THIRD RAJAN MEMORIAL SYMPOSIUM

DVT and PE:

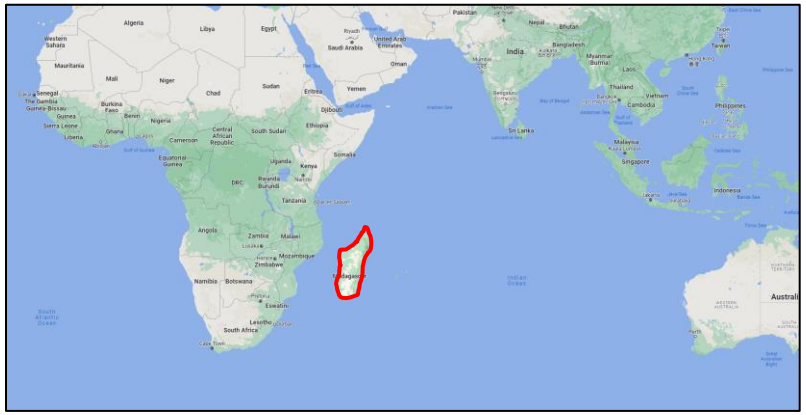
Making a Diagnosis and Creating a Treatment Plan

Stephan Moll, MD

Hematology
University of North Carolina
Chapel Hill, NC

Duke LEMUR CENTER

Lemurs: native to Madagascar

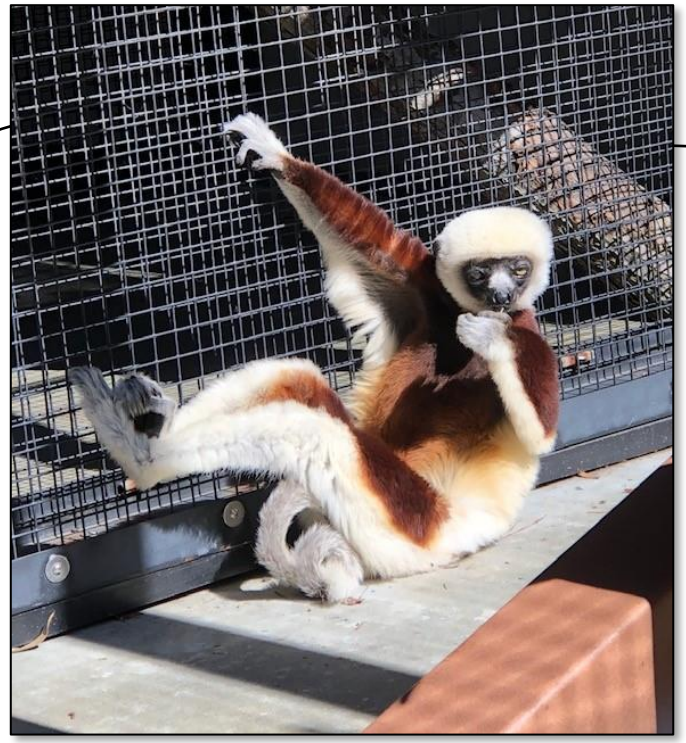


Duke Lemur Center:

- Founded 1966
- Non-invasive research center
- Over 200 lemurs

[https://lemur.duke.edu]

Duke LEMUR CENTER



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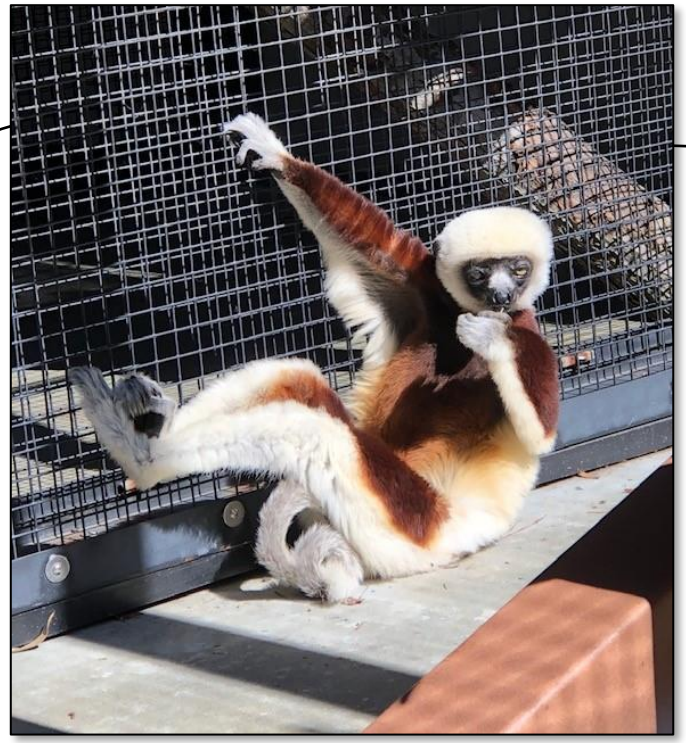
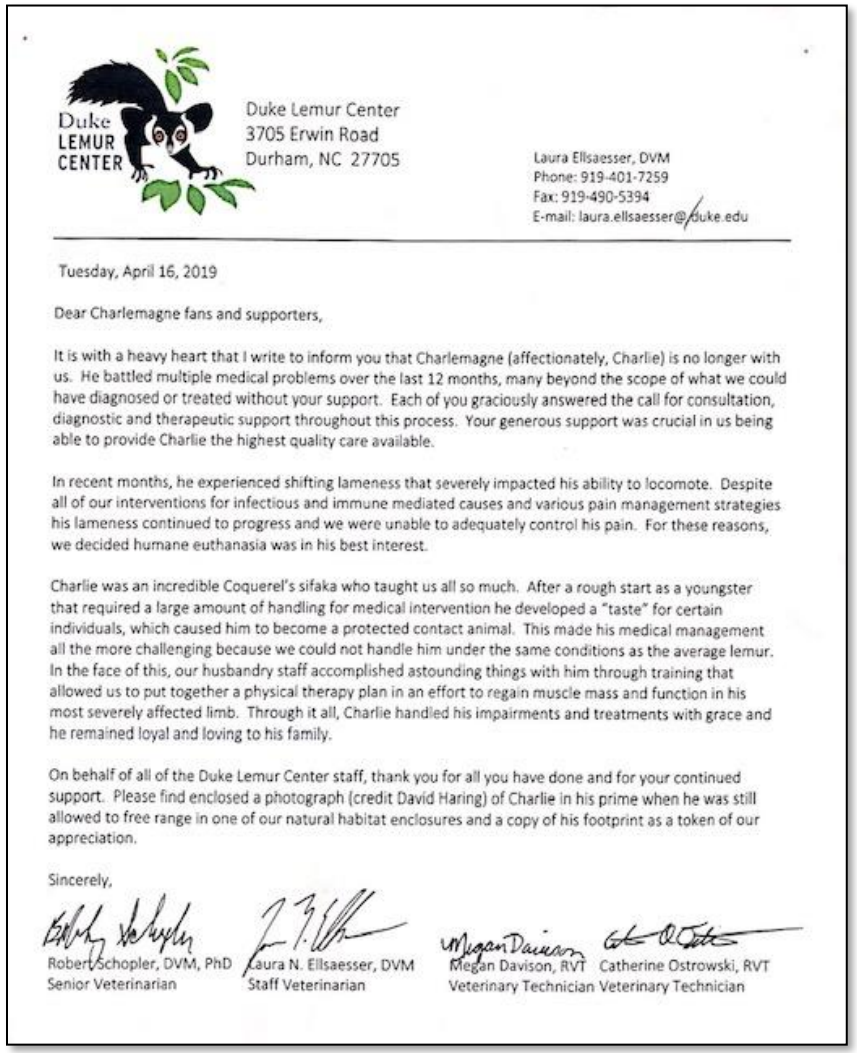


