Tromboembolická choroba

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CEEA Košice 2016

Aspekty tromboembolickej choroby

- Všeobecné
  - („internistické, hematologické“)
- Anestéziologické
  - (v súvislosti s perioperačným obdobím)
- Intenzivistické
  - (v súvislosti s kriticky chorým pac.)

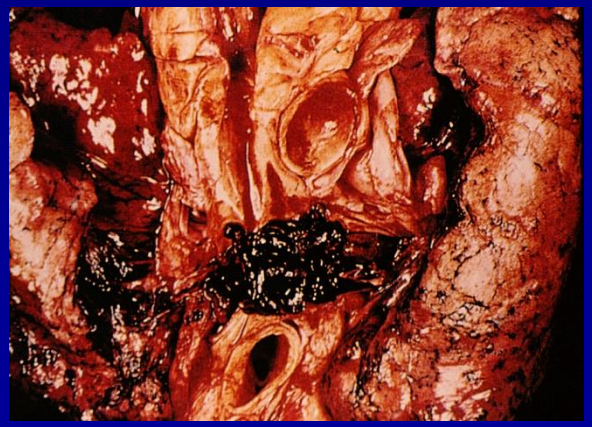
Tromboembolizmus
(vymedzenie pojmu)

- **zložka trombotická**

Tromboembolizmus
(vymedzenie pojmu)

- **zložka trombotická**

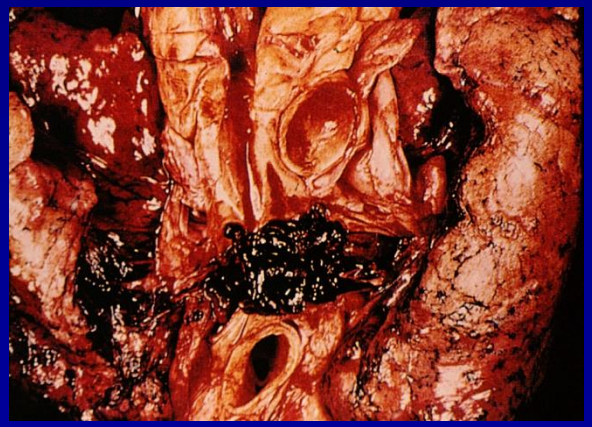
- **zložka embolická**

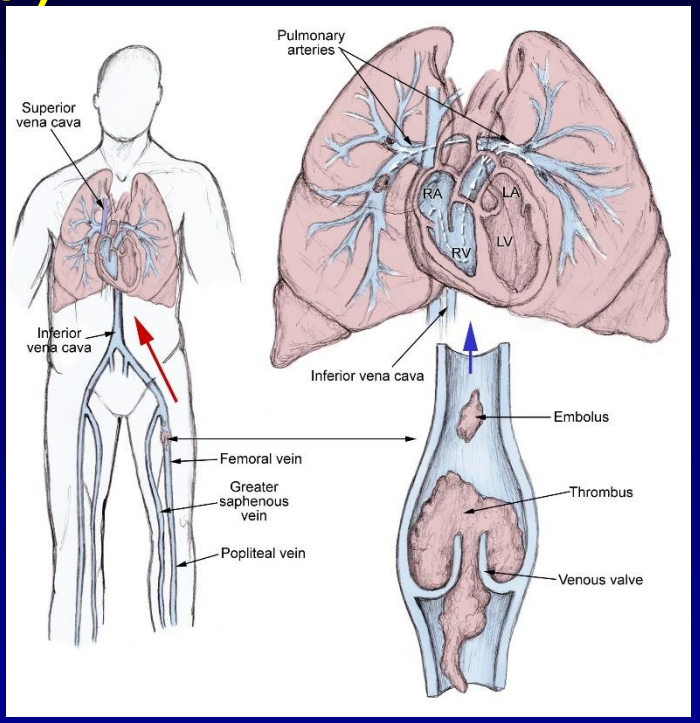


Tromboembolizmus
(vymedzenie pojmu)

- **zložka trombotická**

- **zložka embolická**

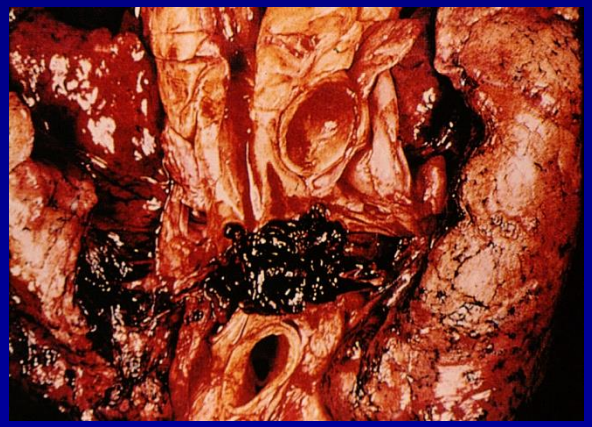


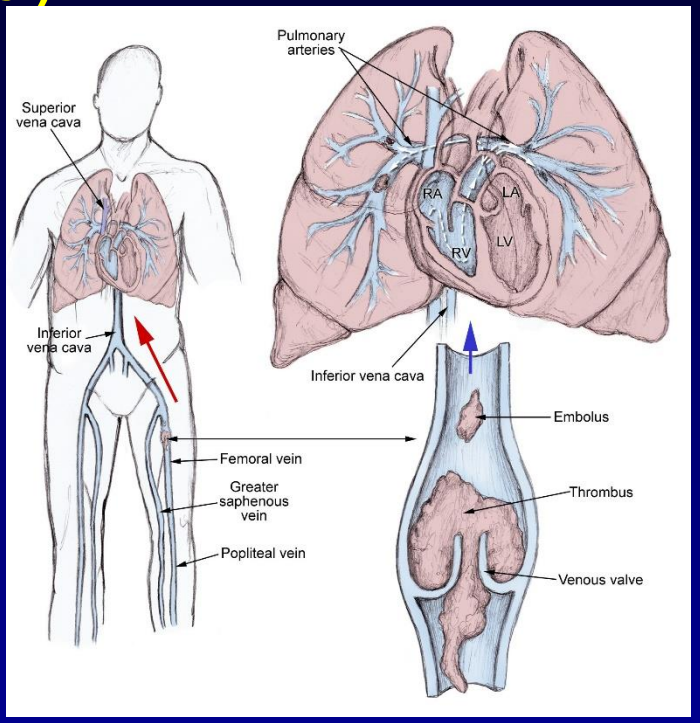


Tromboembolizmus
(vymedzenie pojmu)

- **zložka trombotická**

- **zložka embolická**



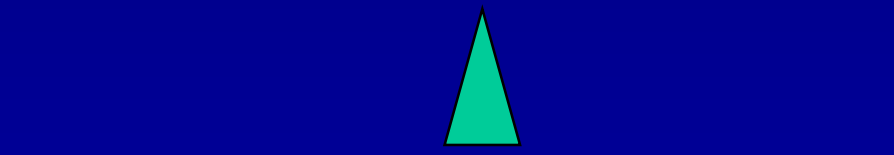


chronická tromboembolická pľúcna hypertenzia

posttrombotický syndróm

Trombóza
(patofyziológia)

Trombogenéza **Trombolýza**



Trombóza
(patofyziológia)

- Poškodený endotel
- Spomalený krvný prietok
- Hyperkoagulabilita

Trombogenéza

Trombolýza

HYPERCOAGULABLE STATE

- Malignancy
- Pregnancy and peri-partum period
- Oestrogen therapy
- Trauma or surgery of lower extremity, hip, abdomen or pelvis
- Inflammatory bowel disease
- Nephrotic syndrome
- Sepsis
- Thrombophilia

VASCULAR WALL INJURY

- Trauma or surgery
- Venepuncture
- Chemical irritation
- Heart valve disease or replacement
- Atherosclerosis
- Indwelling catheters

CIRCULATORY STASIS

- Atrial fibrillation
- Left ventricular dysfunction
- Immobility or paralysis
- Venous insufficiency or varicose veins
- Venous obstruction from tumour, obesity or pregnancy

Embólia
(patofyziológia)

- **Embolizácia do pľúcneho riečiska**

(t.j. obštrukcia **mechanická** ale aj **vazokonstrikcia** pľúcnych ciev)**:**

- **afterload pravej komory**
- **preload ľavej komory**

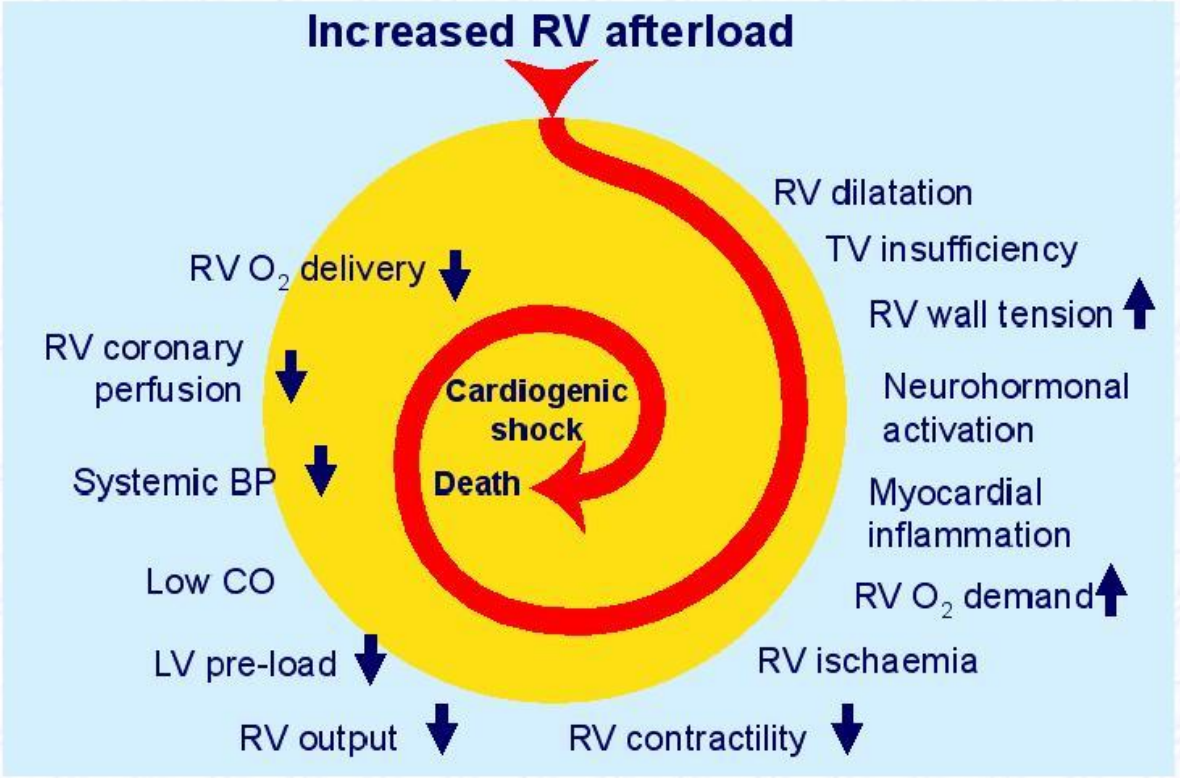
⇒ **obehové zlyhanie**

- **ventilačno – perfúzny nepomer**

⇒ **respiračné zlyhanie**

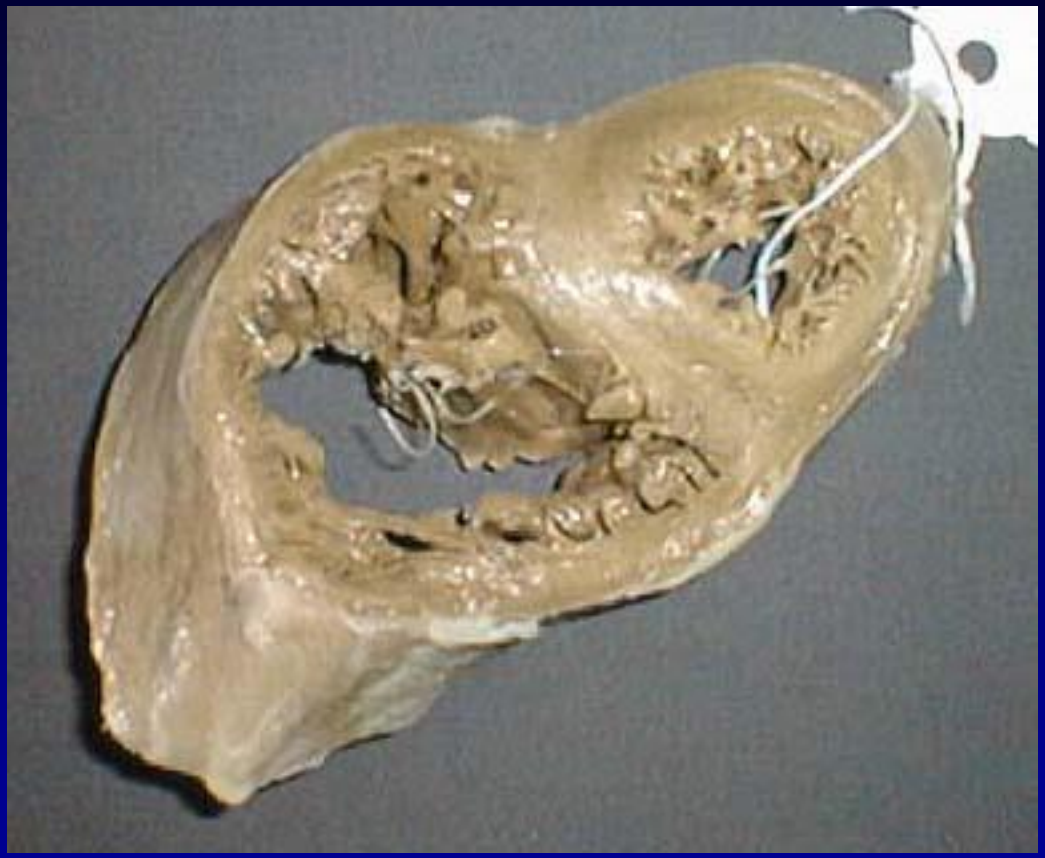
- **alveolárna hyperventilácia**
- **bronchokonstrikcia, odpor dýchacích ciest**
- **pľúcny edém, dychová práca**

Key factors contributing to haemodynamic collapse in acute pulmonary embolism



BP = blood pressure; CO = cardiac output; LV = left ventricular; RV = right ventricular; TV = tricuspid valve.

