

Management and Prophylaxis of Venous Thromboembolism in the Emergency Room and ICU

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Case report

- Patient, female, 72 Jahre
- Hip fracture, Hip - total endoprosthesis without complications
- 5 weeks thromboprophylaxis with low molecular weight heparin
- 7 weeks after trauma synkope
- 1 week later „feels bad“ and unspecific thoracic pain
- Patient is brought to a local hospital

Case report

- Patient, female, 72 Jahre
- No fever, heart rate 92/min, no cough, no leg swelling
- ECG: no signs of myocardial ischemia
- Thoracal X-ray: no infiltration, small pleural effusion left side
- Laboratory:
 - C-reactive protein ↑ (5 times above normal)
 - Blood count analysis: normal, leucocyte count: 8.4 G/l
 - Liver and kidney function tests normal
 - Normal prothrombin time, fibrinogen 380 mg/dl
- Patient admitted to hospital and treated with antibiotics plus prophylactic LMWH

Diagnosis of pulmonary embolism

- Evaluate clinical pre-test probability by a score (e.g. Wells score)
- Include a biomarker (D-Dimer), when there is suspicion for VTE
- Based on the outcome perform imaging procedures
 - Spiral CT
 - Ventilation/perfusion isotope scan

Wells' score for pretest probability of pulmonary embolism

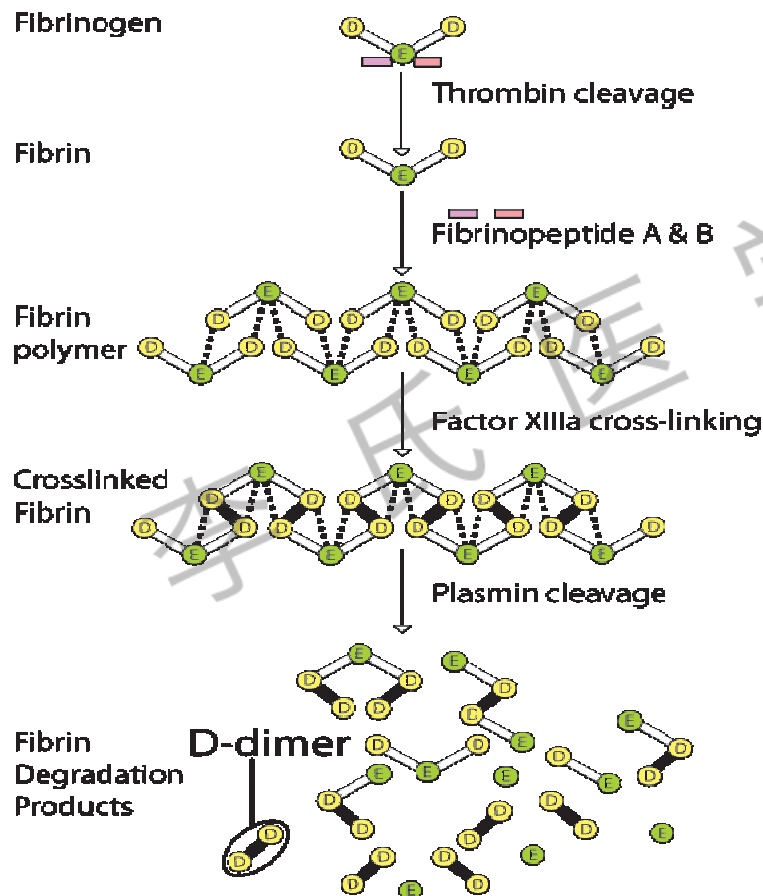
Variable	Points
Clinical signs and symptoms of deep vein thrombosis (minimum of leg swelling and pain with palpation of the deep veins)	3.0
Alternative diagnosis less likely than pulmonary embolism	3.0
Heart rate >100/min	1.5
Immobilization (>3 days) or surgery in previous 4 weeks	1.5
Previous pulmonary embolism or deep vein thrombosis	1.5
Hemoptysis	1.0
Malignancy (receiving treatment, treated in the last 6 months, or palliative)	1.0