An Unusual Consult



Duke LEMUR CENTER

Duke Lemur Center
3705 Erwin Road
Durham, NC 27705

Laura Ellsaesser, DVM
Phone: 919-401-7259
Fax: 919-490-5394
E-mail: laura.ellsaesser@duke.edu

Tuesday, April 16, 2019

Dear Charlemagne fans and supporters,

It is with a heavy heart that I write to inform you that Charlemagne (affectionately, Charlie) is no longer with us. He battled multiple medical problems over the last 12 months, many beyond the scope of what we could have diagnosed or treated without your support. Each of you graciously answered the call for consultation, diagnostic and therapeutic support throughout this process. Your generous support was crucial in us being able to provide Charlie the highest quality care available.

In recent months, he experienced shifting lameness that severely impacted his ability to locomote. Despite all of our interventions for infectious and immune mediated causes and various pain management strategies his lameness continued to progress and we were unable to adequately control his pain. For these reasons, we decided humane euthanasia was in his best interest.

Charlie was an incredible Coquerel's sifaka who taught us all so much. After a rough start as a youngster that required a large amount of handling for medical intervention he developed a "taste" for certain individuals, which caused him to become a protected contact animal. This made his medical management all the more challenging because we could not handle him under the same conditions as the average lemur. In the face of this, our husbandry staff accomplished astounding things with him through training that allowed us to put together a physical therapy plan in an effort to regain muscle mass and function in his most severely affected limb. Through it all, Charlie handled his impairments and treatments with grace and he remained loyal and loving to his family.

On behalf of all of the Duke Lemur Center staff, thank you for all you have done and for your continued support. Please find enclosed a photograph (credit David Haring) of Charlie in his prime when he was still allowed to free range in one of our natural habitat enclosures and a copy of his footprint as a token of our appreciation.

Sincerely,

Robert Schopler, DVM, PhD
Senior Veterinarian

Laura N. Ellsaesser, DVM
Staff Veterinarian

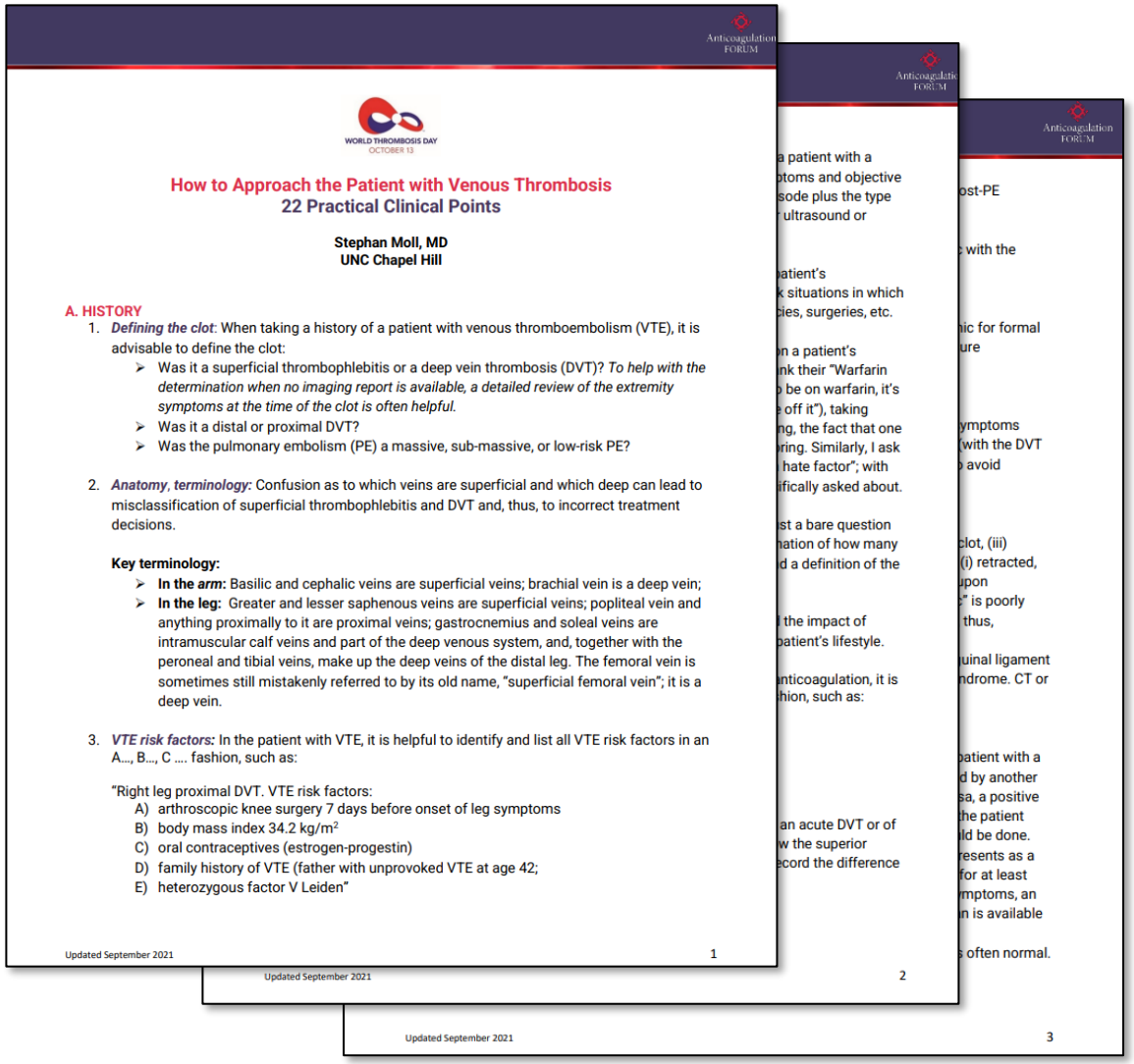
Megan Davison, RVT
Veterinary Technician

Catherine Ostrowski, RVT
Veterinary Technician

"An unusual consult";
ASH's *The Hematologist* 2019

"An unusual thank-you letter";
ASH's *The Hematologist* 2019

22 Teaching Points



WORLD THROMBOSIS DAY
OCTOBER 13

How to Approach the Patient with Venous Thrombosis
22 Practical Clinical Points

Stephan Moll, MD
UNC Chapel Hill

A. HISTORY

1. ***Defining the clot***: When taking a history of a patient with venous thromboembolism (VTE), it is advisable to define the clot:
   - Was it a superficial thrombophlebitis or a deep vein thrombosis (DVT)? *To help with the determination when no imaging report is available, a detailed review of the extremity symptoms at the time of the clot is often helpful.*
   - Was it a distal or proximal DVT?
   - Was the pulmonary embolism (PE) a massive, sub-massive, or low-risk PE?

