

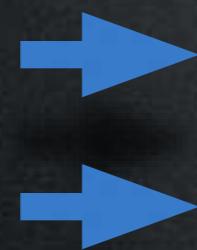
# Tromboembolismul pulmonar

Dr.M.Păpurică

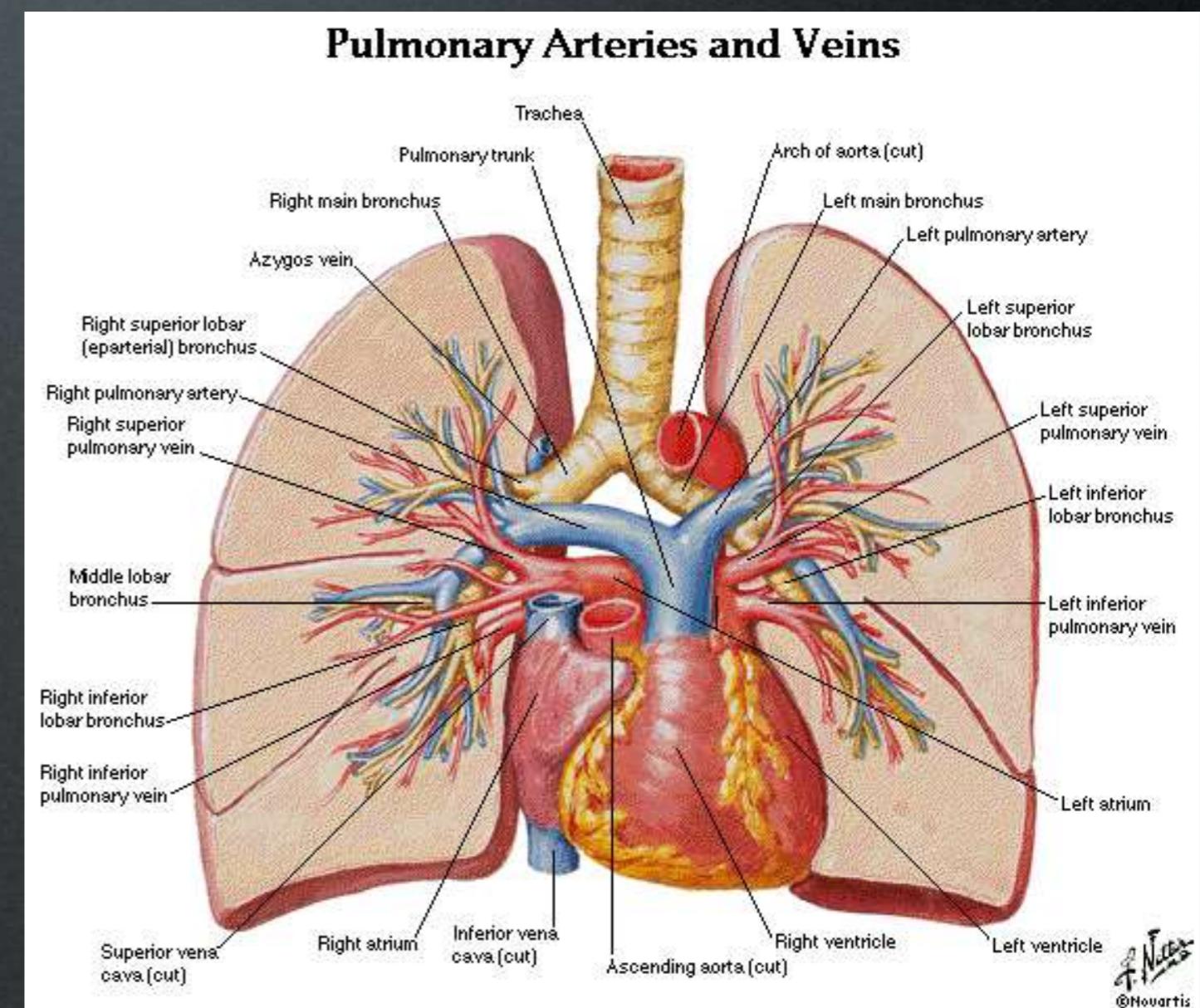


# Obturarea lumenului arterelor pulmonare

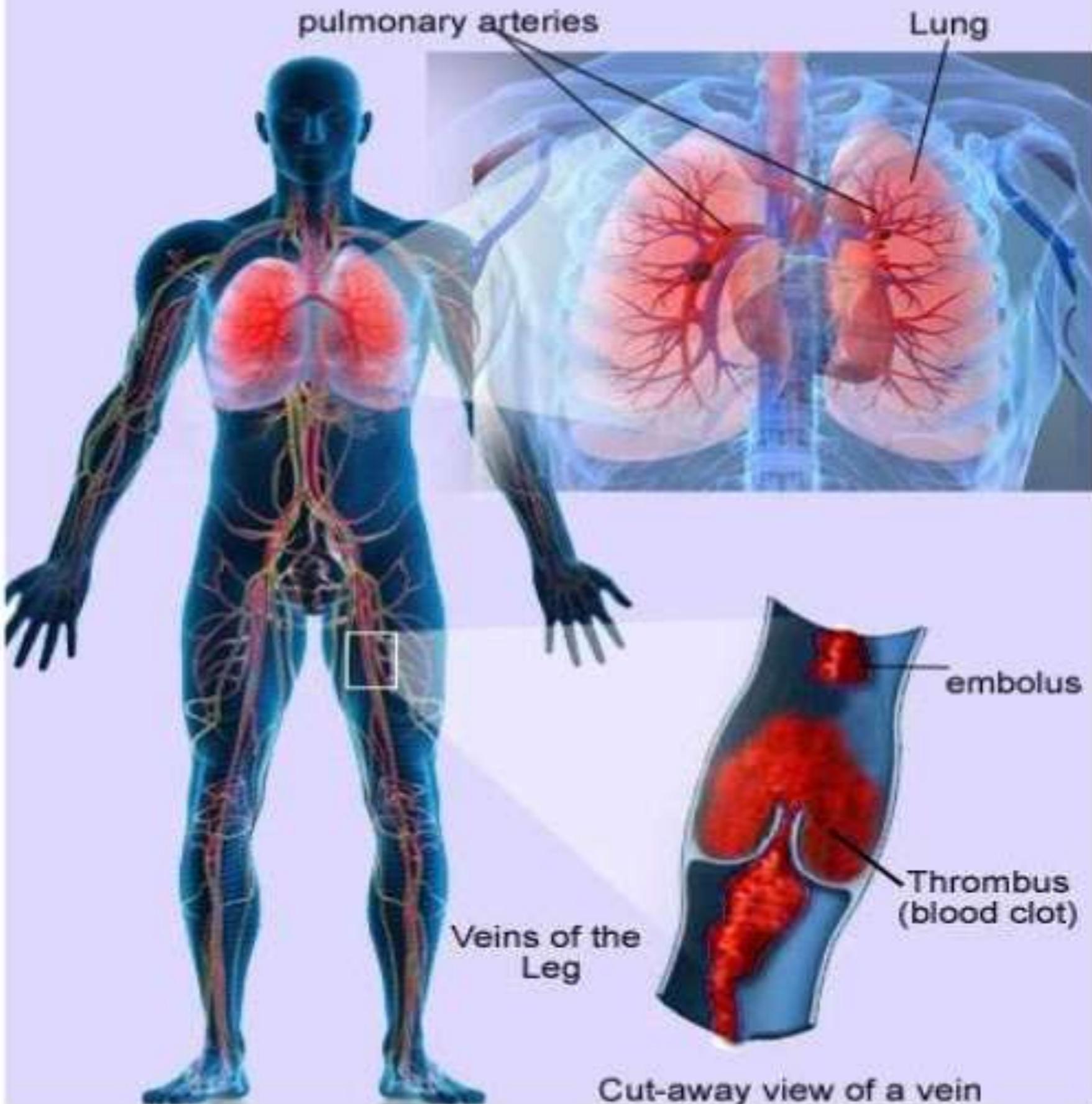
- cu un tromb  
- cu un embol



T.E.P.  
E.P.



## Pulmonary Embolism and Deep Vein Thrombosis / Venous Thromboembolism



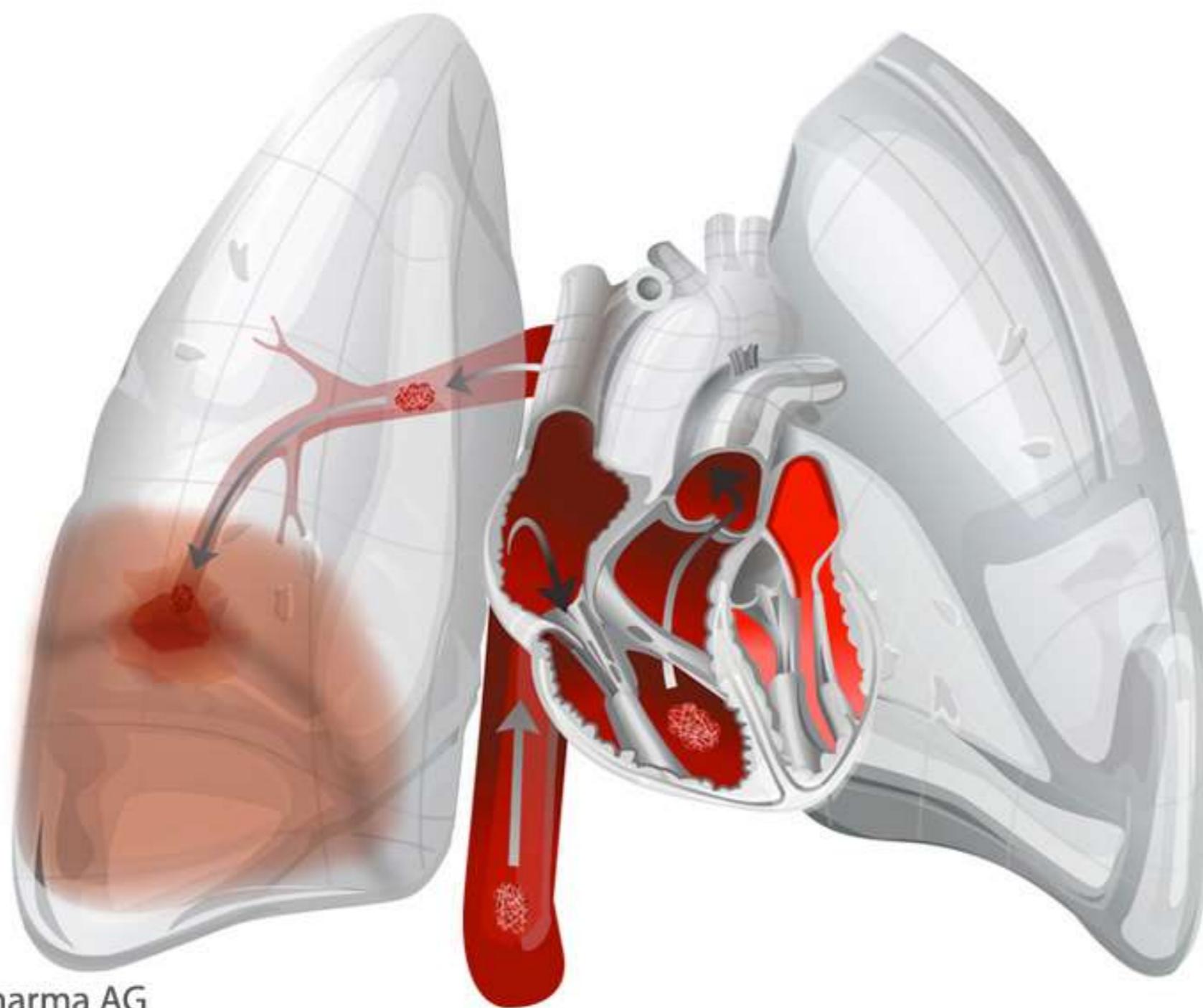
# E.P nontrombotica - material biologic

Tip embol	Mecanism fiziopatologic	Istoric aparitie
<b>Lichid amniotic, elem. trofoblastice</b>	Obstructie mecanica cu celule fetale/lanugo/meconium, apoi rc.inflamatorie, vasospasm, CID, reducerea fluxului coronar prin metab.ac.arahidonic	In cursul sau dupa nastere
<b>Tesut osos, fragm.tisulare</b>	Obstructie mecanica	Trauma grava, transplant de maduva osoasa
<b>Emboli grasosi</b>	Obstructie mecanica cu cellule grasoase,apoi rc.inflamatorie la acizii grasi	Dupa fractura sau trauma de parti moi
<b>Embolie hidatica</b>	Obstructie mecanica cu chiste hidatice	Echinococoza cardiaca sau hepatica
<b>Emboli septici</b>	Obstructie mecanica cu trombi ce contin microorganisme, apoi rc.inflamatorie	Infectii de obice cu sediu extrapulmonar
<b>Emboli tumorali</b>	Obstructie mecanica progresiva cu celule tumorale	Pacienti oncologici

