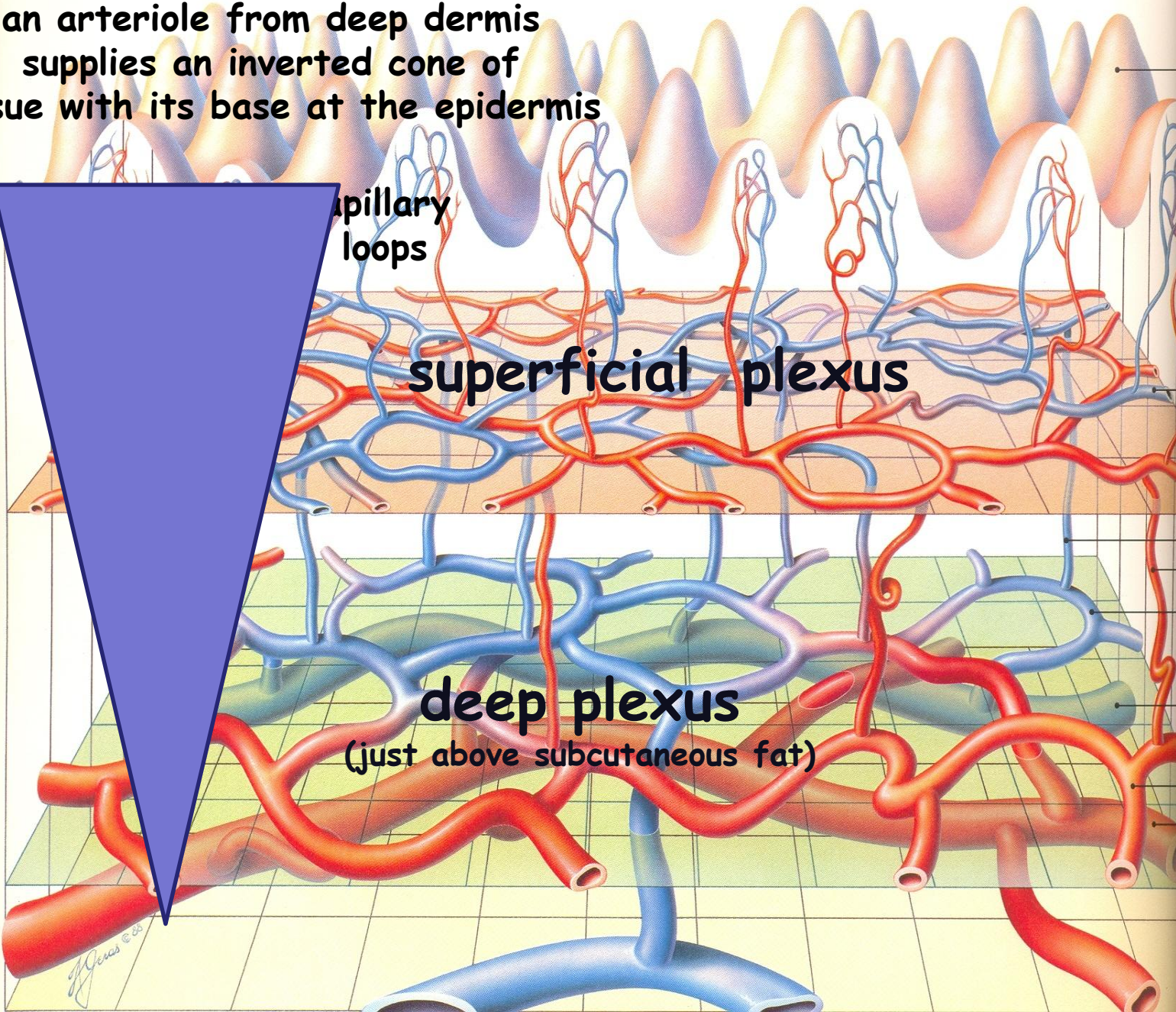
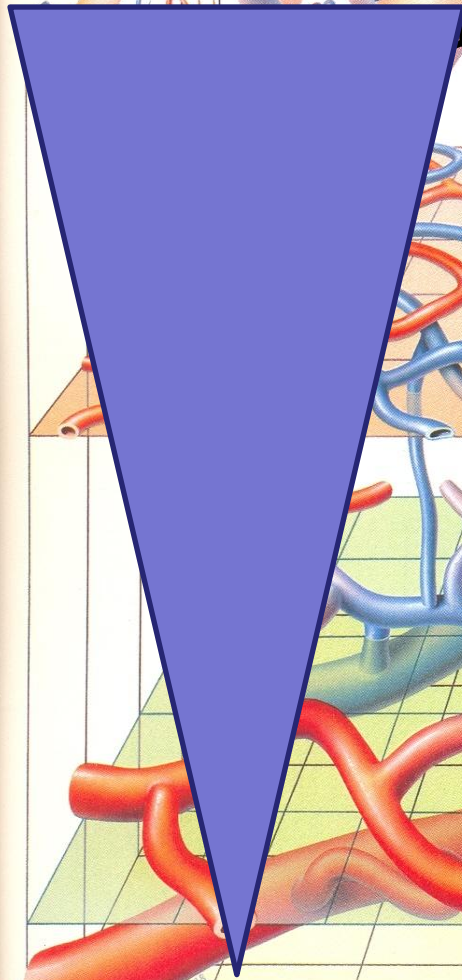
an arteriole from deep dermis
supplies an inverted cone of
tissue with its base at the epidermis

Blood
vessels

capillary
loops

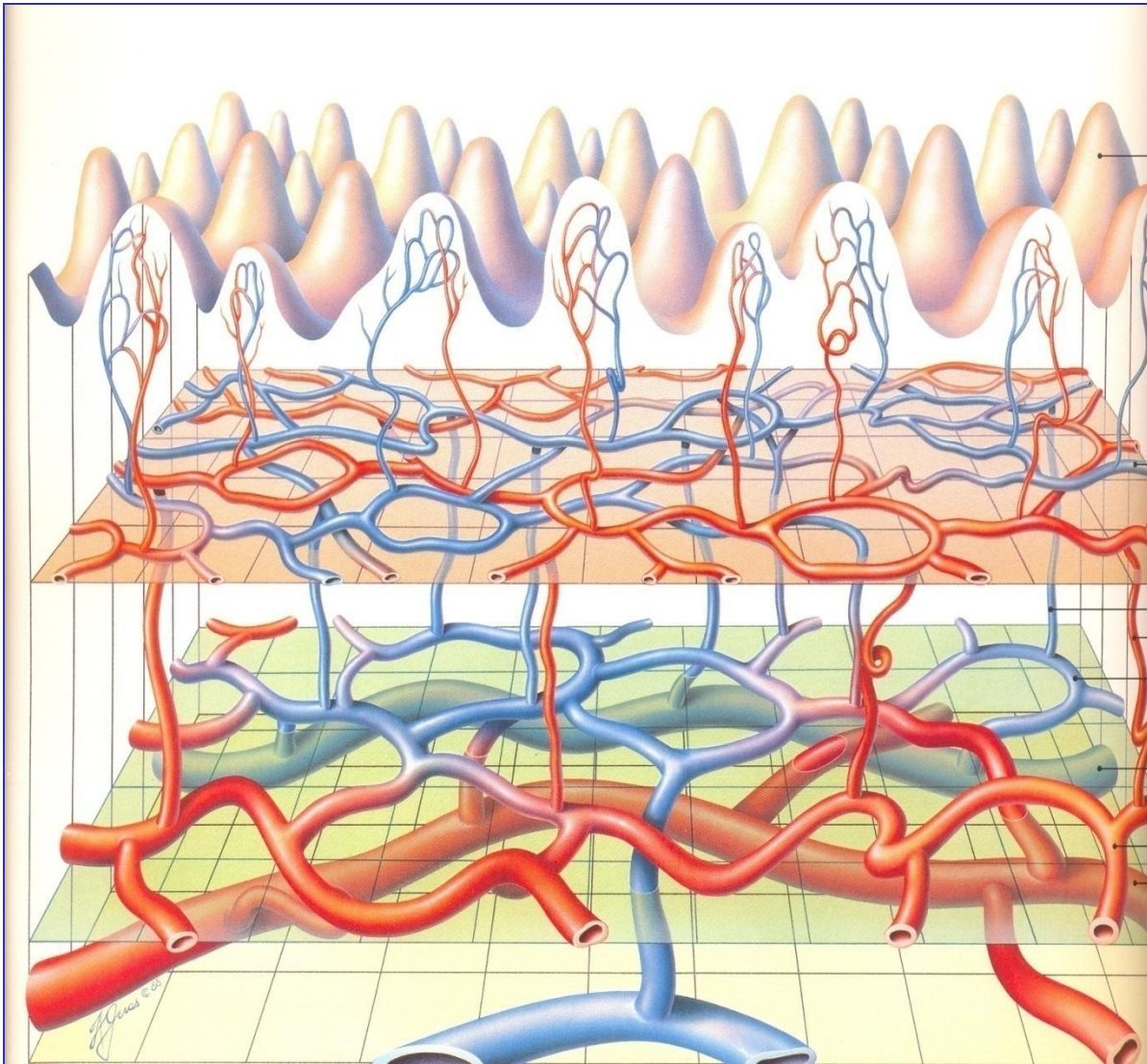
superficial plexus

deep plexus
(just above subcutaneous fat)



Functional disease - abnormalities are reversible, no vessel wall damage

Disease of the structure - vessel wall damage (vasculitis)



Disorders involving small blood vessels

Acrocyanosis (hands, feet, nose, cheeks, ears)



arteriolar constriction and dilatation of the subpapillary venous plexus and by cold-induced increases in blood viscosity

"poor circulation"

often familial

common in females

blue-red and cold

palms are clammy

Treatment:

warm clothes

avoidance of cold

Erythrocyanosis



occurs in fat, young women
over fatty areas

unpleasant burning sensation

Treatment:

warm clothes
avoidance of cold
weight reduction

Livedo reticularis



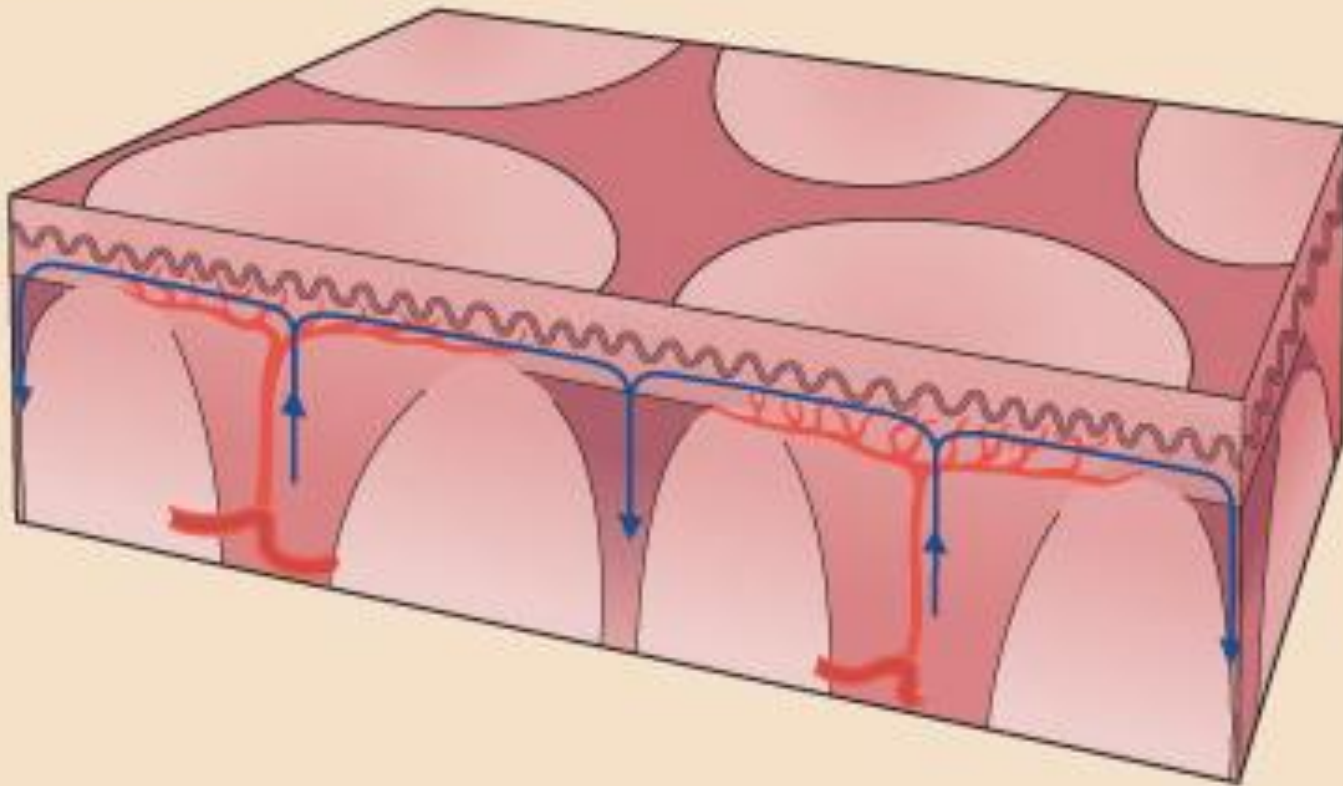
cutis marmorata

net-like or marbled

**caused by stasis in
the capillaries**

many causes of livedo
(physiological, vessel
wall disease, autoimmune,
hyperviscosity states,
cryopathies, congenital,
idiopathic)

anatomic base for development of livedo





**inflammatory
angiopathy**

Livedo racemosa

Livedo racemosa



inflammatory
disease

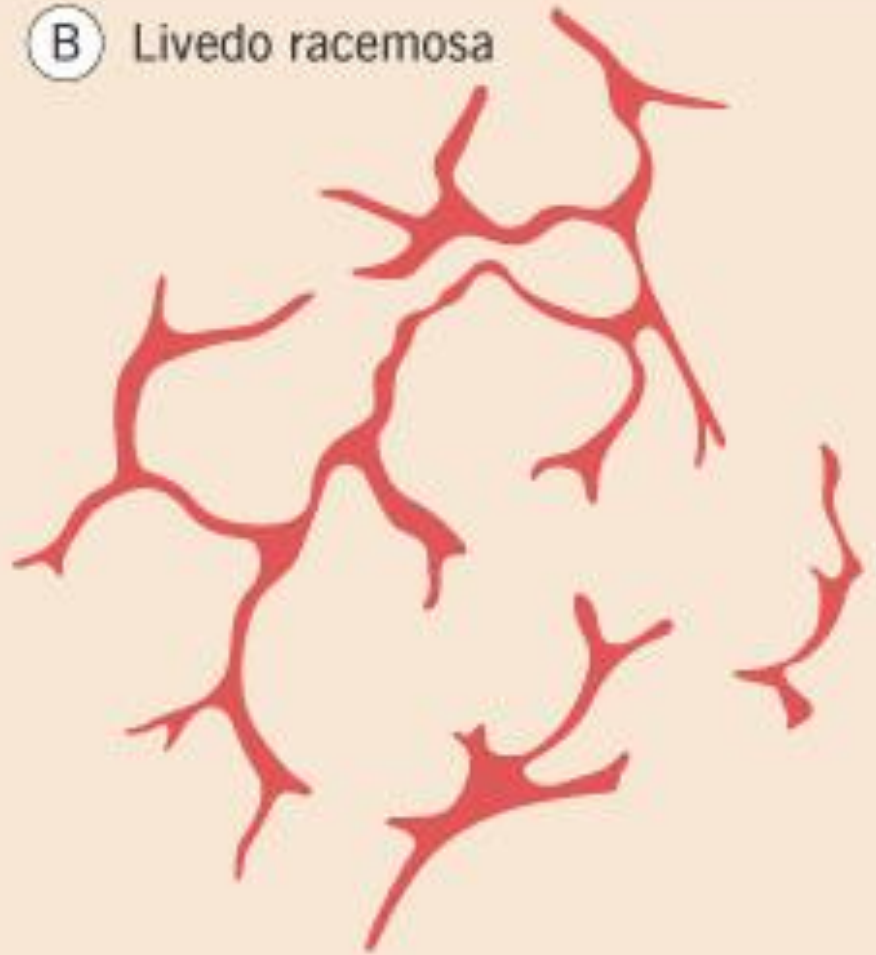
differences between livedos

(A) Livedo reticularis



regular

(B) Livedo racemosa

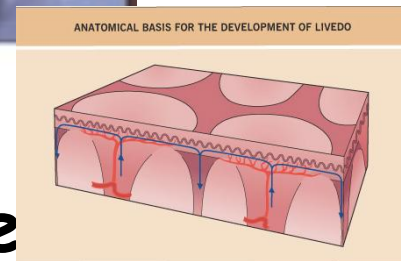


irregular

livedo?



Erythema ab igne -
chronic exposure to the heat source





the appearance is determined
by underlying vascular network



long-term exposure to local
heat (open fire, hot water
bottle, heating pad)

Perniosis (chilblains)



purple-pink swellings on fingers,
toes (nose and ears)

start with winter and
are introduced by cold

painful, and itchy or burning
on rewarming, can ulcerate



Treatment:

warm clothes

nicotinamide (500 mg 3x day)

Ca⁺⁺ channel blockers

Teleangiectases



primary

secondary

permanently dilated and visible small
vessels of the skin

appear as linear, punctate or stellate
crimson-purple markings

Spider naevi



stellate teleangiectases
palpable feeding vessel

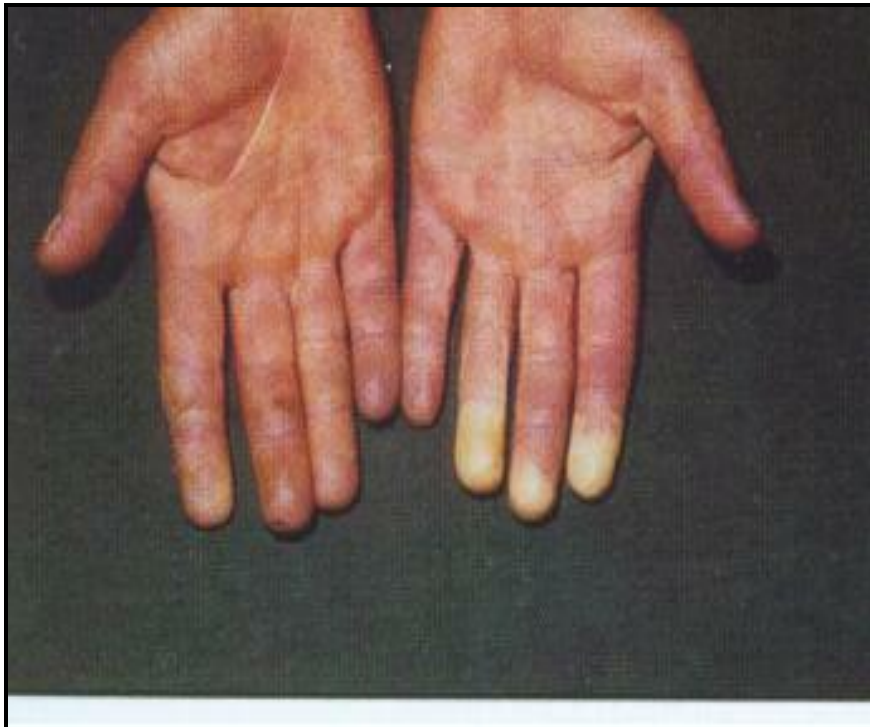
face of children
pregnancy
liver disease

Treatment:
electrodesiccation
pulsed dye laser

Arterial disease

Raynaud's phenomenon

Paroxysmal pallor of the digits provoked by
cold
emotional stress



on rewarming painful
cyanosis appears

Raynaud's disease:

often familial

no cause can be found

some patients will later develop scleroderma

5x more frequently in women



Syndroma Raynaud:

Associated with connective tissue diseases

- Scleroderma systemica (80-90%)
- Lupus erythematosus systemicus (35%)
- Dermatomyositis (do 3%)
- Sclerosis multiplex
- Thrombangitis obliterans
- Beta adrenergic drugs
- Nicotin and vibrations...