2. ***Anatomy, terminology:*** Confusion as to which veins are superficial and which deep can lead to misclassification of superficial thrombophlebitis and DVT and, thus, to incorrect treatment decisions.

   Key terminology:
   - **In the *arm*:** Basilic and cephalic veins are superficial veins; brachial vein is a deep vein;
   - **In the leg:** Greater and lesser saphenous veins are superficial veins; popliteal vein and anything proximally to it are proximal veins; gastrocnemius and soleal veins are intramuscular calf veins and part of the deep venous system, and, together with the peroneal and tibial veins, make up the deep veins of the distal leg. The femoral vein is sometimes still mistakenly referred to by its old name, "superficial femoral vein"; it is a deep vein.

3. ***VTE risk factors:*** In the patient with VTE, it is helpful to identify and list all VTE risk factors in an A..., B..., C .... fashion, such as:

   "Right leg proximal DVT. VTE risk factors:
   A) arthroscopic knee surgery 7 days before onset of leg symptoms
   B) body mass index 34.2 kg/m^2
   C) oral contraceptives (estrogen-progestin)
   D) family history of VTE (father with unprovoked VTE at age 42;
   E) heterozygous factor V Leiden"

[Moll S. 2021: https://acforum.org/web/downloads/How%20to%20Approach%20the%20Patient%20with%20VTE%20-%2022%20Teaching%20Points.pdf]

First Step

Take-home points

1. Define the blood clot
2. …..
3. …..
4. …..

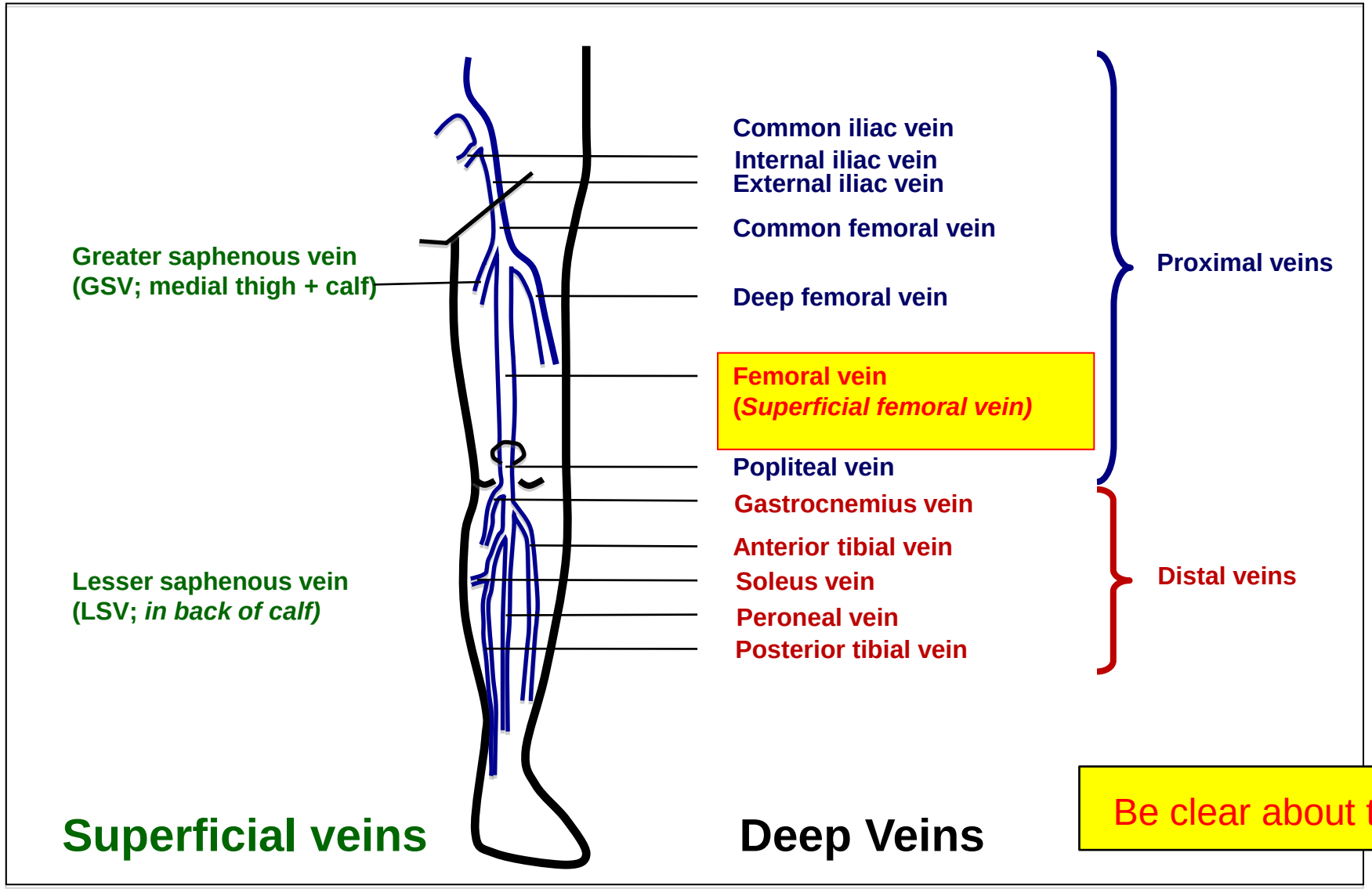
“Curbside Consult”

“Quick question: Superficial thrombophlebitis in the right leg superficial femoral vein; not very symptomatic. My plan was to observe.”

Caveat!

- “Superficial femoral vein” is NOT a superficial vein.
- This paient has a leg DVT.