Score \leq 4 PE unlikely
Score $>$ 4 PE likely

D-Dimer

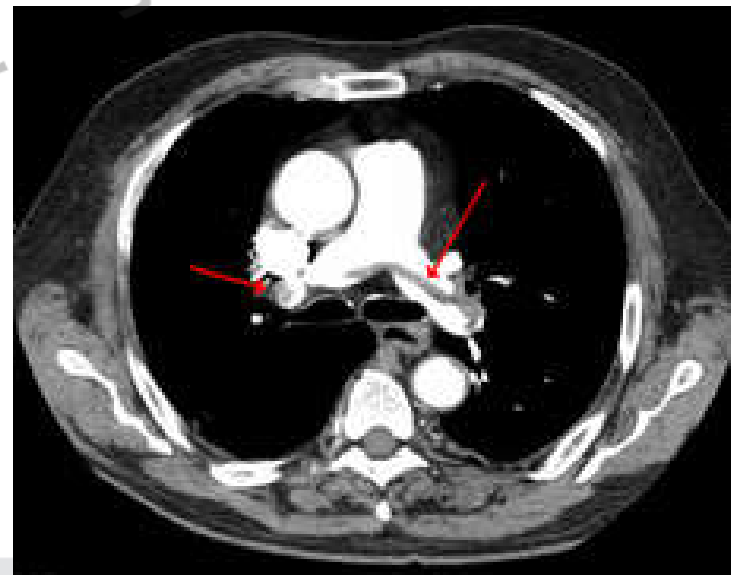
Generation of D-dimer from cross-linked fibrin



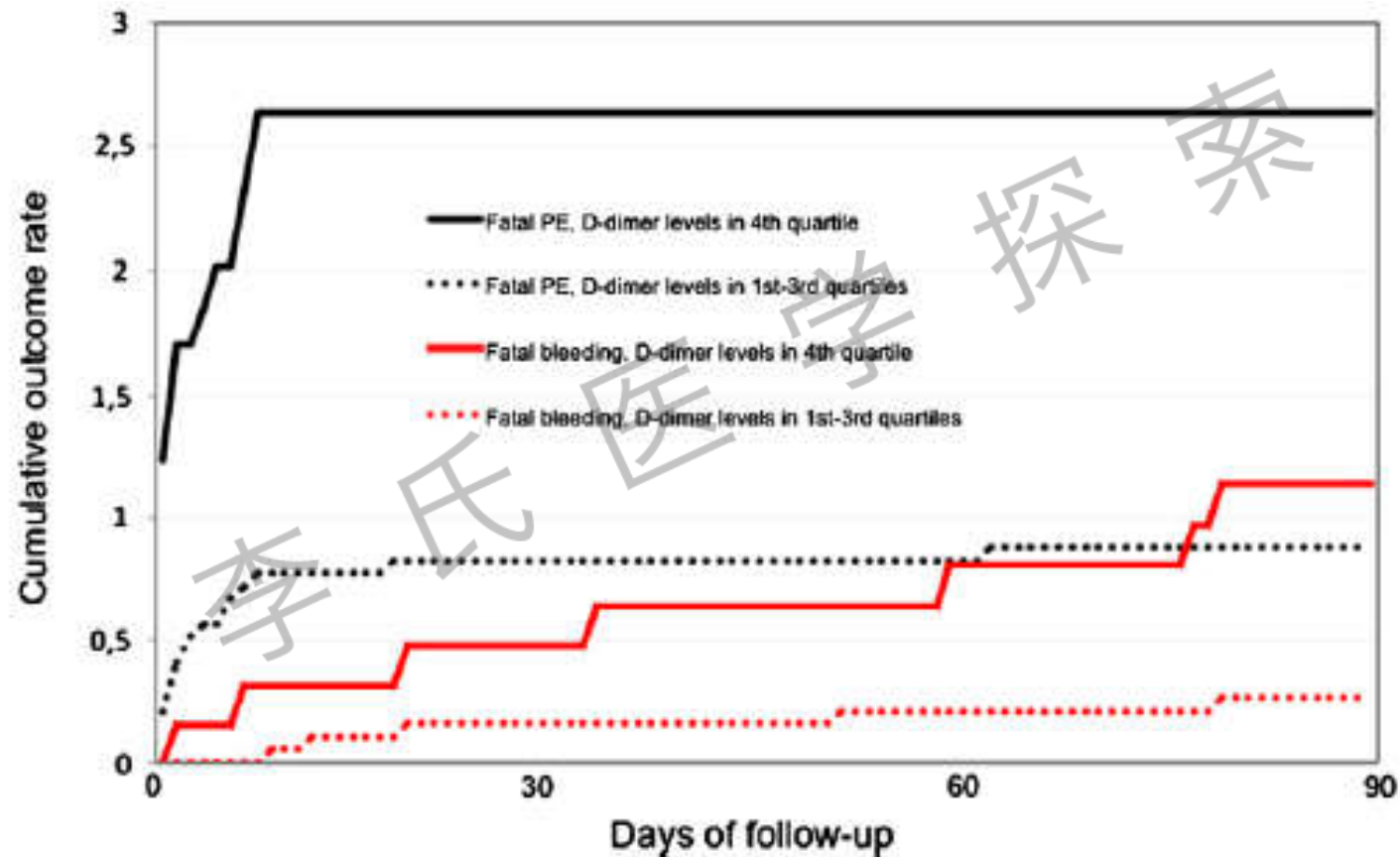
- global marker of coagulation activation
- degradation product of cross-linked fibrin, formed after thrombin-generated fibrin has been degraded by plasmin
- diagnosis of acute VTE
- higher levels in cancer patients