Treatment

protection from cold

warm clothing

smoking should be abandoned

calcium-channel blockers (nifedipine
start with 5 mg/day, increasing 5 mg
every 5 days up to 10-30 mg 3x daily)

Treatment

diltiazem (30-60 mg/3x daily) less effective

low-dose acetylsalicylic acid

antiplatelet drug dipyridamole

glycerol trinitrate patches 1x daily

Venous disease

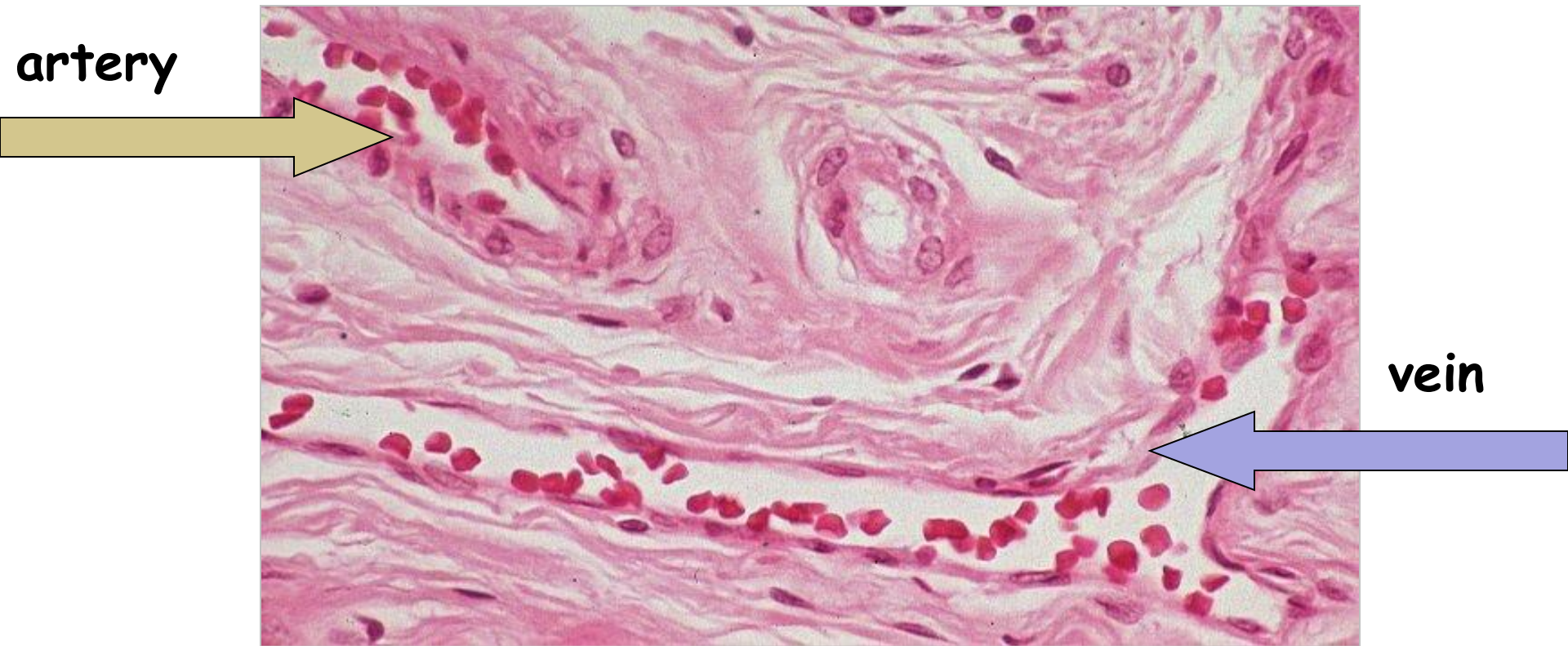
**Venous hypertension,
the gravitational
syndrome and venous
leg ulceration**

Disorders of venous circulation

among 2500 patients - 25 patients with leg ulcers

1% is prevalence, more common among women

Differences between arterial and vein wall vessels

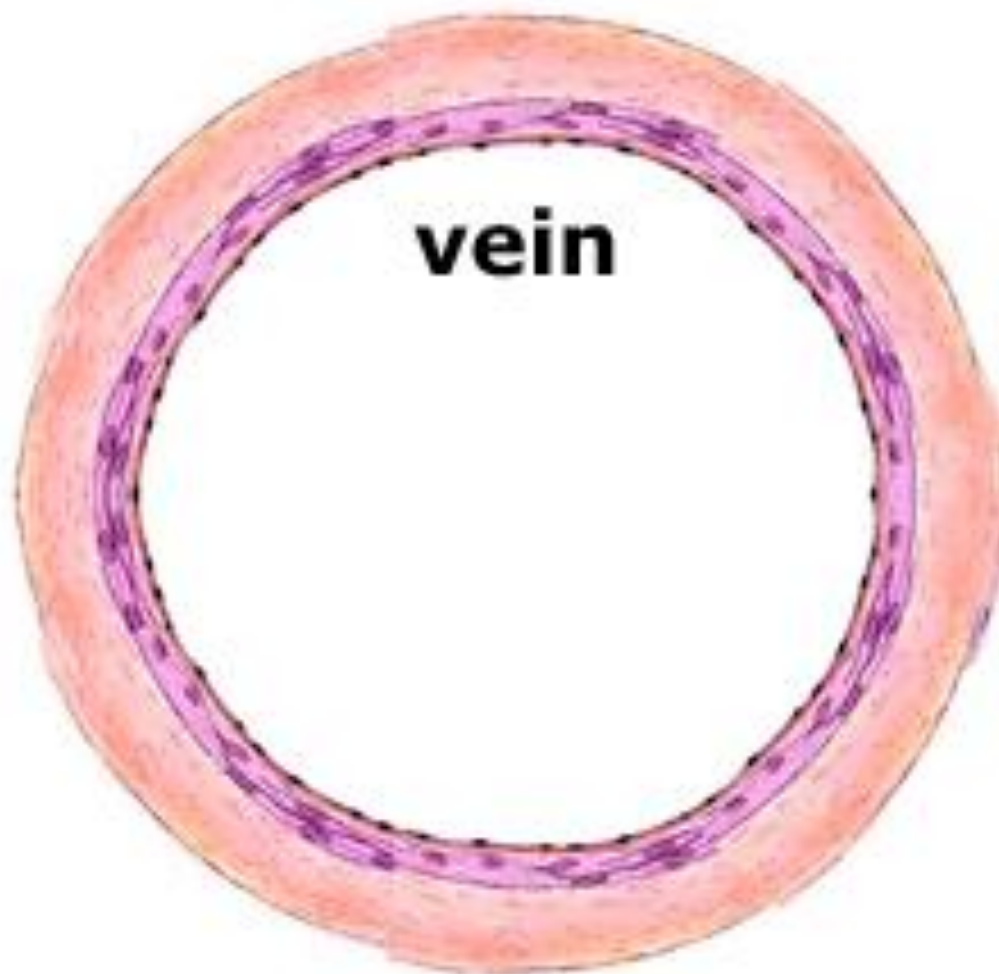


Artery Vein Pair

artery

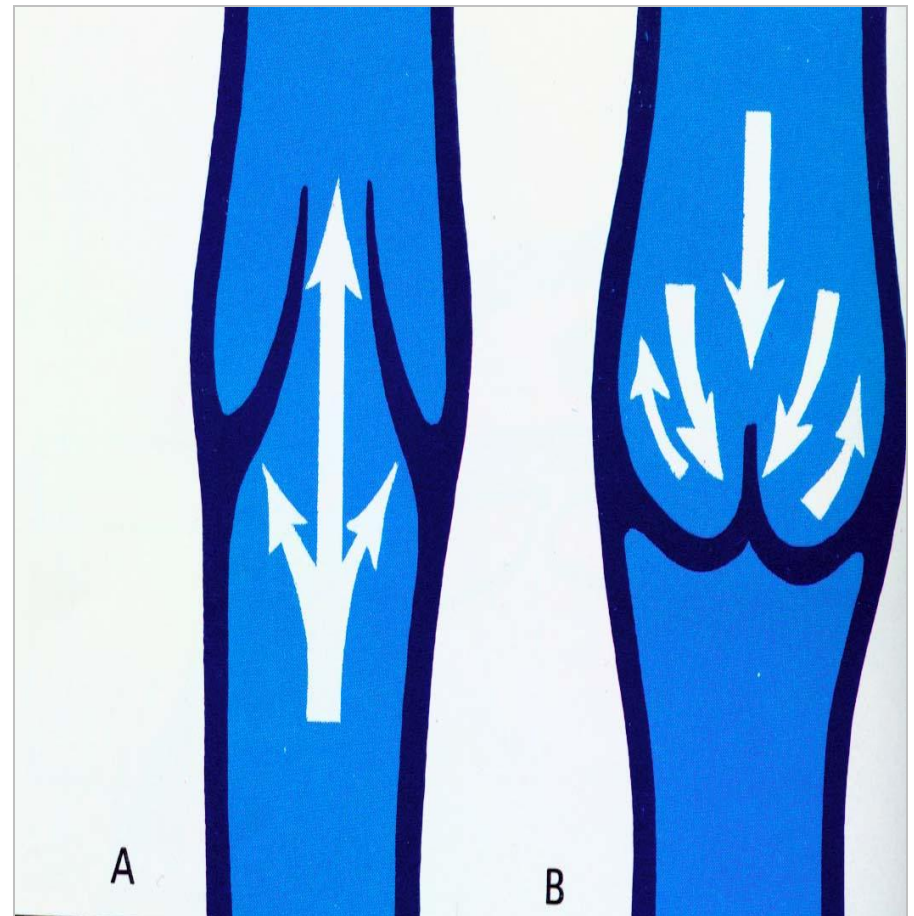


vein



Veins have valves

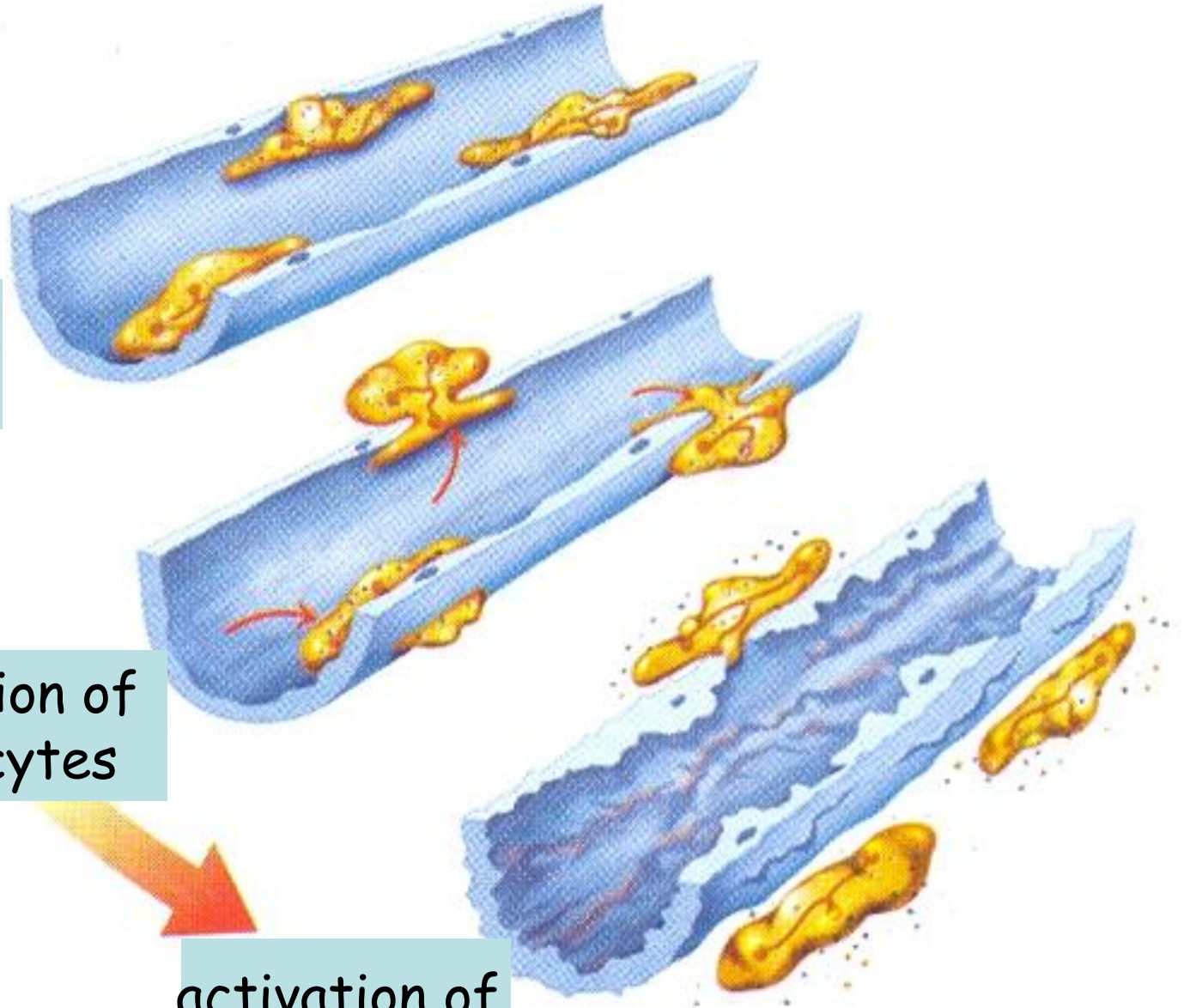
venous walls are
sensitive to
hemodynamic
disorders