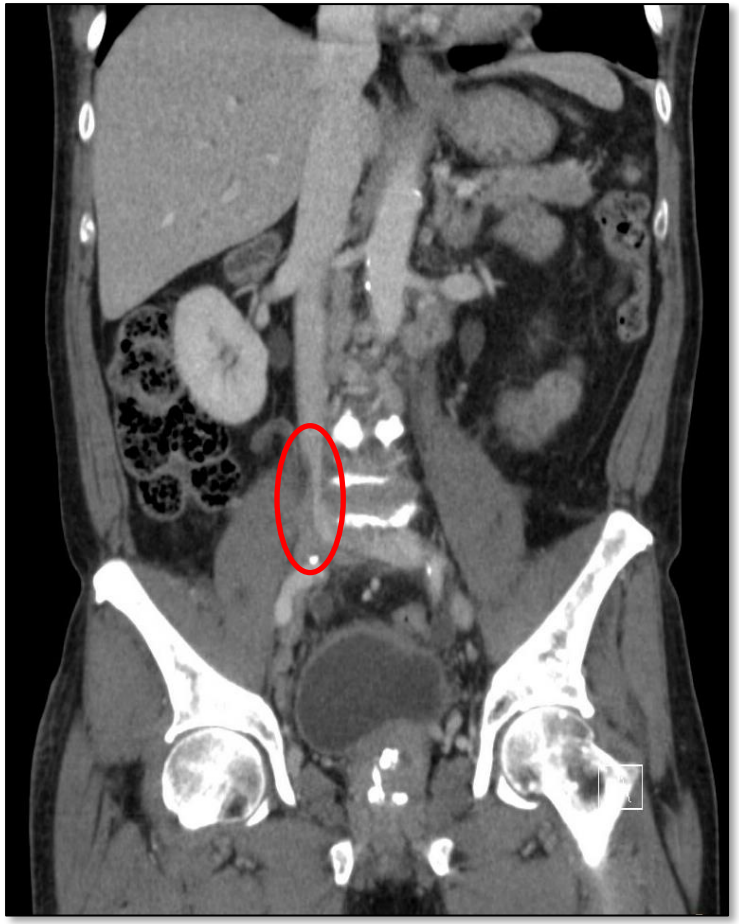
Leg Clots – Basic Anatomy



“DVT”

- 69 year old patient with known metastatic prostate cancer
- Evaluation for increasing right leg pain
- Doppler ultrasound study of legs:

Final Interpretation
Right
Possible obstruction proximal to the inguinal ligament.



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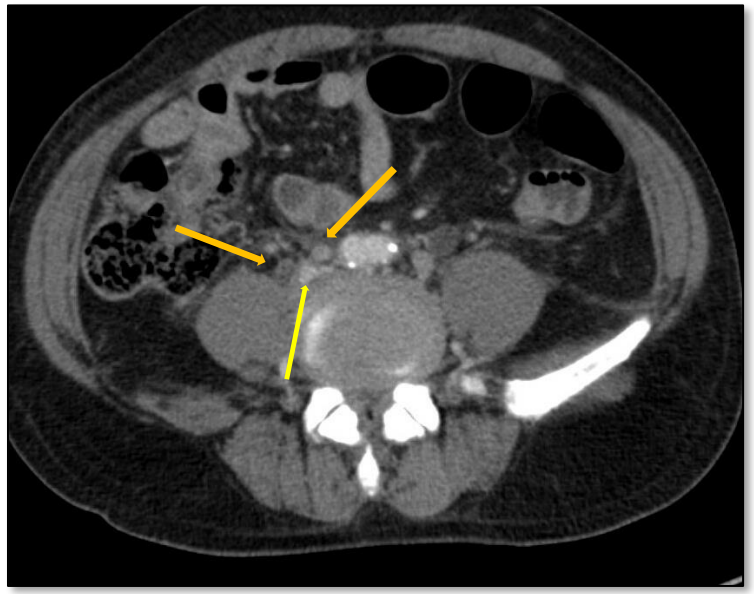
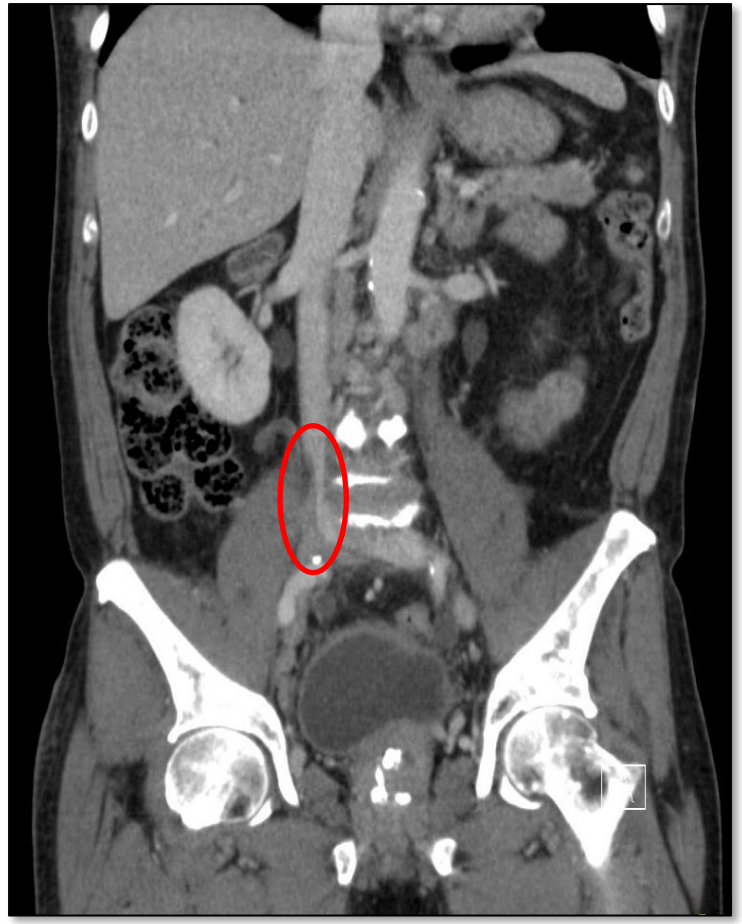


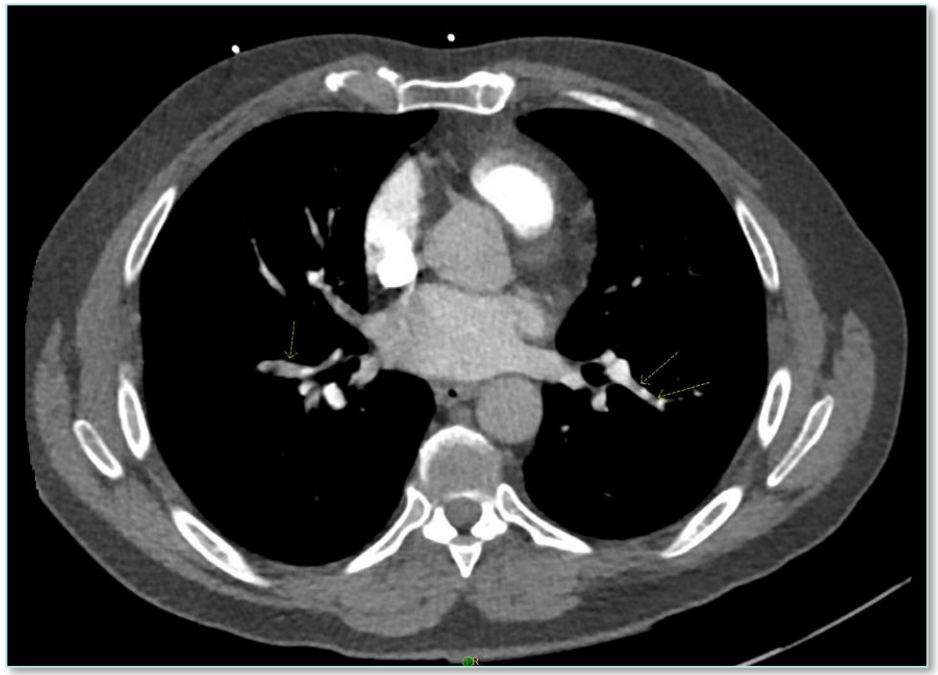


Be clear about the diagnosis

“PE”

Q: “How long to anticoagulate?”