# E.P nontrombotica - material non-biologic

Tip embol	Mecanism fiziopatologic	Istoric aparitie
Ciment medical	Obstructie mecanica cu polymethyl-metacrilat	vertebroplastii, proteze ortopedice cimentate
<b>Embolia gazoasa</b>	Obstructie mecanica cu cantitati mari de gaze (aer)	Iatrogenie, scufundari, accidente, trauma
Material uleioase sau adezive	Obstructie mecanica cu uleiuriiodate, n-butyl-2-cyanoacrylat si glutaraldehida	Utilizare de adezivi vasculari, limfografie, chemoembolizare
Mercur	Obstructie mecanica cu mercur metalic	Injectare iv de mercur
Markeri radiologici	Obstructie mecanica cu granulemicroscopice de markeri radiologici	Examinari radiologice
Silicon	Obstructie mecanica si rc.inflamatorie la injectare subcutanata de silicon (polydimethylsiloxane)	Interventii reconstructive sau estetice
Talc, ac.hialuronic	Obstructie mecanica dat de aditivi insolubili	Suicid, iatrogenie

# E.P este o complicație\* !!!!!



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[www.thrombosisadviser.com](http://www.thrombosisadviser.com)

# Amploarea fenomenului

- **Incidenta in SUA - de 1/1000 de persoane<sup>2</sup>**
- **In Europa incidenta - 0,8-1/1000 de persoane<sup>6</sup>**
- **a treia cauza de deces a pacientilor internati in spital<sup>3,4</sup>**
- **Aprox. 60% din autopsiile efectuate pacientilor *decedati in spital* releva prezenta embolilor in arterele pulmonare<sup>6</sup>**
- **15% din decesele postoperatorii sunt puse pe seama EP<sup>5</sup>**

2. Horlander KT, Mannino DM, Leeper KV. Pulmonary embolism mortality in the United States, 1979-1998: an analysis using multiple-cause mortality data. *Arch Intern Med.* Jul 28 2003;163(14):1711-7.

3. DeMonaco NA, Dang Q, Kapoor WN, Ragni MV. Pulmonary embolism incidence is increasing with use of spiral computed tomography. *Am J Med.* Jul 2008;121(7):611-7.

4. Burge AJ, Freeman KD, Klapper PJ, Haramati LB. Increased diagnosis of pulmonary embolism without a corresponding decline in mortality during the CT era. *Clin Radiol.* Apr 2008;63(4):381-6.

5. Tapson VF. Acute pulmonary embolism. *N Engl J Med.* Mar 6 2008;358(10):1037-52.

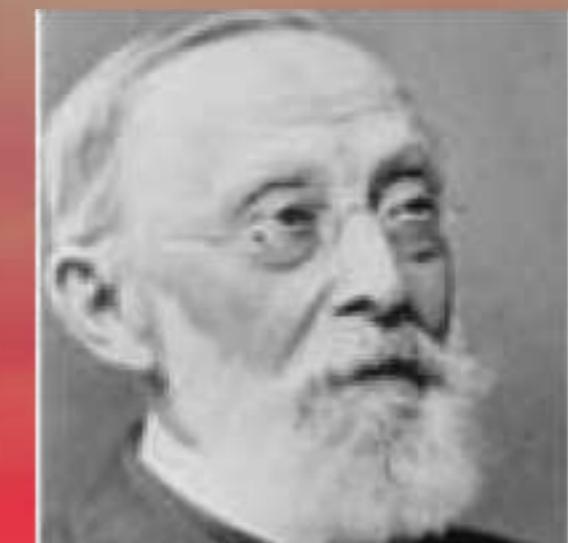
6. Heit JA. The epidemiology of venous thromboembolism in the community. *Arterioscler Thromb Vasc Biol.* Mar 2008;28(3):370-2.

# Amploarea fenomenului

- Barbati
  - Americani
  - pacienti varstnici
- 
- Femei
  - Africani
  - Tineri

Horlander KT, Mannino DM, Leeper KV. Pulmonary embolism mortality in the United States, 1979-1998: an analysis using multiple-cause mortality data. *Arch Intern Med.* Jul 28 2003;163(14):1711-7.

# Trombogeneza



# Trombogeneza

## Endothelial injury

Trauma or surgery  
Venipuncture  
Heart valve disease or replacement  
Chemical irrigation eg. iv kcl  
Atherosclerosis  
Acute MI  
Indwelling catheters

## Hypercoagulability

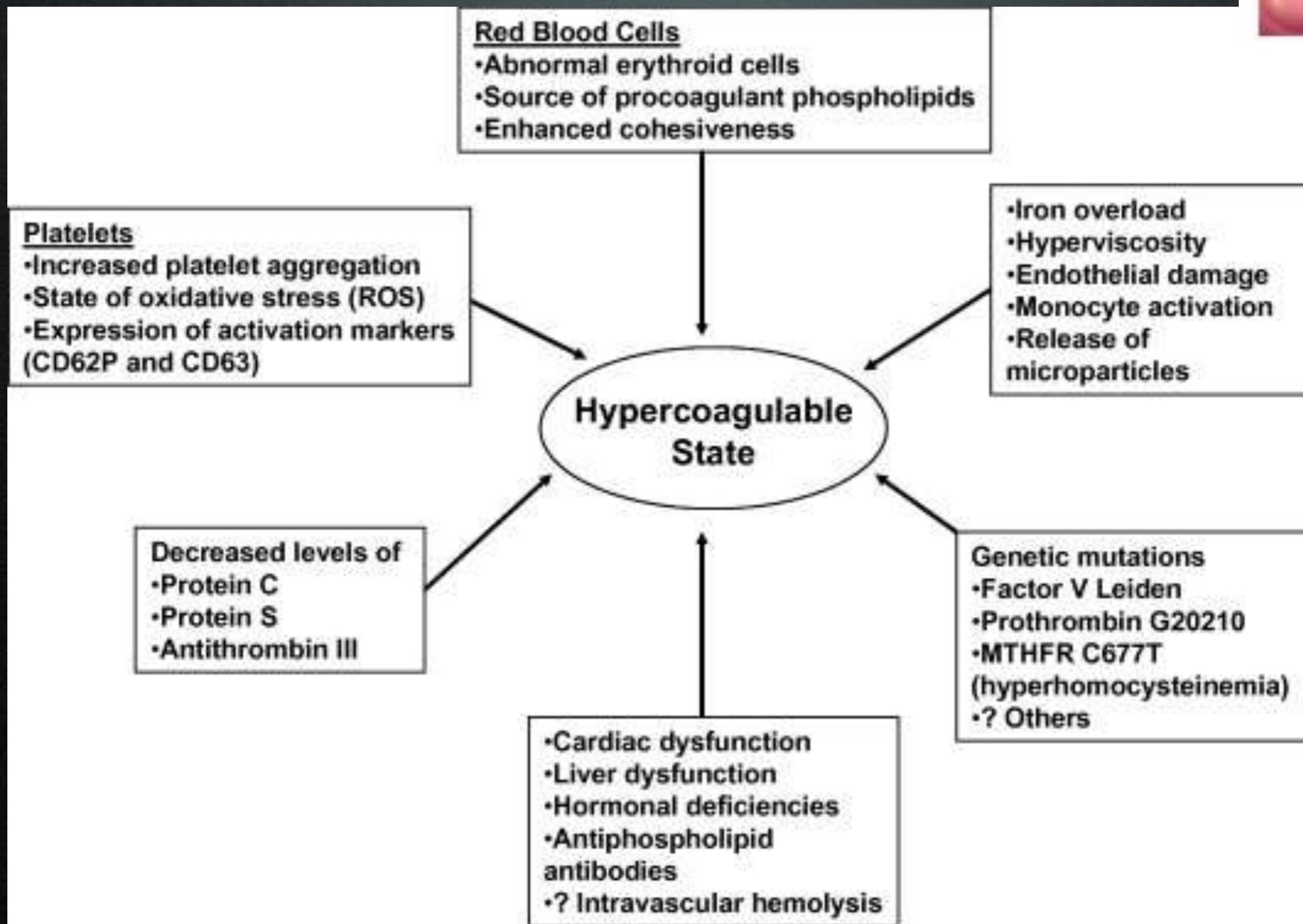
Malignancy, pregnancy  
Trauma or surgery  
Oestrogen therapy  
Inflammatory bowel disease  
Sepsis, nephrotic syndrome  
Protien C & S deficiency

## Circulatory stasis

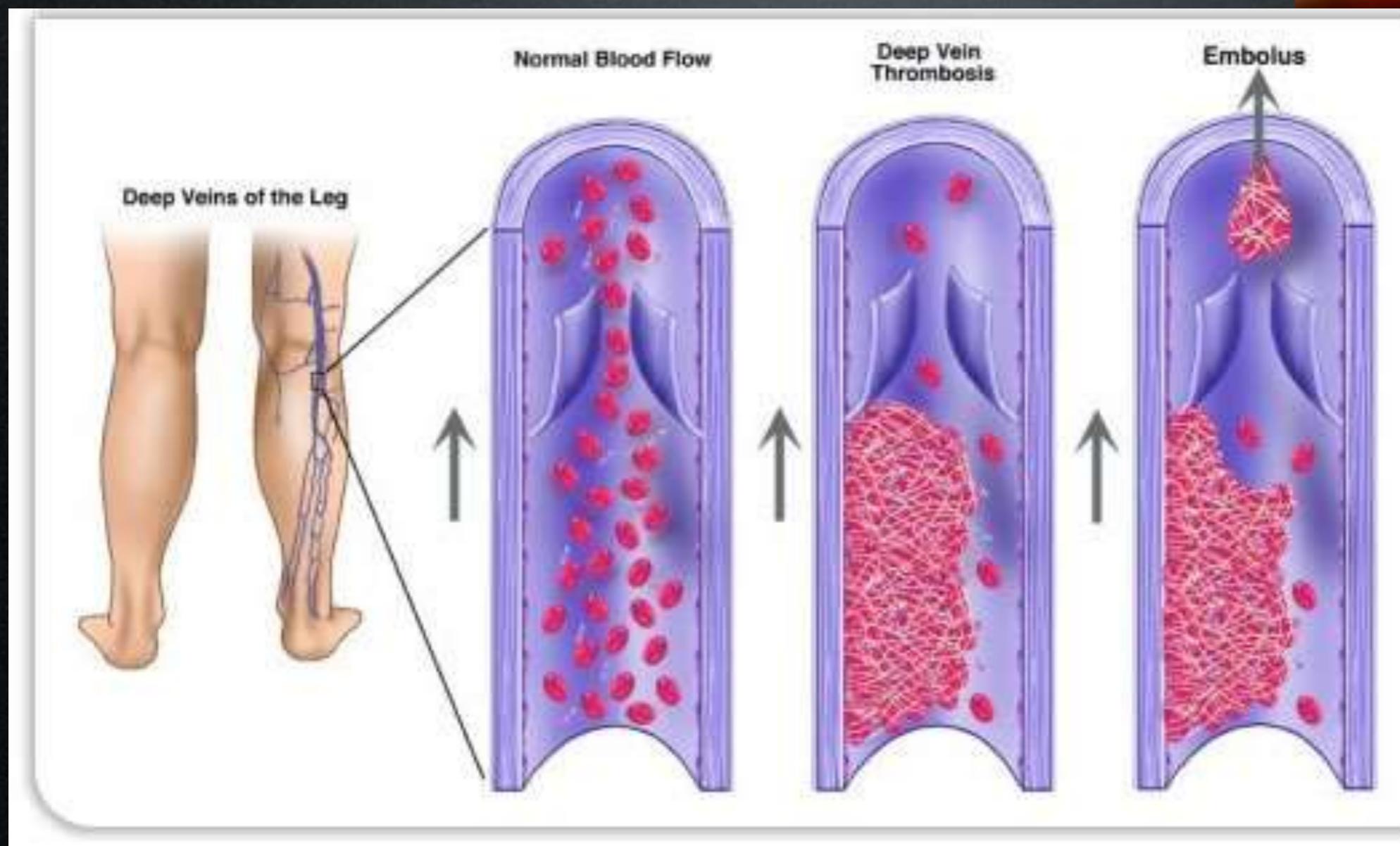
Atrial fibrillation, LVF  
Immobility like e.g. CVA  
Trauma or surgery  
Long haul flights  
Venous insufficiency or varicose veins  
Venous obstruction e.g. pelvic tumours