Case report

- Patient, female, 72 Jahre
- Request for a D-Dimer-test : 8.500 $\mu\text{g/l}$
(normal < 500)
- Spiral computer tomography: Central
bilateral pulmonary embolism



D-Dimer indicates prognosis in PE patients in non-cancer patients



Diagnosis of deep venous thrombosis

- Evaluate clinical pre-test probability by a score (e.g. Wells score)
- Include a biomarker (D-Dimer), when there is suspicion for VTE
- Based on the outcome perform imaging procedures
 - Compression and/or duplex sonography
 - Phlebography

Deep vein thrombosis



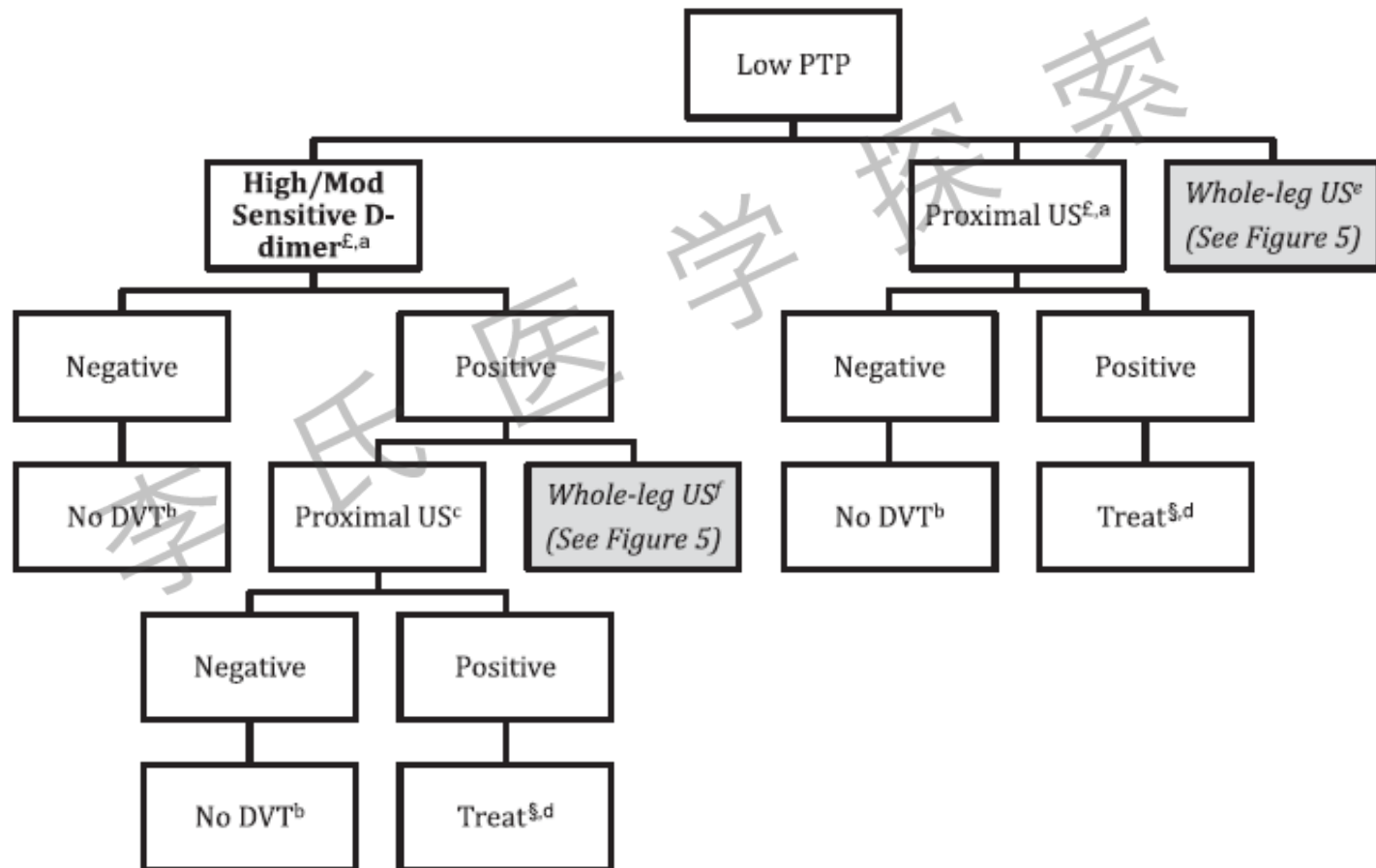
Wells' score for pretest probability of deep vein thrombosis