- 60 year old, smoker
- Sudden SOB
  - D-Dimer: negative
  - CTA: PE
  - Venous Doppler legs: no DVT
- Anticoagulation and COPD treatment.



IMPRESSION:
1. Several small acute subsegmental pulmonary emboli in both lower lobes. Overall clot burden is minimal.
2. Pattern of diffuse centrilobular ground-glass attenuation micronodularity throughout the lungs bilaterally. This is likely a manifestation of a smoking related disease such as RB (respiratory bronchiolitis), or if the patient is symptomatic, RB-ILD (respiratory bronchiolitis-interstitial lung disease). If the patient is not a smoker, this can be seen with acute hypersensitivity pneumonitis.
3. Emphysema (ICD10-J43.9).
4. Aortic atherosclerosis (ICD10-I70.0).

Question radiology reports!

First Step

Take-home points

1. Define the blood clot
2. List the blood clot risk factors
3. …..
4. …..

Blood Clot Risk Factors

Weak risk factors (OR < 2)
Bed rest >3 days
Diabetes mellitus
Arterial hypertension
Immobility due to sitting (e.g. prolonged car or air travel)
Increasing age
Laparoscopic surgery (e.g. cholecystectomy)
Obesity
Pregnancy
Varicose veins

Moderate risk factors (OR 2–9)
Arthroscopic knee surgery
Autoimmune diseases
Blood transfusion
Central venous lines
Intravenous catheters and leads
Chemotherapy
Congestive heart failure or respiratory failure
Erythropoiesis-stimulating agents
Hormone replacement therapy (depends on formulation)
In vitro fertilization
Oral contraceptive therapy
Post-partum period
Infection (specifically pneumonia, urinary tract infection, and HIV)
Inflammatory bowel disease
Cancer (highest risk in metastatic disease)
Paralytic stroke
Superficial vein thrombosis
Thrombophilia

Strong risk factors (OR > 10)
Fracture of lower limb
Hospitalization for heart failure or atrial fibrillation/flutter (within previous 3 months)
Hip or knee replacement
Major trauma
Myocardial infarction (within previous 3 months)
Previous VTE
Spinal cord injury

Blood clots are often <u>multifactorial</u>:
A….., B…., C…..

[Konstantinides SV , et al. *Eur Heart J*. 2019 Nov 1;40(42):3453-3455]

How Long to Treat?

Conglomerate decision of:

1. Risk of recurrent clot

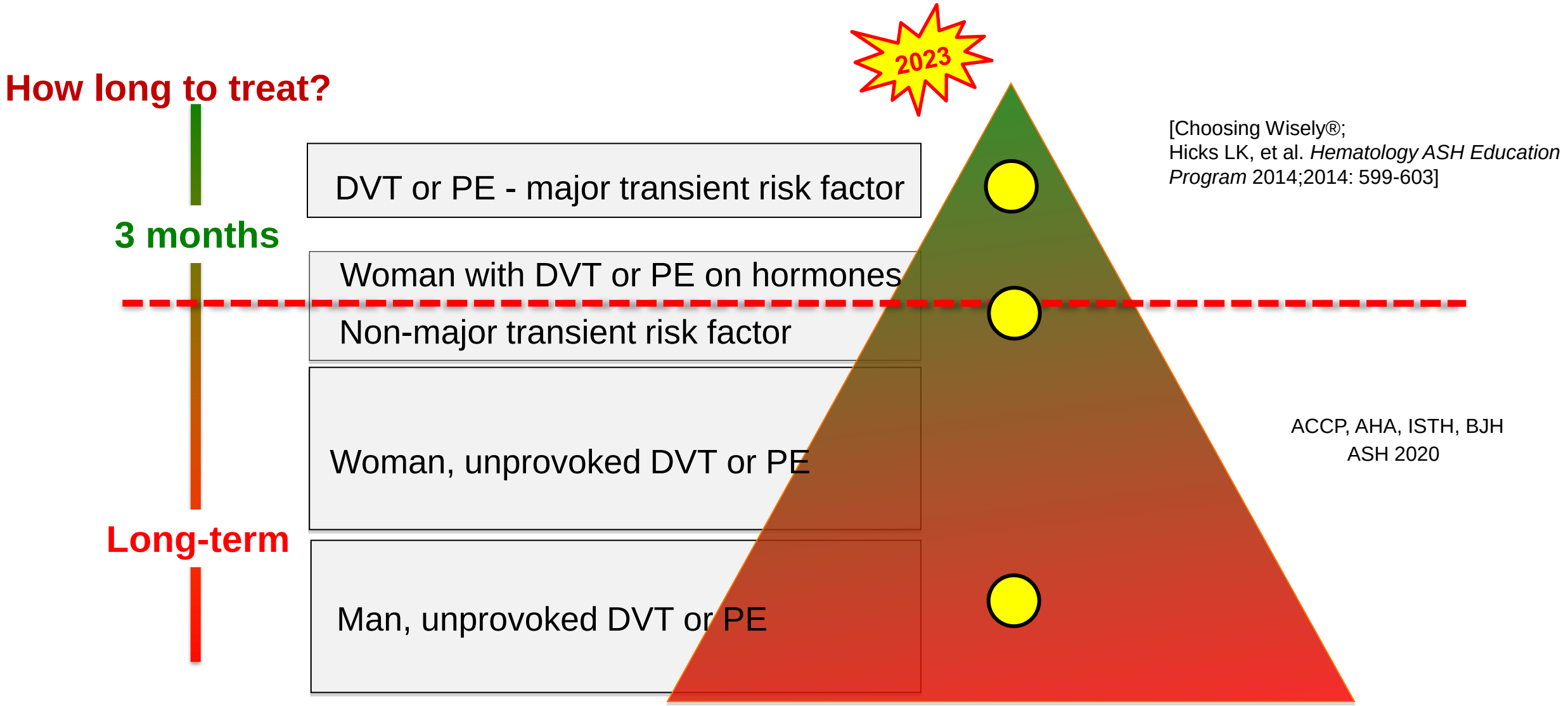
A. ..., B. ..., C. ...