DVT

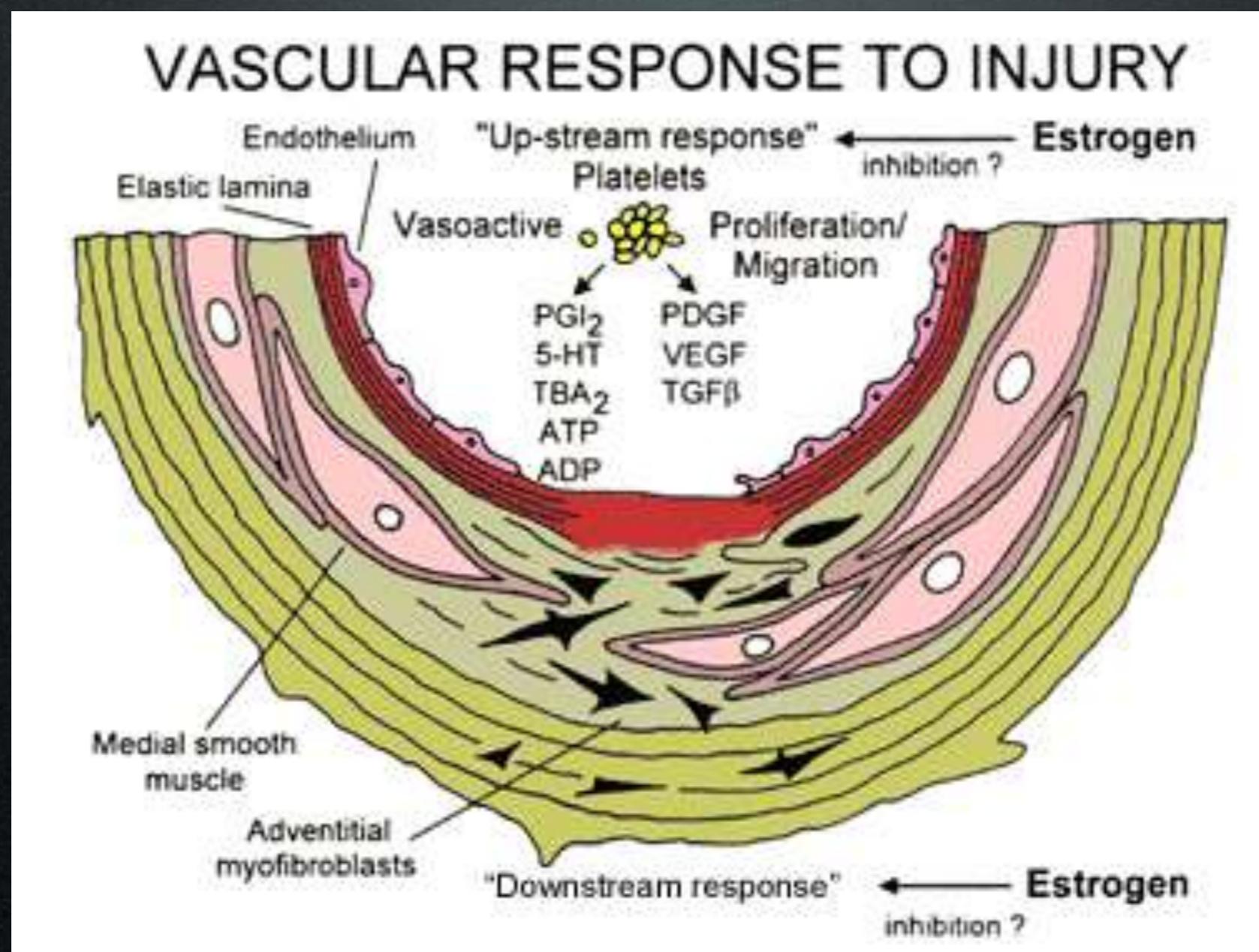
# Statusul hipercoagulabil



# Staza vasculara



# Leziunea endoteliului vascular



# Factori de risc

## Congenitali

- istoric familial + de DVT sau EP
- app DVT sau EP
- deficiente Antithrombina III (1%)
- deficiente Proteina C (3%)
- deficiente Proteina S (4%)
- Factor V Leiden (20%)
- hyperhomocystinemia
- disfibrinogenemia (3%)

## Dobânditi

- varsta > 40
- malignitatea
- obezitatea
- insuficienta cardiaca
- infarctul miocardic
- fumatul
- arsuri
- flebite

- chirurgie sau trauma mmb.inf./pelvis
- imobilizare prelungita
- chirurgie > 30 min in AG
- chirurgie lap. sau robotica
- leziuni traumatice tesuturi/vase
- sarcina (postpartum)
- terapia cu estrogeni
- sindrom antifosfolipidic
- sindrom nefrotic

# Fiziopatologie

## Modificari de circulatie pulmonara:

- hipertensiune precapilara
- redistributia fluxului sanguin pulmonar (V/Q)
- supraincarcare ventricul drept

## Modificari de circulatie venoasa sistematica:

- cresterea presiunii venoase centrale
- hipotensiune
- tahicardie
- modificari de geometrie a ventriculului drept

# Fiziopatologie

**Alterarea circulatiei coronare**

- ischemie miocardica

- Bronchoconstrictie reflexa
- Hiperventilatie cu hipocapnie
- Hipoxemie

# Consecintele TEP

*Disfunctie ventriculara dreapta*

*Rezistenta vasculara pulmonara crescuta*

*Alterarea schimbului de gaze*

*Hiperventilatie alveolara*

*Hipoperfuzie alveolara in teritoriul embolizat*

*Rezistenta crescuta a cailor aeriene*

*Complianta pulmonara scazuta*

# Manifestari clinice

**EP masiva**

**EP moderata**

**Infarctul pulmonar acut**



## fara simptome

**dispnee (80%)**

**tahipnee (56%)**

**durere toracica tip pleuritic (44%)**

**ortopnee (28%)**

**wheezing (21%)**

**tuse seaca (20%)**

**hemoptizie (7%)**

fara simptome

**tahicardie (24%)**

**diminuarea zgomotelor cardiace (17%)**

**raluri pulmonare (18%)**

**distensia V.jugulare (14%)**

**soc (14%)**



fara simptome



deces

**transpiratii profuze (36%)**

**subfebrilitati (36%)**

**cianoza (19%)**

**semne TVP/tromboflebita (32%)**



**radioimagistica**

Rx pulmonar

V/Q scanare

Angiografia pulmonara

CT spiral

ECHO cardiac

ECHO Doppler m.inf

**teste de laborator**

Bch, hemato, coag.