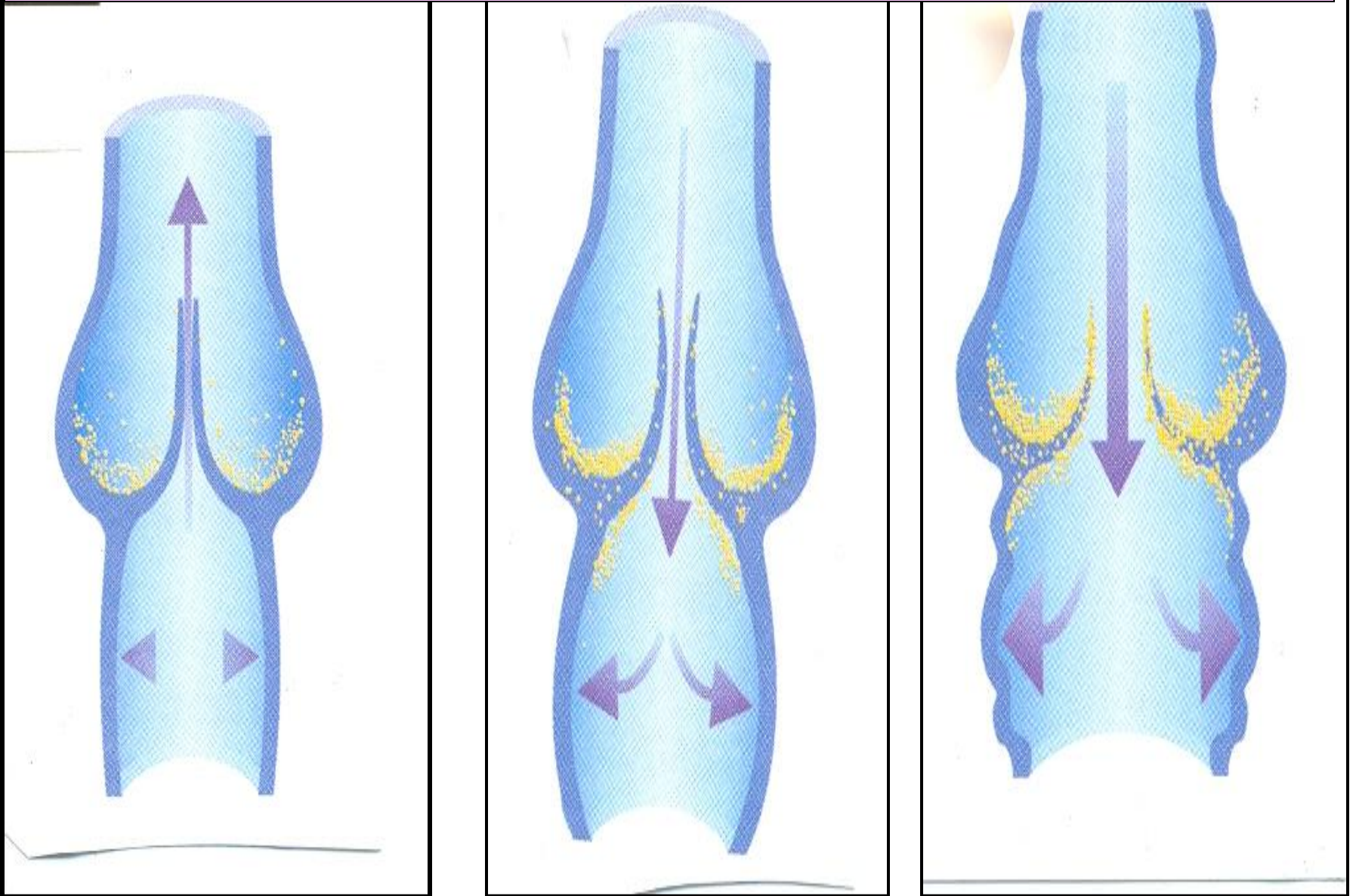
adhesion
of leukocyte

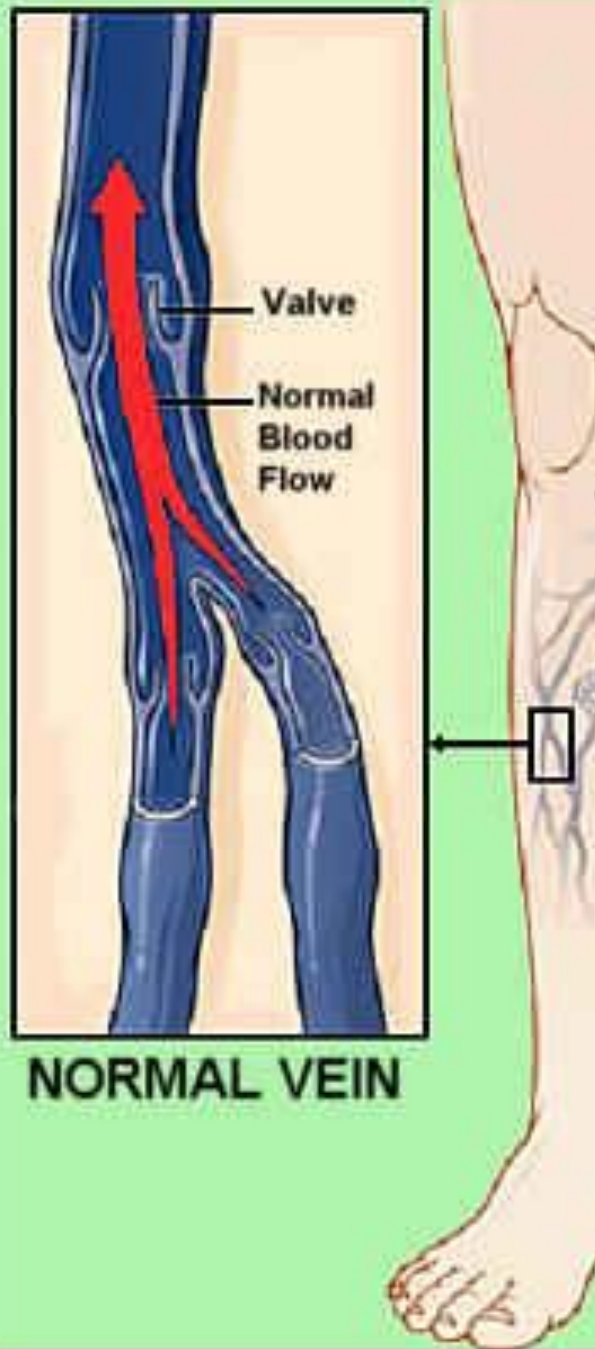
migration of
leukocytes

activation of
leukocytes



appearance of valvular insufficiency phenomenon



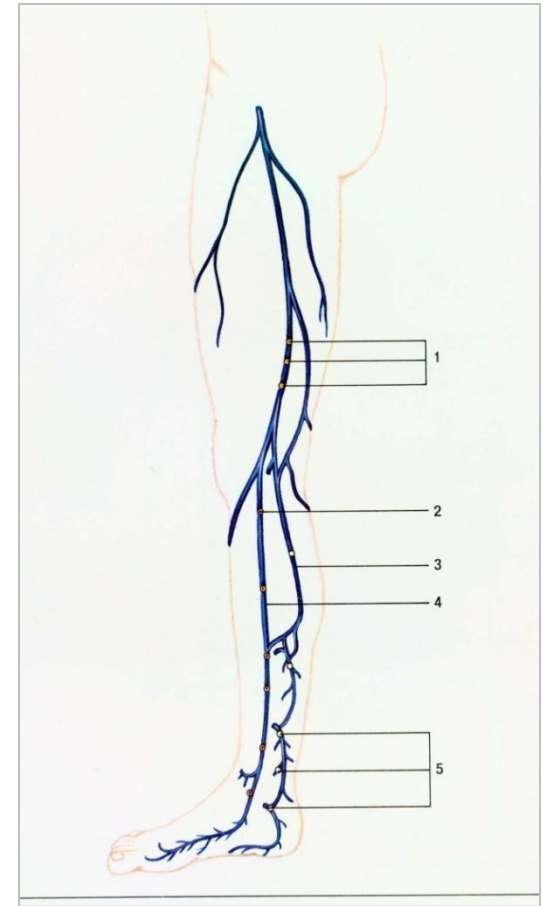


Anatomy of veins

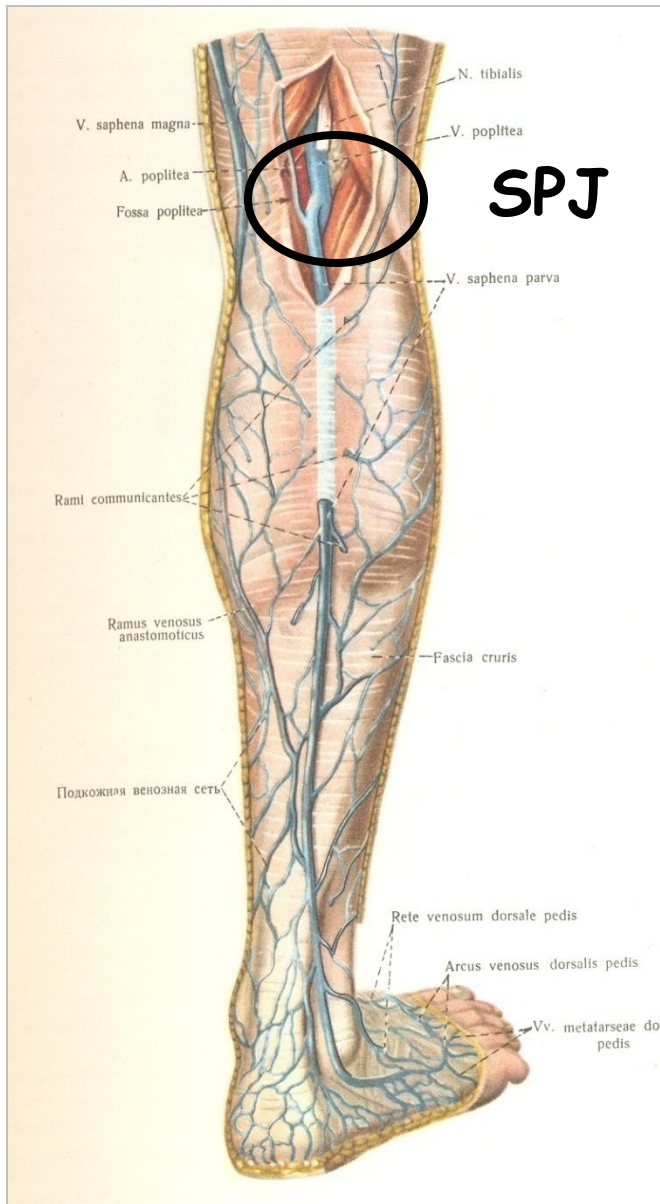
superficial vein system

deep vein system

communicating veins (perforant veins)



vena saphena parva



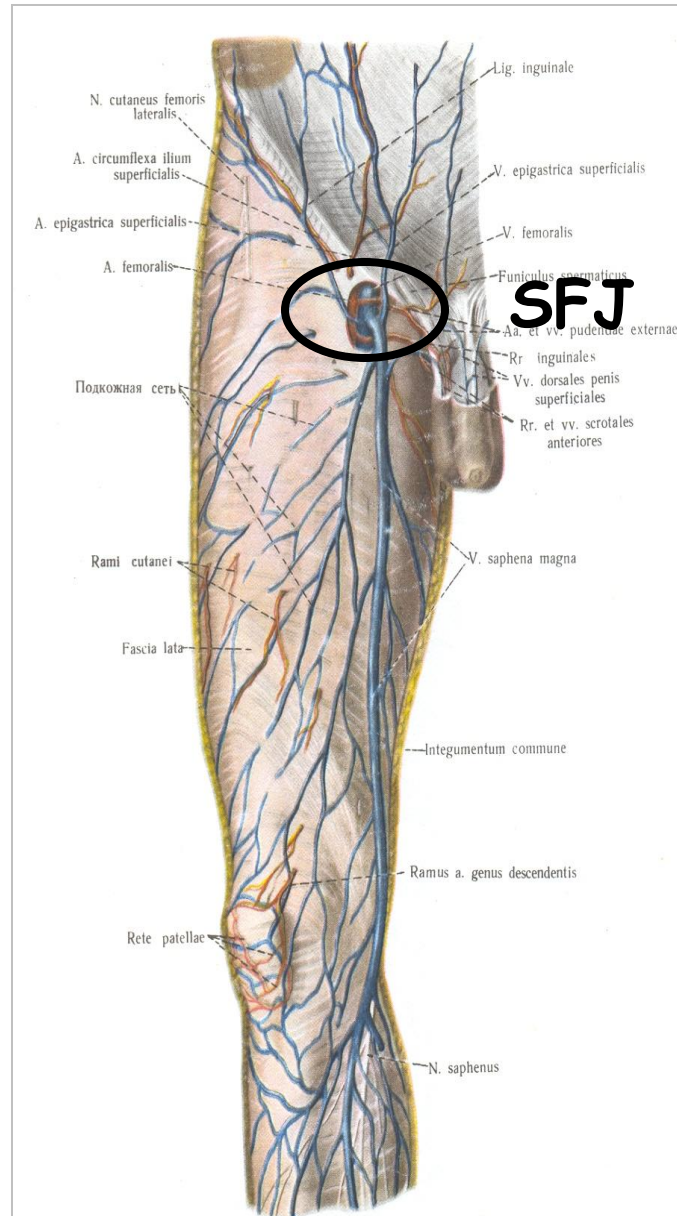
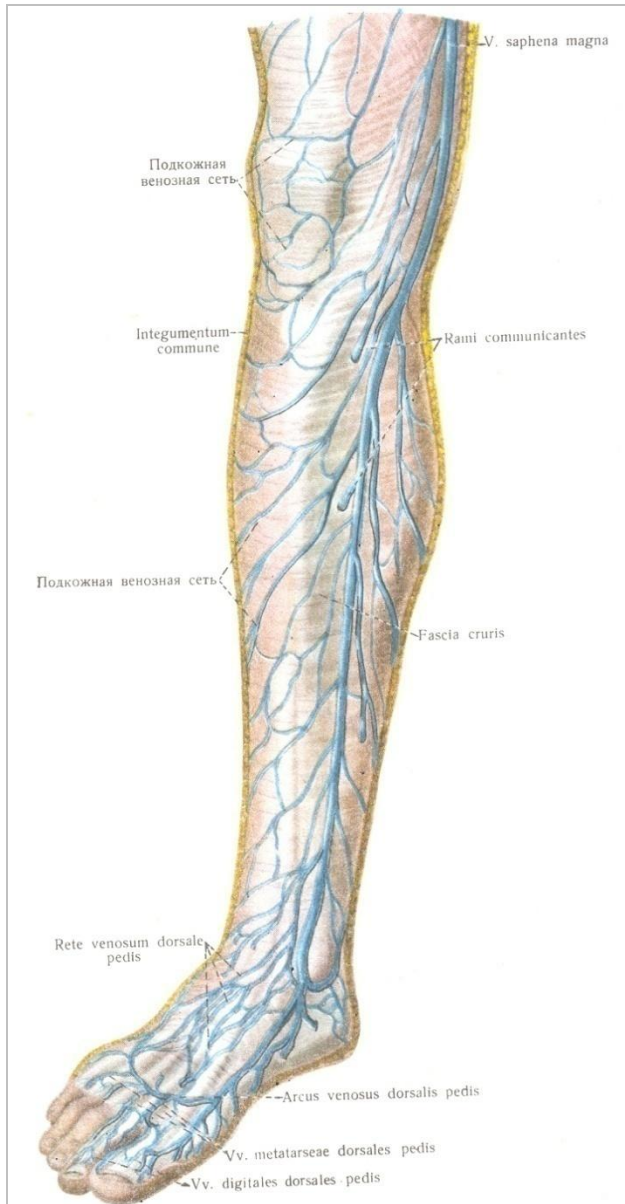
knee