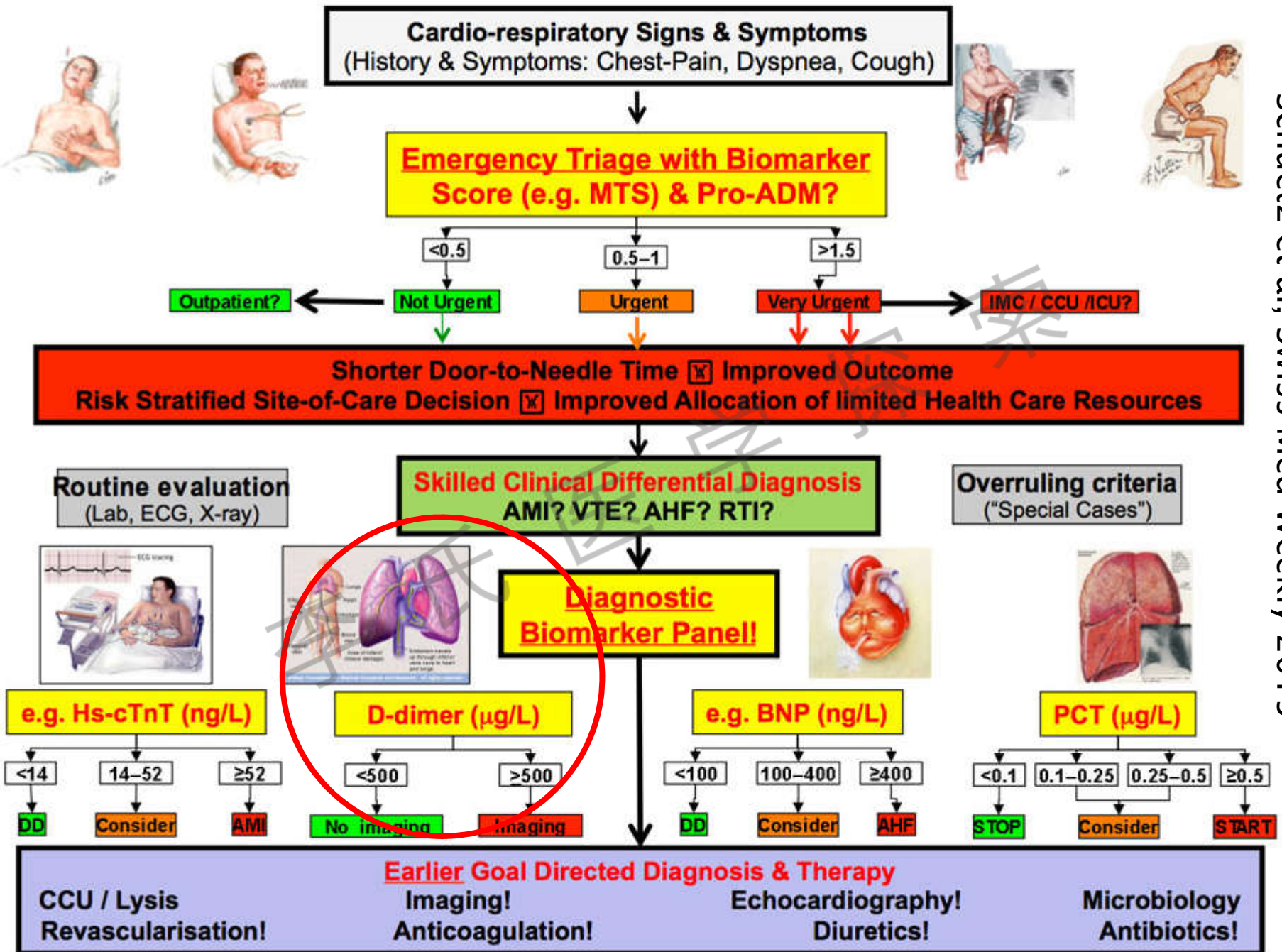
Clinical Characteristic(s)	Score
Active cancer	+1
Paralysis, paresis, or recent plaster immobilization of the lower extremities	+1
Recently bedridden for three days or major surgery within the last 12 weeks	+1
Localized tenderness along the deep venous system	+1
Entire leg swollen	+1
Calf swelling ≥ 3 cm larger than asymptomatic side	+1
Pitting edema confined to symptomatic leg	+1
Collateral superficial veins	+1
Previously documented DVT	+1
Alternative diagnosis at least as likely as a DVT	-2
Clinical Probability of DVT	Total Score
Likely	< 2
Unlikely	≥ 2