D-dimeri fibrina

BNP, Troponina T, I

Astrup

**alte teste**

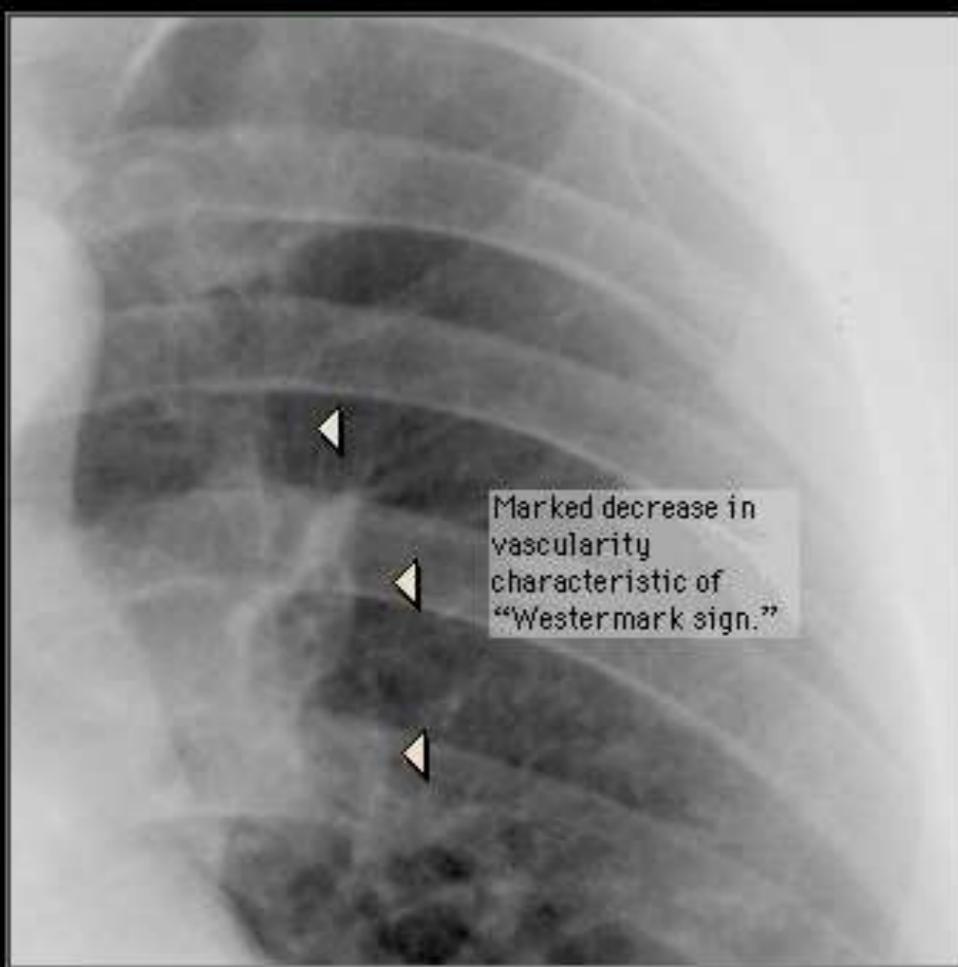
**ECG**

**Pulsoximetria**

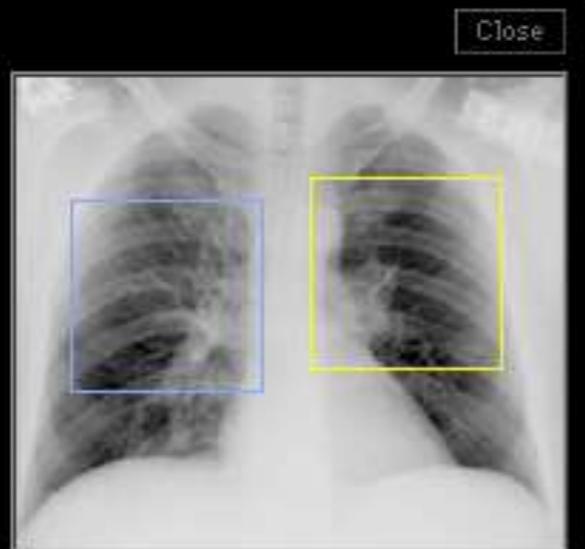


# pulmonar

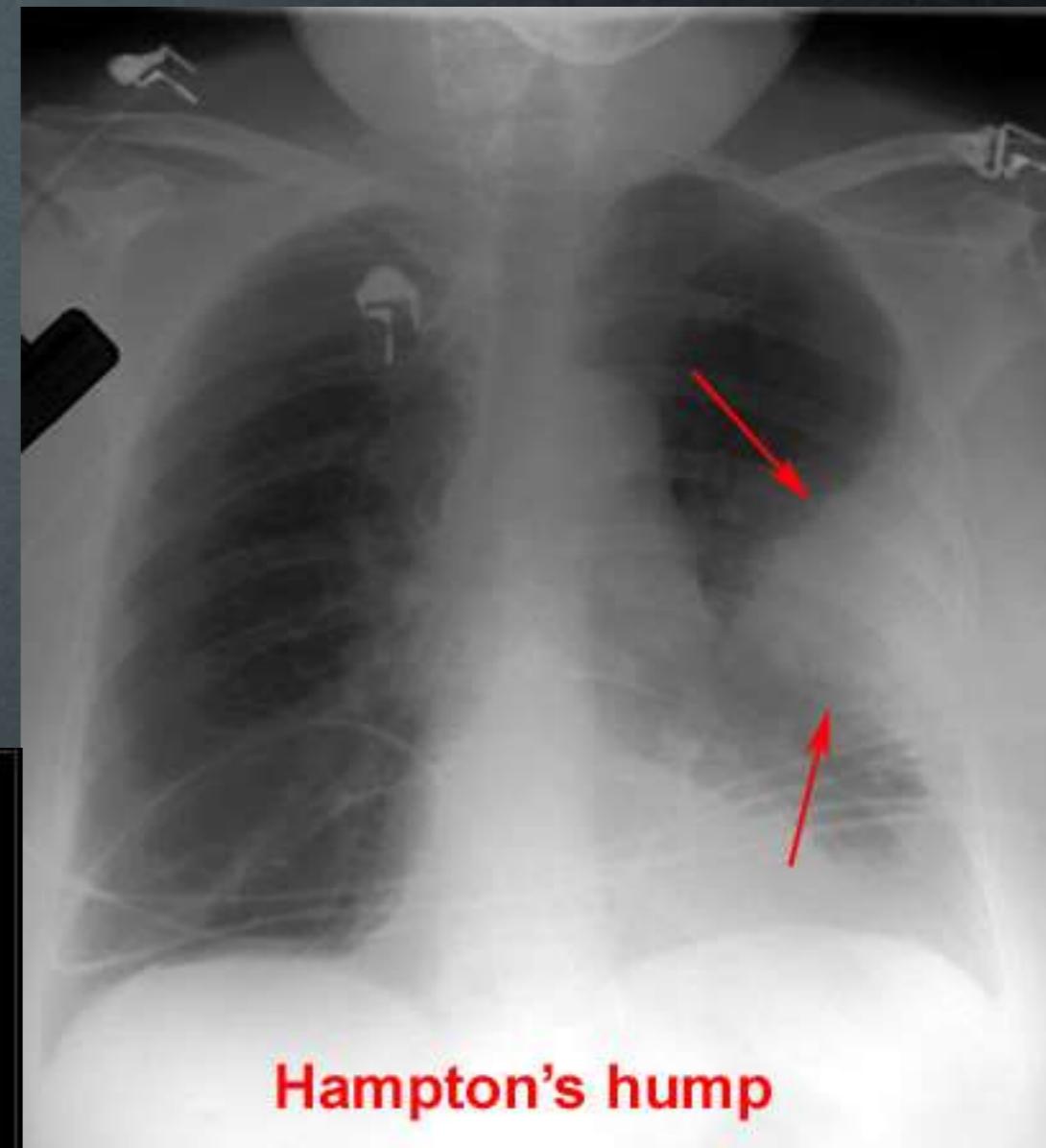
Zoom Image—Westermark Sign in Pulmonary Embolus



Marked decrease in vascularity characteristic of "Westermark sign."

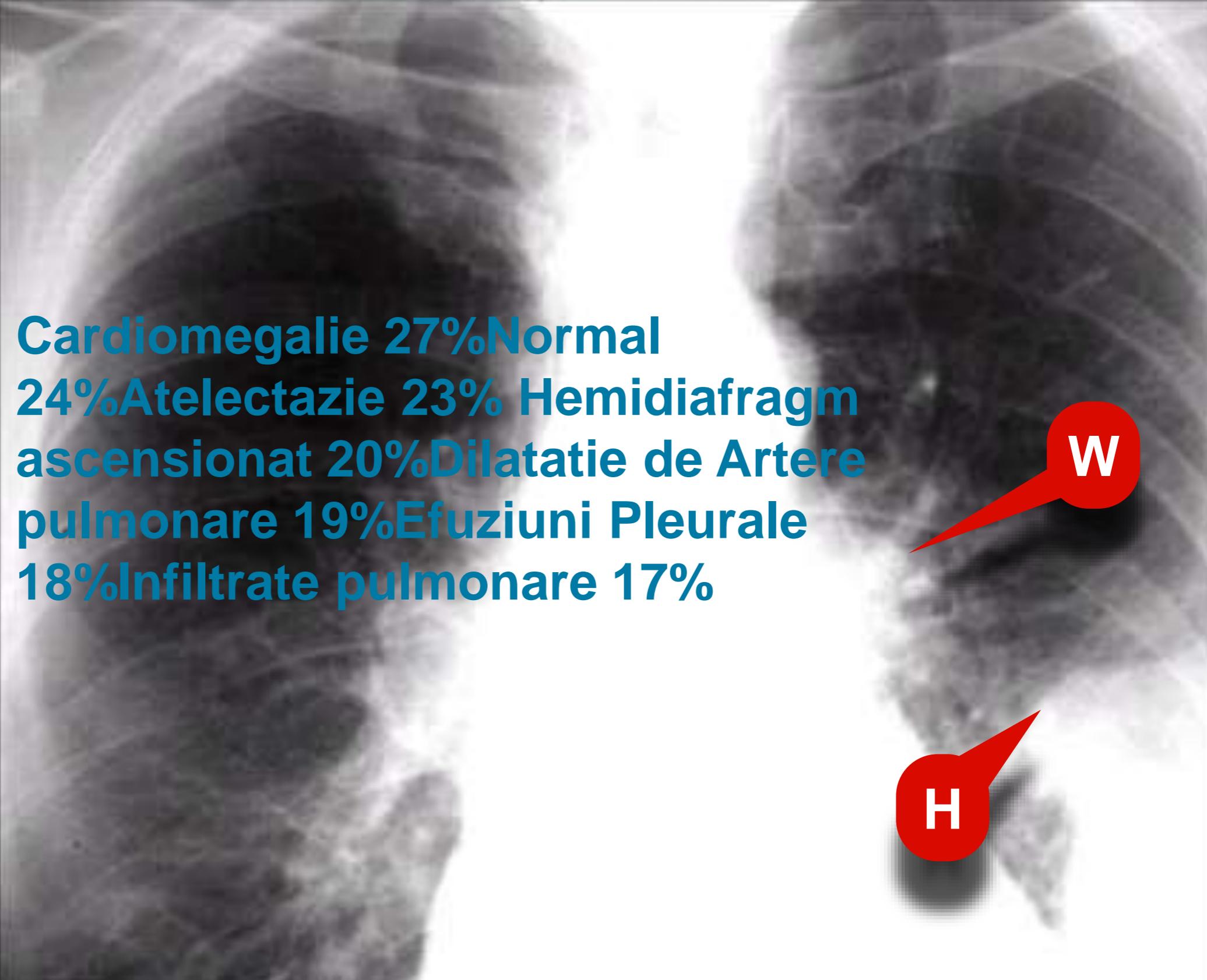


The classical, but rare frontal X-ray finding is clearcut truncation of pulmonary vessels with normal appearing pulmonary parenchyma implying recent sudden obstruction of the local pulmonary artery.



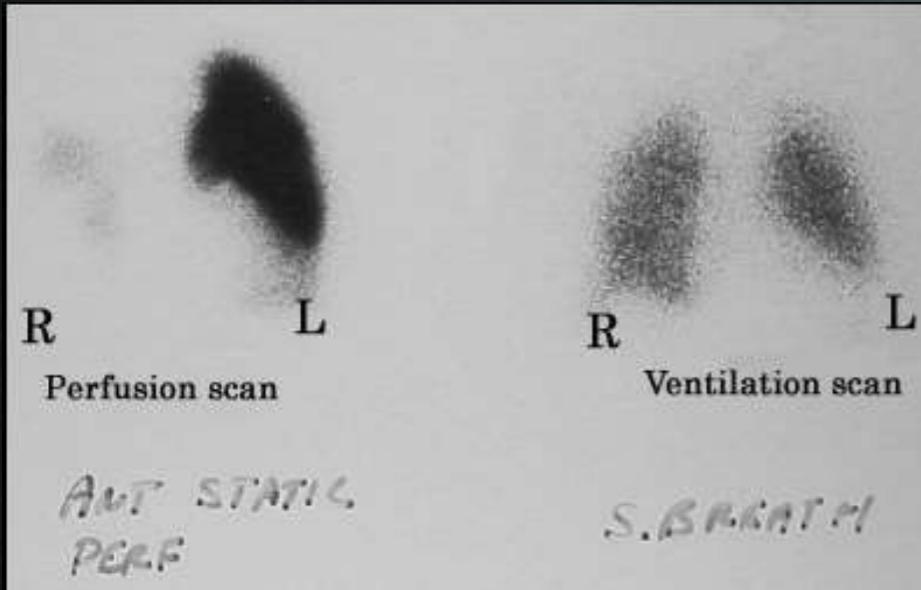


pulmonar

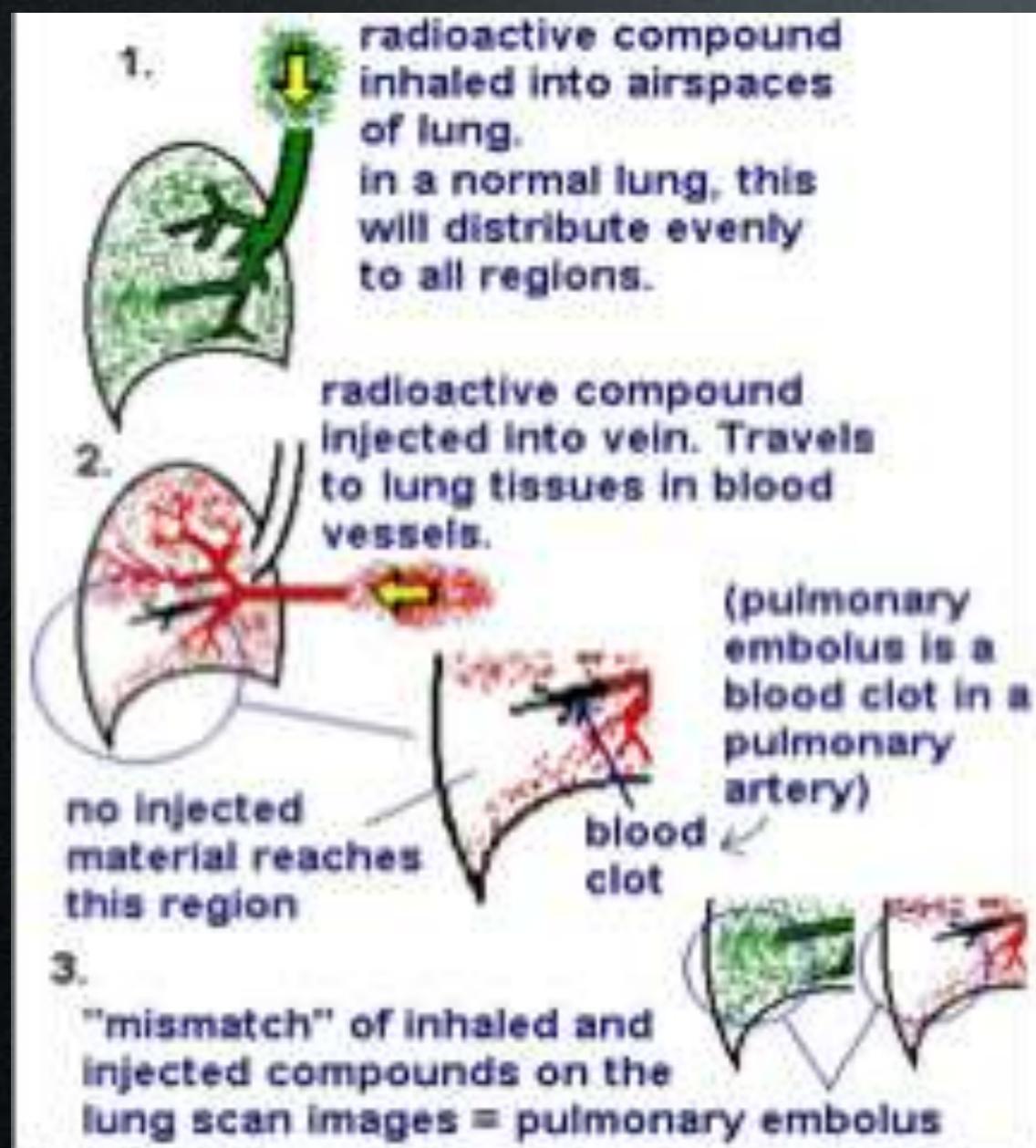
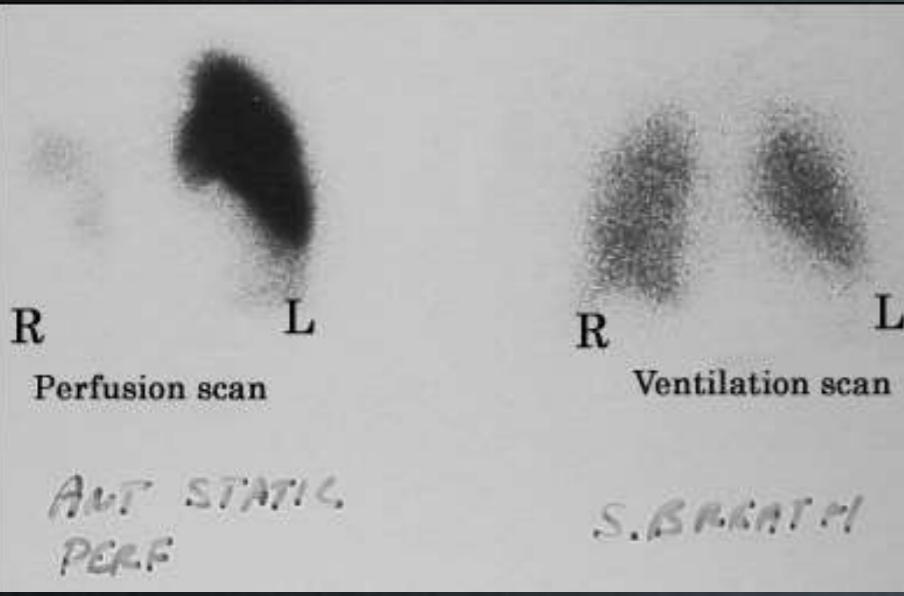