low pressure
thin wall

store of 10% blood

ankle joint

vena saphena magna



groin

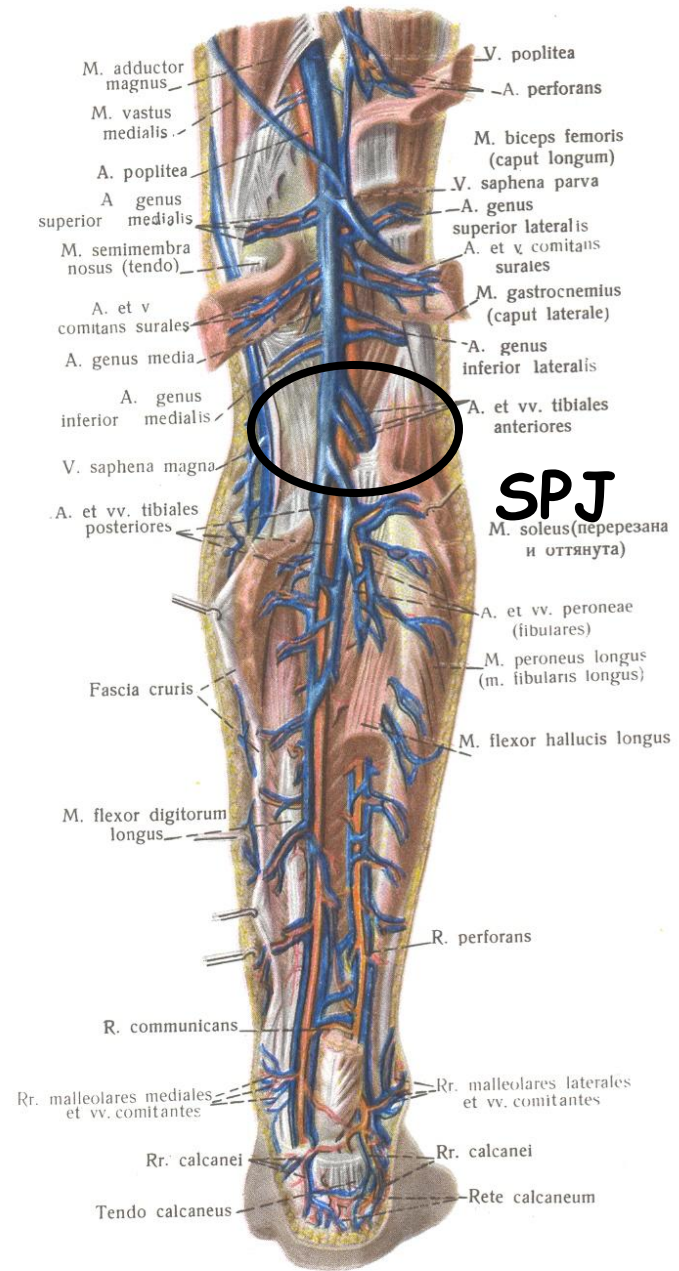
ankle joint

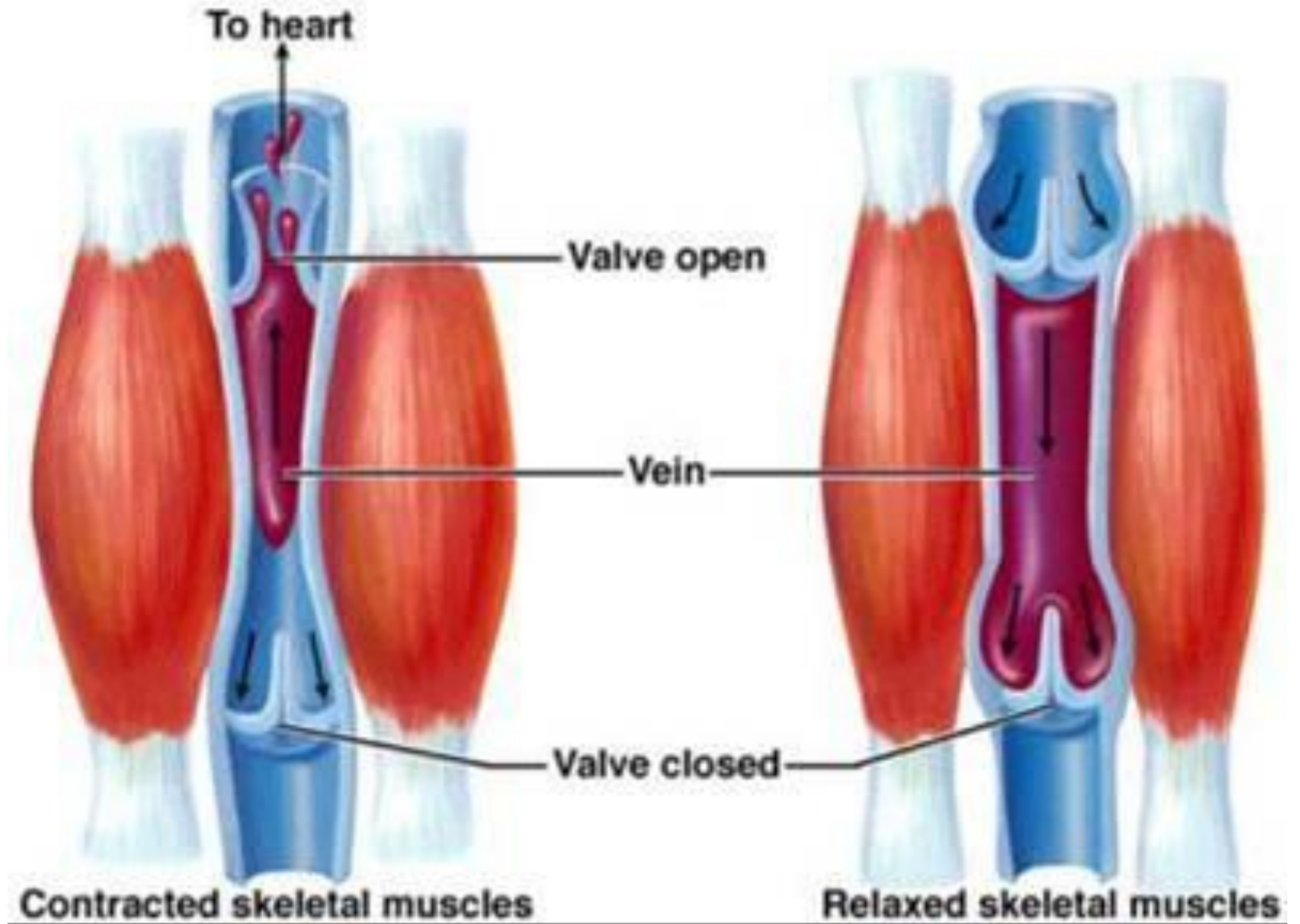
Deep veins

vena tibialis anterior

vena tibialis posterior

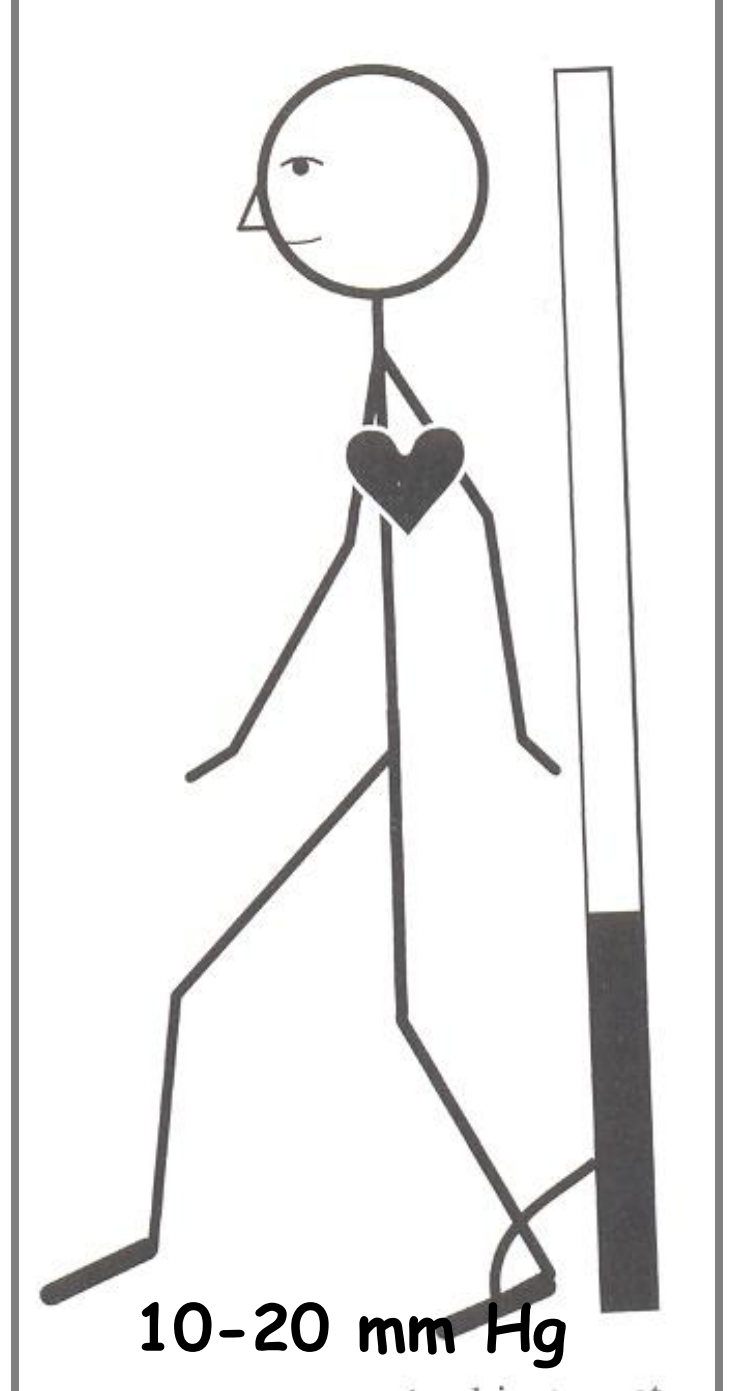
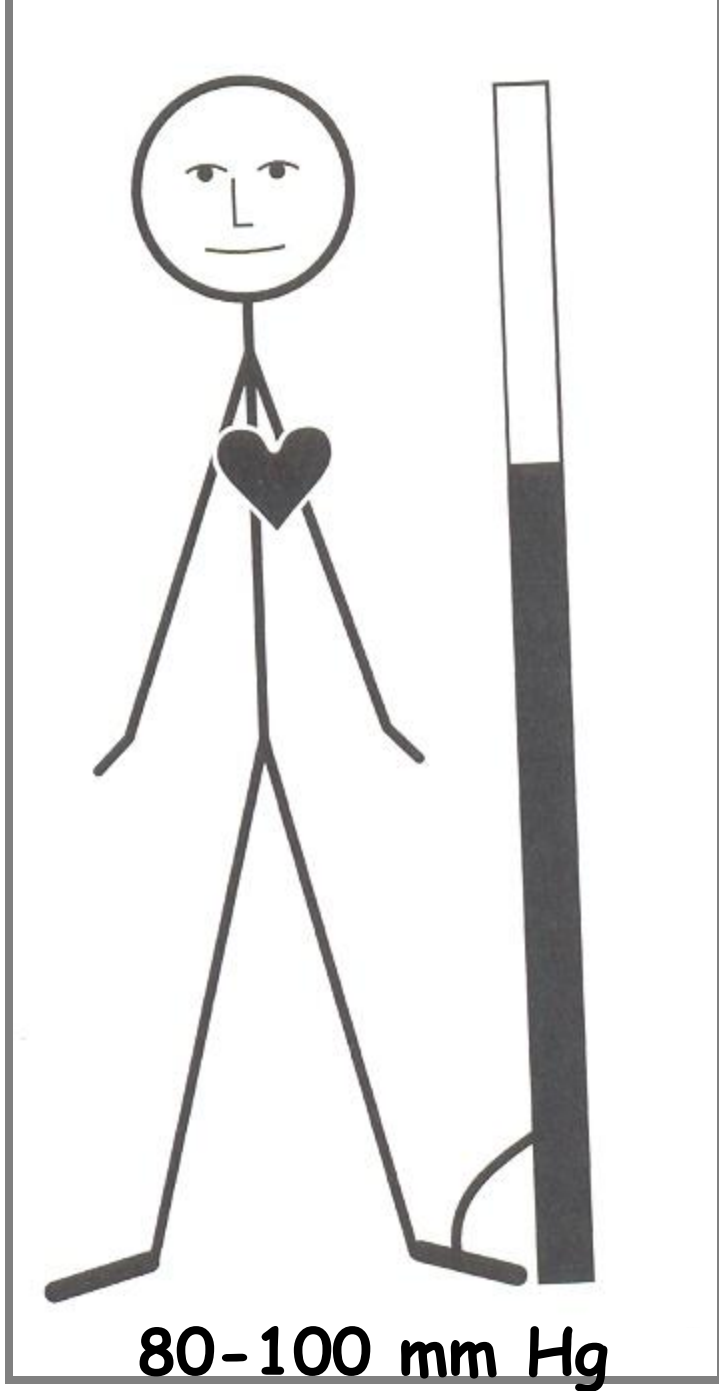
high pressure
thicker wall



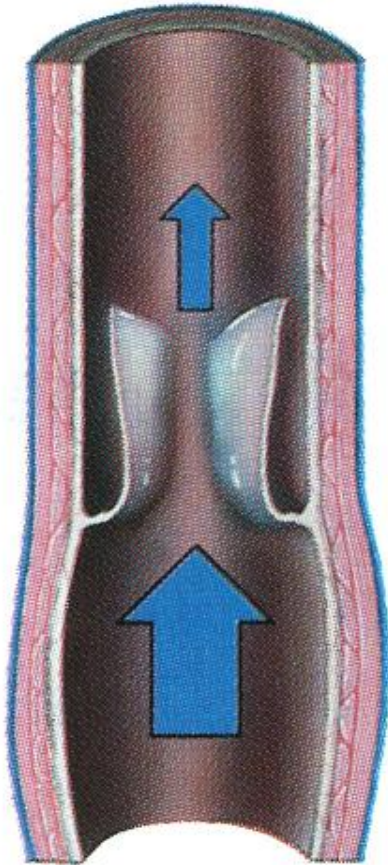


blood in the deep veins is squeezed
against gravity to the heart

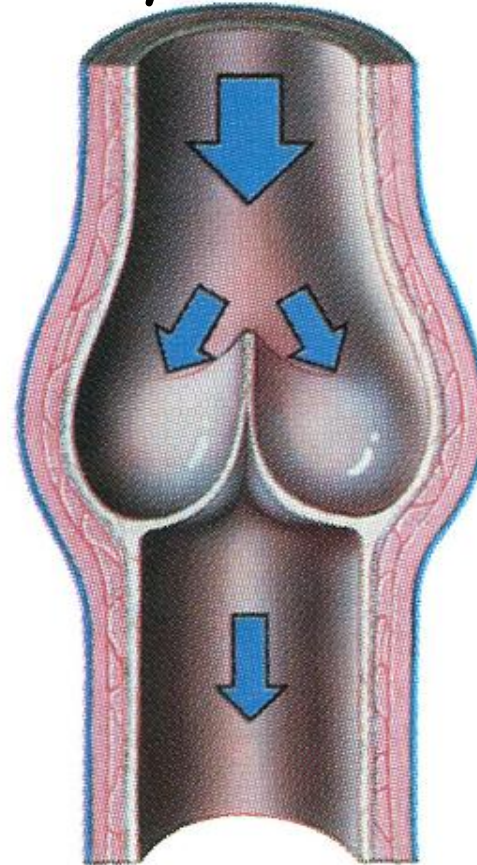
reflux is prevented by valves



reflux is prevented by valves

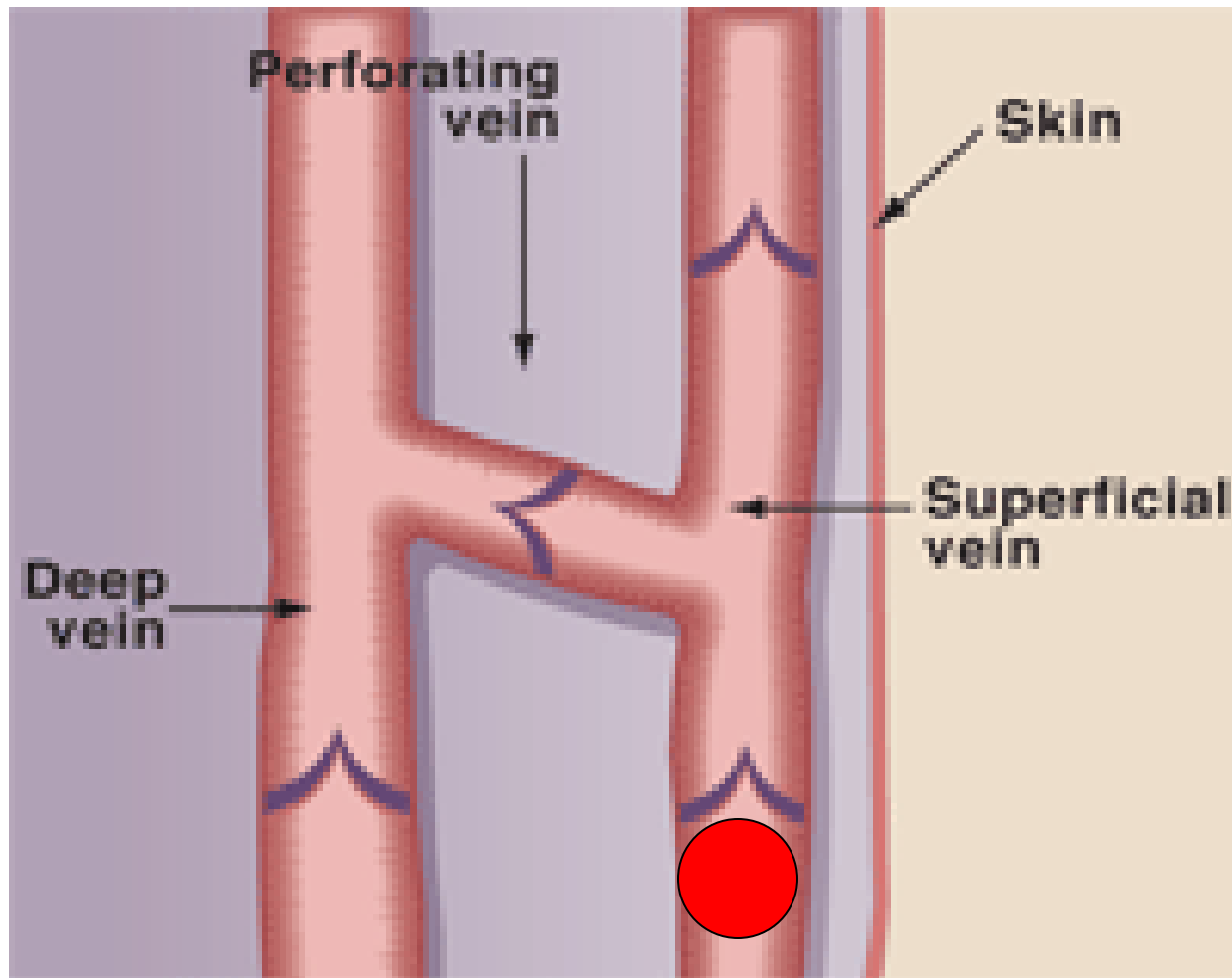


Valves open when muscles contract, allowing blood to return to the heart.



Valves close when muscles relax. Blood cannot flow backwards.

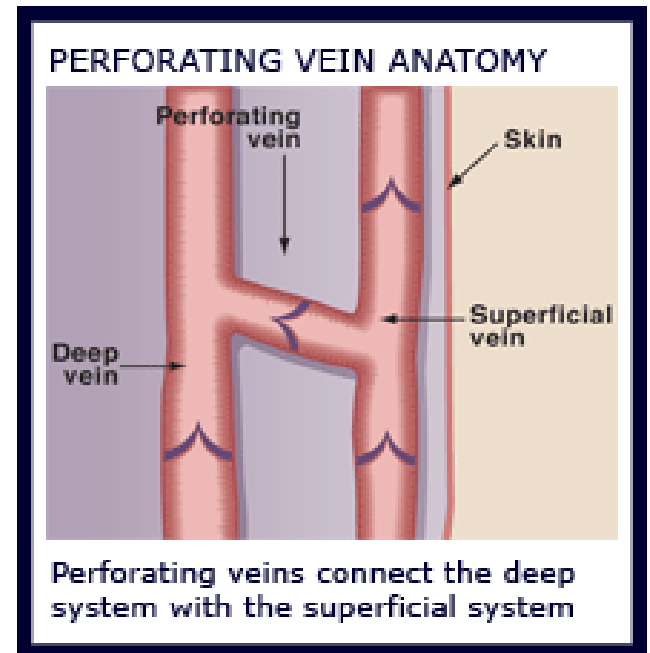
PERFORATING VEIN ANATOMY



Perforating veins connect the deep system with the superficial system

Satisfactory venous drainage of the leg requires few factors

1. deep veins
2. superficial veins
3. valves and communicating veins
4. the calf muscle pump

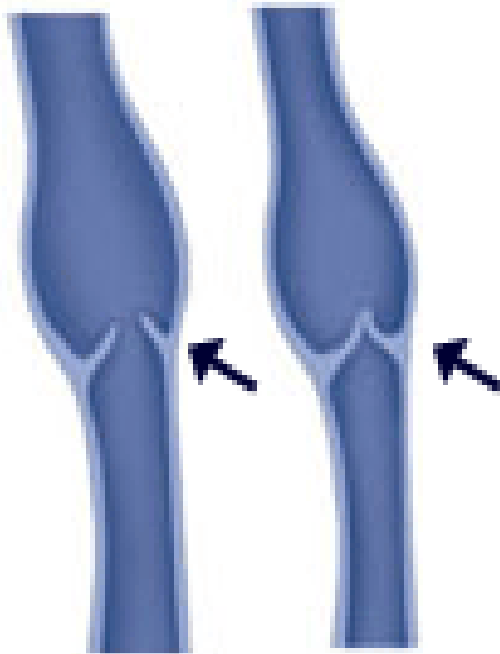


Failure of one of the factors

chronic venous disease (CVD)

NORMAL VEIN

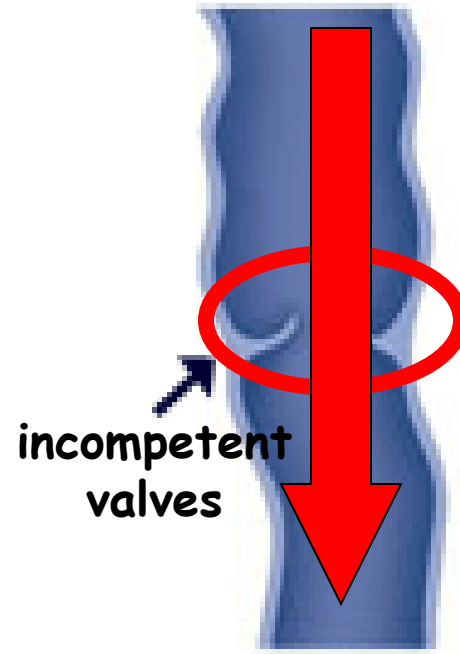
Healthy Vein Valves
and
Correct Blood Flow



Valve Open Valve Closed

DILATED VEIN

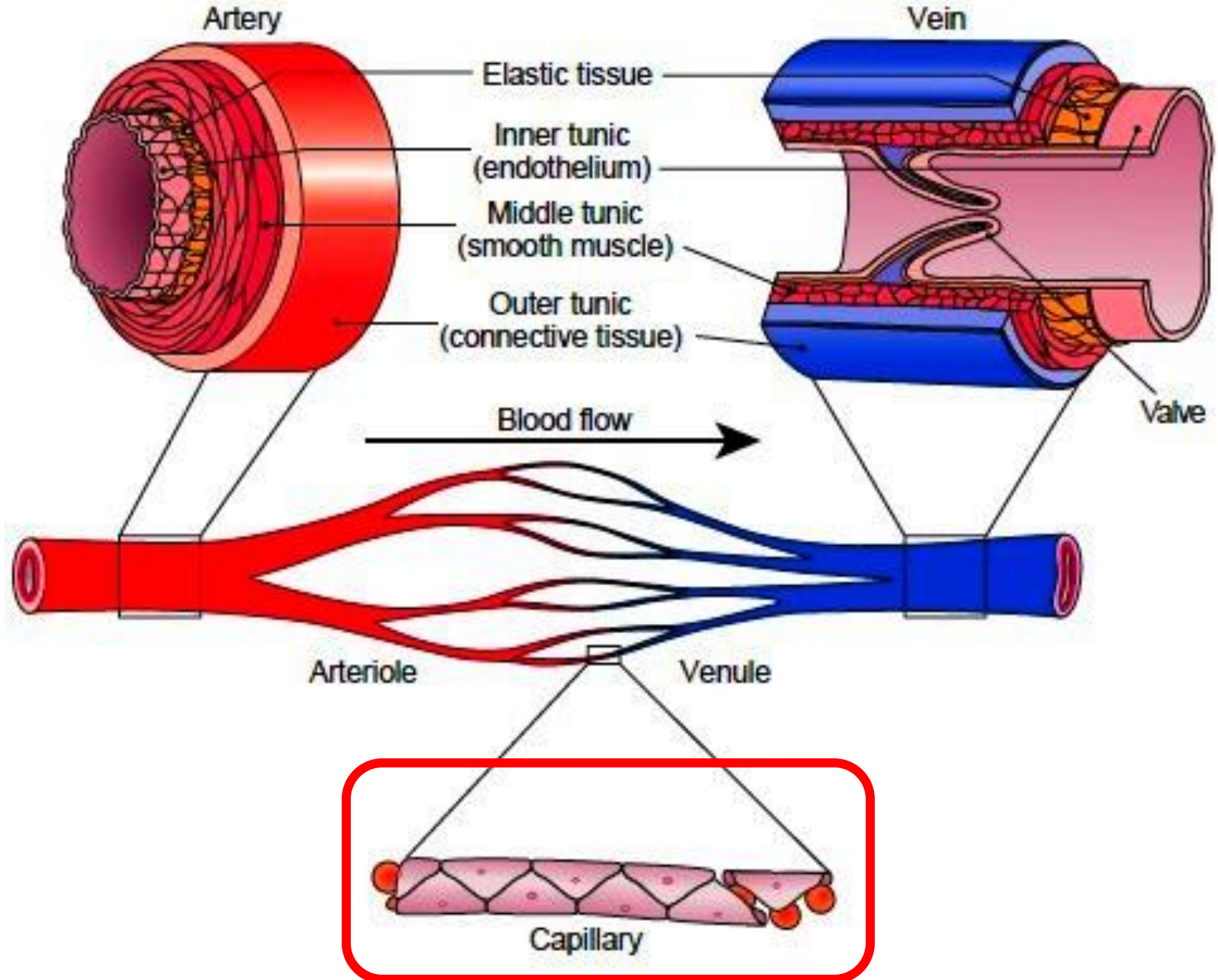
Damaged Vein Valve
and
Incorrect Blood Flow