European Heart Journal (2014):doi:10.1093/eurheartj/ehu283



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ESC GUIDELINES

2013 ESC guidelines on the Diagnosis and Management of Acute Pulmonary Embolism

The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC).

Endorsed by the European Respiratory Society (ERS).

Chairpersons: Stavros V. Konstantinides (Germany/Greece), Adam Torbicki (Poland).

Authors/Task Force members: Giancarlo Agnelli (Italy), Nicolas Danchin (France), David Fitzmaurice (UK), Nazzareno Galiè (Italy), J. Simon R. Gibbs (UK), Menno V. Huisman (The Netherlands), Marc Humbert (France), Nils Kucher (Switzerland), Irene Lang (Austria), Mareike Lankeit (Germany), John Lekakis (Greece), Christoph Maack (Germany), Eckhard Mayer (Germany), Nicolas Meneveau (France), Arnaud Perrier (Switzerland), Piotr Pruszczyk (Poland), Lars H. Rasmussen (Denmark), Thomas H. Schindler (USA), Pavel Svitil (Czech Republic), Anton Vonk Noordegraaf (The Netherlands), Jose Luis Zamorano (Spain), Maurizio Zompatori (Italy).

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Relevant *new* aspects 2014

1. Recently identified predisposing factors for venous thromboembolism.
2. Simplification of clinical prediction rules
3. Age-adjusted D-dimer cut-offs
4. Sub-segmental pulmonary embolism (PE)
5. Incidental, clinically unsuspected PE
6. Advanced risk stratification of intermediate-risk PE
7. Initiation of treatment with vitamin K antagonists
8. Treatment and secondary prophylaxis of venous thromboembolism with non-Vitamin-K-dependent oral anticoagulants (NOACs)
9. Efficacy and safety of reperfusion treatment for patients at intermediate risk
10. Early discharge and home (outpatient) treatment of PE
11. Current diagnosis and treatment of CTEPH
12. Formal recommendations for the management of PE in pregnancy and of PE in patients with cancer

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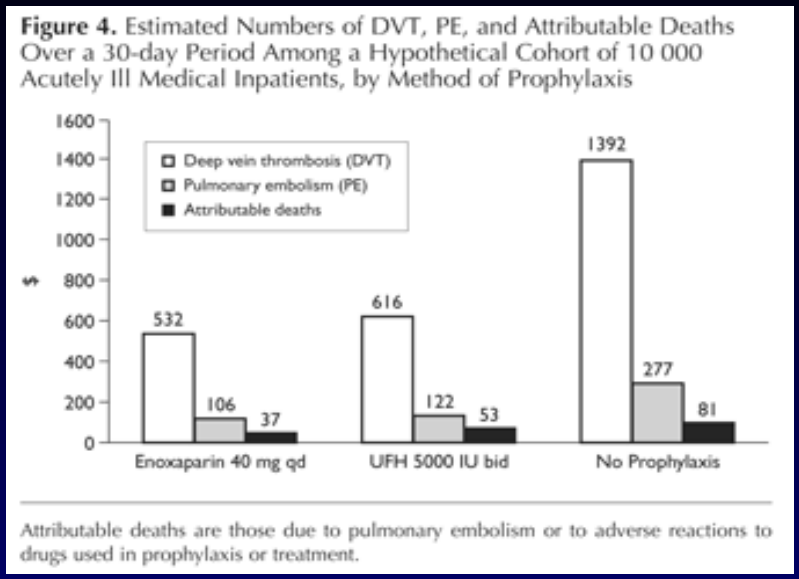
Výskyt TECH



- v kontexte iných chorobných stavov
- tretie najčastejšie kardiovaskulárne ochorenie
  (po koronárnej a cerebrálnej ischémii)
- klinická prezentácia = iba špička ľadovca
- má tendenciu opakovať sa
- TECH ako príčina smrti: 543 454 ľudí v EU (r. 2001)
  25 000 v Británii (r. 2005)

Rizikové faktory TECH - hereditárne

- Mutácia faktora V (Leiden)
- Mutácia protrombínového génu
- Deficit proteínu C a/alebo S
- Deficit antitrombínu
- Hyperhomocysteinémia
- Zvýšené hladiny faktora VIII
- Dysfibrinogénémie

Rizikové faktory TECH - získané

- operácia
- úraz (najmä dolných končatín a polytrauma)
- imobilizácia (vrátane dlhej cesty lietadlom, autom), paréza, plégia
- malignita
- onkoterapia (hormonálna, chemo- alebo rádioterapia)

Rizikové faktory TECH - získané

Venous Thromboembolism and Hormonal Contraception
July 2010

- **operácia**
- **gravidita a šestonedelie**
- **<u>estrogénová</u> antikoncepcia alebo suplementácia**
- **selektívne modulátory estrogénových receptorov (tamoxifen)**

Rizikové faktory TECH - získané

- **predošlé epizódy tromboembolizmu**
- **vyšší vek**
- **obezita (BMI nad 30 kg/m^2)**
- **fajčenie**
- žilové varixy ?
- **kardiálna alebo respiračná insuficiencia**

Rizikové faktory TECH - získané

- enteritída, enterokolitída
- nefrotický syndróm
- myeloproliferatívne ochorenia
- paroxyzmálna nočná hemoglobinúria
- kanyly v centrálnych žilách, kardiostimulátory
- antifosfolipidový syndróm
- heparínom indukovaná trombocytopénia

Klinický obraz TECH

- **Trombóza hlbokých žíl (býva prevažne klinicky nemá):**

  Opuch, teplá koža končatiny

  Citlivosť: lýtko, mediálna strana stehna

  Homansov príznak: senzitivita 33%, špecificita 50%

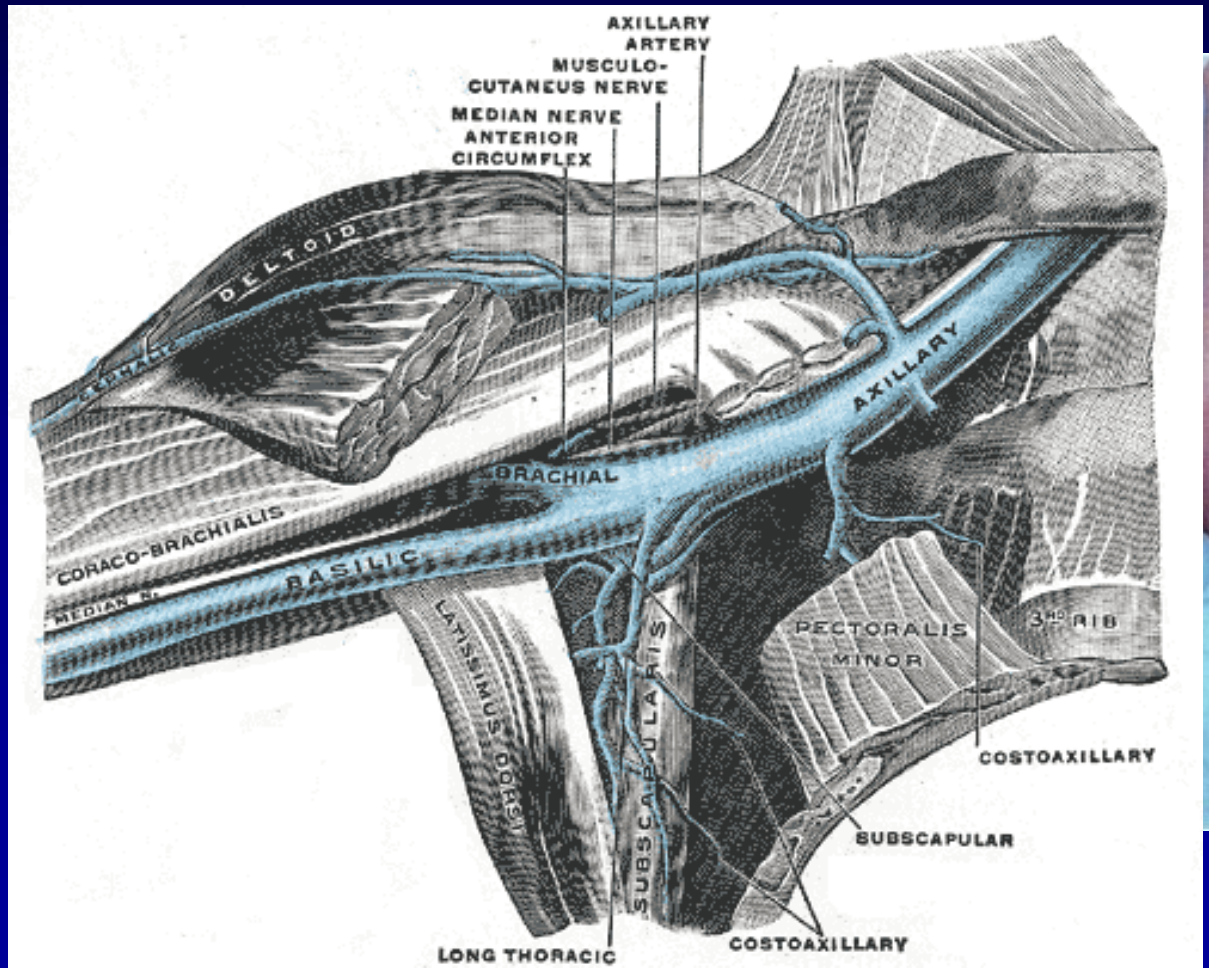
  Masívny opuch, cyanóza, petechie

  (phlegmasia coerulea dolens) veľmi zriedkavé

Klinický obraz TECH

Klinický obraz TECH

Klinický obraz TECH



Klinický obraz TECH

Klinický obraz TECH

- **Embólia (prvý príznak trombózy až v 10%):**

  Náhle dyspnoe, úzkosť, strach zo smrti

  Tachypnoe, tachykardia, akcentovaná II ozva, synkopa

  Pleurálna bolesť, kašeľ, hemoptýza, subfebrílie

Diagnostika trombózy

Klinické prejavy a symptómy

Prítomnosť rizikových faktorov

- **Pravdepodobnostné skóre**

Diagnostika trombózy

- **Pravdepodobnostné skóre trombózy (Wells, 1997, 2000, 2006)**

Faktor	body
• Aktívne onkologické ochorenie	1
• Paralýza, paréza, sadrová imobilizácia DK	1
• Kľud na lôžku viac než 3 dni alebo väčšia operácia v posledných 4 týž.	1
• Palpačná citlivosť v oblasti hlbokých žíl	1
• Opuch celej DK	1
• Opuch lýtka viac než 3 cm oproti druhej strane	1
• Kompresibilný edém	1
• Povrchové venózne kolaterály (nie varixy)	1
• Alternatívna dg pravdepodobnejšia než HŽT	-2

Pravdepodobnosť:
Vysoká : 3 b a viac **stredná: 1-2 b** **nízka: 0 b a menej**

Diagnostika trombózy

D-dimér: špecificita je nízka (pozit. býva u malignít, traumy, sepsy, gravidity, aktívneho krvácania, pooperačne)

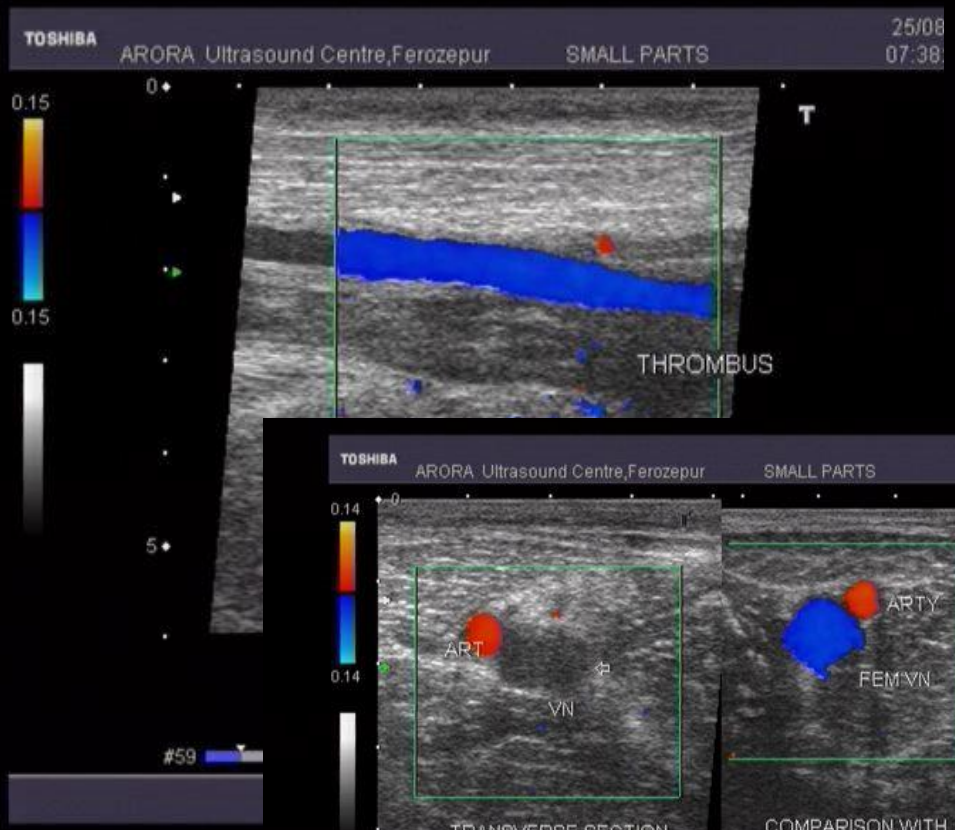
ale predikčná hodnota negativity je až 99%!