**Cardiomegalie 27% Normal  
24% Atelectazie 23% Hemidiafragm  
ascensionat 20% Dilatatie de Artere  
pulmonare 19% Efuziuni Pleurale  
18% Infiltrate pulmonare 17%**

# raport V/Q scintigrafia pulmonara



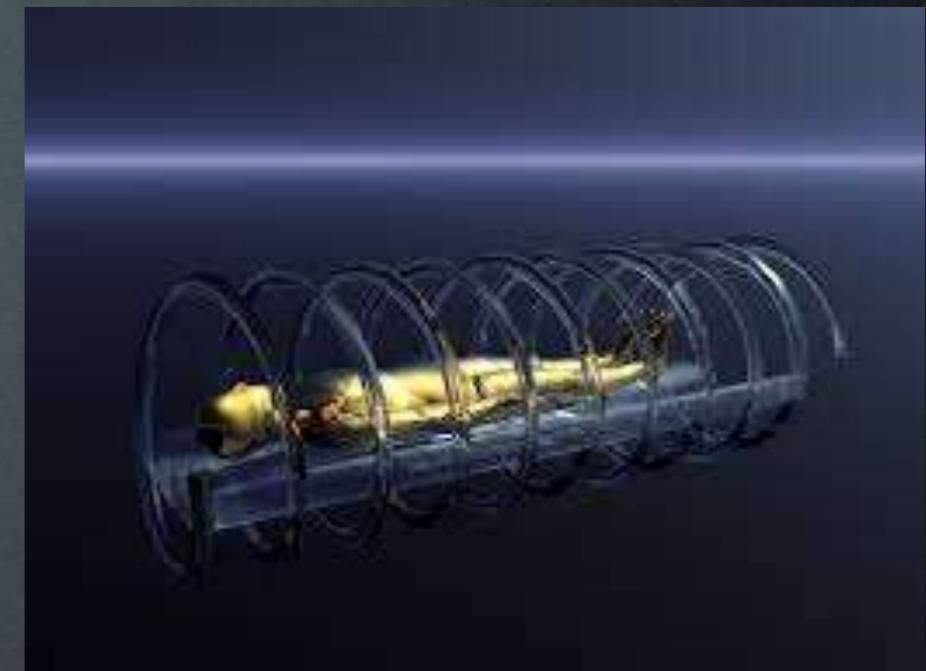
- metoda imagistica uzuala de a evalua afectarea pulmonului
- relativ noninvaziva, din pacate frecvent nondiagnostică
- metoda de electie in unele centre
- testul preferat in cazul femeilor gravide



Normal	No perfusion defects of any kind.
Near-normal	Perfusion defects smaller or equal in size and shape to the following roentgenographic abnormalities: cardiomegaly, enlarged aorta, hili and mediastinum; elevated diaphragm, blunting of the costophrenic angle; pleural thickening, intrafissural collection of liquid.
Abnormal (PE+)	Single or multiple wedge-shaped perfusion defects with or without matching chest-roentgenographic abnormalities. Wedge-shaped areas of overperfusion usually coexist.
Abnormal (PE-)	Single or multiple perfusion defects other than wedge-shaped, with or without matching chest-roentgenographic abnormalities. Wedge-shaped areas of overperfusion are usually not seen.

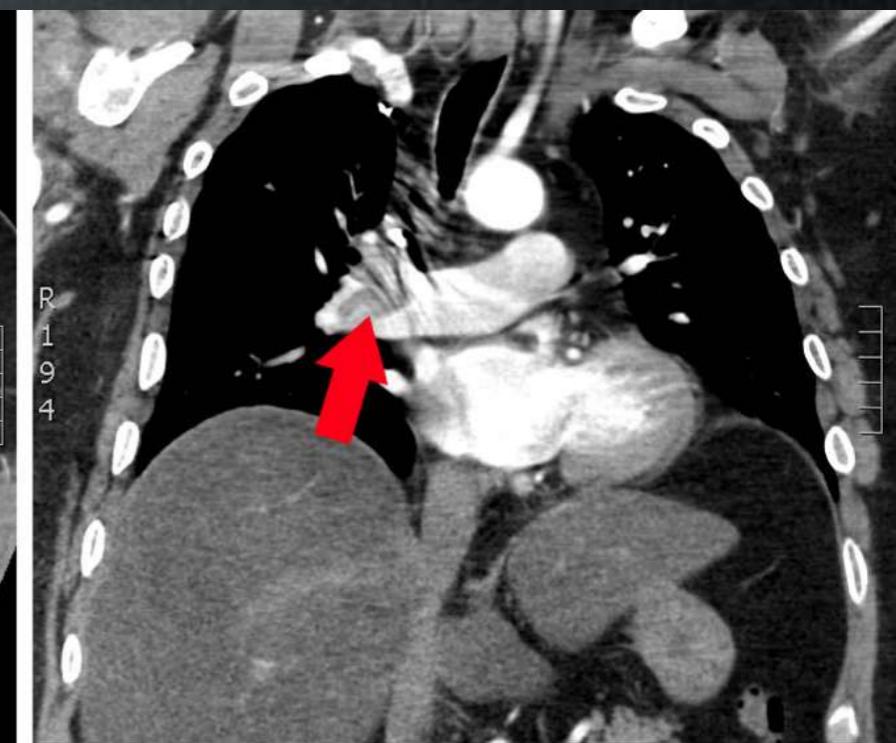
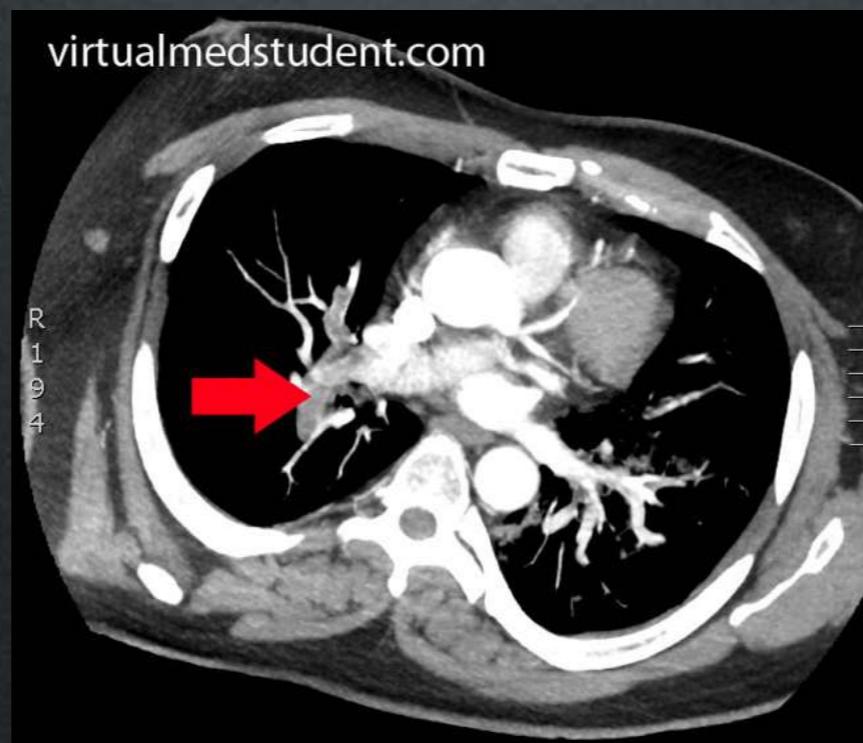
# CT spiral de torace

- metoda invaziva
- substanta de contrast
- utila in TEP masiv
- nu poate detecta embolii periferici



## C.I.

- IRA
- alergie la iod
- sarcina
- claustrofobia



The areas at the tip of the arrowheads are slightly "darker" than normal indicating a decreased ability for contrast dye to enter the pulmonary artery and its branches. This is indicative of a pulmonary embolism (ie: a blood "clot" in the blood vessels of the lung).

# Angiografie pulmonara

- standardul de aur
- evalueaza intreg sistemul microvascular pulmonar
- dificil de interpretat cavitatile drepte ale inimii

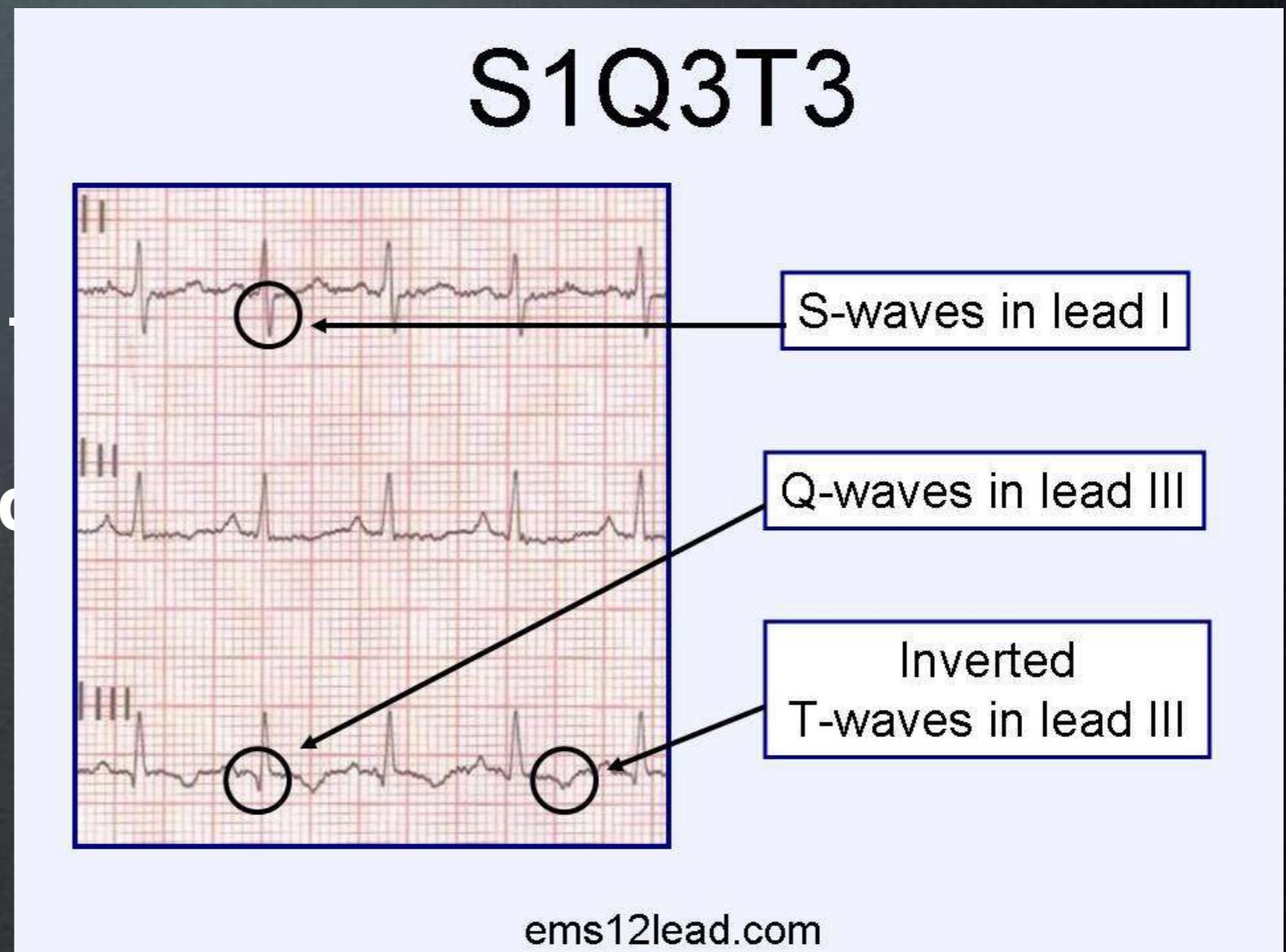
(SPECT)  
single photon emission computed tomography