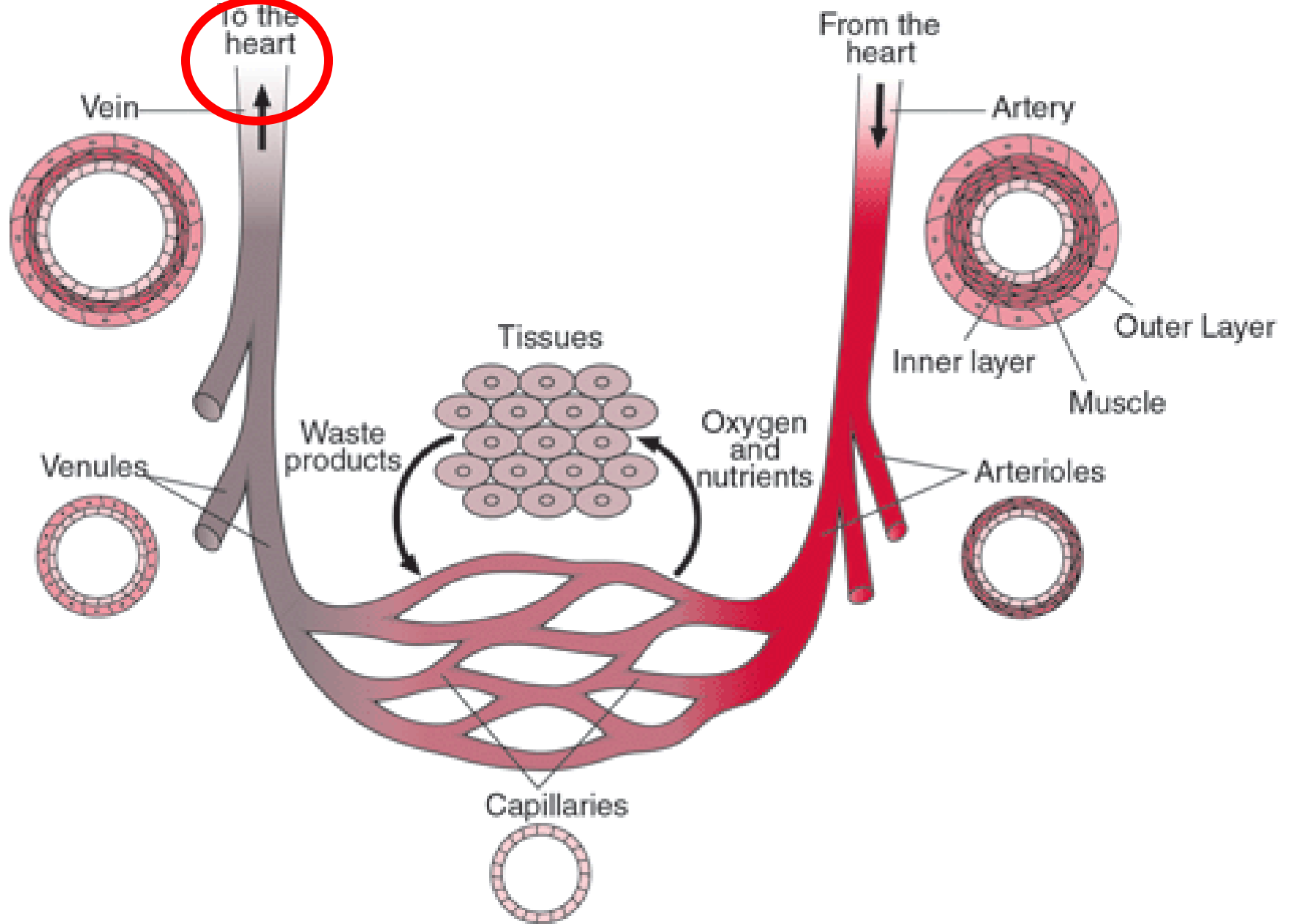
Leaky Valve

pressure
remains
high
"venous
hypertension"

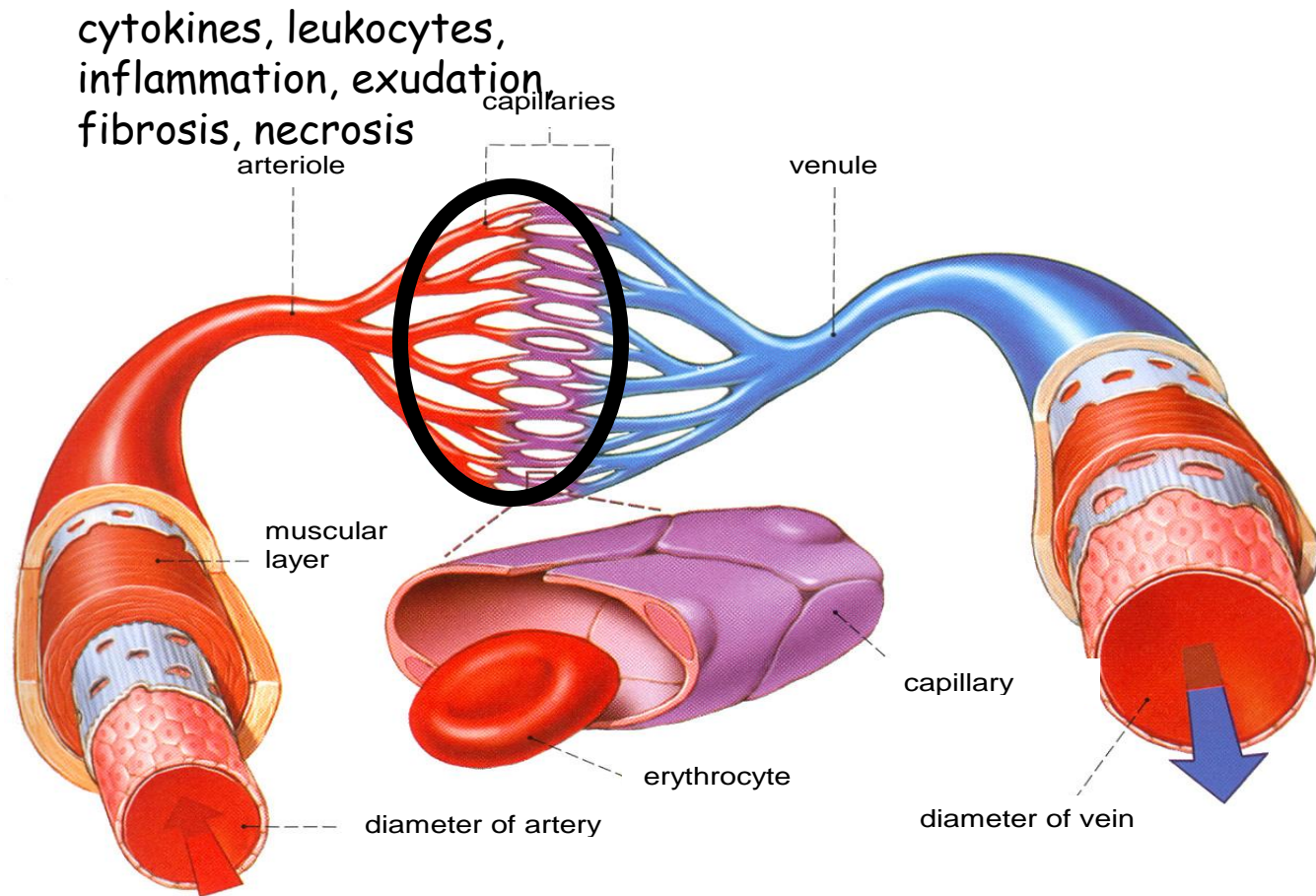
if the valves of **deep** and **communicating** veins are **incompetent**
the calf muscle pump now pushes blood into the superficial veins



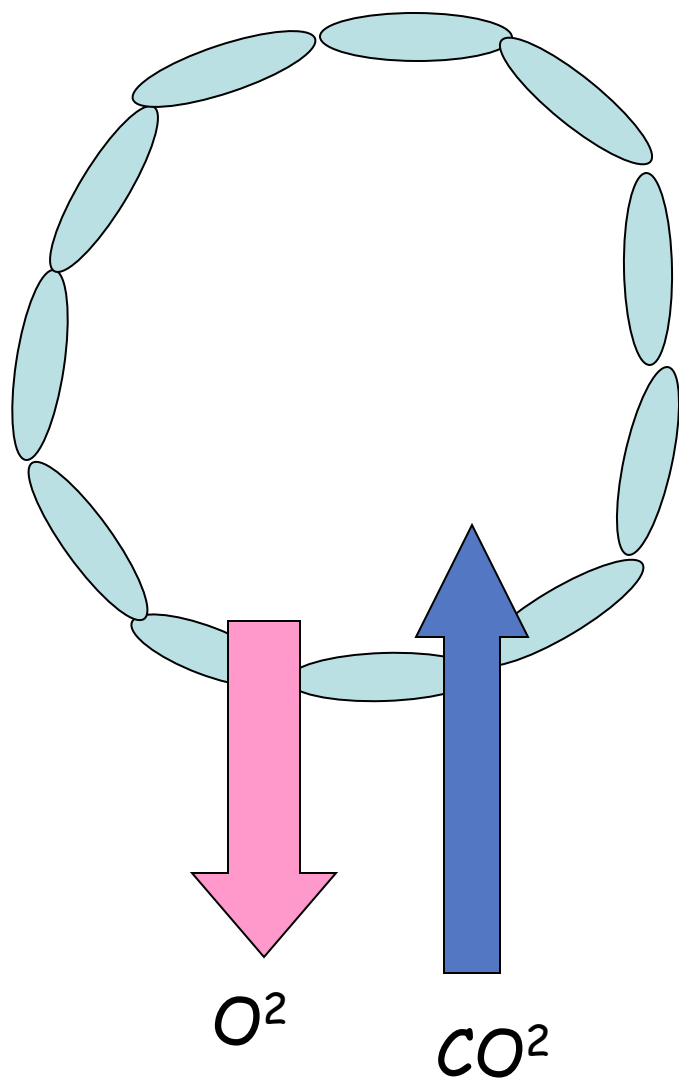
this persisting venous hypertension is transferred and enlarges the capillary bed

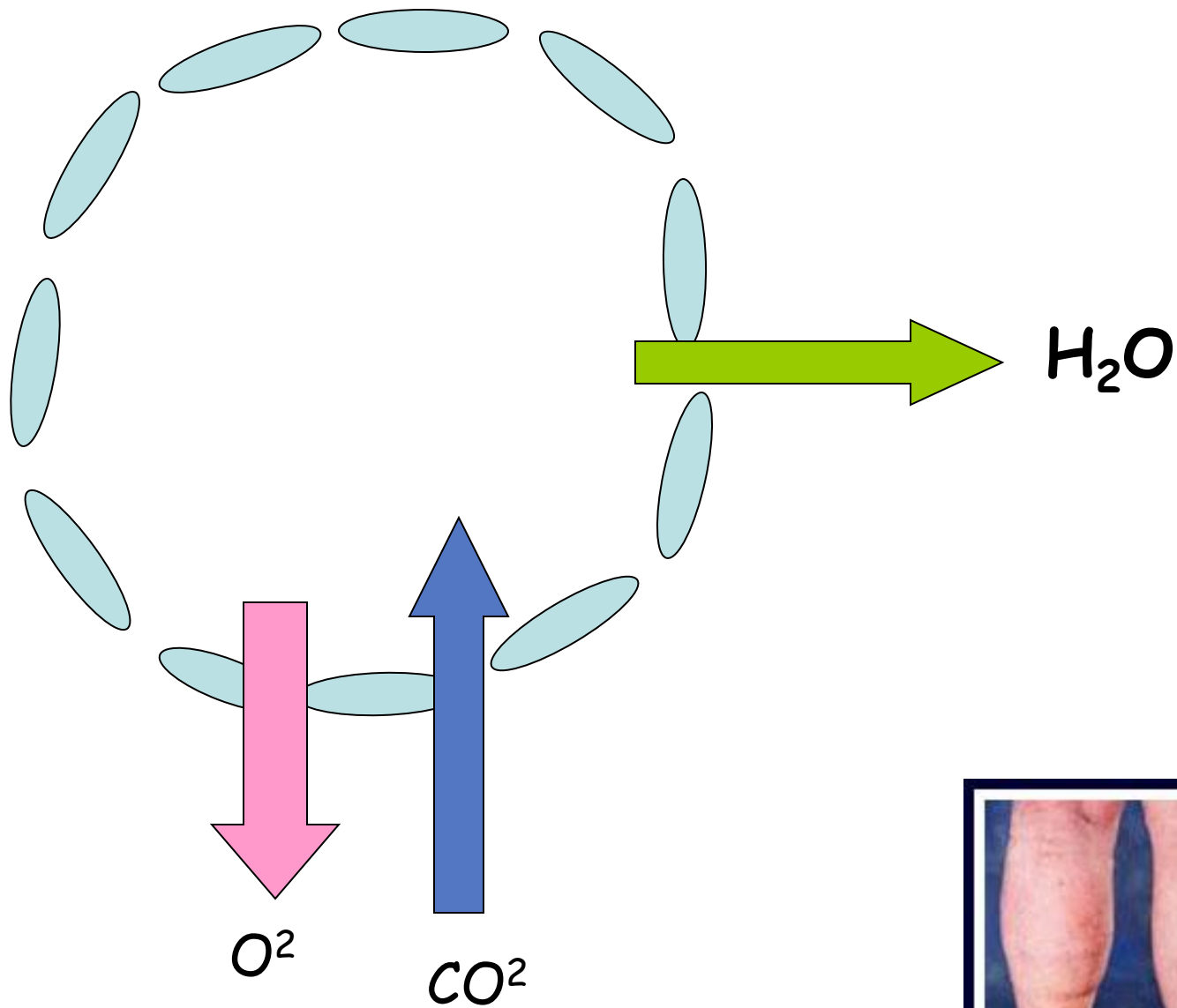


the pressure is transmitted to the capillaries



**venous hypertnesion is transmitted
at the level of microcirculation**

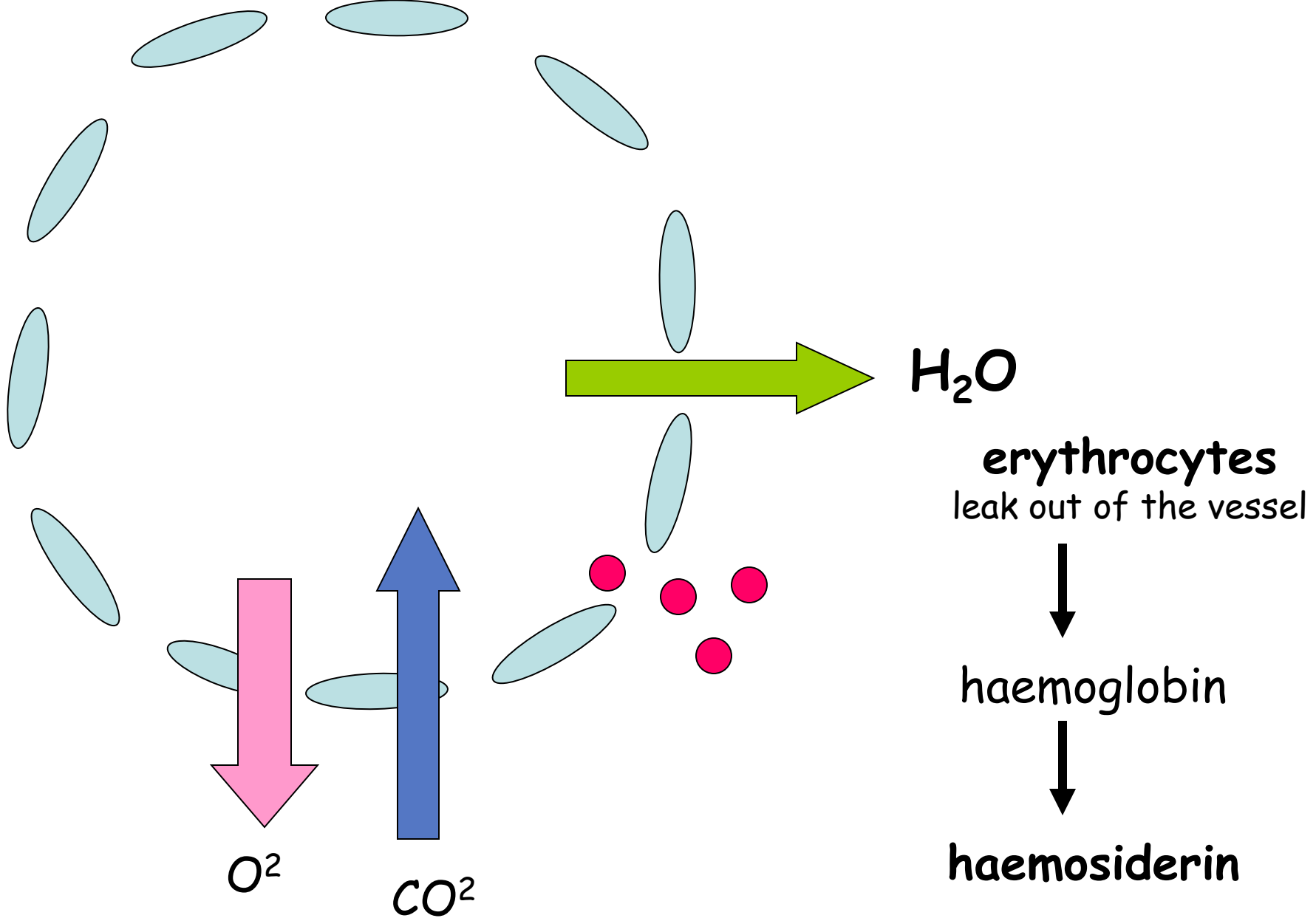




oedema



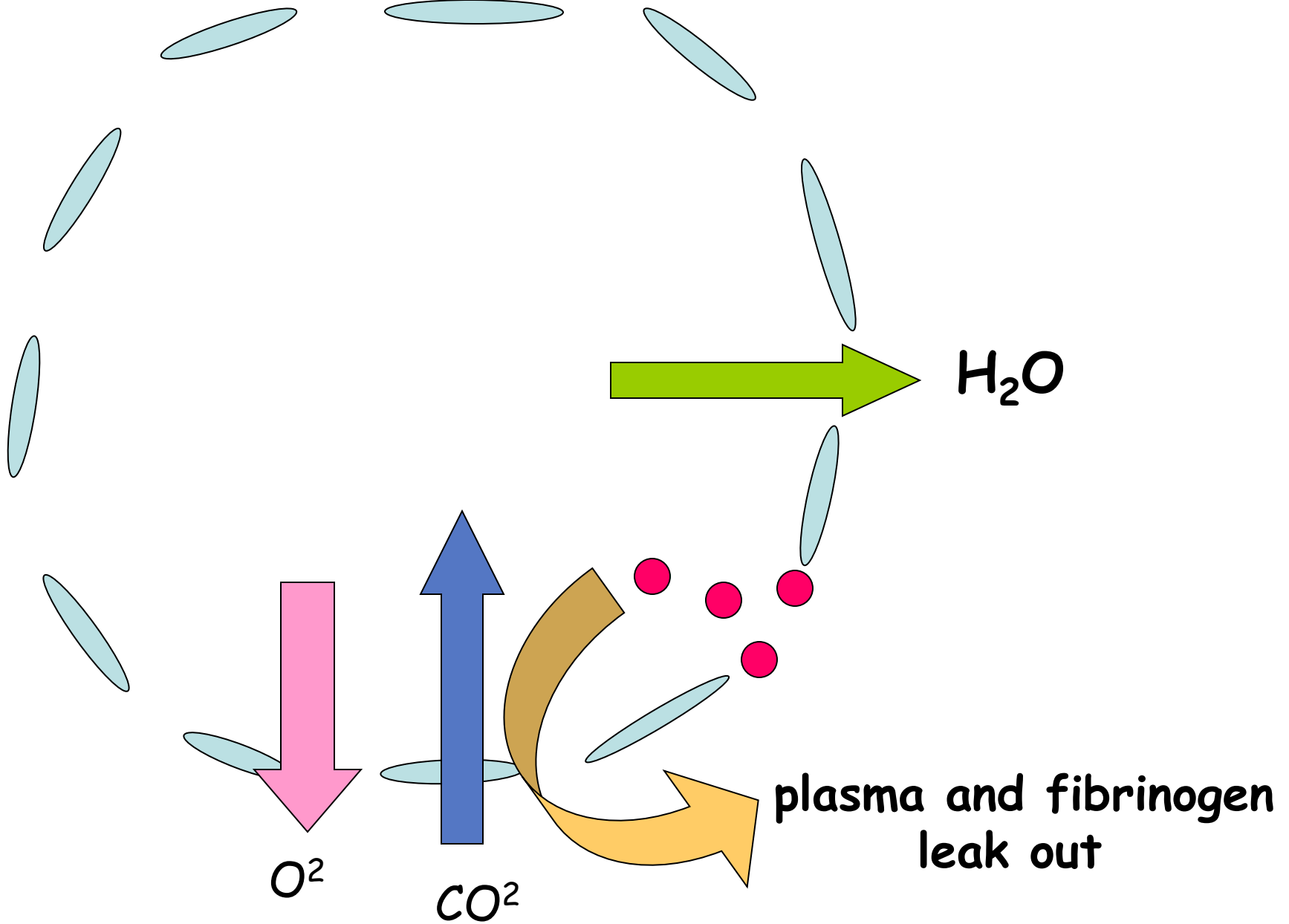
persisting hypertension enlarges the capillary bed increasingly