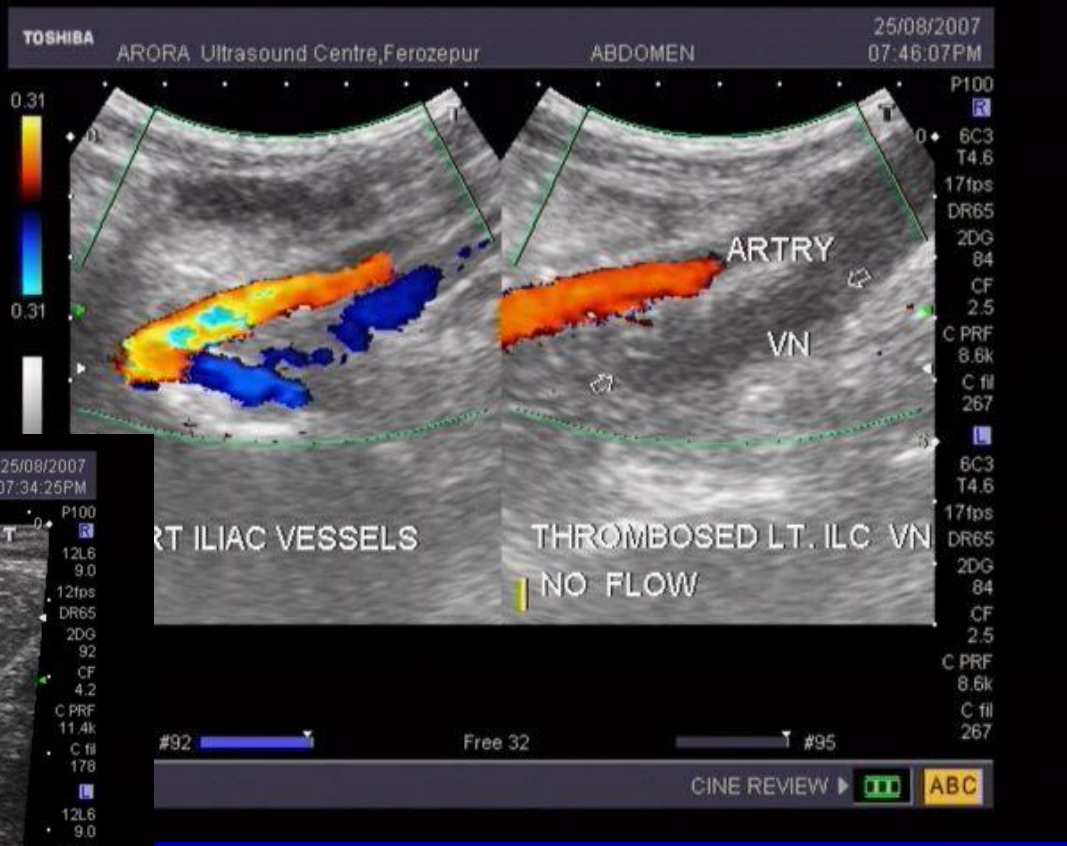
Duplexná ultrasonografia: najčastejšia - pohotová, neinvazívna
špecificita 95%, senzitivita 98%
problematická napr. u obezity

„Klasická“ venografia: bývalý „zlatý štandard“
problém sú reakcie po kontraste

Iné: magnetická rezonancia, CT venografia

Diagnostika trombózy





Diferenciálna diagnostika TECH

Od trombózy hlbokých žíl treba odlíšiť:

- **Asymetrický edém DK (kardiálna dekompenzácia, hepatopatie, renálna insuficiencia)**
- **Ruptúra Bakerovej cysty**
- **Arteriálna insuficiencia**
- **Hematóm, distenzia, kontúzia svalov a iných mäkkých tkanív**
- **Artritída, tendinitída, celulitída, lymfangoitída**
- **Kompresia v. iliaca (tumor, hematóm, absces)**
- **Lymfedém**
- **Afekcie postihujúce n. ischiadicus, neurogénna bolesť**
- **Povrchová tromboflebitída a postflebitický syndróm**

Diagnostika embólie

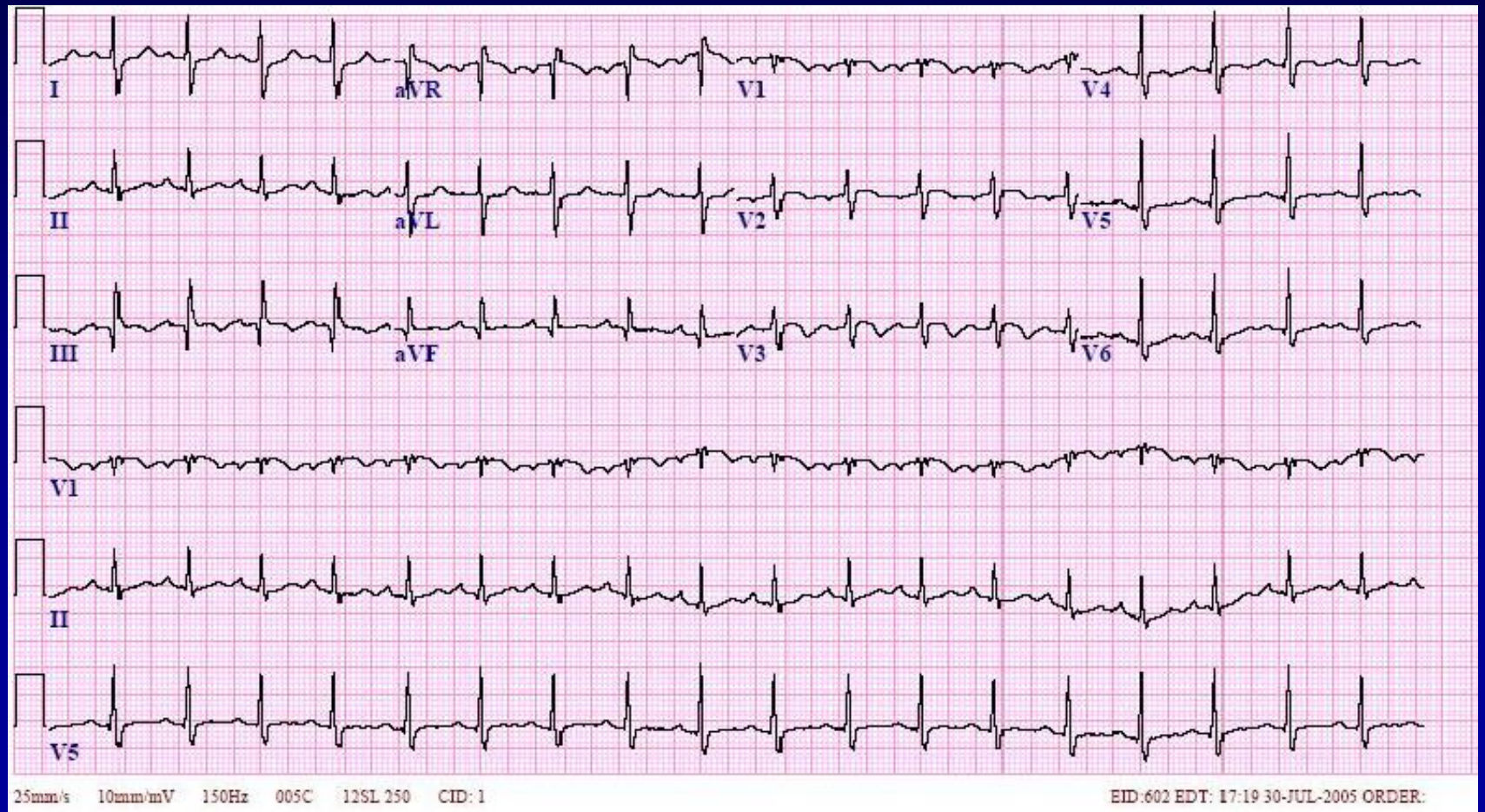
- **Pravdepodobnostné skóre embólie (Wells, 1997, 2000, 2006)**

Faktor	body
• Klinické príznaky HŽT	3
• Alternatívna dg menej pravdepodobná než PE	3
• Tachykardia nad 100/min.	1,5
• Imobilizácia viac než 3 dni alebo väčšia operácia v posledných 4 týž.	1,5
• Predošlá epizóda PE alebo HŽT	1,5
• Hemoptýza	1
• Malignita (onkoterapia v posledných 6 mes.)	1

Pravdepodobnosť:
Vysoká : 6 b a viac stredná: 2 – 6 b nízka: menej než 2 b

Diagnostika embólie

EKG: hlavný prínos – odlíšenie AIM. Klasický obraz $S_1Q_3T_3$, často však len nešpecifické zmeny ST a T, alebo akútna fibrilácia predsiení, BPTR



Diagnostika embólie

Vyšetrenie krvných plynov:	**typicky hypoxémia normálny paO_2 nevylučuje PE**
RTG hrudníka:	**nešpecifický obraz, exsudát, atelektáza**
CT angiografia pľúcnice:	**v súčasnosti špecifickejšia než V/Q scan odhalí aj periférnejšiu embolizáciu, zmenu geometrie pravej komory a tromby v v. cava inf. nevýhody: značná radiačná záťaž**
povodí	
Pľúcna scintigrafia (V/Q scan):	**vhodná u gravidných, u nefropatií**

Diagnostika embólie

EchoKG:

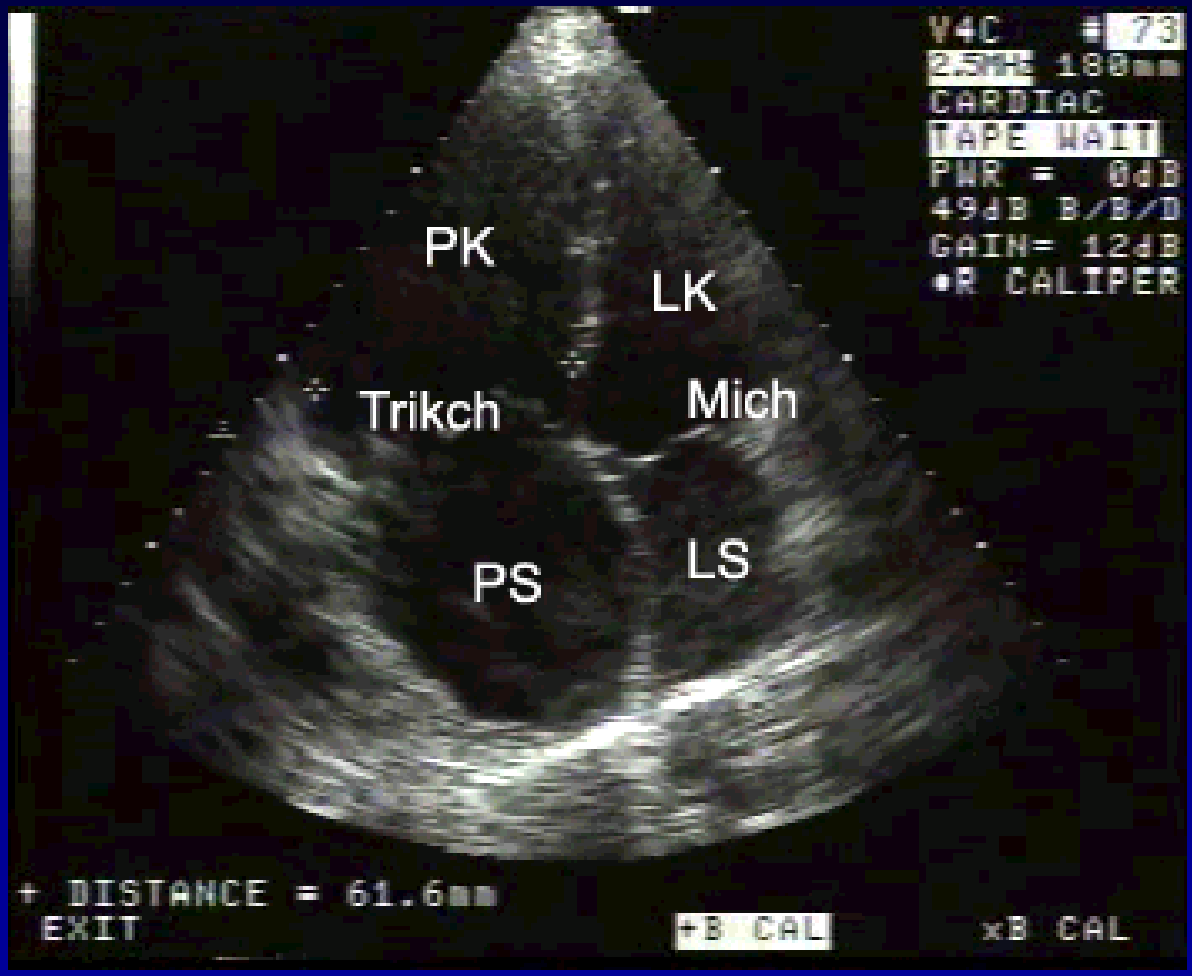
- **vyše 50% hemodynamicky stabilných pacientov:**
  nie sú TTE známky dysfunkcie pravej komory

- **u cirkulačného kolapsu:**
  TTE i TEE je výbornou metódou na rýchle potvrdenie PE pri lôžku

Diagnostika embólie

EchoKG:

- dilatácia PK, hypokinéza PK
- regurgitácia na trikuspidálnej chlopni
- oploštenie septa
- paradoxný pohyb septa
- pľúcna hypertenzia
- diastolická dysfunkcia ĽK kvôli presunu septa
- príležitostne zobrazenie embolu



Diagnostika embólie

Biomarkery (troponíny, nátriuretické peptidy):