- mai mare acuratete
- reduce frecventa DG.gresit
- poate fi viitorul in DG + al TEP

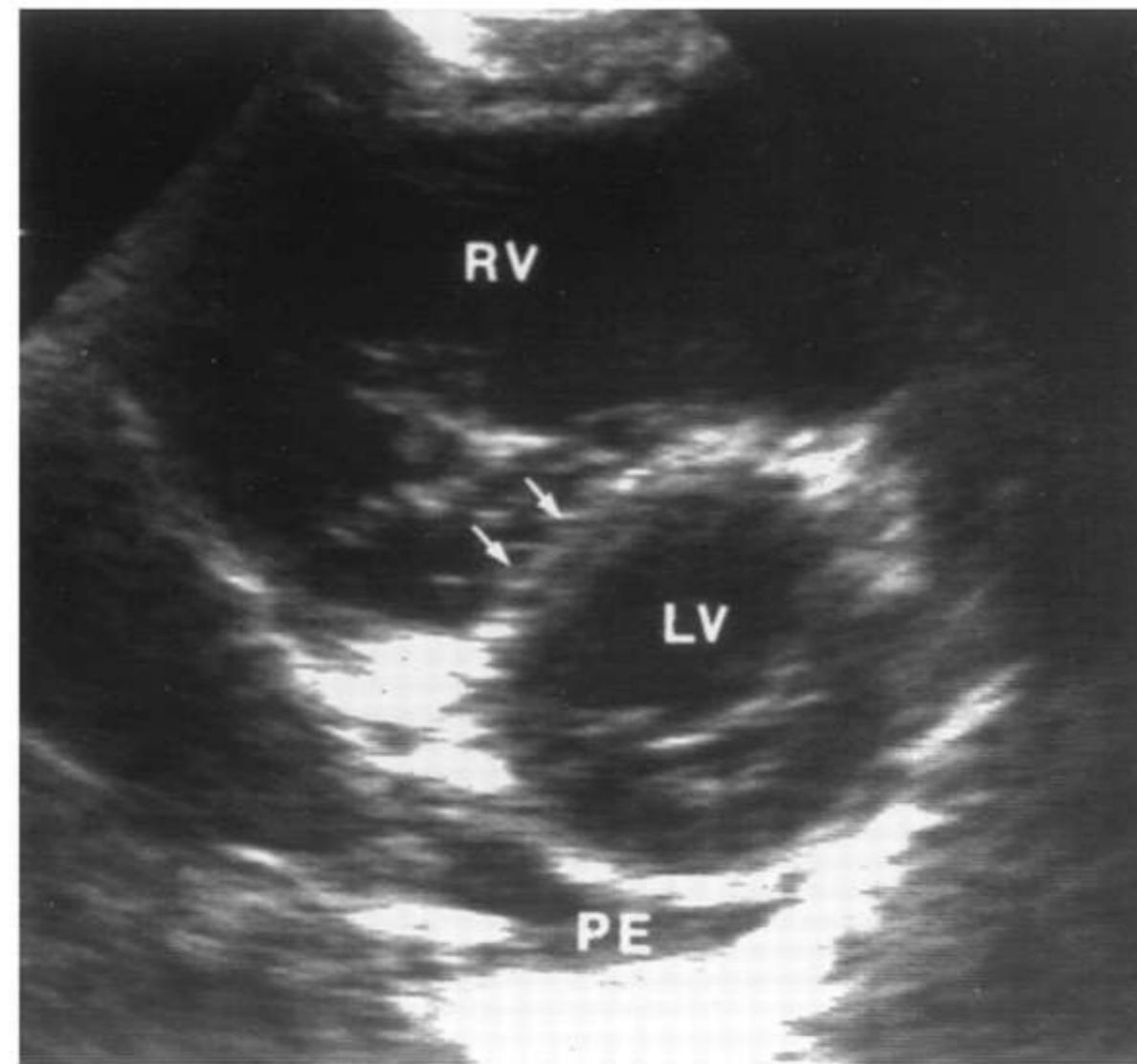
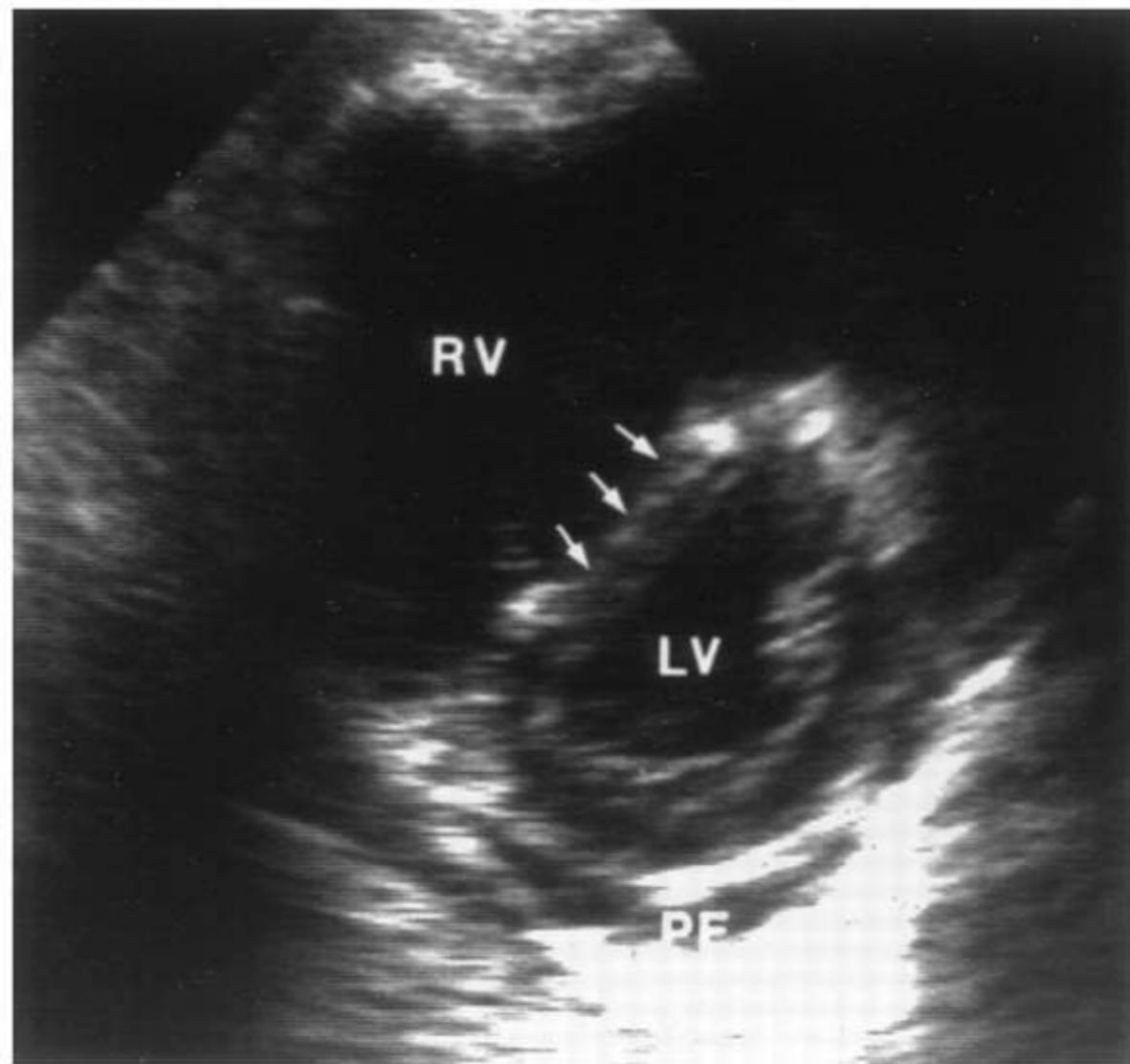


# ECG

-- tachycardie sinusale  
imagine S1 Q3 T3 –  
tachyarrhythmia atriale – und  
Q in DIII  
– imagine Q3 T3



# ECHO cardiac



# Laborator

## D-dimeri de fibrina

- test nespecific
- apar dat. activarii concomitente a fibrinoloizei in TPE
- pozitiv si in cancer, inflamatie, necroze, disectii vase mari, arsuri
- test negativ in urg. - exclude PE la 30%

## Troponina T si I - crescute, prog.rezervat

- mortalit.asoc 5,9%<sup>1</sup>

## Peptidul Natriuretic

- BNP si T-terminal proBNP crescute
- mortalitate asoc. 9,57%<sup>2</sup>

1.Giannitsis E, Müller-Bardorff M, Kurowski V, Weidtmann B, Wiegand U, Kampmann M, Katus HA. Independent prognostic value of cardiac troponin T in patients with confirmed pulmonary embolism. *Circulation*. 2000;102:211–217

2.Cavallazzi R, Nair A, Vasu T, Marik PE. Natriuretic peptides in acute pulmonary embolism: a systematic review. *Intensive Care Med*. 2008; 34:2147–2156.