persisting hypertension enlarges the capillary bed increasingly

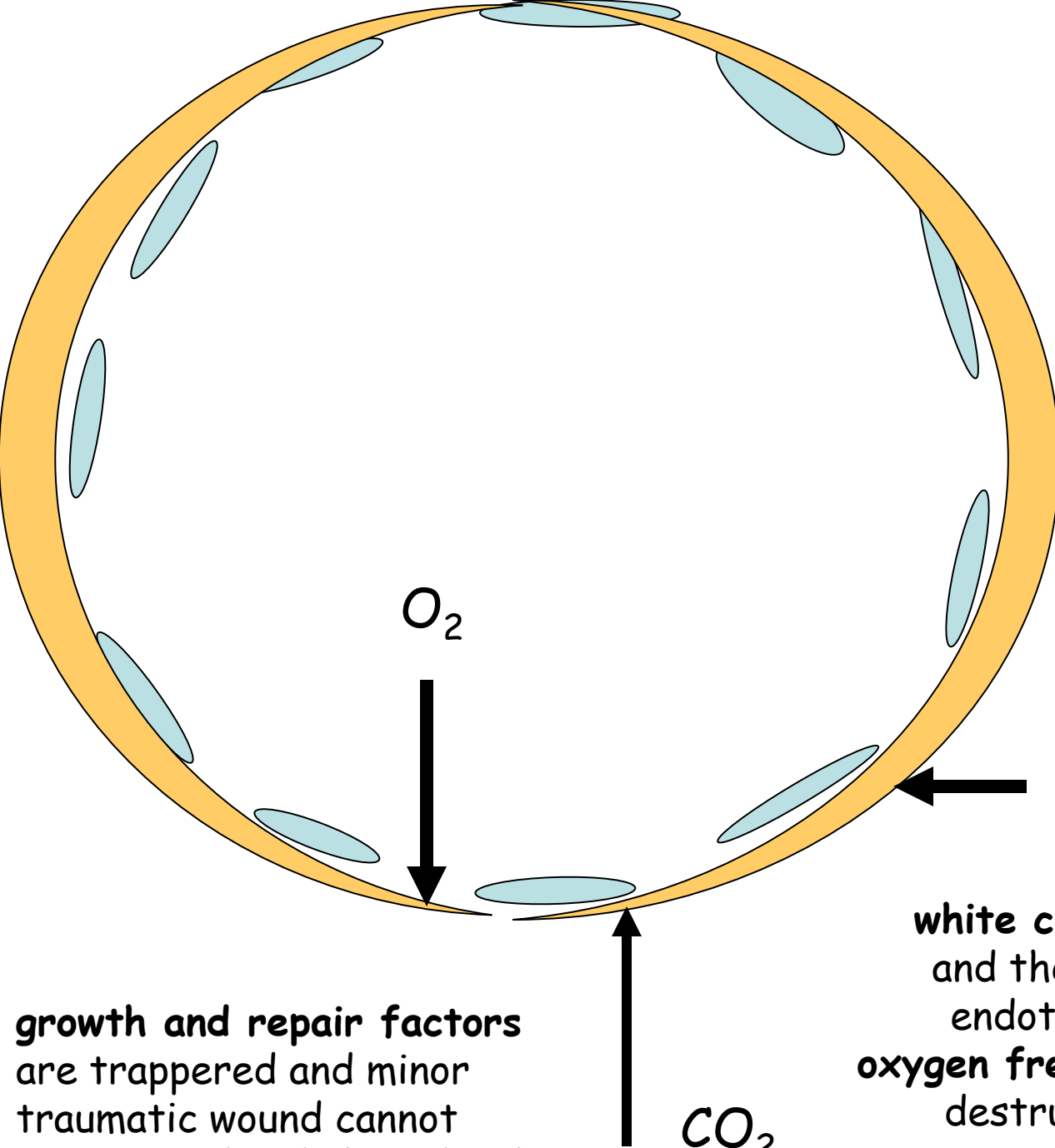


**stasis dermatitis with
pigmentation**



persisting hypertension enlarges the capillary bed increasingly

**fibrin's block
"fibrin cuff theory"**



H_2O

**white cells accumulate here
and then activated by hypoxic
endothelial cells releasing
oxygen free radicals - local tissue
destruction and ulceration**

**growth and repair factors
are trapped and minor
traumatic wound cannot
be repaired and ulcer develops**

Lipodermatosclerosis



Copyright (©) 2000 V. Falanga All rights reserved.

patients with these changes **develop lipodermatosclerosis**
they have **high serum fibrinogen** and **reduced blood fibrinolytic activity**

Venous hypertension is manifested with:



red pitting
oedema



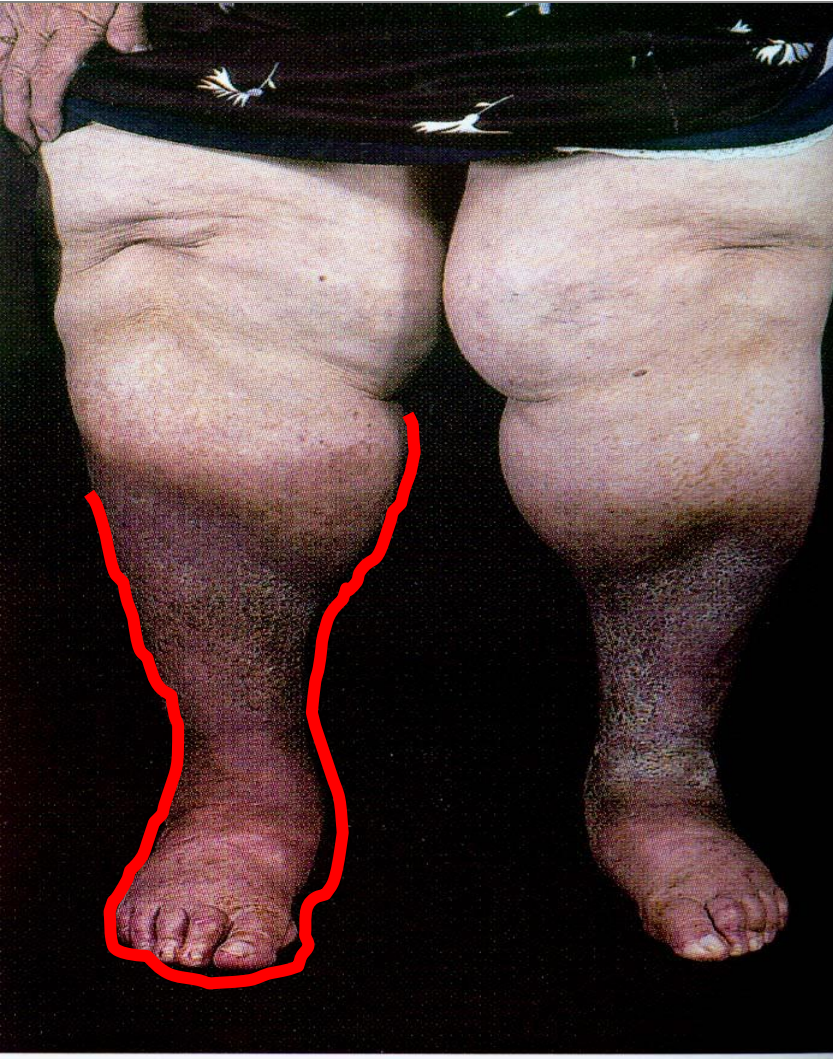
atrophie blanche



red bluish
discoloration

feeling of heaviness in the legs

prolonged lipodermatosclerosis gives the leg the look of an inverted champagne bottle





large and shallow
prominent granulation tissue

ulceration is most common near the medial malleolus

Ulcus cruris

venous	75%
--------	-----

arterial	10%
----------	-----

mixed	10%
-------	-----

venous and arterial ulcers

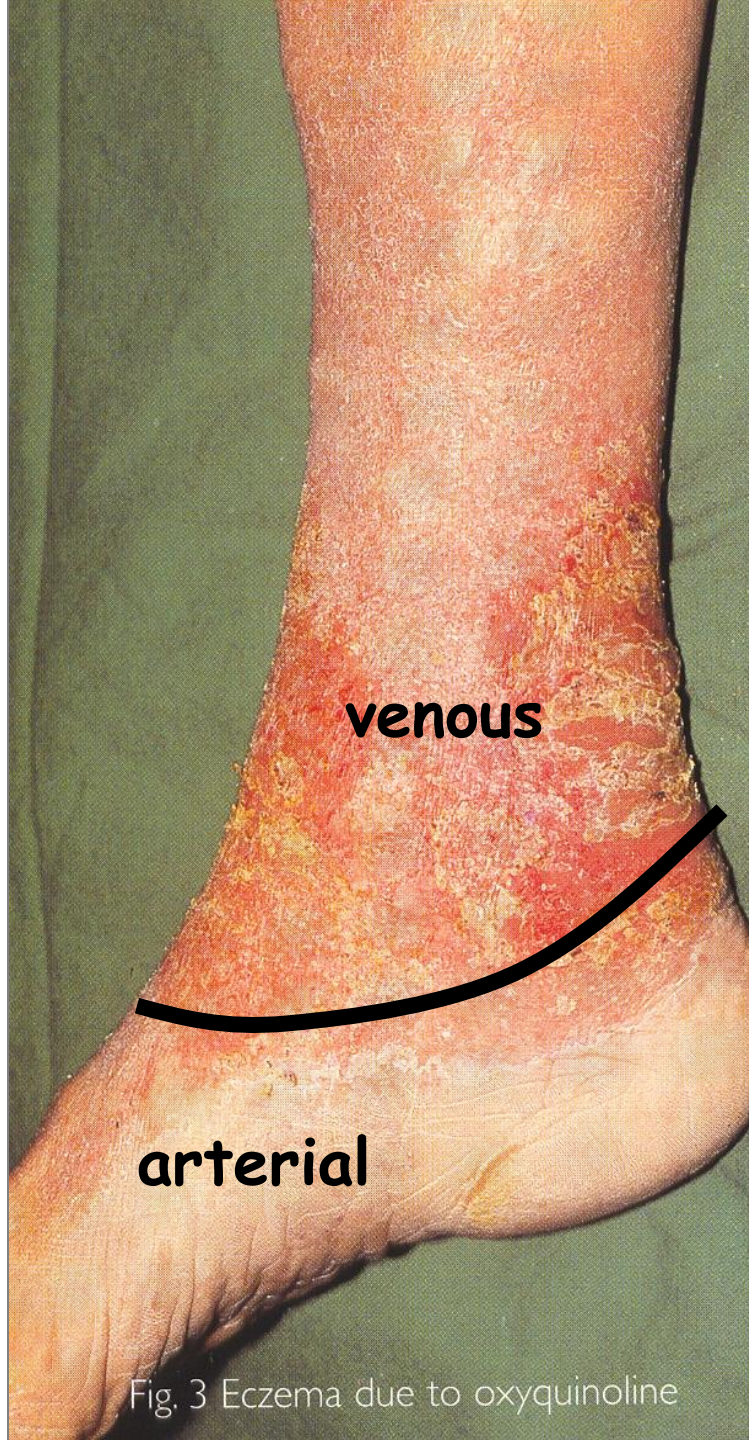
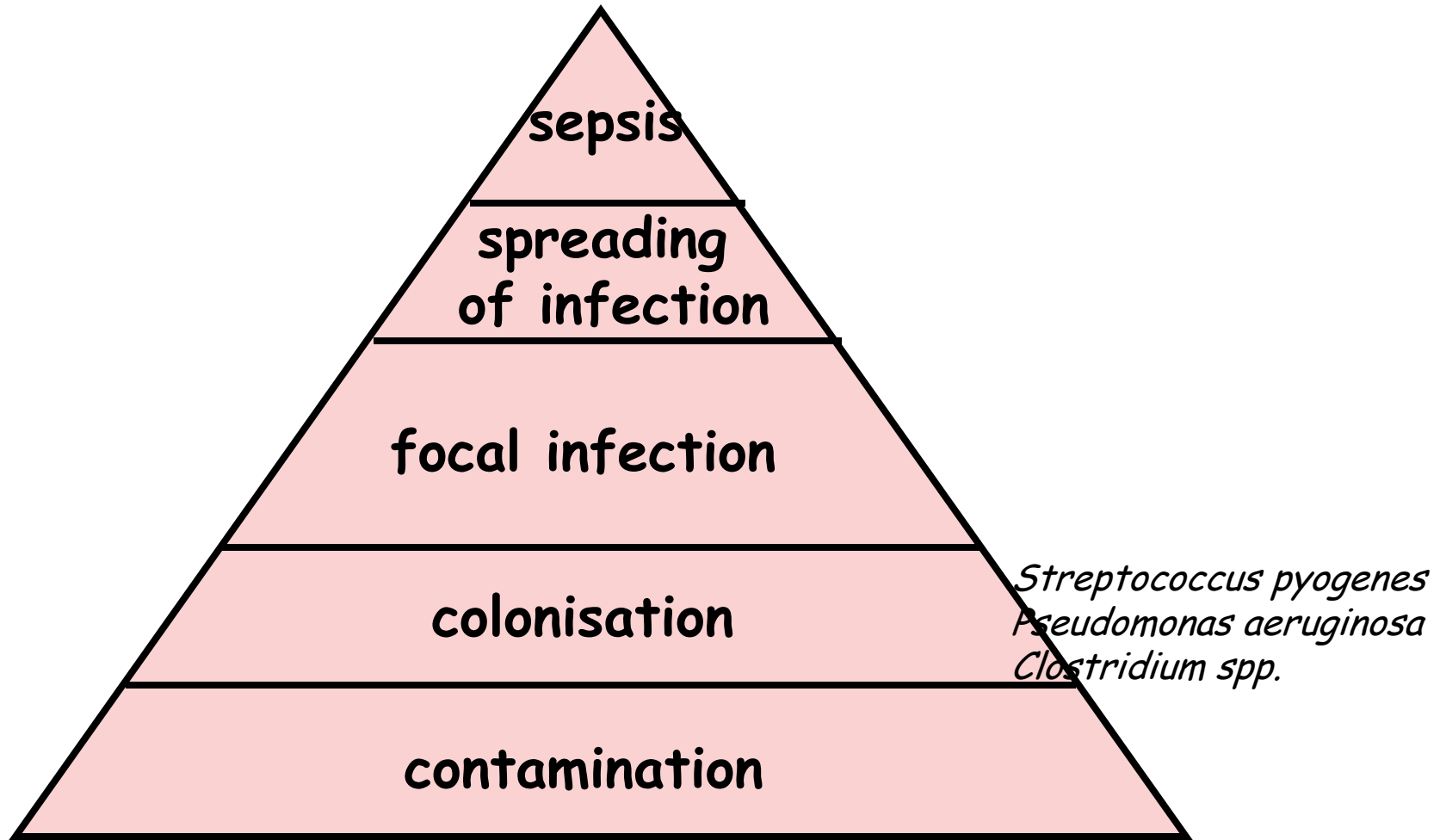


Fig. 3 Eczema due to oxyquinoline

Complications

bacterial colonisation is inevitable

(systemic antibiotic only if there is pyrexia, a purulent discharge, an increase in pain, cellulitis or septicaemia)



The most frequent are: *staphylococcus*, *pseudomonas*, *enterococcus*, *proteus*...



Complications

eczema is common around ulcers

allergic contact dermatitis (if the rash worsens, itches or fails to improve with local treatment).

lanolin, parabens (a preservative) and neomycin are the most common culprits.

Stasic dermatitis with eczema

Exudation and itch

very common- **eczematisation**

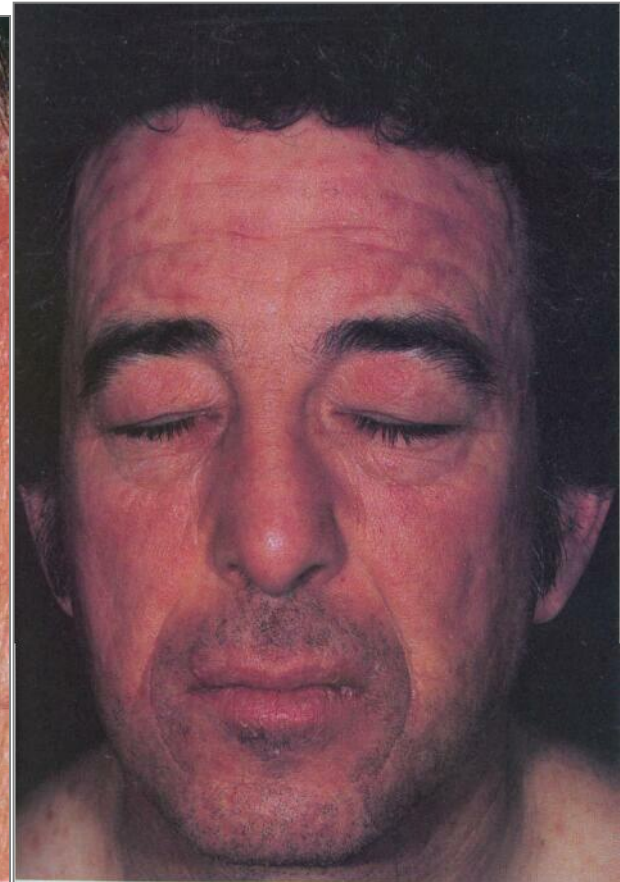
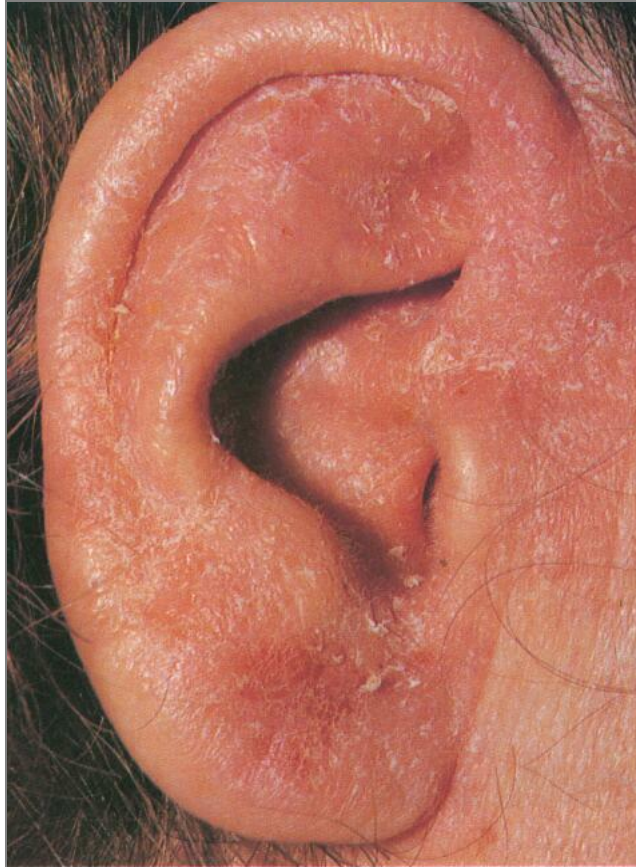
acute