2. Risk for beeding

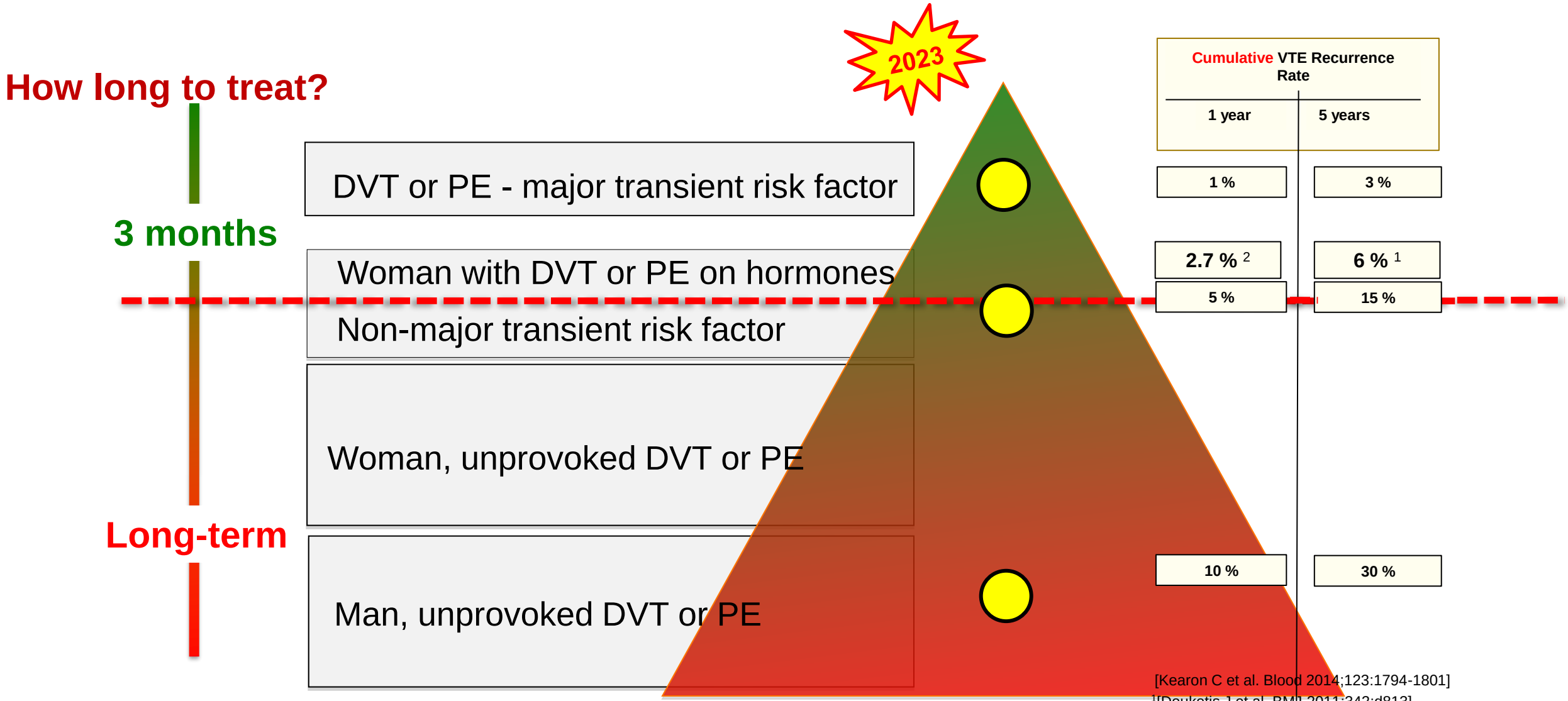
A. ..., B. ..., C. …

3. Patient preference

How Long to Treat?



How Long to Treat?

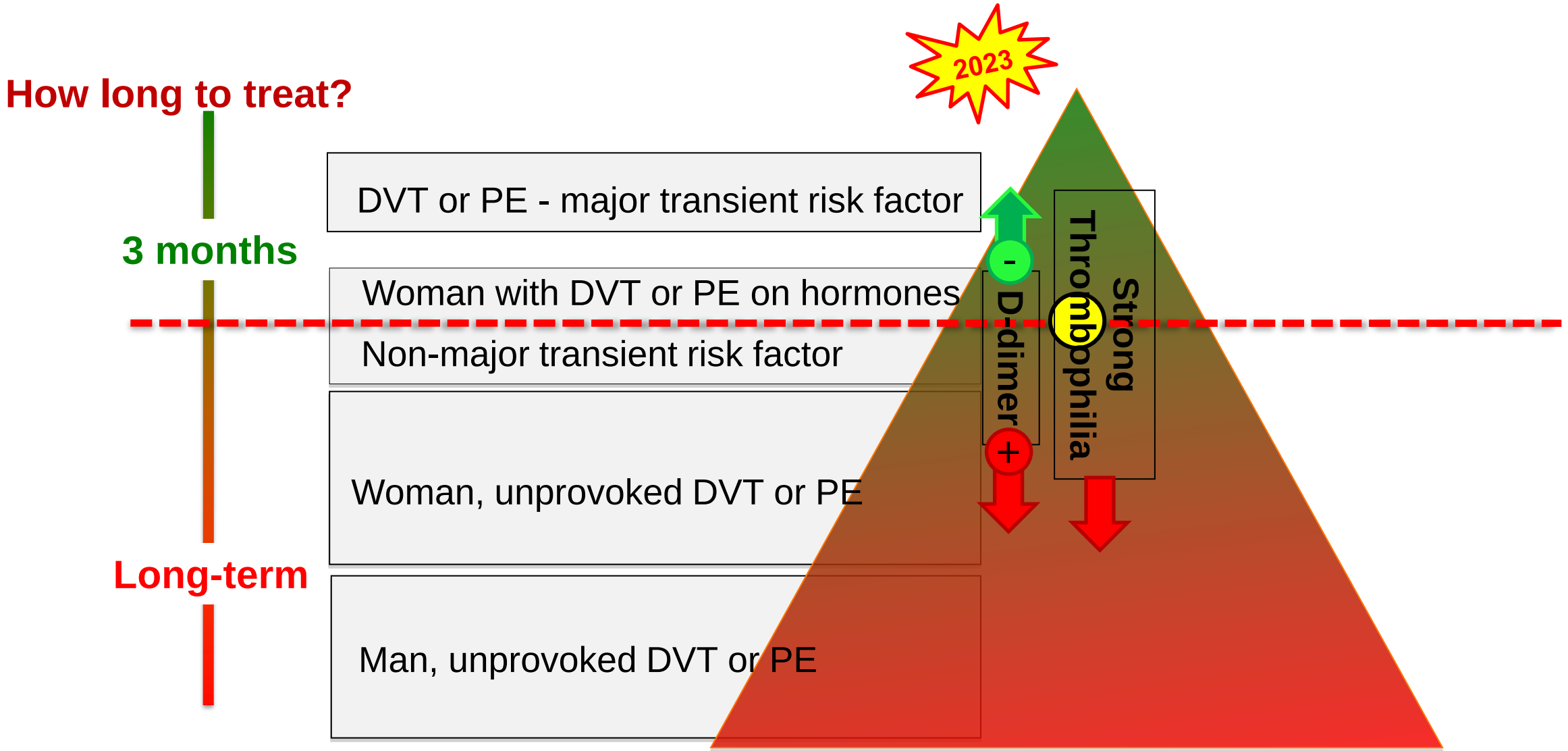


[Kearon C et al. Blood 2014;123:1794-1801]

[1][Douketis J et al. BMJ 2011;342:d813]

[2][Wiegers HMG et al. J Thromb Haemost **2022**;20:1158-65]

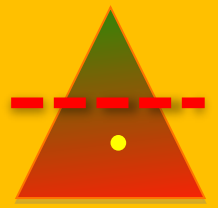
How Long to Treat?



How Long to Treat?