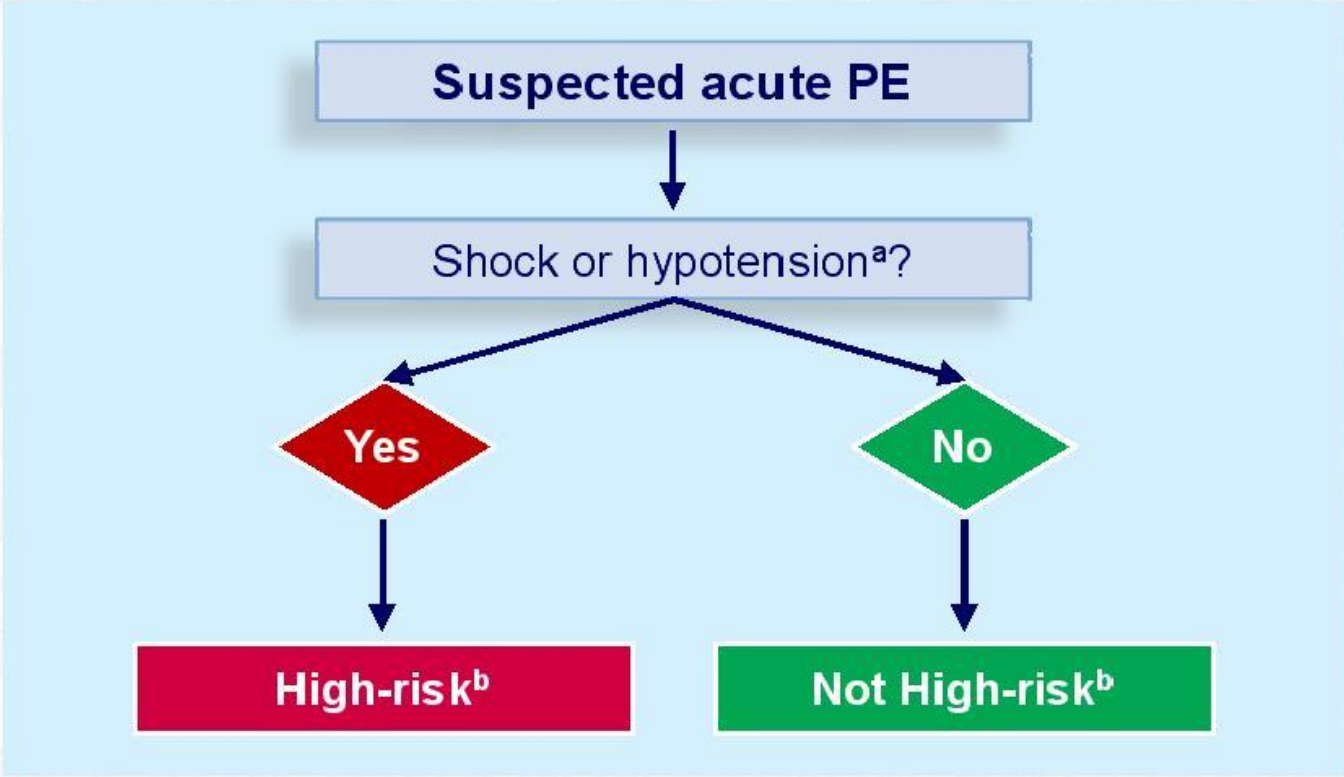
zvýšenie kardiotroponínov koreluje s echo nálezom tlakového preťaženia pravej komory a s nepriaznivou prognózou

zvýšenie BNP (pri vylúčení dysfunkcie obličiek): takisto

Klasická pľúcna angiografia: ostáva referenčnou metódou, z bežného používania ju vytlačila CT Ag

NMR angiografia: horšia špecificita i senzitivita než CT

Initial risk stratification of acute PE



[a] Defined as systolic blood pressure <90 mmHg, or a systolic pressure drop by ≥40 mmHg, for >15 minutes, if not caused by new-onset arrhythmia, hypovolaemia, or sepsis.
[b] Based on the estimated PE-related in-hospital or 30-day mortality.

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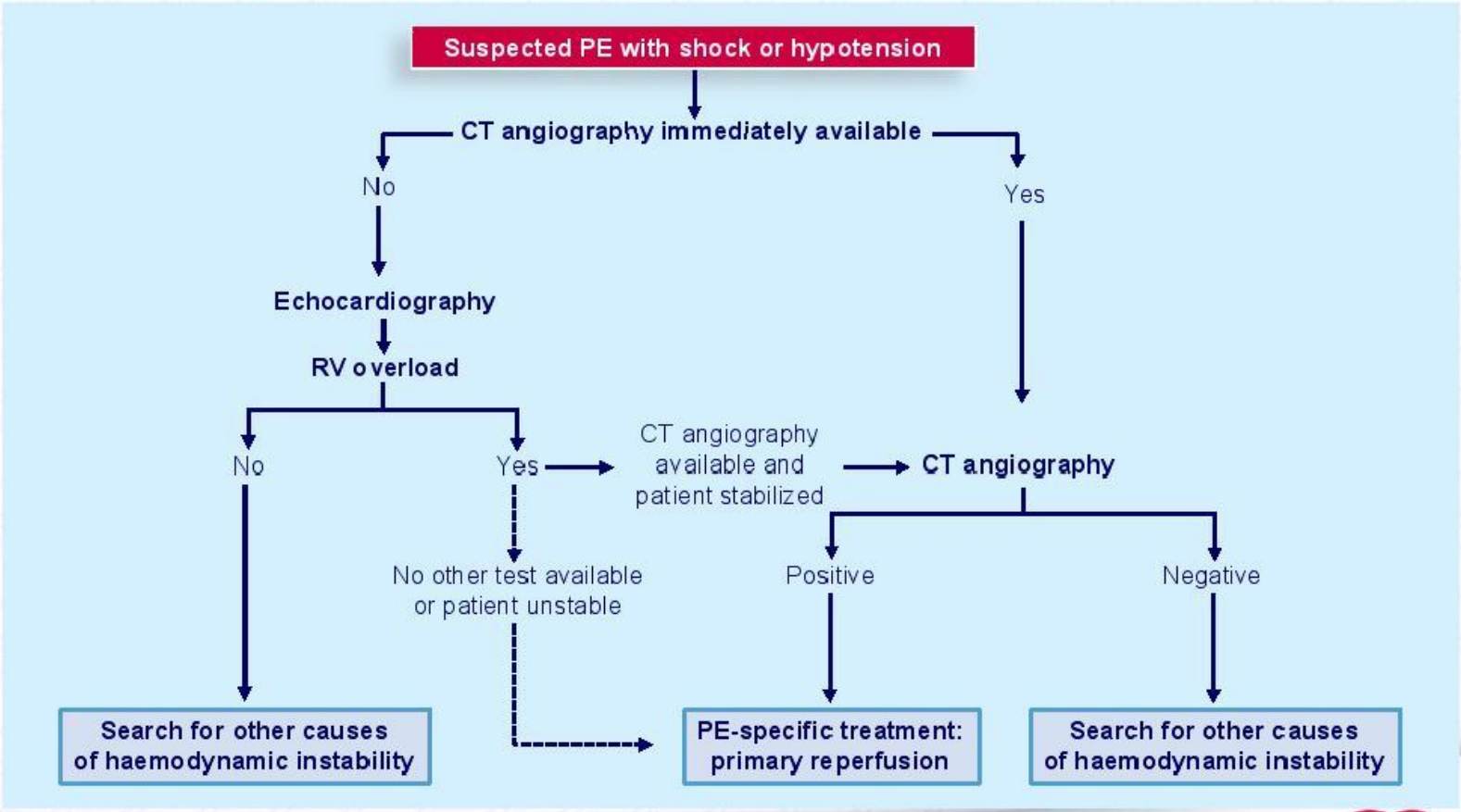
Diagnostic algorithm: high-risk PE



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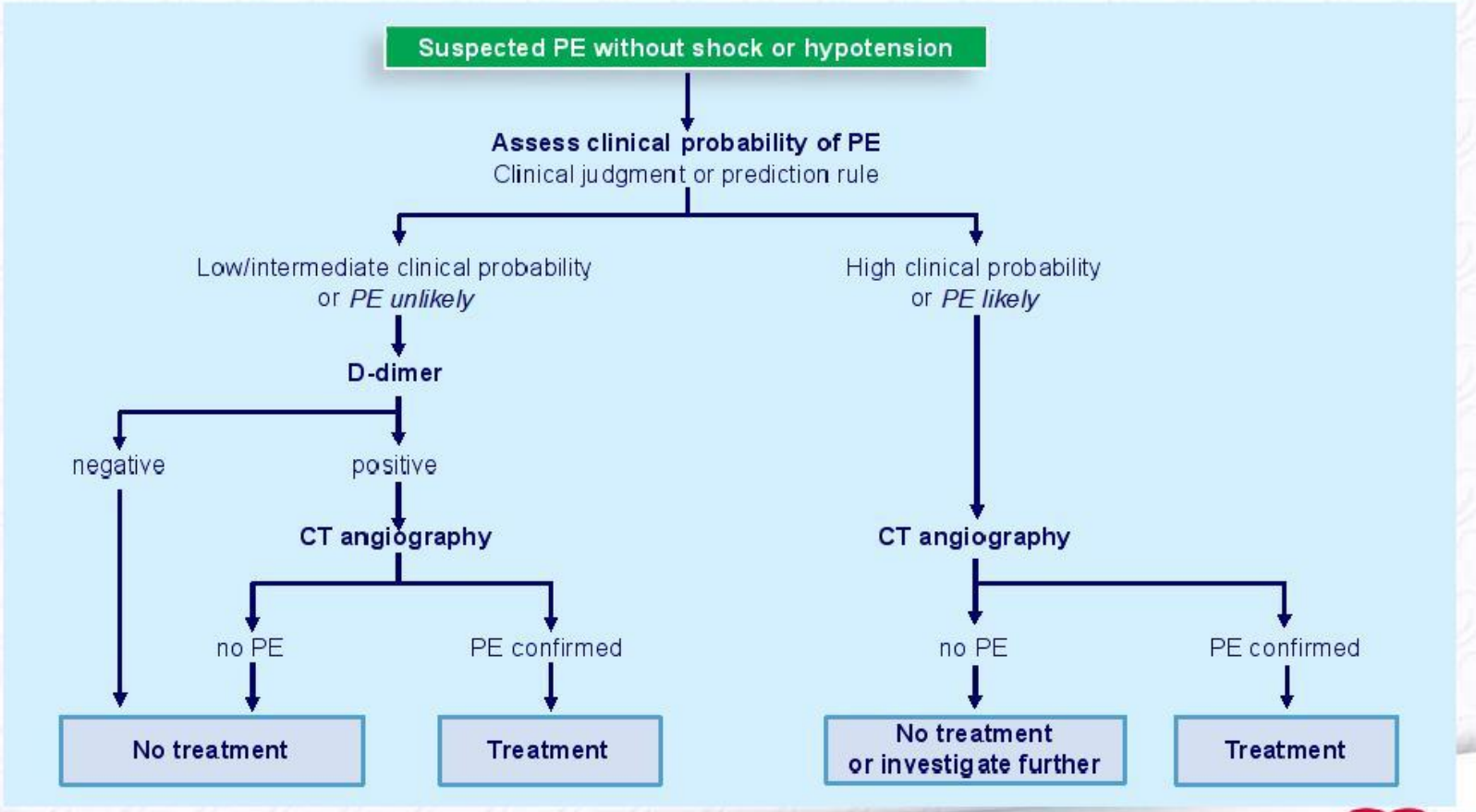
Diagnostic algorithm: not high-risk PE



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Diferenciálna diagnostika TECH

Od pľúcnej embólie (náhle dyspnoe a hypoxémia) treba odlíšiť:

- **Infarkt myokardu**
- **Tamponáda perikardu**
- **Akútna pľúcna hypertenzia**
- **Pľúcna infekcia**
- **ARDS**

Liečba tromboembolizmu

- **Dlhodobé ciele liečby trombózy:**

  prevencia pľúcnej embólie

  prevencia posttrombotického syndrómu

  prevencia opakovania trombózy

- **Metódy:**

  antikoagulácia **trombolýza** **(embolektómia)**

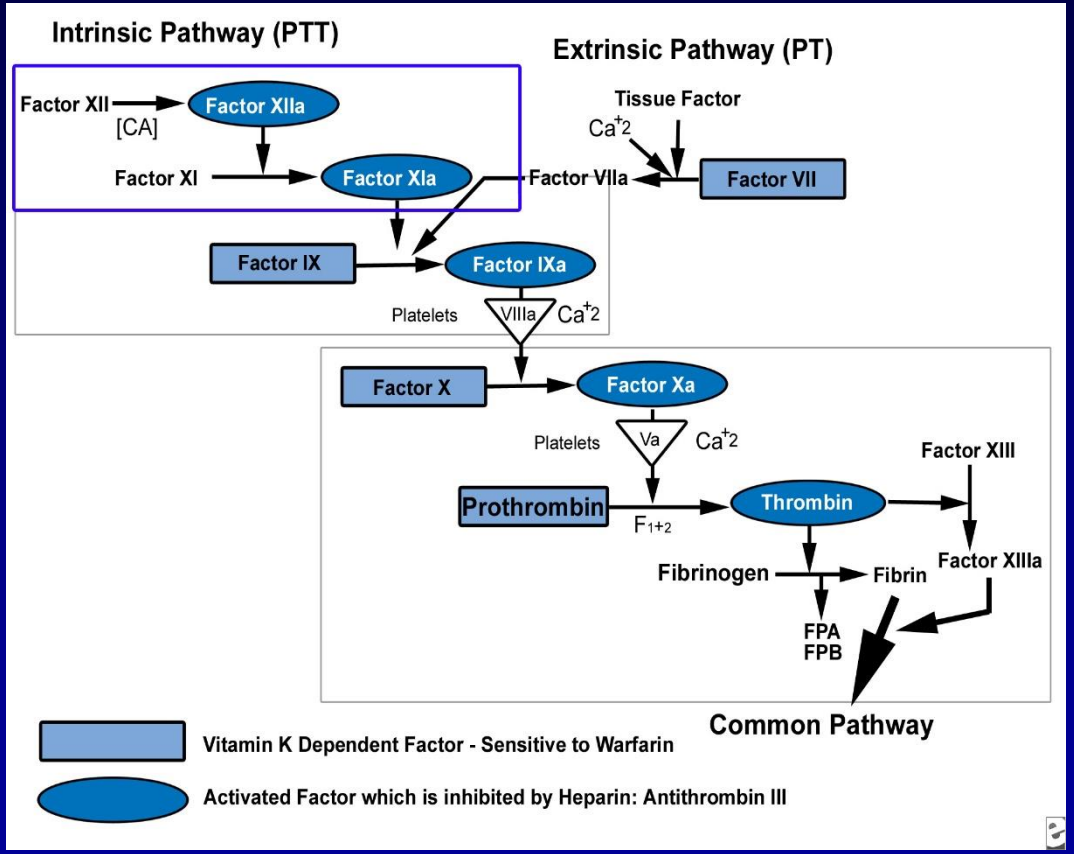
Liečba tromboembolizmu

- **Antikoagulácia :**
- **Iniciálna (už pri podozrení)**

  heparín

  frakcionované heparíny (LMWH)

  fondaparinux



- **Dlhodobá antikoagulačná liečba**

  kumaríny – antagonisti vitamínu K (warfarin)

Liečba tromboembolizmu

- **Heparín :**

- **Bolus 80 j./kg t. hm.**
- **Infúzia 18 j./kg t. hm.**

dosahujú terapeutické hodnoty aPTT rýchlejšie než fixné schémy

- **terapeutické hodnoty aPTT (aktivovaný parciálny tromboplastínový čas):**

1,5 až 2,5-násobok kontrolnej hodnoty aPTT

veľké medzilaboratórne rozdiely hodnôt aPTT
kalibrácia aPTT voči hladinám heparínu 0,3 – 0,7 j./ml (inhibíciou f. Xa)