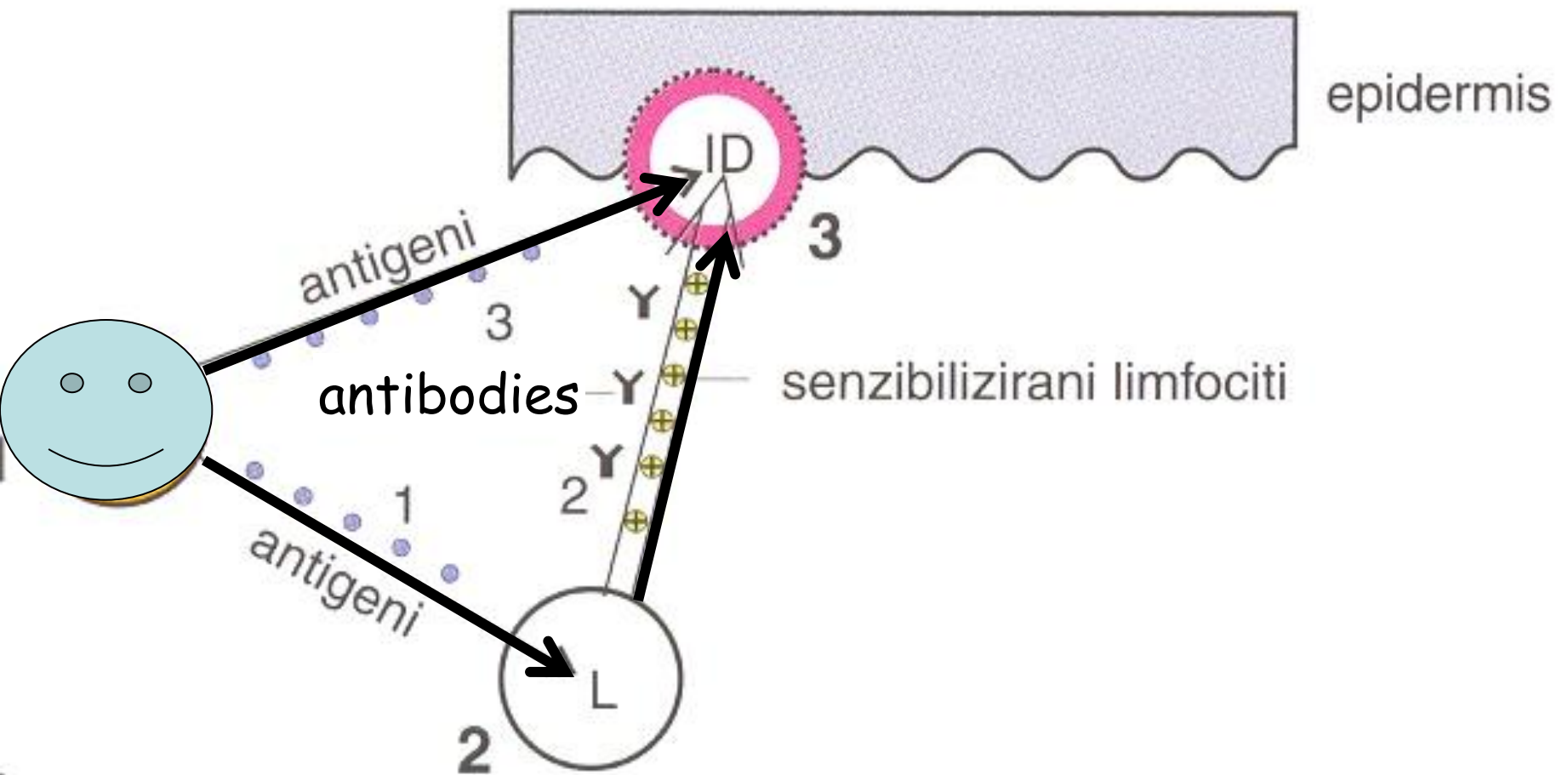
chronic



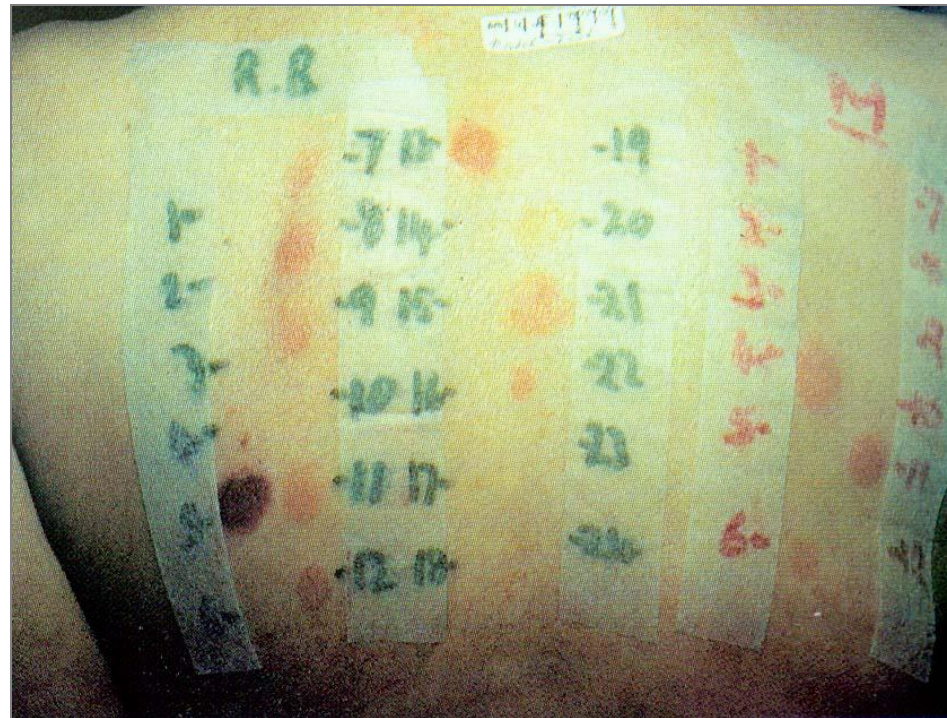
Stasic dermatitis with eczema



Autoeczematization (IV type of allergic reaction)



Autoeczematisation IV type of allergic reaction



sensibilisation to neomycine
preservatives
rubber

Treatment of stasic dermatitis:

medicament therapy

resting and leg elevation

wet dressing

corticosteroid topical treatment

antihistaminics

corticosteroid systemic

elastic bandage

moderately fast walking (40 steps/min)

Investigations

blood glucose

full blood count to detect anaemia

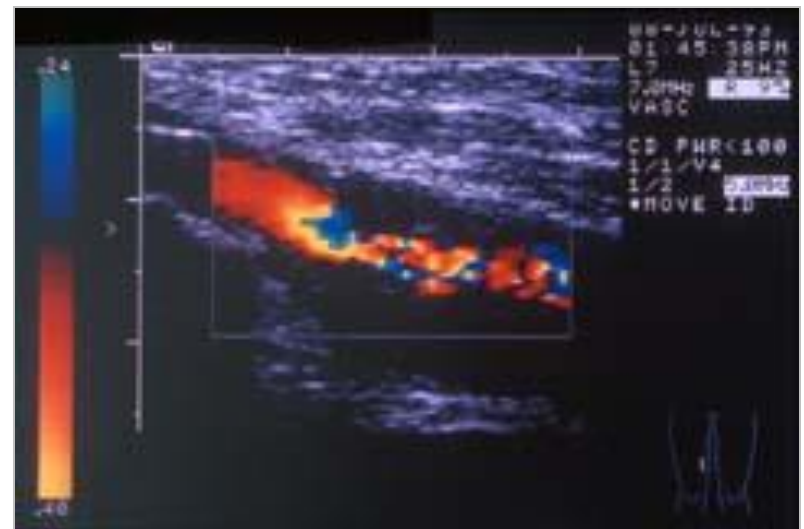
swabbing for pathogens

doppler ultrasound

cardiac evaluation for congestive failure



Color duplex scan



Treatment of venous ulcers

venous ulcer will not heal if the leg remains swollen

pressure bandages

leg elevation

bed rest

Treatment

physical measures

local therapy

oral treatment

surgery

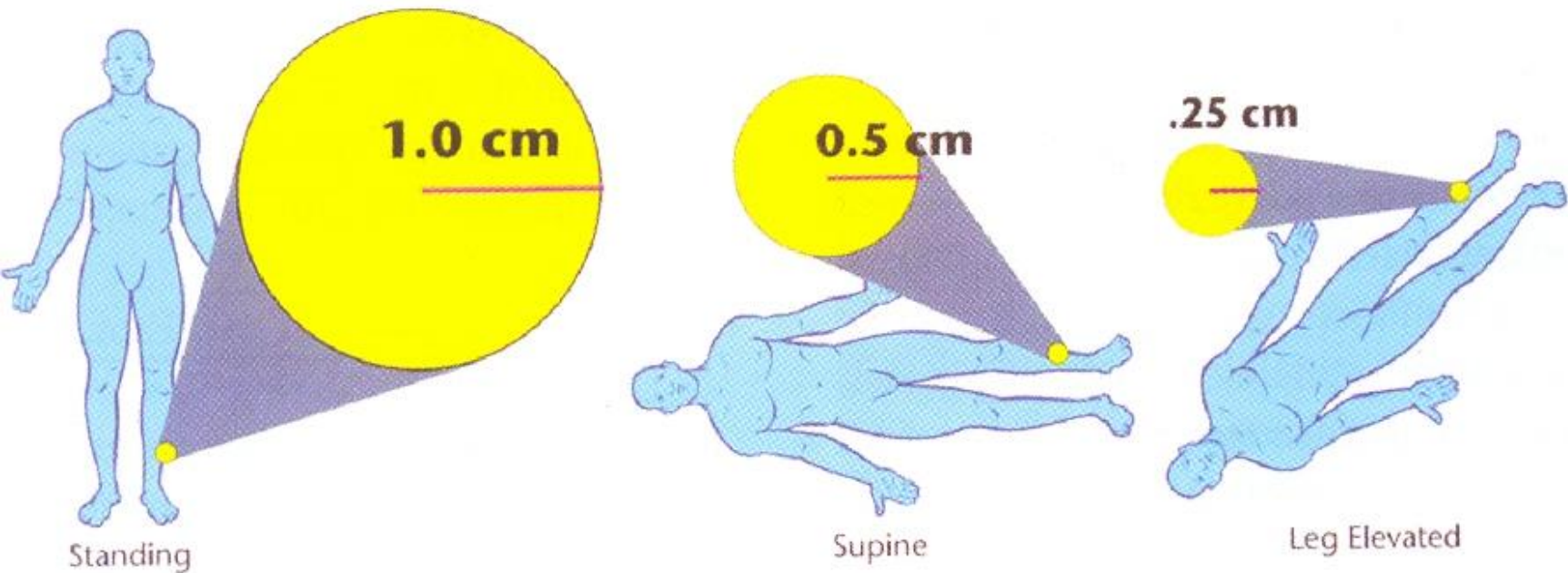
Treatment

physical measures

local therapy

oral treatment

surgery



radius of the vein at different positions of leg



aids to venous drainage

decreases oedema

raises oxygen tension

elevation of affected limb
above hips for at least
2 hours every afternoon

The foot of the bed should be raised by
at least 15 cm

15-20 mm Hg

Fig 26 A. Application of an elastic bandage outside a zinc-impregnated, cotton stocking

25-40 mm Hg

should be put on
before rising from bed

C. An elastic bandage applied above the hydrocolloid dressing. Note that the elastic bandage should start at the toe bases and end below the knee with the heel covered

B. Venous ulcer covered with hydrocolloid dressing

Elastic compression bandages

compression is graduated
the greatest is at the
ankle and least at the top
of the bandage

it reduces oedema and
aids venous return

Graduated Compression



Compression stockings

elastic stocking

- Class 1** (15-21 mm Hg)
- Class 2** (23-32 mm Hg)
- Class 3** (34-46 mm Hg)
- Class 4** (>49 mm Hg)

A-T Panty PLUS
for larger thigh circumference

Size of tight

for leg measurements

Circumference:

small

b 19-23 cm
d up to 34 cm
f up to 54 cm
g up to 60 cm
hip up to 110 cm
waist up to 80 cm

medium

b 23-26 cm
d up to 37 cm
f up to 62 cm
g up to 68 cm
hip up to 120 cm
waist up to 90 cm

large

b 26-29 cm
d up to 40 cm
f up to 70 cm
g up to 76 cm
hip up to 130 cm
waist up to 100 cm

short
Length (A-G):
up to 70 cm

long
71 cm and over

*New: 222 Premium Cotton Quality available as of October 1999

Qualities	C.Cl.	Foot sizes	Colours
202/222* cotton	2	open toe	beige 78/nature 76*
503 natural rubber	2	open toe	beige 77
701 Top Fine Quality/ synth. fibres	1	closed toe one size	navy blue 10, ascot 44, crista 66, silver 87, savanna 97, black 99
702 Top Fine Quality/ synth. fibres	2	closed toe one size	navy blue 10, ascot 44, crista 66, terra 71, silver 87, savanna 97, black 99
801 fine/synth. fibres	1	8-9 1/2/10-11 closed toe	ascot 44, crista 66, black 99, light beige 17A, smoke 31A
802 fine/synth. fibres	2	8-9 1/2/10-11 closed toe	ascot 44, crista 66, black 99, light beige 17A, smoke 31A
901 fine/synth. fibres	2	8-9 1/2/10-11 closed toe	ascot 44, crista 66, black 99, light beige 17A, smoke 31A
902 N+P fine/synth. fibres	2	8-9 1/2/10-11 closed toe	ascot 44, crista 66, black 99, light beige 17A, smoke 31A

▲ sub...

A-D/F Knee-Combi
with stockinet welt D-F

Size of stocking

for leg measurements

Circumference:

small

b 19-23 cm
d up to 34 cm

medium

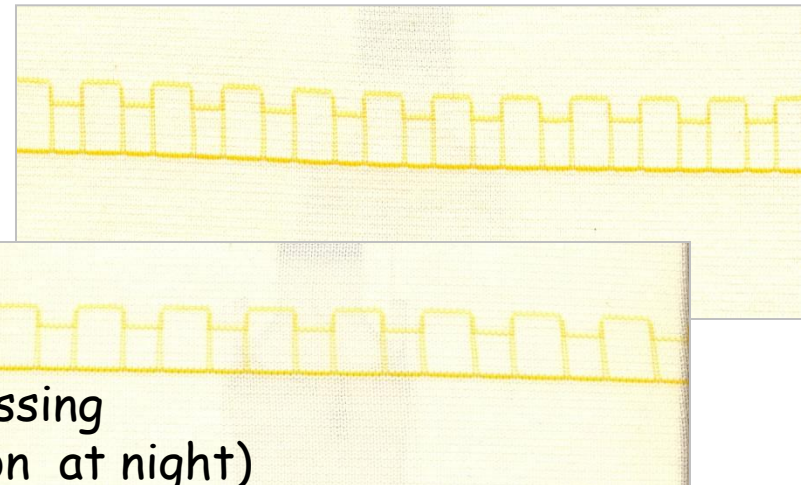
b 23-26 cm
d up to 37 cm

large

b 26-29 cm
d up to 40 cm

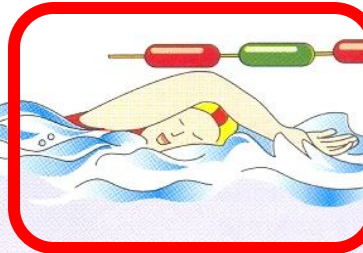
short
Length (A-D):
up to 37 cm

long
38 cm and over

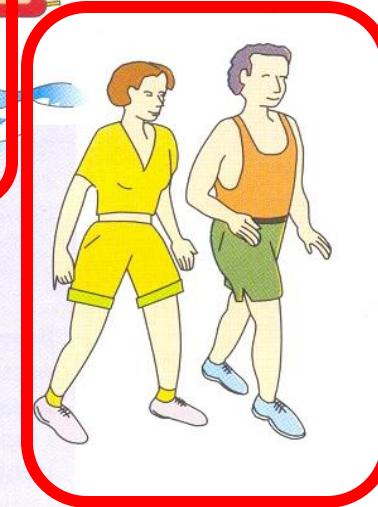


the bandages area applied over the ulcer dressing
bandages can stay on for 2-7 days (and left on at night)

walking is beneficial, not standing or sitting



**Redovito vježbajte
(šetnja, vožnja bicikla,
plivanje)!**



**Nosite cipele s petom
visine 3 do 4 cm!**

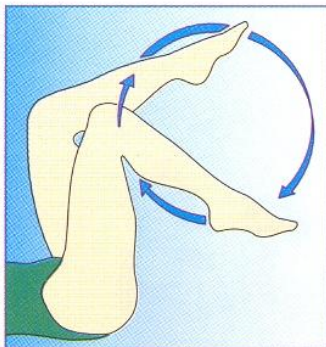


**Izbjegavajte usku odjeću
koja bi mogla utjecati
na vensku cirkulaciju!**

**Redovito odlazite
liječniku i
pridržavajte se
njegovih uputa!**

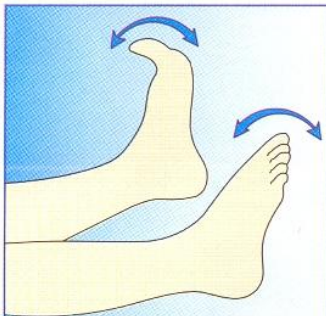


Physiotherapy

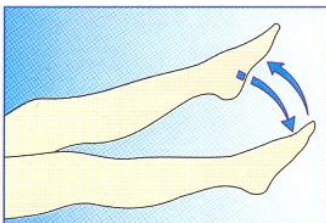


LEŽEĆI POLOŽAJ

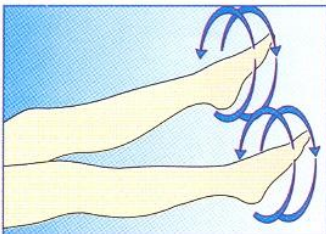
Pokreti vožnje bicikla:
nogama radite žustre pokrete (15-20 puta).



Pomjerajte nožne prste u položaju lagano podignutih i ispruženih nogu: izmjenično savijajte i opušćajte prste (do 2 puta).

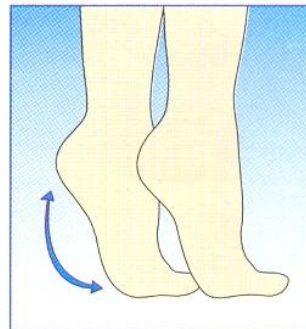


Križajte i širite noge poput škara (10 do 15 puta).

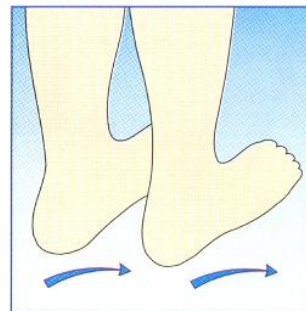


Radite svakom nogom male krugove do 10 puta.

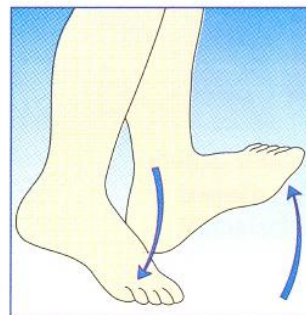
STOJEĆI POLOŽAJ



Stojte na vršcima prstiju.



Hodajte na petama.



Njišite se s pete na prste.