Take-home points

1. Define the blood clot
2. List the blood clot risk factors: A...., B…., C….
3. “Recurrence Triangle”
4. Blood thinner “Hate Factor”



Another Unusual Consult

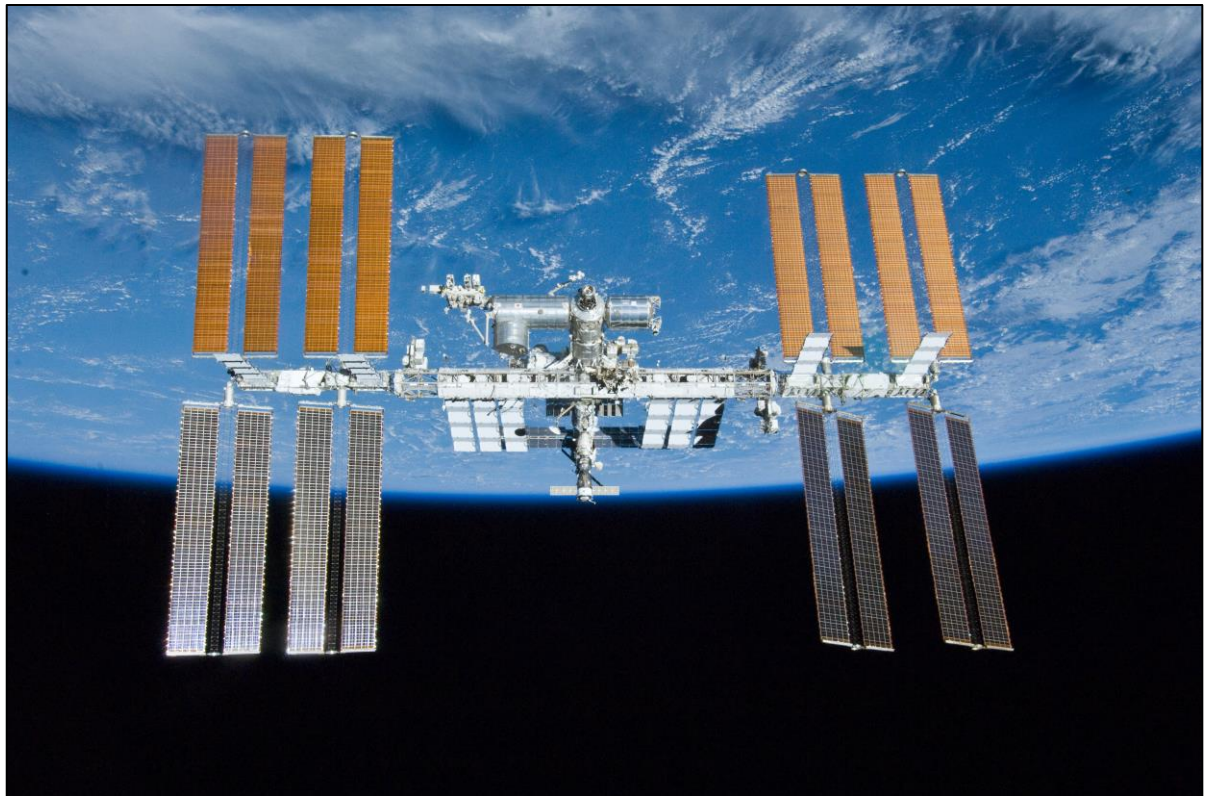


Photo courtesy of NASA

Astronaut with Neck Vein Clot

1. Define the blood clot

Internal Jugular DVT, no symptoms

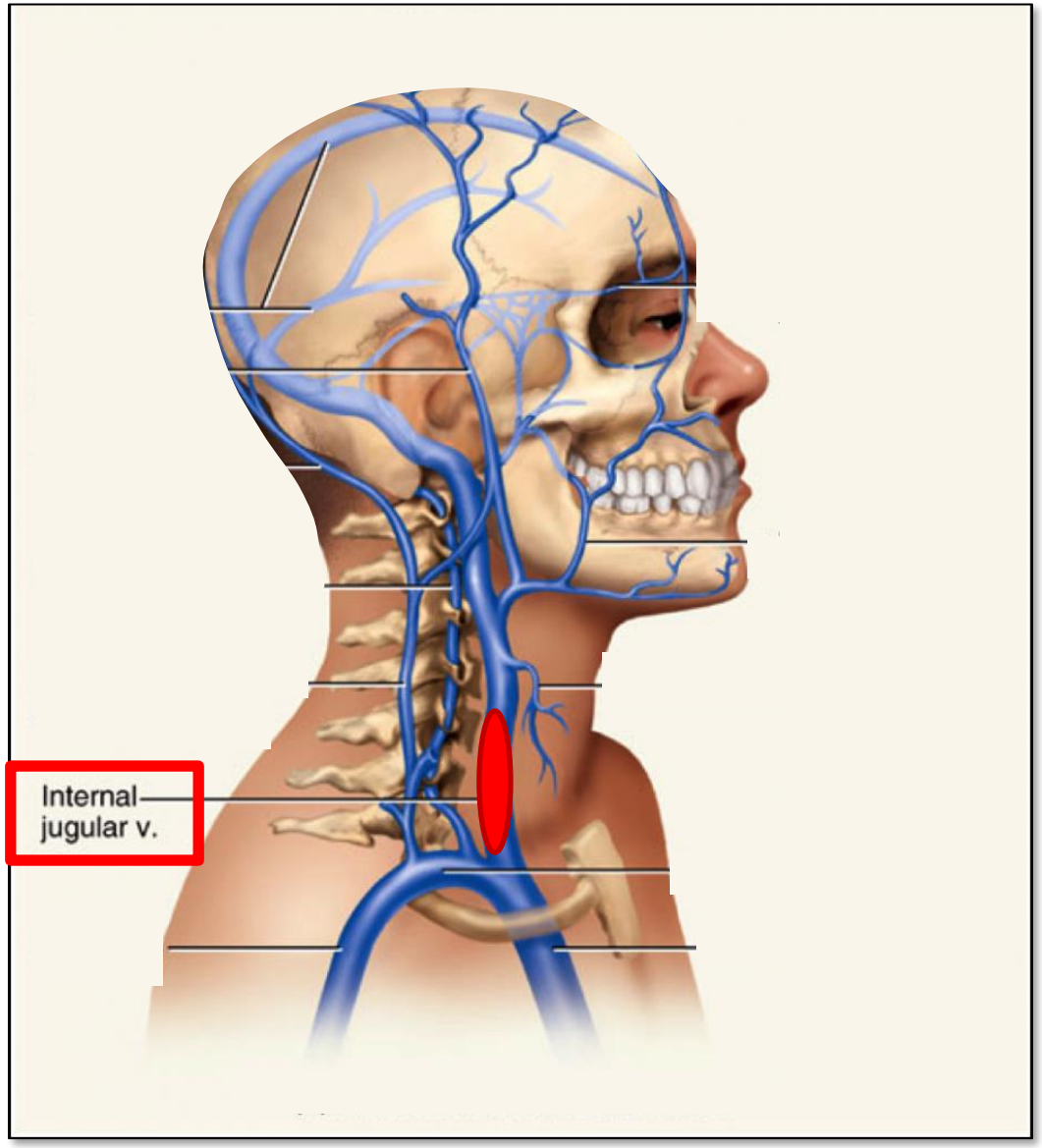
2. List the risk factors: A...., B…., C….