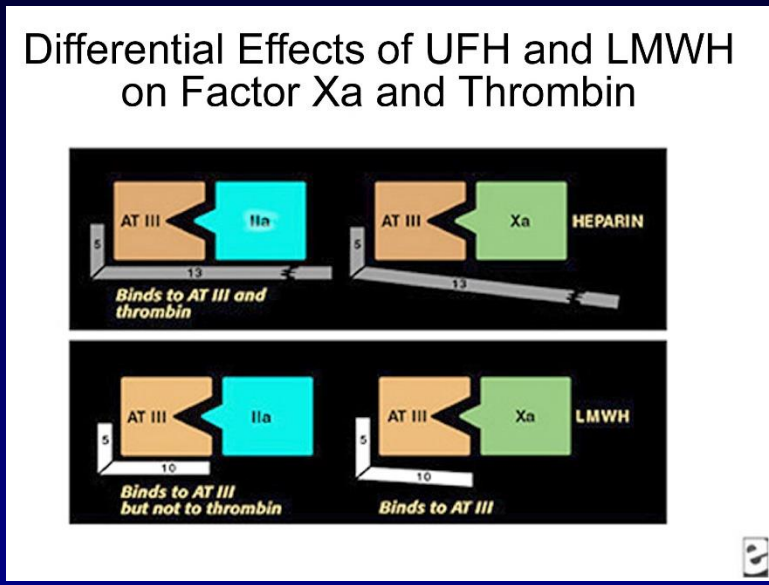
Liečba tromboembolizmu

- **Heparín :**

aPTT nie je vhodný kontrolný parameter u pacientov s abnormálnymi bazálnymi hodnotami (napr. lupus, deficit AT III, niektoré malignity, gravidita)

Tu je výhodnejší a presnejší test anti – faktor Xa

Liečba tromboembolizmu



- **Heparín :**

Sú rôzne dávkovacie nomogramy:

1. Úvodný bolus 5000 j. heparínu i.v.
potom 5000 j. s.c. každých 12 hodín
aPTT po 6 hod., úprava dávky podľa výsledku

2. Úvodný bolus 333 j./kg s.c.,
potom 250 j./kg každých 12 hodín bez potreby kontroly aPTT

Liečba tromboembolizmu

Parenteral anticoagulation for PE

LMWHs and pentasaccharide (fondaparinus) approved for the treatment of pulmonary embolism		
	Dosage	Interval
Enoxaparin	1.0 mg/kg or 1.5 mg/kg	Every 12 hours Once daily
Tinzaparin	175 U/kg	Once daily
Dalteparin	100 IU/kg or 200 IU/kg	Every 12 hours Once daily
Nadroparin	86 IU/kg or 171 IU/kg	Every 12 hours Once daily
Fondaparinux	5 mg (body weight <50 kg); 7.5 mg (body weight 50-100 kg); 10 mg (body weight >100 kg)	Once daily

Liečba tromboembolizmu

- **Inhibítor faktora Xa :**

Fondaparinux (nepriamy inhibítor f. Xa)

Podáva sa raz denne

Profylaxia HŽT:	**2,5 mg s.c.**		
Liečba HŽT a PE:	**5 mg**	**7,5 mg**	**10 mg s.c.**
podľa tel. hm.	**do 50 kg**	**50 – 100 kg**	**nad 100 kg**

kontraindikácia: **renálna insuficiencia (GFR pod 0,5 ml/s)**
bakteriálna endokarditída

Liečba tromboembolizmu

- **Trombolýza :**

Systémové podávanie ustúpilo do úzadia, preferuje sa riadená aplikácia katétrom

- **U vybraných prípadov s rozsiahlou proximálnou HŽT**
- **S nízkym rizikom krvácania**
- **V dobrom stave a s očakávanou dobou prežitia aspoň 1 rok**

„if the expertise and resources are available.“
(ACCP Guidelines, Chest 2008)

Liečba tromboembolizmu

- **Pľúcna embólia :**

Trombolýza – chýbajú EBM dôkazy účinnosti (pokles mortality)
Promptná diagnóza a antikoagulácia má lepšie výsledky.

Rezervuje sa pre hemodynamicky nestabilných pac. s nízkym rizikom hemoragických komplikácií

Streptokináza: bolus 250 000 j., potom infúzia 100 000 j./hod. na 24 hod.

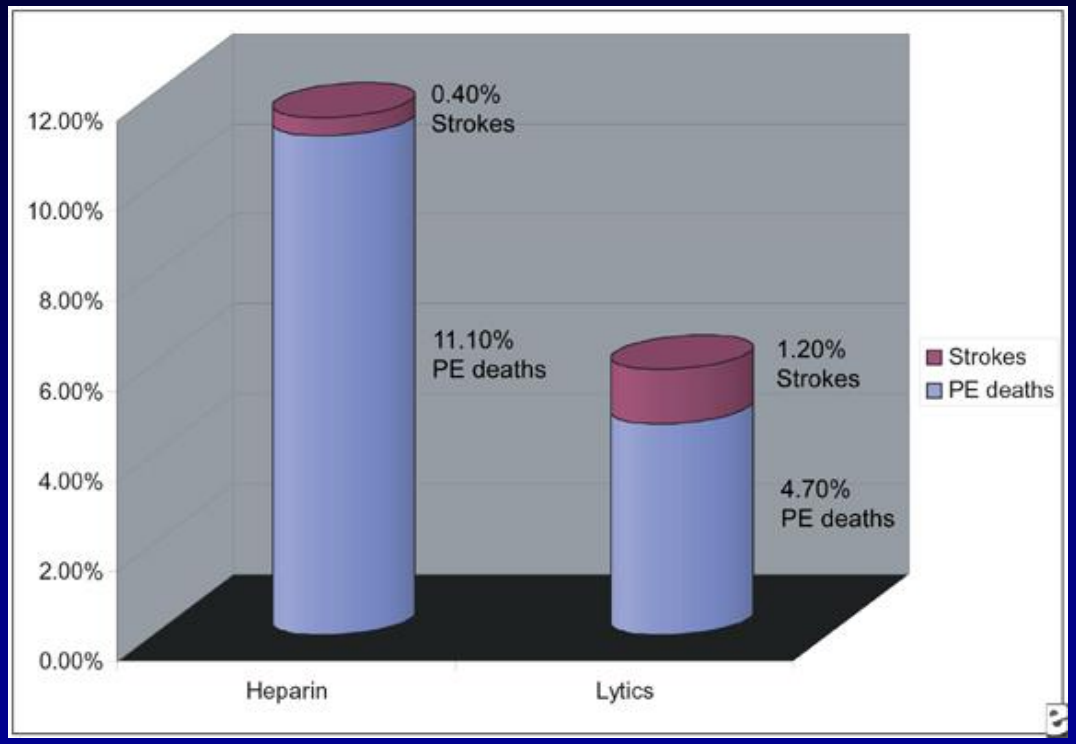
rtPA: 100 mg i.v. na 2 hodiny

Liečba tromboembolizmu

- **Pľúcna embólia :**

Trombolýza - hlavná nevýhoda:

krvácanie.



Lokálna aplikácia katétrom sa neodporúča práve pre riziko krvácania v mieste vpichu.

Riziko intrakraniálneho krvácania: medzi 1 – 2 %.

Liečba tromboembolizmu

Thrombolytic treatment of PE

Approved thrombolytic regimens for pulmonary embolism	
Streptokinase	250 000 IU as a loading dose over 30 minutes, followed by 100 000 IU/h over 12-24 hours.
	Accelerated regimen: 1.5 million IU over 2 hours.
Urokinase	4400 IU/kg as a loading dose over 10 min, followed by 4400 IU/kg per hour over 12-24 hours.
	Accelerated regimen: 3 million IU over 2 hours.
rtPA	100 mg over 2 hours; or
	0.6 mg/kg over 15 minutes (maximum dose 50 mg).

Liečba tromboembolizmu

Contraindications to thrombolysis

Absolute contraindication

- Haemorrhagic stroke or stroke of unknown origin at any time
- Ischaemic stroke in the preceding 6 months
- Central nervous system damage or neoplasms
- Recent major trauma/surgery/head injury in the preceding 3 weeks
- Gastrointestinal bleeding within the last month
- Known bleeding risk

Relative contraindications

- Transient ischaemic attack in the preceding 6 months
- Oral anticoagulant therapy
- Pregnancy, or within one week postpartum
- Non-compressible puncture site
- Traumatic resuscitation
- Refractory hypertension (systolic blood pressure >180 mmHg)
- Advanced liver disease
- Infective endocarditis
- Active peptic ulcer

Liečba tromboembolizmu

- **Pľúcna embólia :**

Embolektómia – podľa ACCP Guidelines:

- **pre pacientov s masívnou PE (pokiaľ možno verifikovanou AG)**
- **šok pretráva napriek heparínu a resuscitačným postupom**
- **pri neúčinnej alebo kontraindikovanej trombolýze**

Chýbajú randomizované štúdie,
retrospektívne analýzy udávajú 20 % mortalitu.

European Society of Anaesthesiology ESA

RÝCHLY SPRIEVODCA NALIEHAVÝMI SITUÁCIAMI

Prihovor k slovenskému vydaniu

Slovenskej anestéziologickej verejnosti, ale aj iným záujemcom, predkladáme postupy pre optimálne zvládnutie vybraných akútnych situácií, ktoré sa môžu vyskytnúť v perioperačnom období, ale aj v inej každodennej lekárskej praxi.
Text na stránke http://html.esahq.org zverejnila Európska spoločnosť anestéziológov (ESA). Odporučila to zároveň sprístupniť a prispôsobiť praxi v lokálnych a národných podmienkach. Ide o stručné postupy, ktoré je preto možné pripomenúť si aj v akútnych situáciách. Odporúčame mať tento materiál všade na miestach, kde sa uvedené situácie môžu vyskytnúť. A to najmä na operačných sálach.

doc. MUDr. Jozef Firment, PhD.
prednosta I. KAIM LF UPJŠ a UNLP Košice
hlavný odborník MZ SR pre odbor anestéziológia a intenzívna medicína

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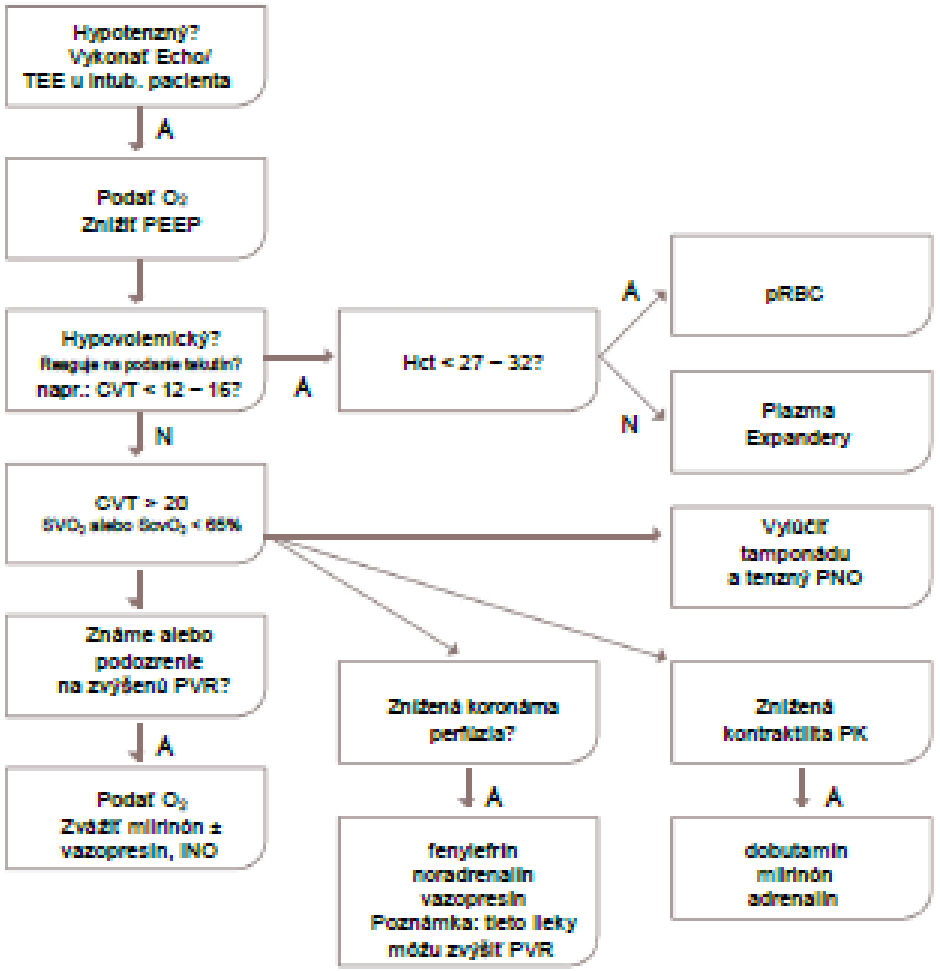
prezident SSAIM

MUDr. Boris Mavrodiev
primár OAMIS
NsP Spišská Nová Ves, a.s., člen siete nemocníc Svet zdravia, a.s.