Diagnostic testing to confirm/rule out deep vein thrombosis

- Clinical pretest probability
 - High: Imaging procedure (Doppler/Duplex sonography or Phlebography)
 - Low: Determine D-Dimer,
 - if negative, thrombosis ruled out,
 - if positive, perform imaging

Suspected deep vein thrombosis and low clinical pretest probability





Treatment of the acute venous thrombosis/pulmonary embolism

Treatment goals

- Prevent thrombus growth
- Prevent new embolism
- (Reopening of the vessel)

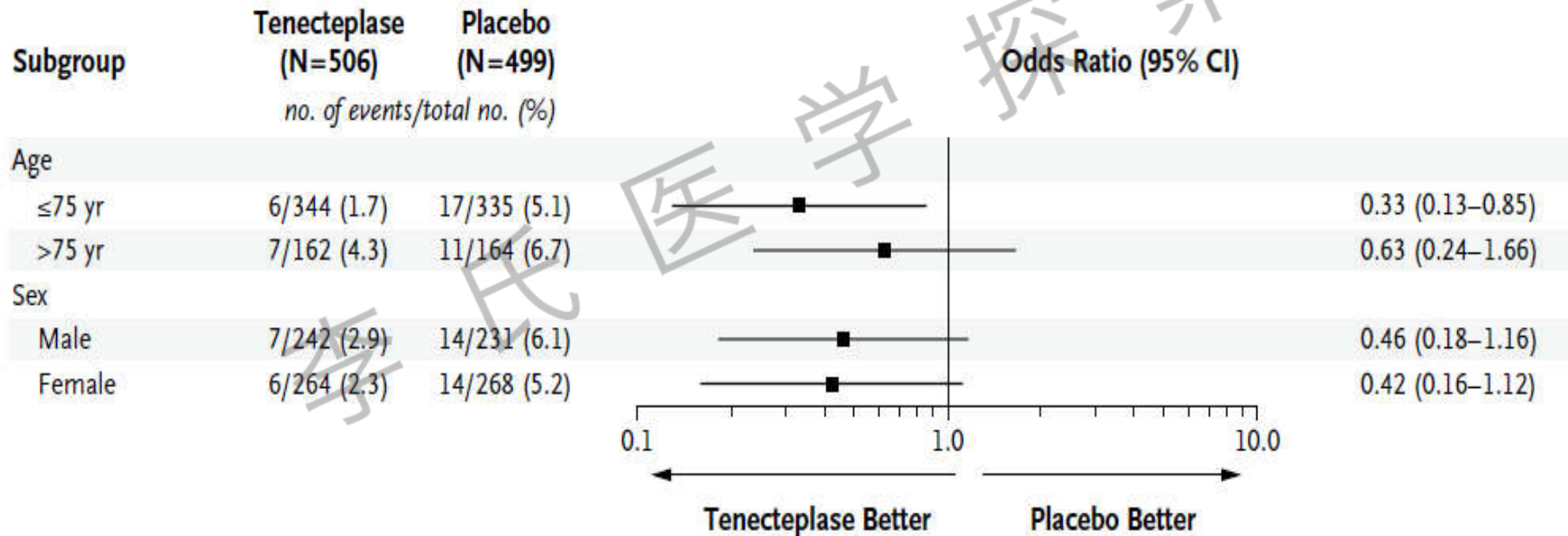
Treatment of the acute venous thrombosis/pulmonary embolism