# **Diagnostic diferențial**

- patologia cardiaca
- patologia respiratorie
- cauzele de moarte subita
- patologia vasculara mediastinala



## Tratament - scop

## Tratament - metode

### 1. Medicamentoase

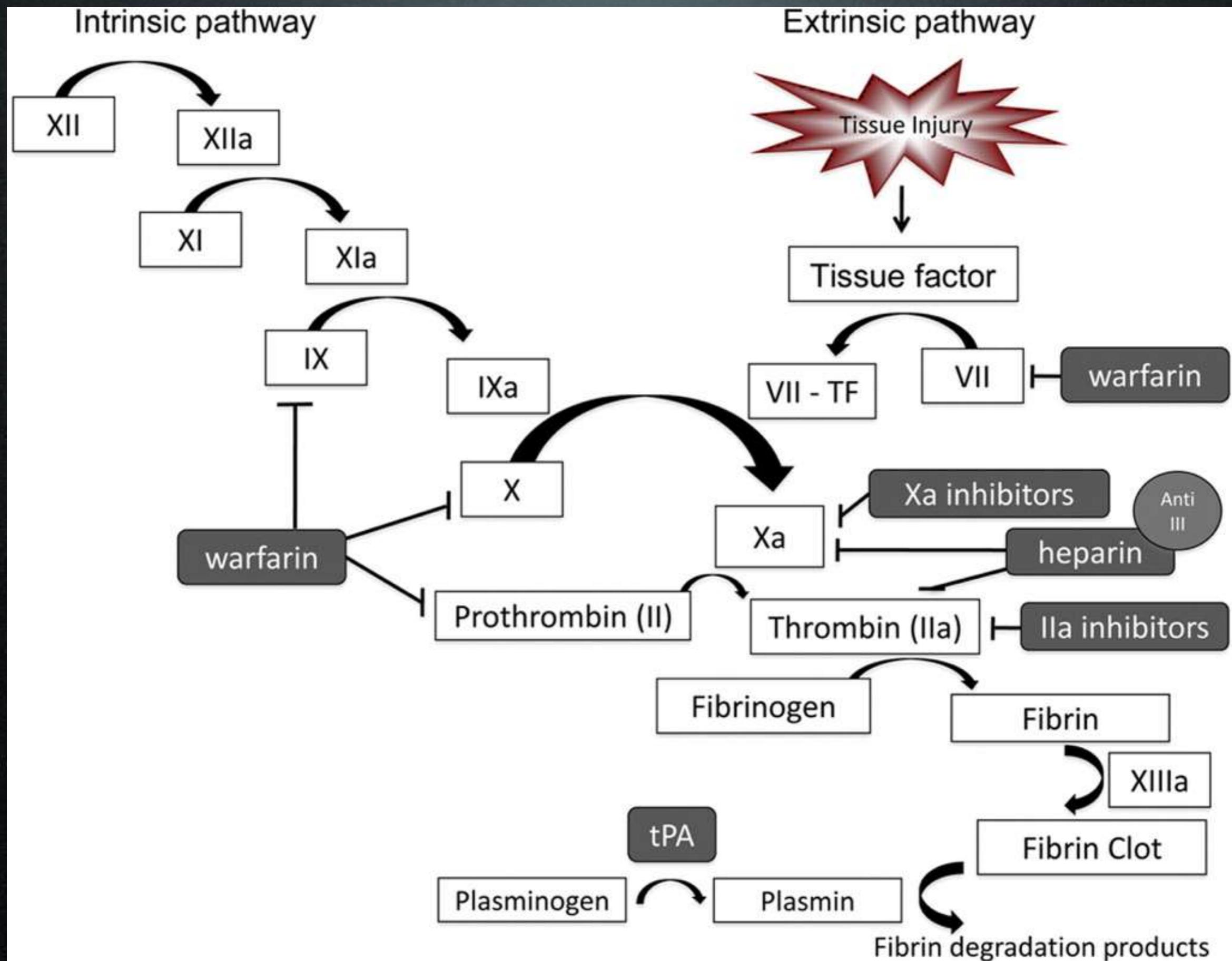
- Anticoagulante

- Heparina nefractionata
- HGMM
- anticoagulante orale

- Trombolitice

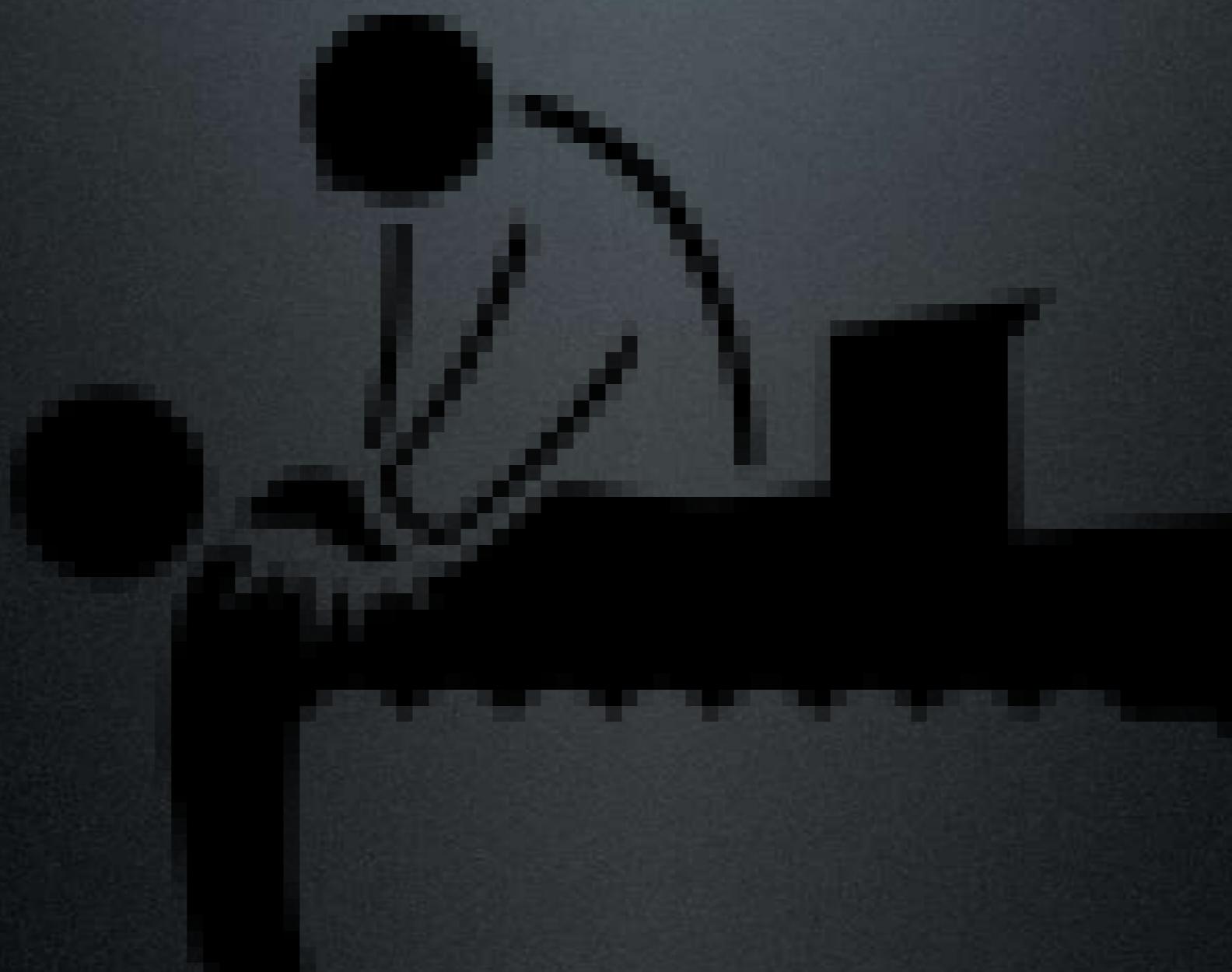
### 2. Chirurgicale

- embolectomie sau fragmentare pe cateter
- plasare filtru in vena cava inferioara

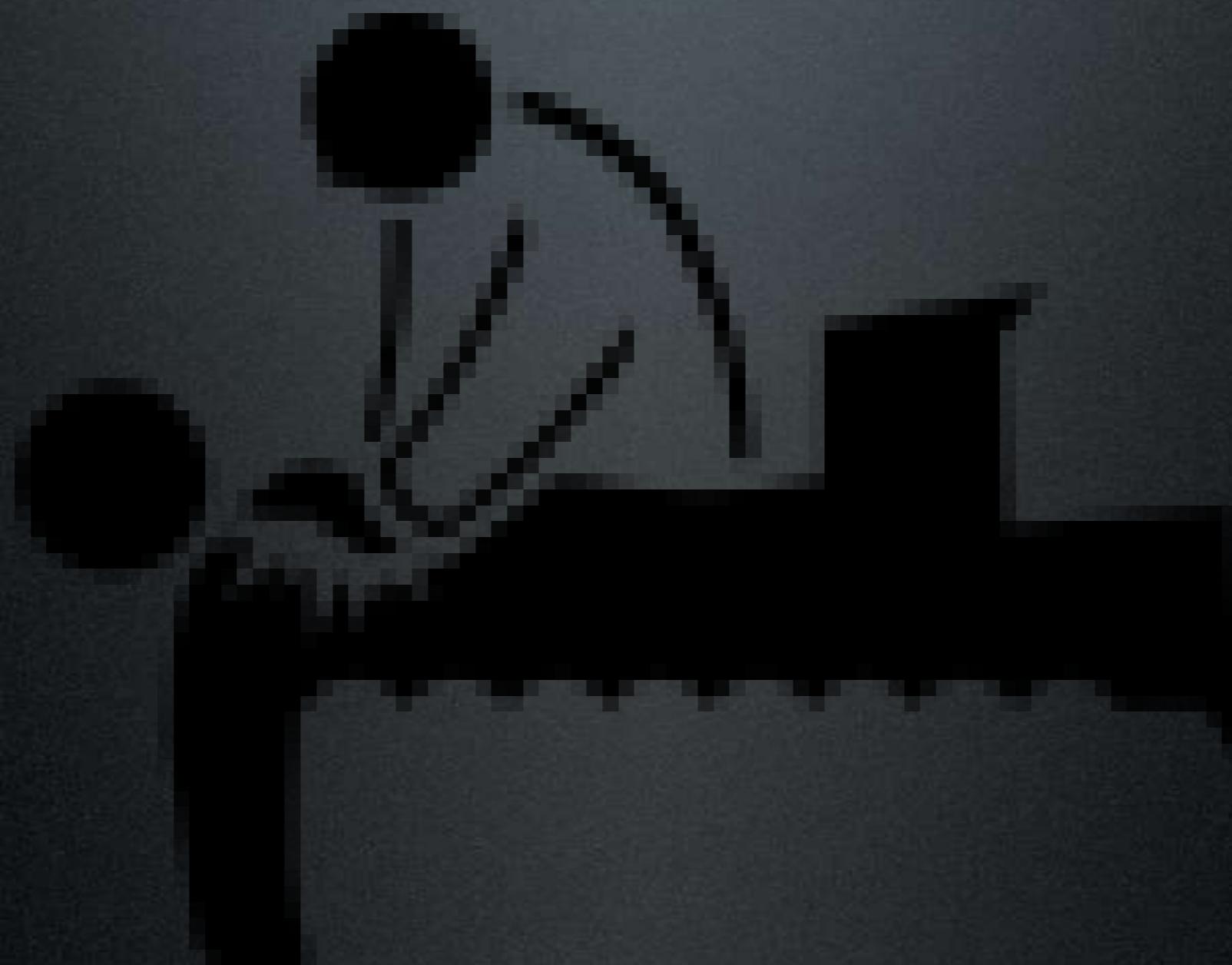


BLS

ALS



**American College of Chest Physicians (ACCP)'s  
Guidelines for Diagnosis & Management of DVT / PE,  
9th Ed.**



T.E.P. clinic +

teste paraclinice.....?!?!?!

Terapie anticoagulanta DA/NU ??

Suspiciune *crescută* - DA

Suspiciune *moderată* , timp pt.teste sub 4 ore - DA

Suspiciune...atat, teste sosesc in 24 ore - NU

# Management pacient cu T.E.P. confirmat

- **START** tratament anticoagulant parenteral imediat (1B)
- **START** warfarin (Coumadin) precoce, ziua respectiva; fara intarziere (1B)
- **CONTINUA** - tratament anticoagulant parenteral *cel putin 5 zile, CHIAR daca INR peste 2.0 precoce* (1B)
  - tratament anticoagulant parenteral PANA cand INR este peste 2.0 pentru *MAI mult de 24 ore* (1B)

# Anticoagulante

HNF

80UI/kg, 18UI/kg/h

S.C.  
...tromboliza

HGMM

gravide

Enoxaparina

1,5mg x 1/zi

Tinzaparina

1mg/kg -2/zi

Fondaparinux

?? 5mg - 7,5mg - 10mg/zi

# Thromboliza in Embolia Pulmonara Acuta

( [ACCP Guidelines, 9th Ed.](#))

## Tromboliza sistemica

- pacienti cu T.E.P + hTA (TAs 90mmHg) (2C)
- pacienti *potentiali* cu hTA FARA risc de sangerare (2C)

**NU** tromboliza sistemica la T.E.P **FARA** hTA (1C)

“Looking sick” - dispneic, hipoxic, disfunctie VD  
ECHO, troponine crescute, jugulare turgescente,  
tahicardie severa



## Tromboliza sistematică (2C)

- perfuzie max.2h
- tPA (activator al plasminogenului tisular) t<sub>1/2</sub> scurt
- vena periferică / cateter pulmonar

Alteplase 0,9 mg/kg

Reteplase 2x10ui

Ce facem cu HNF în timpul trombolizei ???