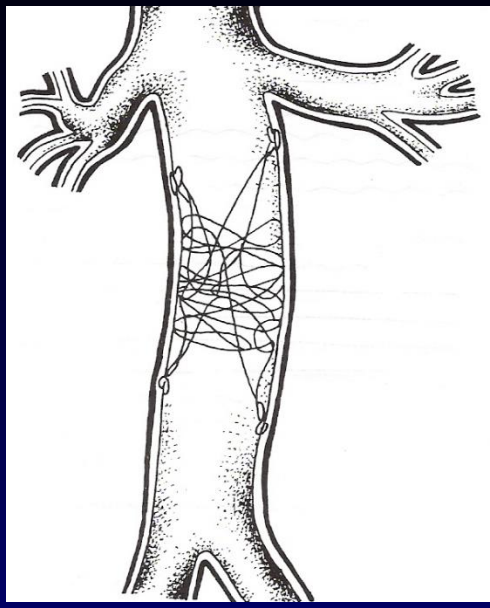
OBSAH

18B ZLYHANIE PRAVEJ KOMORY



TEE = Transezofageálna echokardiografia
CVT = centrálny venózny tlak v mmHg (1mmHg=1,36 cm H_2O)
pRBC = erytrocytárny koncentrát
SVO_2 = systémová spotreba kyslíka
$ScvO_2$ = saturácia kyslíkom v centrálnej žilovej krvi
PEEP = pozitívny endexspiračný tlak
INO = inhalačný oxid dusnatý
PVR= pľúcna vaskulárna rezistencia

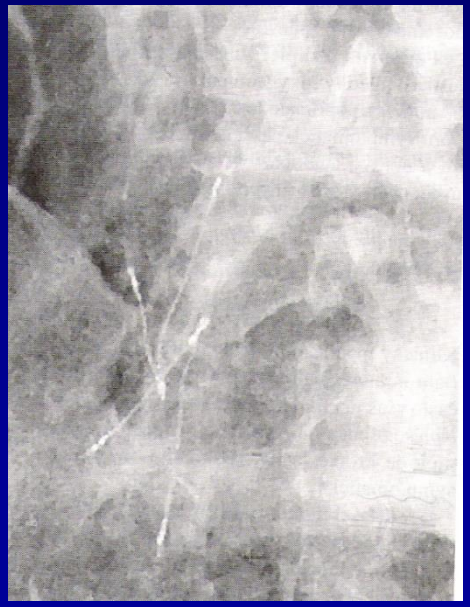
Profylaxia a prevencia tromboembolizmu



- **Pľúcna embólia :**

Implantácia kaválneho filtra:

- **pri neúčinnej alebo kontraindikovanej antikoagulácii**
- **pri rekurentnej tromboembólii**
- **pri embolektómii**



Profylaxia a prevencia tromboembolizmu

- **Dlhodobá antikoagulácia :**

Kumaríny (warfarin):

- **dávka sa riadi predĺžením protrombínového času**
  cieľové INR medzi 2,0 – 3,0
- **pri prechode z akútnej antikoagulácie dodržať 5-dňové prekrývanie**
- **nezabúdať na agonistické a antagonistické liekové a potravinové interakcie**

Profylaxia a prevencia tromboembolizmu

- **Mechanická profylaxia:**

(nie u prebiehajúcej trombózy!!!)

- **Aktívna a pasívna rehabilitácia dolných končatín**
- **Kompresné pančuchy**
- **Cyklická kompresia rôznych častí DK (tlakové manžety)**

Prevencia a profylaxia TECH

Venous thromboembolism prophylaxis and treatment in patients with acute stroke and traumatic brain injury

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Current Opinion in Critical Care 2008, 14:149–155

Purpose of review
Patients with acute stroke and traumatic brain injury are at risk to develop venous thromboembolism. This review analyzes the available literature to propose guidelines for the prevention and treatment of venous thromboembolism in these groups of patients.
Recent findings
In acute ischemic stroke, low-dose low-molecular-weight heparin has the best benefit–risk ratio to prevent venous thromboembolism. Patients with primary intracerebral hemorrhage and traumatic brain injury should receive intermittent pneumatic compression, followed by low-dose low-molecular-weight heparin or unfractioned heparin 3–4 days after stroke onset or 24 h after injury or surgery, respectively, and after cessation of bleeding. Concerning treatment, in patients with deep-vein thrombosis lower doses of heparin are indicated to prevent pulmonary embolism, and a vena cava filter should be considered. In patients with pulmonary embolism, treatment could be more aggressive, because of a high mortality risk.
Summary
Adequate prevention of venous thromboembolism with intermittent pneumatic compression or pharmacological prophylaxis is important. The best treatment of venous thromboembolism remains unclear. In case of pulmonary embolism, more aggressive treatment is warranted.

Thromboprophylaxis in medical–surgical critically ill patients

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Current Opinion in Critical Care 2008, 14:520–523

Purpose of review
Although critically ill patients are at high risk of venous thromboembolism and bleeding, and thromboprophlyaxis is of proven effectivity in other settings, there remain relatively few data to assist clinicians in providing evidence-based care for medical–surgical patients in the intensive care unit.
Recent findings
Deep vein thrombosis occurs in 5–10% of critically ill patients even if they receive unfractionated heparin for prophylaxis. Both heparin and low molecular weight heparin can be safely administered to the majority of critically ill patients and the low molecular weight heparin dalteparin does not appear to bioaccumulate even when administered to patients with severe renal dysfunction. Further research is currently underway to better define how these conditions can be optimally treated.
Summary
Despite the high morbidity and mortality because of critical illness, the risk of venous thromboembolism in these patients, and adverse outcomes due to venous thromboembolism, much more methodologically rigorous data are required in the form of large, well designed randomized trials before firm recommendations about prophylaxis can be provided to this highly vulnerable population.

Prevencia a profylaxia TECH

Supplement

ANTITHROMBOTIC AND THROMBOLYTIC THERAPY 8TH ED: ACCP GUIDELINES

The Perioperative Management of Antithrombotic Therapy*

American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition)

James D. Douketis, MD, FRCP(C); Peter B. Berger, MD, FACP; Andrew S. Dunn, MD, FACP; Amir K. Jaffer, MD; Alex C. Spyropoulos, MD, FACP, FCCP; Richard C. Becker, MD, FACP, FCCP; and Jack Ansell, MD, FACP, FCCP

This article discusses the perioperative management of antithrombotic therapy and is part of the American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition). The primary objectives of this article are the following: (1) to address the perioperative management of patients who are receiving vitamin K antagonists (VKAs) or antiplatelet drugs, such as aspirin and clopidogrel, and require an elective surgical or other invasive procedures; and (2) to address the perioperative use of bridging anticoagulation, typically with low-molecular-weight heparin (LMWH) or unfractionated heparin (UFH). A secondary objective is to address the perioperative management of such patients who require urgent surgery. The recommendations in this article incorporate the grading system that is discussed in this supplement (Guyatt G et al, *CHEST* 2008; 133:123S–131S). Briefly, Grade 1 recommendations are considered strong and indicate that the benefits do (or do not) outweigh risks, burden, and costs, whereas Grade 2 recommendations are referred to as suggestions and imply that individual patient values may lead to different management choices.

The key recommendations in this article include the following: in patients with a mechanical heart valve or atrial fibrillation or venous thromboembolism (VTE) at high risk for thromboembolism, we recommend bridging anticoagulation with therapeutic-dose subcutaneous (SC) LMWH or IV UFH over no bridging during temporary interruption of VKA therapy (Grade 1C); in patients with a mechanical heart valve or atrial fibrillation or VTE at moderate risk for thromboembolism, we suggest bridging anticoagulation with therapeutic-dose SC LMWH, therapeutic-dose IV UFH, or low-dose SC LMWH over no bridging during temporary interruption of VKA therapy (Grade 2C); in patients with a mechanical heart valve or atrial fibrillation or VTE at low risk for thromboembolism, we suggest low-dose SC LMWH or no bridging over bridging with therapeutic-dose SC LMWH or IV UFH (Grade 2C).

In patients with a bare metal coronary stent who require surgery within 6 weeks of stent placement, we recommend continuing aspirin and clopidogrel in the perioperative period (Grade 1C); in patients with a drug-eluting coronary stent who require surgery within 12 months of stent placement, we recommend continuing aspirin and clopidogrel in the perioperative period (Grade 1C).

In patients who are undergoing minor dental procedures and are receiving VKAs, we recommend continuing VKAs around the time of the procedure and coadministering an oral prothrombotic agent (Grade 1B); in patients who are undergoing minor dermatologic procedures and are receiving VKAs, we recommend continuing VKAs around the time of the procedure (Grade 1C); in patients who are undergoing cataract removal and are receiving VKAs, we recommend continuing VKAs around the time of the procedure (Grade 1C).

(CHEST 2008; 133:299–339S)

Key words: arterial thromboembolism; aspirin; bleeding; bridging anticoagulation; clopidogrel; low-molecular-weight heparin; oral anticoagulant; perioperative; stroke; surgery; unfractionated heparin; venous thromboembolism; vitamin K antagonist

Abbreviations: APTT = activated partial thromboplastin time; CABG = coronary artery bypass graft; $CHADS_2$ = Congestive Heart Failure-Hypertension-Age-Diabetes-Stroke; CI = confidence interval; DDAVP = 1-deamino-8-D-arginine vasopressin; INR = international normalized ratio; LMWH = low-molecular-weight heparin; NSAID = nonsteroidal antiinflammatory drug; OR = odds ratio; PCI = percutaneous coronary intervention; SC = subcutaneous; UFH = unfractionated heparin; VKA = vitamin K antagonist; VTE = venous thromboembolism

Postinjury thromboprophylaxis

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Current Opinion in Critical Care 2008, 14:673–678

Purpose of review
In trauma patients, pulmonary embolism occurs in up to 4% of cases and carries a mortality of 20–50%. The incidence of deep vein thrombosis (DVT) varies from 5 to 63% depending on patients' risk factors, modality of prophylaxis, and methods of detection. For these reasons, trauma patients require adequate DVT prophylaxis.

Recent findings
Spinal fracture or cord injury patients are at particular risk. Increasing injury severity, head injury, older age, lower limb injuries, and obesity are other risk factors. The current standard of care for DVT prophylaxis is enoxaparin (a low molecular weight heparin) as long as anticoagulation is not contraindicated. Unfractionated heparin alone does not provide sufficient protection against DVT. Selective factor Xa inhibitors such as fondaparinux are showing promising results. Other strategies for pulmonary embolism prevention include: graduated compression stockings, sequential compression devices, continuous passive motion, and prophylactic inferior vena cava filter. There is lack of consensus regarding the optimal DVT prophylaxis in trauma patients and few level I recommendations exist.

Summary
Best practice in thromboprophylaxis for trauma patients will remain on the basis of recommendations until definitive risk–benefit ratios are determined to justify the use of various mechanical and pharmacological measures, in combination or alone.

Thromboprophylactic management in the neurosurgical patient with high risk for both thrombosis and intracranial bleeding

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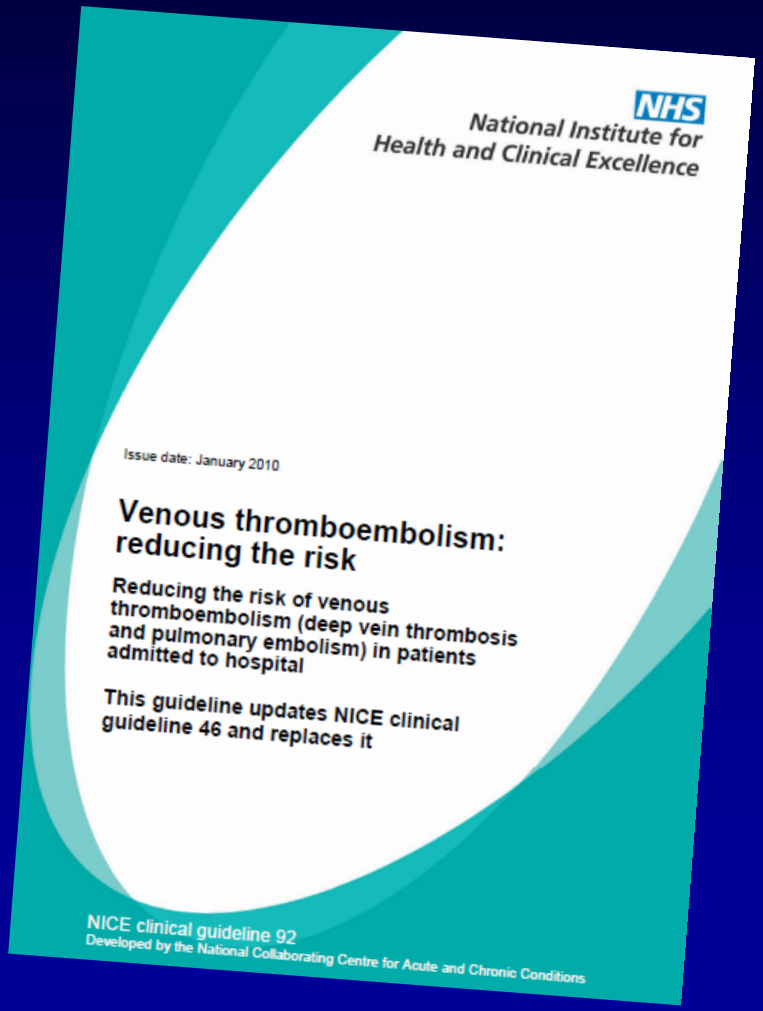
Current Opinion in Anaesthesiology 2010, 23:558–563

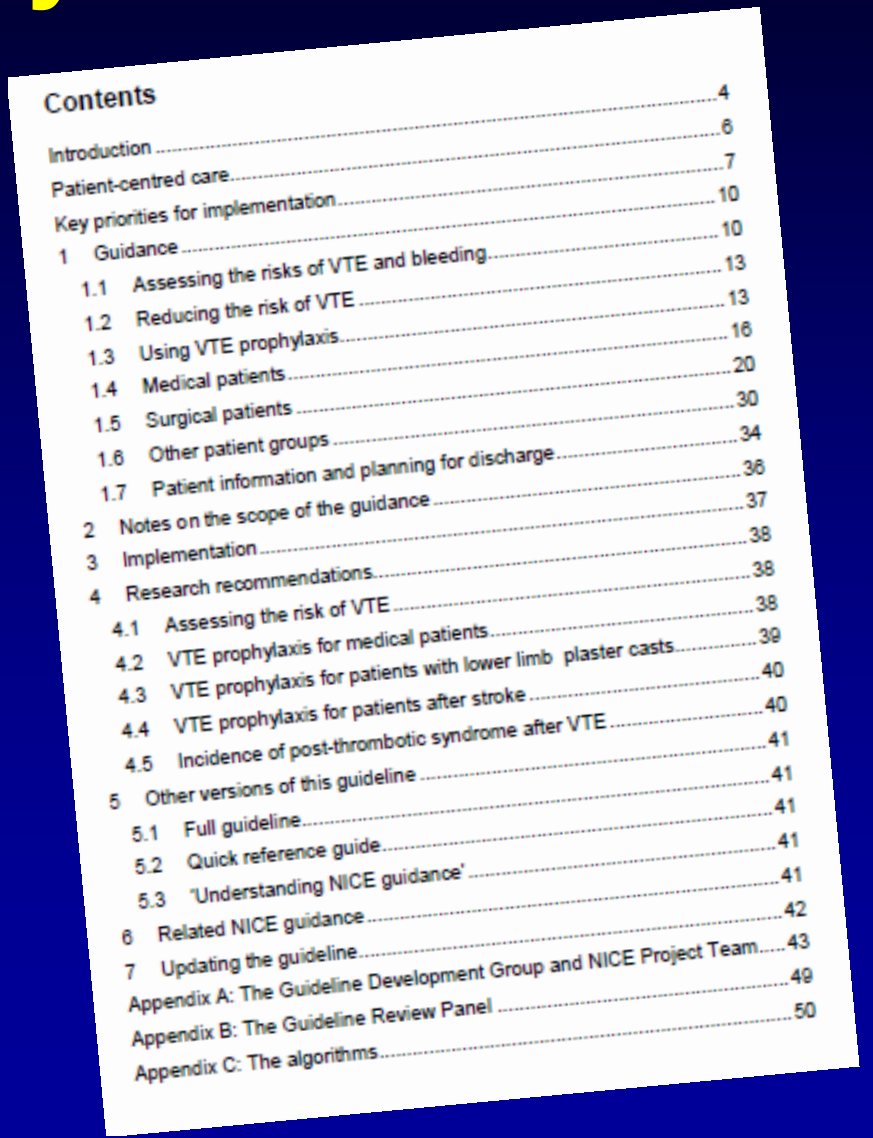
Purpose of review
Pharmacologic thromboprophylaxis is indicated in neurosurgery patients having high risk for venous or arterial thrombosis. The pharmacologic thromboprophylaxis, as well as temporary interruption of antithrombotic drugs because of surgery, and possible use of substitutive medication ('bridging therapy') are reviewed.