Treatment options

- Watch and wait – only in calf vein thrombosis
- Fibrinolysis – only in hypotensive patients with PE
- Mechanical removal of the thrombus
- Anticoagulation

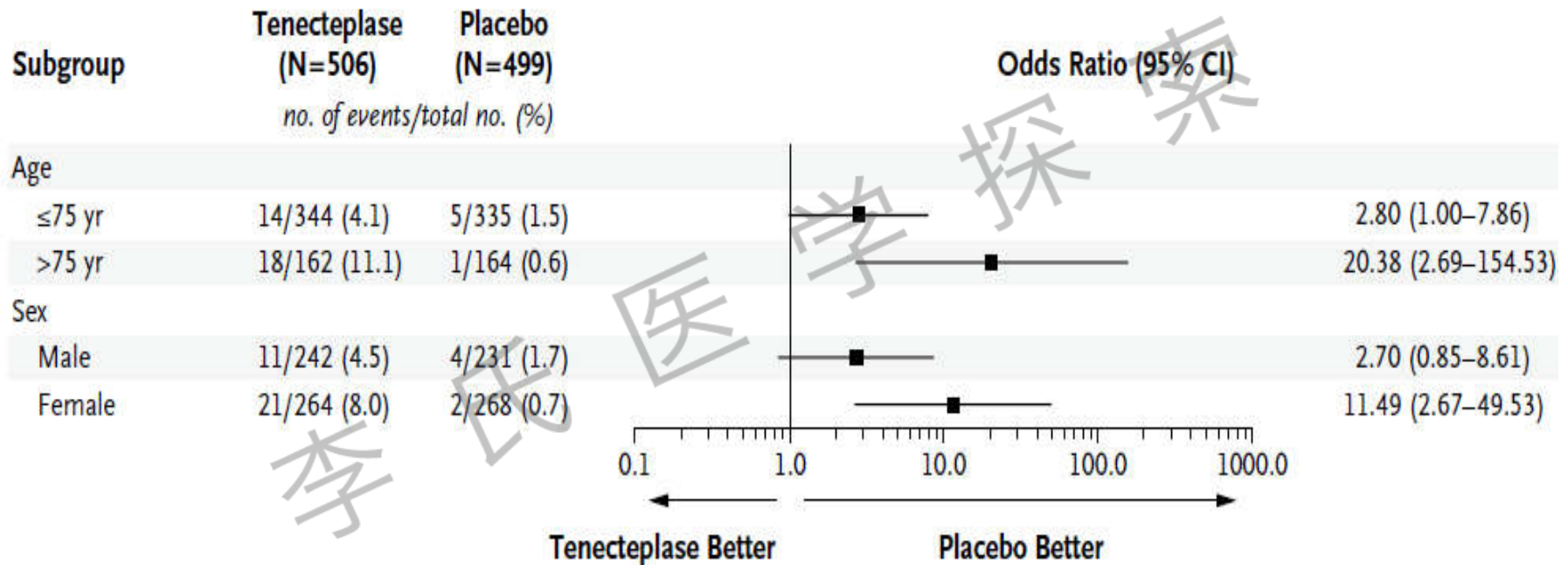
Lysis (Tenecteplase) versus placebo in intermediate risk patients with pulmonary embolism (death, hemodynamic decompensation)

A Death or Hemodynamic Decompensation



Randomized study lysis (Tenecteplase) versus placebo in intermediate risk patients (Bleeding)

B Major Extracranial Bleeding



10 hemorrhagic strokes in patients with versus
1 in those without Tenecteplase !