Diet for obese patients



Treatment

physical measures

local therapy

oral treatment

surgery

many ulcers will heal without treatment

local therapy should be chosen to:

- maintain moist environment
- absorb excess exudates
- reduce pain
- control the odour
- protect the surrounding skin
- remove surface debris
- promote reepithelization
- make optimal use of nursing time

this is achieved by



P R O T O K O L



* ZA INFILTRIRANE RANE
primljeni AQUACEL

STADIJ RANE

NEKROZE



FIBRINSKE naslage



GRANULACIJE



EPITELIZACIJE



SLABA

SREDNJA

JAČA

JAKA

EKSUDACIJA

corrosive effect
lot of MMP
destroyed GF
leukocytes

Chronic ulcer in tissue and exudate:

↑ proteases
MMP

↓ GF







P R O T O K O L



* ZA INFICIRANE RANE
primijeniti AQUACEL Ag

EKSUDACIJA

stage of ulcer

	SLABA	SREDNJA	JAČA	JAKA
NEKROZE 	Granugel + Granuflex ^{III} Granuflex Extra Thin	Granugel + KALTOSTAT ^{III} Granuflex Bordered ^{III} CombiDERM	Granugel i KALTOSTAT + CombiDERM ^{III} CarboFlex	Granugel i AQUACEL * + CombiDERM ^{III} CarboFlex
FIBRINSKE naslage 	Granugel ^{III} Granuflex Pasta + Granuflex ^{III} Granuflex Extra Thin	Granugel ^{III} Granuflex Pasta + KALTOSTAT ^{III} CombiDERM	Granugel i KALTOSTAT + CombiDERM ^{III} CarboFlex	Granugel i AQUACEL * + CombiDERM ^{III} CarboFlex
GRANULACIJE 	Granuflex Pasta + Granuflex ^{III} Granuflex Extra Thin	Granugel + KALTOSTAT ^{III} CombiDERM	KALTOSTAT + CombiDERM	AQUACEL * + CombiDERM
EPITELIZACIJE 	Granuflex Extra Thin	Granuflex	Granuflex Bordered ^{III} CombiDERM	CombiDERM







P R O T O K O L



* ZA INFICIRANE RANE
primljeniti AQUACEL Ag

EKSUDACIJA

stage of ulcer

	SLABA	SREDNJA	JAČA	JAKA
NEKROZE 	Granugel + Granuflex <i>iii</i> Granuflex Extra Thin	Granugel + KALTOSTAT <i>iii</i> Granuflex Bordered <i>iii</i> CombiDERM	Granugel i KALTOSTAT + CombiDERM <i>iii</i> CarboFlex	Granugel i AQUACEL * + CombiDERM <i>iii</i> CarboFlex
FIBRINSKE naslage 	Granugel <i>iii</i> Granuflex Pasta + Granuflex <i>iii</i> Granuflex Extra Thin	Granugel <i>iii</i> Granuflex Pasta + KALTOSTAT <i>iii</i> CombiDERM	Granugel i KALTOSTAT + CombiDERM <i>iii</i> CarboFlex	Granugel i AQUACEL * + CombiDERM <i>iii</i> CarboFlex
GRANULACIJE 	Granuflex Pasta + Granuflex <i>iii</i> Granuflex Extra Thin	Granugel + KALTOSTAT <i>iii</i> CombiDERM	KALTOSTAT + CombiDERM	AQUACEL * + CombiDERM
EPITELIZACIJE 	Granuflex Extra Thin	Granuflex	Granuflex Bordered <i>iii</i> CombiDERM	CombiDERM

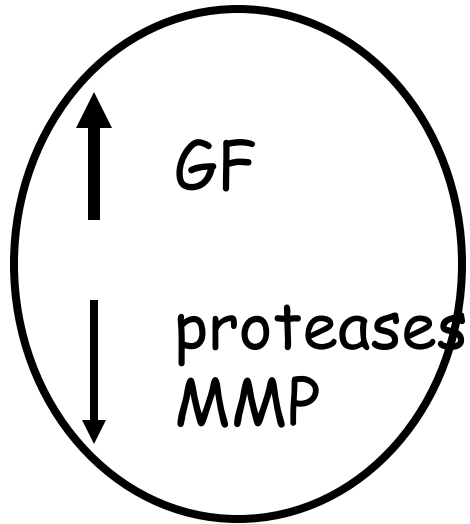
weak exudation

mild

much more

strong

Chronic ulcer in tissue and exudate:



**starts
re-epithelization**



necrectomy with local anaesthesia

Fig 19 A. Venous ulcer before debridement

B. Application of the anaesthetic EMLA 5% sterile cream

C. The ulcer covered by EMLA

D. EMLA covered with occlusive dressing
(Saran wrap) for 30 minutes

30-45'

E. Removal of EMLA

F. The ulcer after debridement

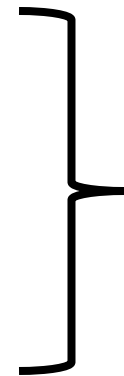
Infected ulcers

useful preparations include:

0,25% acetic acid

0,5% silver nitrate

potassium permanganate



applied as
compresses

**surrounding eczematous skin
treat with weak or moderate strength
local corticosteroid creams**



Treatment

physical measures

local therapy

oral treatment

surgery

Oral treatment

diuretics will combat the oedema of cardiac failure

analgesics especially when dressing is changed

antibiotics only for spreading infections

ferrous sulphate and folic acid for anaemia

zinc sulphate may promote healing (if the plasma Zn is low)

pentoxifylline is fibrinolytic, decreases blood viscosity

Treatment

physical measures

local therapy

oral treatment

surgery

autologous pinch

mesh grafts....

**the cause of the ulcer and slow healing
is an inadequate blood supply**

**local surgery will not be successful if the skin
continues to be deprived of essential nutrients**

Deep vein thrombosis

Some causes of deep vein thrombosis

abnormalities of the vein wall (trauma, infection, chemicals)

abnormalities of the blood flow (stasis, impaired v. return)

abnormalities of clotting (increased or sticky platelets,
decreased fibrinolysis,

unknown mechanisms (malignancy, smking, Behcet sy,
inflammatory bowel disease)

Trombophlebitis



thrombosis of the inflamed
superficial vein

red and feel like tender cord

leg may be diffusely inflamed

fever, leukocytosis, elevated
sedimentation rate

never break away of embolus

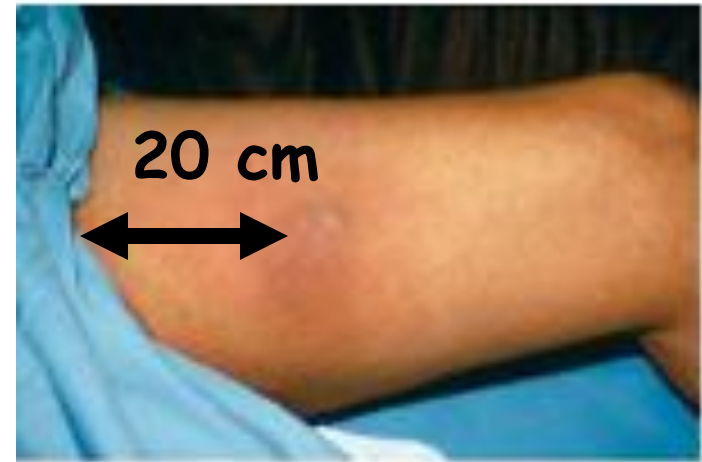
Trombophlebitis

erythema and soreness

in 10-20% associated with deep vein thrombosis
(in 4% with pulmonary embolus)



Trombophlebitis



be careful because of
the possible spread
in the deep venous system

Treatment

popliteal thrombophlebitis - elastic stocking
- gels with heparin
- NSAIDs
- walking

thigh thrombophlebitis - near the confluence with
the deep system/20 cm/ - treat as phlebothrombosis

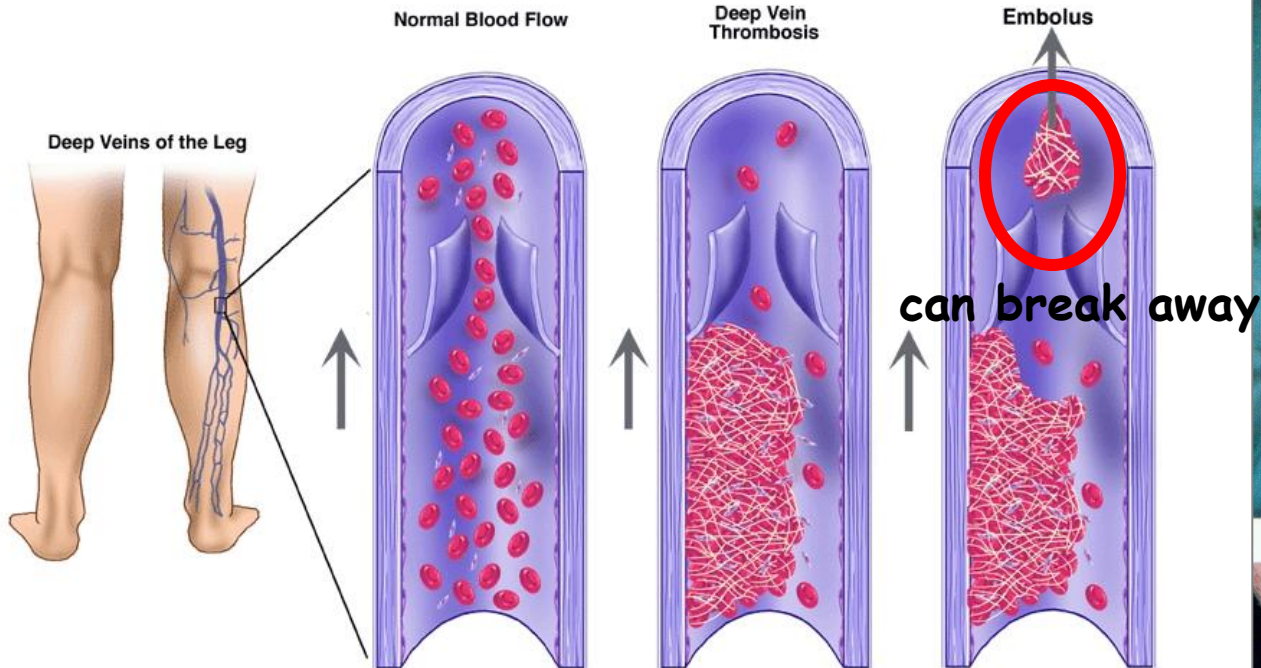
Migratory thrombophlebitis



should arouse suspicion of an underlying
malignancy or **pancreatic disease**

Deep vein thrombosis

Deep Vein Thrombosis (DVT)



the onset may be silent or heralded by pain in the calf (about 10 days after immobilisation, or long aeroplane flight, parturition or an infection)

Blood flow
to the heart
and lungs



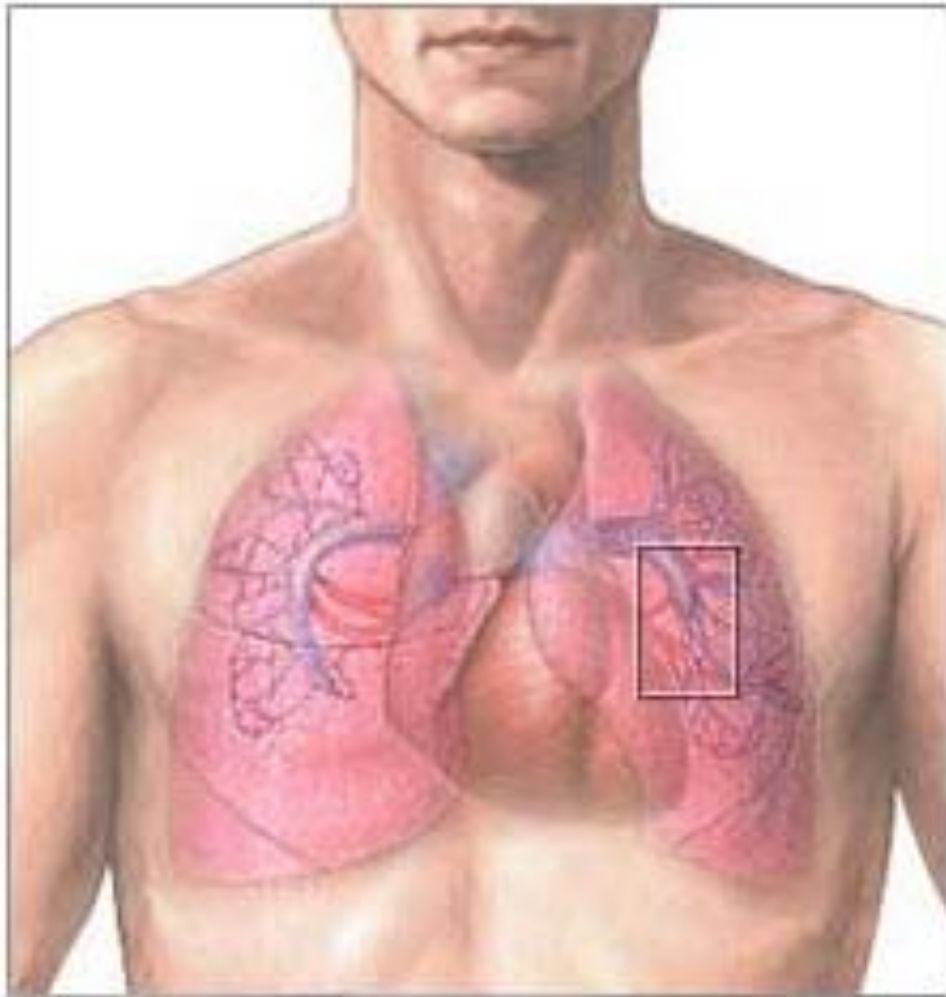
Normal leg

Venous
clot



Swelling and
inflammation
below the
blockage site

DVT



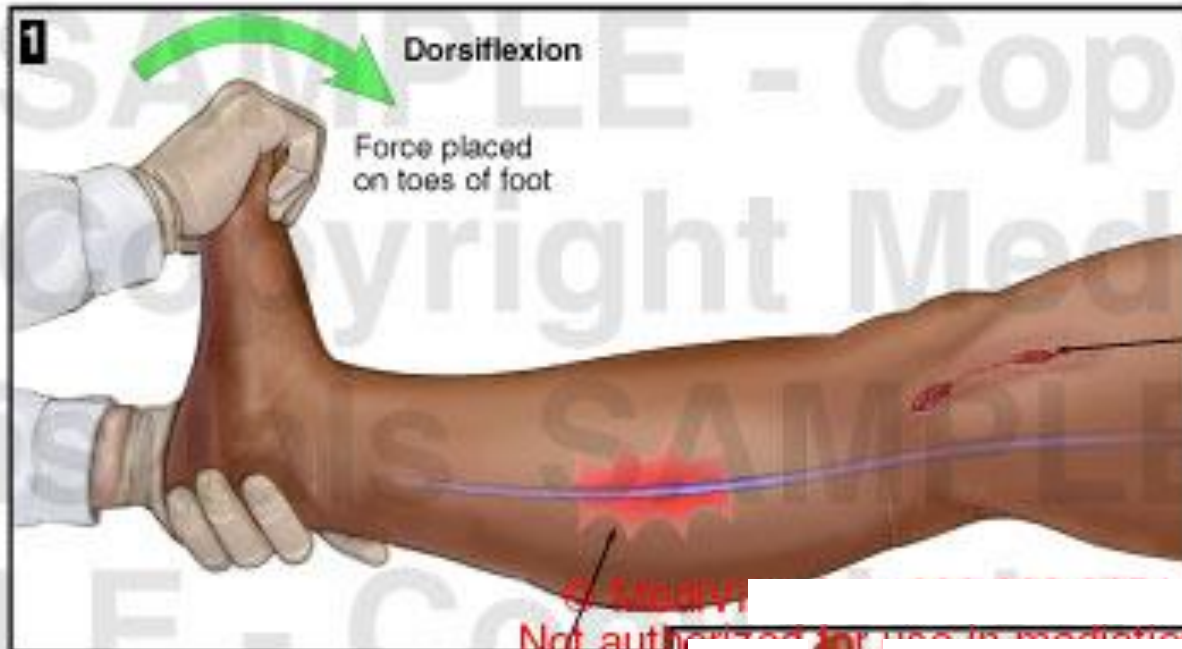
Embolus lodged
in left pulmonary
artery

pumonary embolus can be the first sign of a silent
deep vein thrombosis



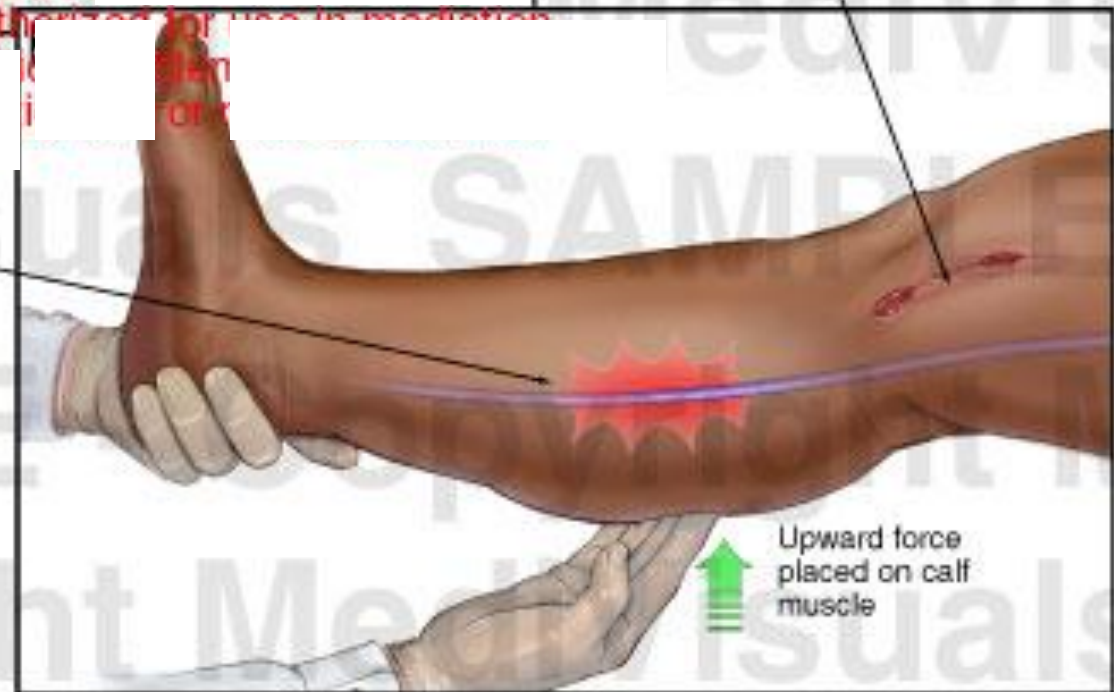
Homan's sign

painful if the foot is
dorsiflexed (in 50%)



Test for Homans' Sign

Pain elicited from the two maneuvers indicates deep vein thrombosis.



Investigations

history and physical examination

doppler ultrasonography - detection of thrombi in large veins

venography

Investigation

history and clinical examination
doppler ultrasonography

Treatment

rest

anticoagulation with heparin and later with coumarine

prevention is important

early postoperative mobilisation and leg exercises

elastic stocking

a mini-aspirin taken before a long flight, elastic stocking

Disorders of lymphatics

Lymphoedema



the skin overlying chronic lymphoedema is firm and pits poorly

long-standing may lead to hyperkeratosis "mossy foot"

Cause of lymphoedema

recurrent lymphangitis (due to infections)

lymphatic obstruction (due to infestations and infections)

lymphatic destruction (surgery, radiotherapy)

functional (venous stasis)

uncertain aetiology (rosacea)

Treatment of lymphoedema

complete decongestive therapy

multilayer compression bandaging

manual lymphatic drainage

prevention of infections

Lymphangitis



infection of lymphatics
may occur without any
lymphoedema

a tender red line extends
proximally

Treatment:

penicillin
flucloxacillin
cephalexin

The End