Recent findings
Pharmacologic thromboprophylaxis is used for most neurosurgical patients, but clinical practices vary a lot. There are only few reports of the management of neurosurgery patients having mechanical prosthetic heart valves, atrial fibrillation with comorbidities, history of deep venous thrombosis, thrombophilia, or coronary artery stent. These patients present a high risk for both thrombosis and bleeding as temporary interruption of antithrombotic medication as well as a substitutive medication would be indicated. Generally, the bridging therapy with low-molecular-weight heparin (LMWH) is a feasible approach in patients needing interruption of vitamin K antagonists. Experiences in neurosurgery patients emphasize carefully secured hemostasis and tailored dose as well as timing of LMWH. In patients with a recent coronary artery stent scheduled for neurosurgery, an individualized plan is needed. Bridging therapy for antiplatelet agents or novel oral anticoagulants is not yet settled.

Summary
Pharmacologic thromboprophylaxis, or bridging therapy, should be tailored according to the individual risks and the type of neurosurgery. The bleeding risk is likely minimized by allowing coagulation capacity to normalize preoperatively and by using reduced doses of LMWH starting relatively late after neurosurgery.

Prevencia a profylaxia TECH





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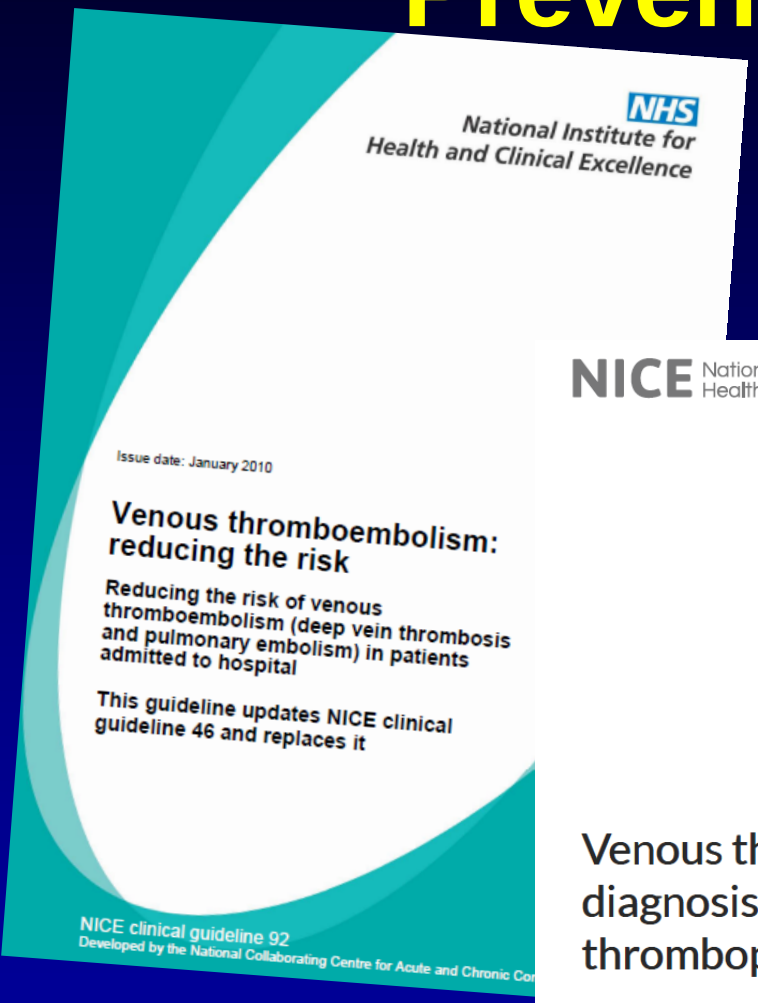

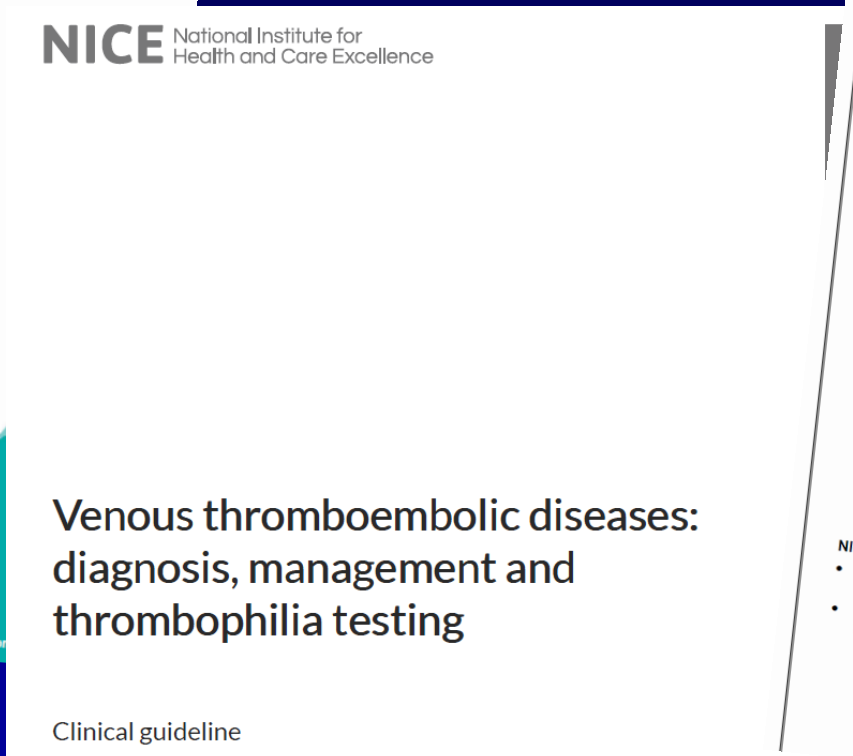

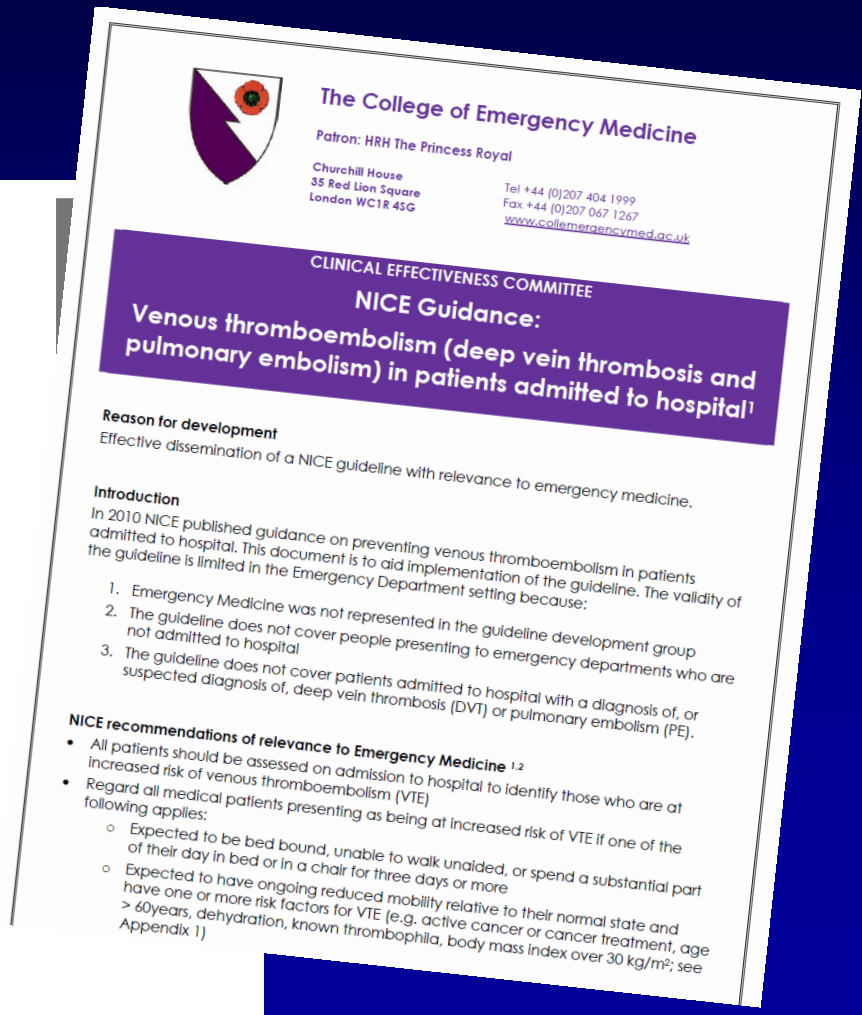

Anestézia a intenzívna medicína a prevencia tromboembolických príhod

Emerging antithrombotic agents: what does the intensivist need to know?

Zafar Iqbal and Marc Cohen

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Current Opinion in Critical Care 2010, 16:419–425

Purpose of review
As thrombus consists of both fibrin and platelets, antithrombotic strategies involve anticoagulants and antiplatelets, alone or in combination.
Recent findings
Traditionally, unfractionated heparin has been the most commonly used parenteral anticoagulant, but owing to its variable dose response and narrow therapeutic indices, it is being replaced by low molecular weight heparin, fondaparinux, and bivalrudin. New oral factor Xa inhibitors like apixaban and rivaroxaban are still on the horizon, awaiting definite evaluation in ACS, DVT and atrial fibrillation. On the contrary, a dramatic advance in the arena of oral anticoagulants has occurred with the introduction of dabigatran, an oral direct thrombin inhibitor. This agent showed better outcomes than oral vitamin K antagonists in patients with atrial fibrillation. The antiplatelet field has also expanded by the addition of two new agents, prasugrel and ticagrelor. These agents have been tested against clopidogrel, in patients with ACS, with superior efficacy outcomes for both agents and higher bleeding events with prasugrel.
Summary
Bleeding risk associated with antithrombotics is not only a function of their inherent biochemical properties but also a reflection of how healthcare professionals choose and dose these agents in individual patients.

New anticoagulants and regional anesthesia

Juan V. Llau[a,b] and Raquel Ferrandis[a,c]

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Current Opinion in Anaesthesiology 2009, 22:661–666

Purpose of review
The use of pharmacological thromboprophylaxis in the perioperative period may conflict with regional anesthetic techniques in which maintaining hemostatic integrity is essential. Recently, new anticoagulants have been developed with more efficacy and a better safety profile. This article reviews the basis for the actual recommendations and the current status and management of these new drugs.
Recent findings
Recent studies have outlined that the risk of epidural hematoma after neuraxial anesthesia may be higher than estimated. Therefore, it is imperative to follow the published recommendations. The use of new anticoagulant drugs may take into account the pharmacological profile of each one to safely perform regional anesthesia, mainly the time to reach peak plasma level and half-life.
Summary
When new anticoagulant drugs are used for thromboprophylaxis in orthopedic surgery, the performance of neuraxial anesthetic techniques should be based on their pharmacology. If a peripheral blockade is chosen, these recommendations should be followed when a block is performed in a noncompressible area.

Profylaxia TECH – anestéziologické implikácie

- Konkrétna anestéziologická metóda ako rizikový faktor
- Interferencia antikoagulácie s regionálnou a neuraxiálnou anestéziou
- „Bridging“ chronickej antikoagulačnej a antitrombocytovej liečby v perioperačnom období (stenty, fibrilácia predsiení atď.)

warfarin, clopidogrel, ASA, ...

Profylaxia TECH
- anestéziologické implikácie

European Society of Anaesthesiology ESA

06RC1

Neuraxial anaesthesia and anticoagulant and antiplatelet agents: the ESA guidelines

Sibylle A. Kozek-Langenecker

Department of Anesthesiology and Intensive Care, Evangelisches Krankenhaus, Vienna, Austria

Saturday, June 12, 2010 15:00-15:45 Room: 101ab

Guideline activity within the European Society of Anaesthesiology (ESA)

A focus group of the ESA Council members recommended in 2007 that the ESA should further its aims of improving the practice of anaesthesia throughout Europe by becoming involved in the production of evidence-based guidelines. Therefore, in 2008 the ESA Guideline Committee was formed to oversee these activities. One of the first guideline produced by the ESA is the recommendation on the role of regional anaesthesia in patients receiving anticoagulant, antiplatelet agents or both. In a recent ESA Newsletter (Autumn 2009), Andrew Smith (UK), chairperson of the ESA Guideline Committee, defined three elements for each ESA guideline: collaboration, transparency and simplicity. Although many national anaesthesia societies have prepared and published their recommendations in this field, European collaboration will hopefully help towards the harmonisation of clinical management, which may also help to improve standards.

Acta Anaesthesiol Scand 2010; 54: 16–41
Printed in Singapore.