Anticoagulation

- Unfractionated Heparin/Vitamin K antagonists
- Low molecular weight heparin/Vitamin K antagonists
- Fondaparinux
- Novel (direct) anticoagulants

Case report

- Patient, female, 72 Jahre
- Request for a D-Dimer-test : 8.500 $\mu\text{g/l}$
(normal < 500)
- Spiral computer tomography: Central
bilateral pulmonary embolism
- Treatment started with Rivaroxaban 15 mg
twice daily , after 3 weeks 20 mg once daily,
end of treatment after 3 months
- No recurrence, no bleeding

Prophylaxis in the ICU

- Patients in the ICU have a high risk of venous thrombosis and pulmonary embolism
- Diagnosis might be hindered by clinical conditions (e.g. unconsciousness, leg swelling...)
- Standard prophylaxis with LMWH or UFH decreases VTE, but not mortality
 - Alhazzani et al, Crit Care Med 2013 (meta-analysis)
- Anti Xa levels in patients with standard LMWH prophylaxis are lower in ICU than in non-ICU patients
 - Priglinger et al, Crit Care Med 2003

Risk factors for VTE in the ICU

- Observational study in 3746 patients receiving standard thrombosis prophylaxis with LMWH or UFH
- VTE in 289 patients (7.7%)
- Increased risk in patients with
 - High body mass index
 - A positive family history of VTE
 - Vasopressor use
- Decreased risk in those on statins the week before admission

Thrombosis prophylaxis in ICU patients (ACCP Guideline)

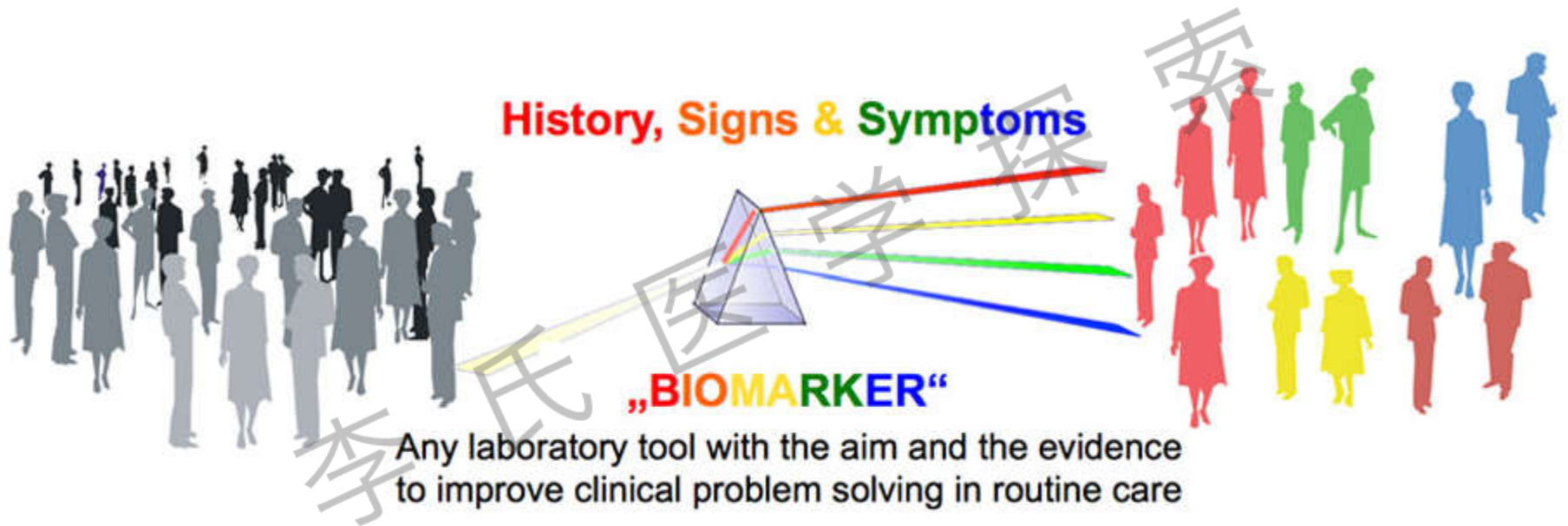
- No routine screening for DVT (Grade 2C)
- Thromboprophylaxis with UFH or LMWH (Grade 2C)
- In patients with bleeding or high risk of bleeding, mechanical thromboprophylaxis (Grade 2C)
-

„Take home messages“

- Think of the possibility that a patient could have deep vein thrombosis or pulmonary embolism
- Use clinical probability evaluation and biomarker (D-Dimer) as appropriate
- Anticoagulation is in most patients still the most effective and safe treatment option
- VTE in ICU is still an unresolved complication, better and more targeted prophylactic options are to be defined



**Thank you
for your attention**



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