ACCP - “acceptable ... to continue or suspend the unfractionated heparin infusion during administration of thrombolytics.”



## **EFFECTELE TROMBOLIZEI**

- reduce presiune in A.Pulmonare
  - amelioreaza oxigenarea
  - amelioreaza performantele cardiace in primele 24 ore
  - risc major de sangerari
- 
- reduce mortalitatea
  - reduce riscul de recurrenta



# **Contraindicatii absolute ale TROMBOLIZEI**

**Istoric de hemoragie intracraniana**

**Leziune vasculară cerebrală cunoscută**

**Neoplasm intracranian**

**AVC ischemic în ultimele 3 luni cu excepția ultimelor 3h**

**Suspiciune de disectie de aorta**

**Sangerare activă, exceptand menstrelle**

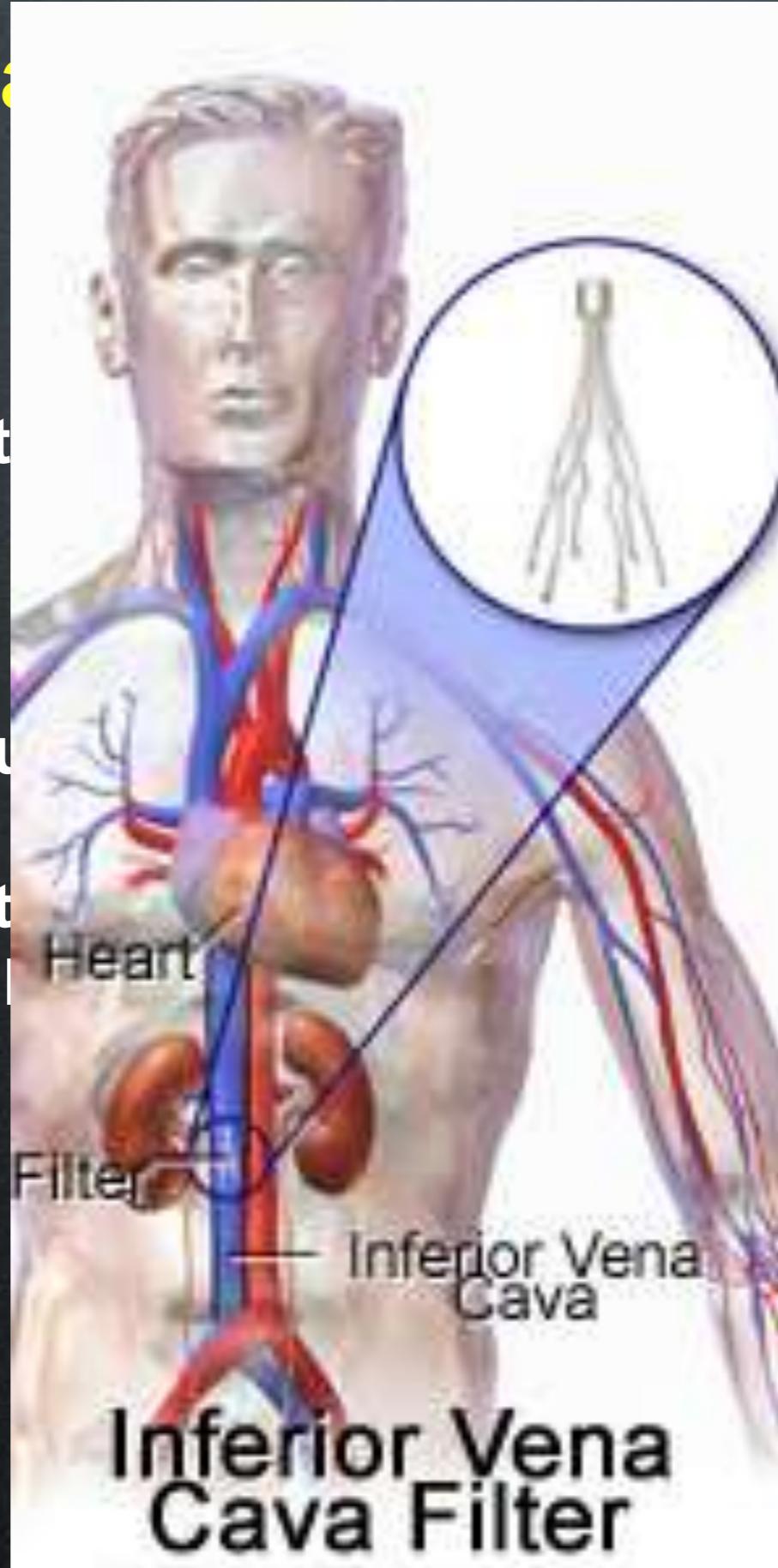
**Traumatism facial sau craniian sever în ultimele 3 luni**

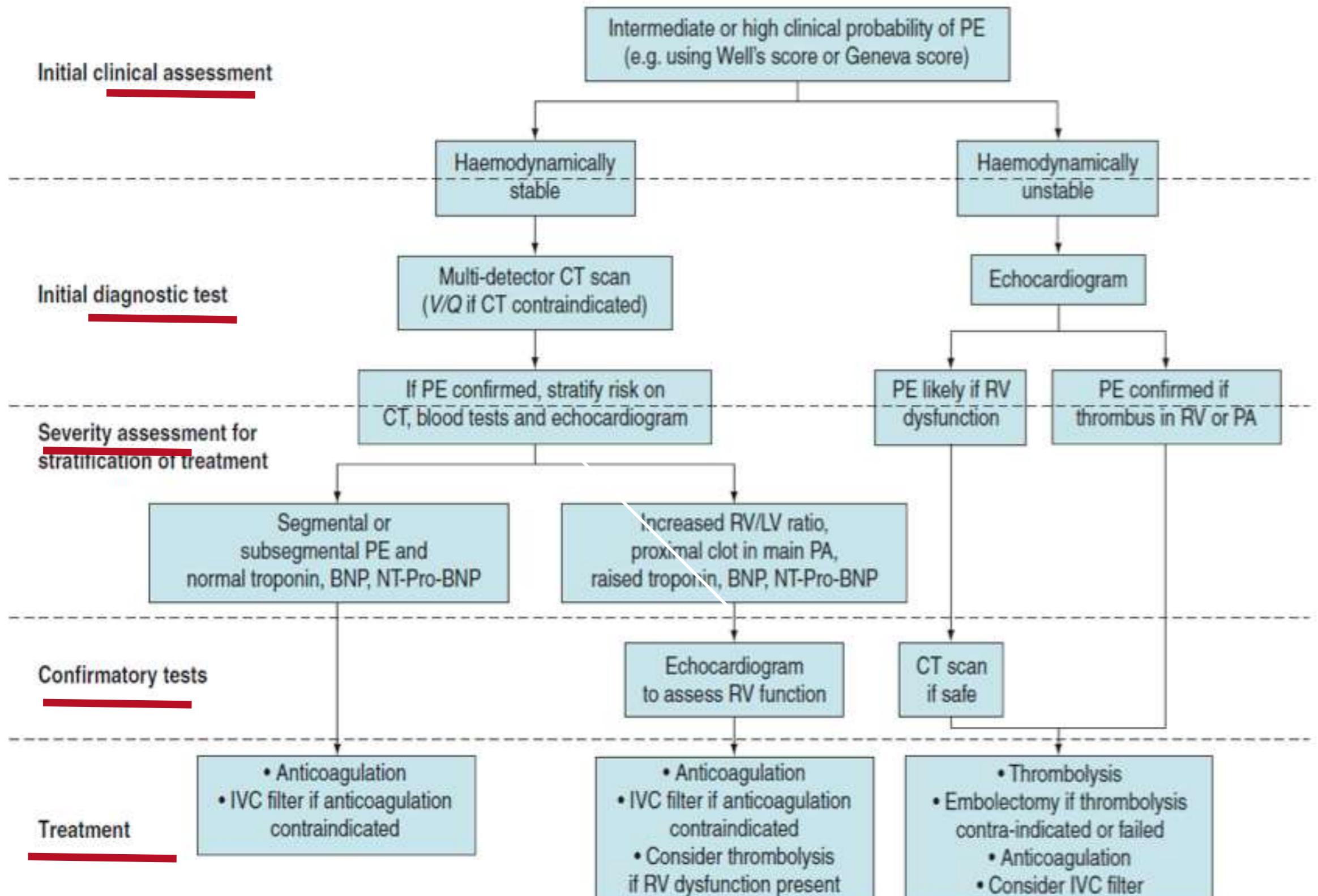
- ~5% din pacientii cu TEP + tratament mor in primele 7 zile
- ~2% mortalitatea la pacientii fara hTA
- ~30% mortalitatea cand + SOC tratat cu inotrope
- ~70% mortalitea cand apare SCR

Pla

n VCI  
Ed.)

- T.E.P sub tratamente recomanda (1B)
- DA la T.E.P cu:
  - tratamentul anticoagulant anticoagulant (1B)
  - plasarea filtrului în Inferior Vena Cava în min.6 luni de la





**Figure 30.1** Suggested investigation and treatment algorithm for pulmonary embolism (PE). CT, computed tomography; V/Q, ventilation/perfusion scan; RV, right ventricular; PA, pulmonary artery; BNP, brain natriuretic peptide; RV/LV, right ventricle/left ventricle; IVC, inferior vena cava.

# Stratificarea riscului vital la pacientii cu TEP

Mortalitate risc clinic	CLINIC	Marker de risc			Tratament
		- SOC	- hipotensiune VD	Ischemie miocardica	
Risc CRES CUT 15%	+	+	+	+	- Tromboliza - Embolectomie
Risc intermediu 3-15%  Fara RISC	-	+	+	+	- Internare in spital - tratament anti-coagulant
		+	-	-	
		-	-	+	
Risc mic 1%	-	-	-	-	- tratament la domiciliu

# Complicatii TEP

- **Hemoragia pulmonara**
- **Hipertensiunea pulmonara**
- **Insuficienta respiratorie**
- **Insuficienta cardica congestiva**
- **Trombocitopenia induusa de heparina**
- **Moarte subita**



**ACCP's new 9th  
clinical practice guidelines for prevention and  
treatment of venous thromboembolism (VTE)**

**Managementul perioperator al  
pacientilor anticoagulați**

## Anticoagulante orale

**STOP** - cu 5 zile preoperator (1C)

**RELUARE** - 12-24 ore postop.; seara op. sau dimineata urmatoare (2C)

**BRIDGING** - pacienti cu valve mecanice cardiaice, TEP, FiA (2C)

- pacienti cu *risc scazut* - NU
- pacienti cu *risc intermediar (moderat)* - DA
- pacienti cu *risc crescut* - BALANTA risc/beneficiu

**CONTINUARE** - proceduri minore STOMA. DERMATO.(2C)

## Stratificarea riscului (bridging)

**pacienti cu  
risc scazut**

- TVP/EP > 12 luni de la ultimul puseu + NU prezinta alti factori majori de risc (thrombofilie sau cancer)
- Fi A au scorul CHADS2 0-2 + fara istoric de AIT/AVC
- Valve mecanice cardiace fara FiA + fara factori de risc pt. AVC (DZ, HTA, varsta > 75, etc.)

**pacienti cu risc  
intermediar**

**pacienti .....**

# **BRIDGING - Tratament cu heparine**

**Heparina nefractionata I.V.**

**STOP cu 2 - 4 ore PREop (2C)**

**HGMM I.V.**

**STOP cu 24 ore PREop (2C)**

**RELUARE** - dupa **24 ore** la pac. cu risc  
*scazut de sangerare (2C)*

- la **48 -72 ore** la pac. cu risc  
*crescut de sangerare (2C)*

## Risc crescut de sangerare postop.:

- Urologie : chirurgia prostatei, biopsie renala, nefrectomie
- Pacemaker/implantare cardioverter-defibrilator
- Rezectii de polipi colonici (CH, Endo)
- Chirurgia - organelor parenchimatoase (ficat, splina, rinichi)
  - oncologica majora
  - plastica si reconstructiva
- Ortopedie - proteze de sold, genunchi, chirurgia spinala
- NCH
- CH cardiaca





# ESA Autumn meeting 4

8 and 9 November 2013 | Timisoara, Romania

[www.euroanaesthesia.org](http://www.euroanaesthesia.org)

ESA Autumn meeting 4  
» Register online



ERVIN BOER  
photographer