ACTA ANAESTHESIOLOGICA SCANDINAVICA
doi: 10.1111/j.1399-6576.2009.02089.x

Review Article

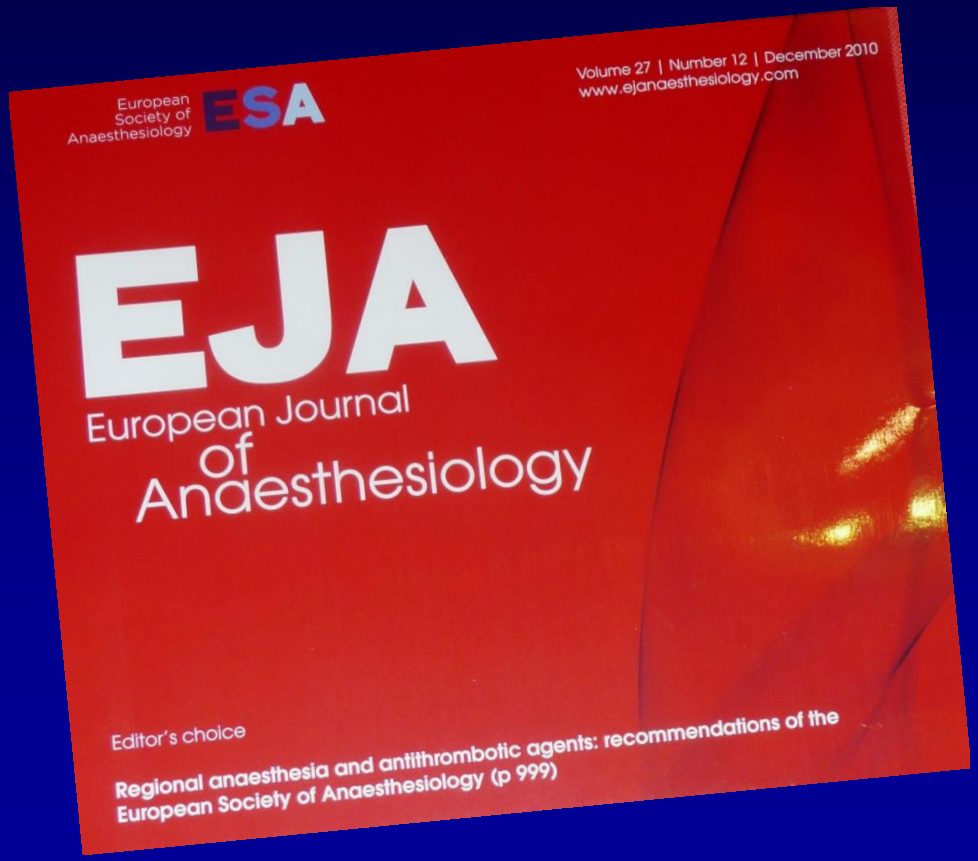
Nordic guidelines for neuraxial blocks in disturbed haemostasis from the Scandinavian Society of Anaesthesiology and Intensive Care Medicine

H. Breivik[1], U. Bang[2], J. Jalonen[3], G. Vigfússon[4], S. Alahuhta[5] and M. Lagerkranser[6]
[1]*Section for Anaesthesiology and Intensive Care Medicine, University of Oslo, Rikshospitalet, Oslo, Norway,* [2]*Department of Anaesthesia and Intensive Care, Aarhus University Hospital, Skejby, Aarhus N, Denmark,* [3]*Department of Anaesthesiology and Intensive Care, Emergency Care and Pain Medicine, Turku University Hospital, University of Turku, Turku, Finland,* [4]*Department of Anaesthesia and Intensive Care, University Hospital Landspitalinn, Reykjavik, Iceland,* [5]*Department of Anaesthesiology, University of Oulu, Oulu, Finland and* [6]*Section for Anaesthesiology and Intensive Care Medicine, Department of Physiology and Pharmacology, Karolinska Institute, Stockholm, Sweden*

Background: Central neuraxial blocks (CNBs) for surgery and analgesia are an important part of anaesthesia practice in the Nordic countries. More active thromboprophylaxis with potent antihaemostatic drugs has increased the risk of bleeding into the spinal canal. National guidelines for minimizing this risk in patients who benefit from such blocks vary in their recommendations for safe practice.
Methods: The Scandinavian Society of Anaesthesiology and Intensive Care Medicine (SSAI) appointed a task force of experts to establish a Nordic consensus on recommendations for best clinical practice in providing effective and safe CNBs in patients with an increased risk of bleeding. We performed a literature search and expert evaluation of evidence for (1) the possible benefits of CNBs on the outcome of anaesthesia and surgery, for (2) risks of spinal bleeding from hereditary and acquired bleeding disorders and antihaemostatic drugs used in surgical patients for thromboprophylaxis, for (3) risk evaluation in published case reports, and for (4) recommendations in published national guidelines. Proposals from the taskforce were available for feedback on the SSAI web-page during the summer of 2008.
Results: Neuraxial blocks can improve comfort and reduce morbidity (strong evidence) and mortality (moderate evidence) after surgical procedures. Haemostatic disorders, antihaemostatic drugs, anatomical abnormalities of the spine and spinal blood vessels, elderly patients, and renal and hepatic impairment are risk factors for spinal bleeding (strong evidence). Published national guidelines are mainly based on experts' opinions (weak evidence). The task force reached a consensus on Nordic guidelines, mainly based on our experts' opinions, but we acknowledge different practices in heparinization during vascular surgery and peri-operative administration of non-steroidal anti-inflammatory drugs during neuraxial blocks.
Conclusions: Experts from the five Nordic countries offer consensus recommendations for safe clinical practice of neuraxial blocks and how to minimize the risks of serious complications from spinal bleeding. A brief version of the recommendations is available on http://www.ssai.info.

Accepted for publication 25 June 2009

Profylaxia TECH
- anestéziologické implikácie



GUIDELINES

Regional anaesthesia and antithrombotic agents: recommendations of the European Society of Anaesthesiology

Wiebke Gogarten, Erik Vandermeulen, Hugo Van Aken, Sibylle Kozek, Juan V. Llau and Charles M. Samama

Background and objectives Performing neuraxial anaesthesia in patients receiving antithrombotic drugs is controversial due to the increased risk of spinal epidural haematoma. Strict adherence to the recommended time intervals between the administration of anticoagulants, neuraxial blockade and the removal of catheters is thought to improve patient safety and reduce the risk of haematoma. Appropriate guidelines have been prepared by a number of national societies of anaesthesiologists, but they do not have universal acceptance. The introduction of new anticoagulants together with recent reports of stent thrombosis in patients with perioperative cessation of antiplatelet drugs have considerably broadened the issue and made revision necessary. To overcome deficiencies in content and applicability, the European Society of Anaesthesiology has taken the initiative to provide current and comprehensive guidelines for the continent as a whole.
Methods Extensive review of the literature.
Results and conclusions In order to minimise bleeding complications during regional anaesthetic techniques, care should be taken to avoid traumatic puncture. If a bloody tap occurs when intraoperative anticoagulation is planned, postponing surgery should be considered. Alternatively, catheters can be placed the night before surgery. Regional anaesthesia in patients receiving full anticoagulation treatment continues to be contraindicated. Catheter manipulation and removal carry similar risks to insertion and the same criteria should apply. Appropriate neurological monitoring is essential during the postoperative recovery period and following catheter removal. The final decision to perform regional anaesthesia in patients receiving drugs that affect haemostasis has to be taken after careful assessment of individual risks and benefits.

Eur J Anaesthesiol 2010;27:999–1015
Published online 1 October 2010

Keywords: apixaban, aspirin, bleeding, cilostazol, clopidogrel, dabigatran, epidural, fondaparinux, haematoma, heparin, hirudin, idrabiotaparinux, low-molecular-weight heparin, prasugrel, regional anaesthesia, rivaroxaban, spinal, ticagrelor

Abbreviations: ACCP, American College of Chest Physicians; ACT, Activated Clotting Time; ADP, Adenosine Diphosphate; aPTT, Activated Partial Thromboplastin Time; ASRA, American Society of Regional Anesthesia; DVT, Deep Venous Thrombosis; ECT, Ecarin Clotting Time; ESA, European Society of Anaesthesiology; ESC, European Society of Cardiology; FDA, US Food and Drug Administration; HIT, Heparin-Induced Thrombocytopenia; INR, International Normalised Ratio; LMWH, Low-Molecular-Weight Heparin; NSAIDS, Non-Steroidal Anti-Inflammatory Drugs; PCC, Prothrombin Complex Concentrates; PF4, Platelet Factor 4; PDE, Phosphodiesterase; PT, Prothrombin Time; SSRI, selective serotonin uptake inhibitor; UFH, Unfractionated Heparin; VTE, Venous Thromboembolism

Súborné práce - anestéziologické implikácie

Journal of Clinical Anesthesia (2011) **23**, 153–165

ELSEVIER

Journal of Clinical Anesthesia

Review article

Perioperative pulmonary embolism: diagnosis and anesthetic management

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Received 1 May 2009; revised 18 June 2010; accepted 29 June 2010

Súborné práce - všeobecné implikácie

Anaesthesia 2013, 68 (Suppl. 1), 102–116 doi:10.1111/anae.12051

Review Article

Medical emergencies: pulmonary embolism and acute severe asthma

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1 Specialist Registrar in Anaesthesia and Intensive Care Medicine, 2 Consultant and Honorary Senior Lecturer in General and Neuro Intensive Care, St George's Hospital, London, UK

Summary

In this, the second of two articles covering specific medical emergencies, we discuss the definitions, epidemiology, pathophysiology, acute and chronic management of pulmonary embolus and acute severe asthma.

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Accepted: 24 September 2012

Súborné práce - všeobecné implikácie

Medscape REFERENCE

Thromboembolism

- Author: Vera A De Palo, MD; Chief Editor: Harris Gellman, MD more...

Updated: Nov 25, 2015

Practice Essentials

Thromboembolism encompasses two interrelated conditions that are part of the same spectrum, deep venous thrombosis (DVT) and pulmonary embolism (PE) (see

Profylaxia TECH
- intenzivistické implikácie

Všeobecné princípy:

- **Kriticky chorí majú vysoké riziko TECH, väčšina prípadov je bez klinických príznakov.**
- **Profylaxia paušálne u všetkých, preferuje sa farmakologická, ak sa nedá, tak mechanická (prípadne spolu).**
- **Započať ju bez zbytočných odkladov.**
- **Má byť súčasťou protokolu, treba sledovať adherenciu (vynechanie významne zvyšuje riziko).**
- **Štandardná dávka nebýva dostatočná, u najviac ohrozených treba monitorovať účinok** *(4 hodiny po podaní, hladina antiXa má byť medzi 0,2 – 0,4 IU/ml)*.
- **Ak je hladina antiXa trvale nízka napriek zvýšenej dávke, vyšetriť AT III.**
- **Zvážiť použitie kompresnej sonografie končatín ako screening.**

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- **Vysoké riziko trombózy a pľúcnej embólie:**
  - **predlžuje pobyt na odd. AIM**
  - **zvyšuje morbiditu a mortalitu, komplikuje liečbu a ošetrovanie**
  - **zvyšuje náklady na terapiu**
  - **významne prispieva k rozvoju syndrómu vyhorenia**

- **Komplexný medicínsky a ošetrovateľský prístup v prevencii TECH kriticky chorých:**
  - **Dôsledné dodržiavanie (aj časové) ordinovanej farmakoprevencie**
  - **Mechanické pomôcky na kompresiu (návleky, bandáže, kompresné systémy)**
  - **Mobilizácia, rehabilitácia – aj pasívna**
  - **Frekventná kontrola končatín, aktívne vyhľadávanie prejavov TECH, reakcie pacienta**
  - **Komunikácia lekár – sestra (verbálna i v dokumentácii)**

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Koncepcia FAST HUG:

- **F** Feeding (výživa)
- **A** Analgesia (analgézia)
- **S** Sedation (sedácia)
- **T** Thromboembolic prophylaxis (prevencia tromboembólie)
- **H** Head of the bed elevated (zvýšená horná polovica tela)
- **U** Stress Ulcer Prevention (prevencia stresového vredu)
- **G** Glucose control (kontrola glykémie)

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- intenzivistické implikácie

Koncepcia Gustav H:

- **G** pravidelná kontrola glykémie
- **U** prevencia stresového vredu
- **S** sedácia
- **T** tromboembolická profylaxia
- **A** analgézia
- **V** výživa
- **H** zvýšená horná polovica tela

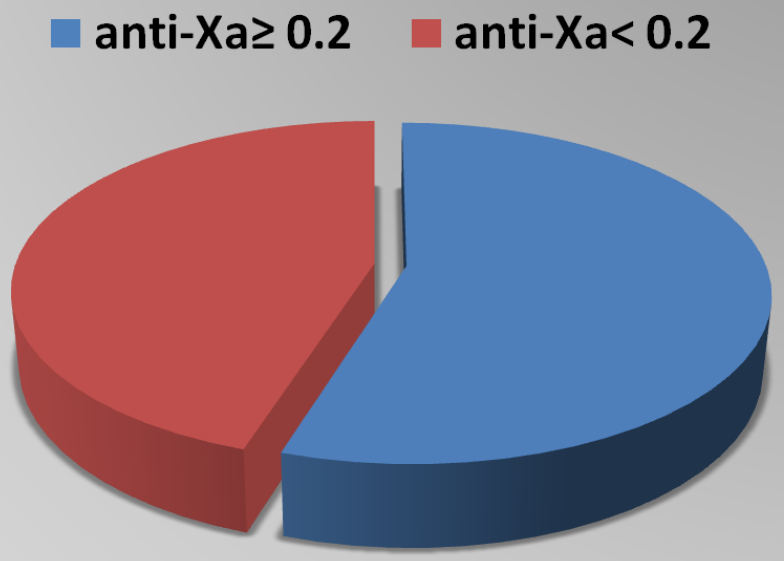
Máme laboratorně monitorovat LMWHs tromboprofylaxi ?

Předběžné výsledky

pilotního průzkumu profylaxe DVT pomocí LMWHs na JIP/ARO

Za projekt **LOVE**
Roman Kula, KARIM FN Ostrava

… efektivita tromboprofylaxe podle anti-Xa v séru (U/ml)



45,4% pacientů (45/101)
= **poddávkována profylaxe**

Závěr …

- značná část pacientů **(45%)** má hodnotu anti-Xa nižší jako je deklarované profylaktické pásmo

… příčinou může být **poddávkování LMWHs**

… optimální dávka je zřejmě **v pásmu 75-100 IU/kg/24h**

… profylaktické pásmo anti-Xa lze dosáhnout **navýšením subkutánní dávky LMWHs**

- při zhoršení stavu pacienta **(retence tekutin, sepse)** lze očekávat snížení biologické dostupnosti subkutánně podaných LMWHs

Ďakujem za pozornosť