A. Birth control pill

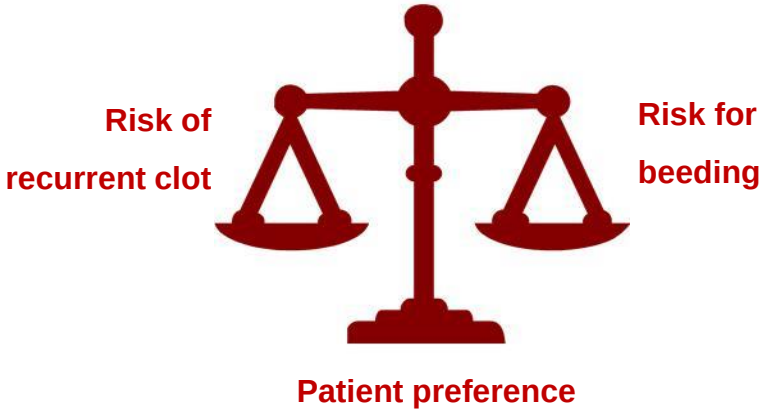
B. Harness?

C. Low gravity: fluid redistribution?

D. Clotting disorder, etc.

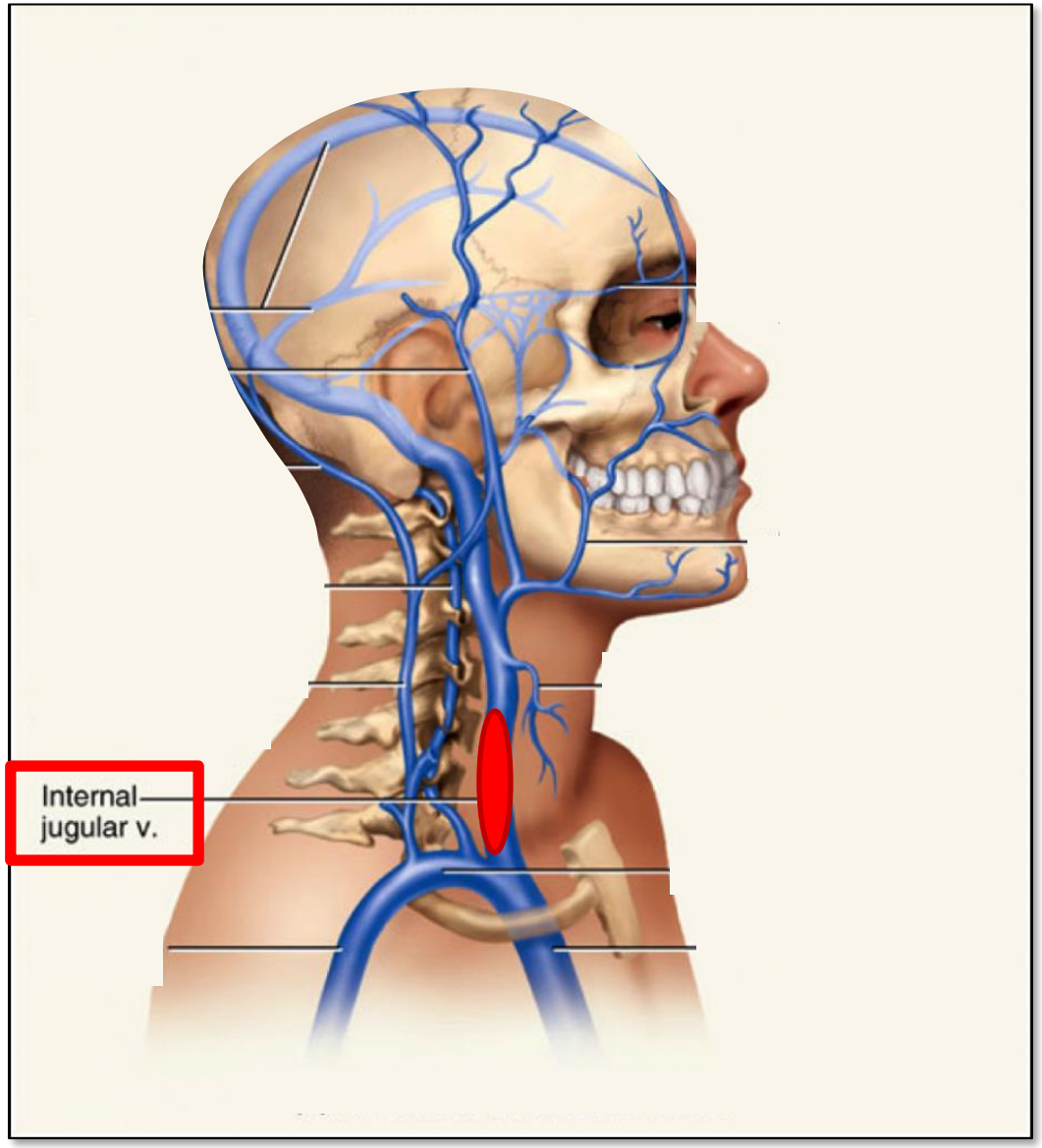


Astronaut with Neck Vein Clot

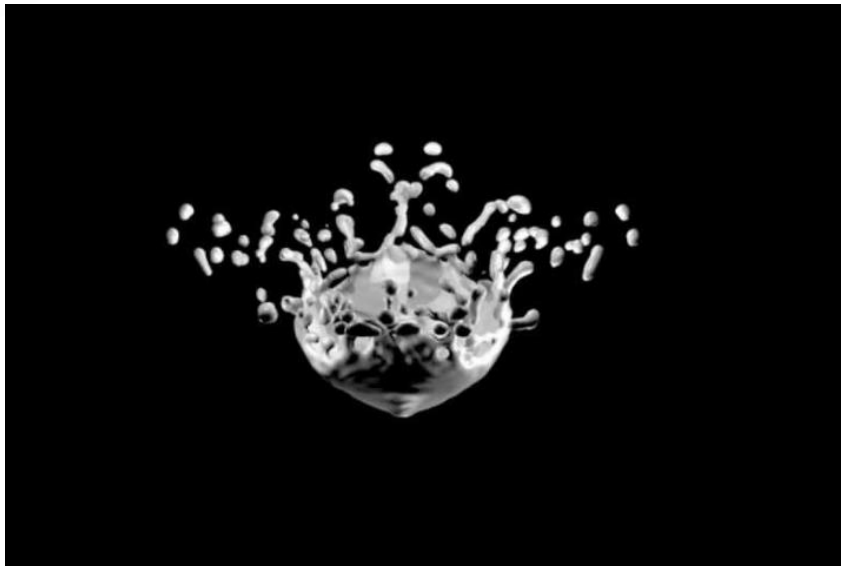


Risks:

- Upstream progression into head/brain
- Downstream progression into arm; or lung (PE)
- Blood thinner: bleeding



Astronaut with Neck Vein Clot

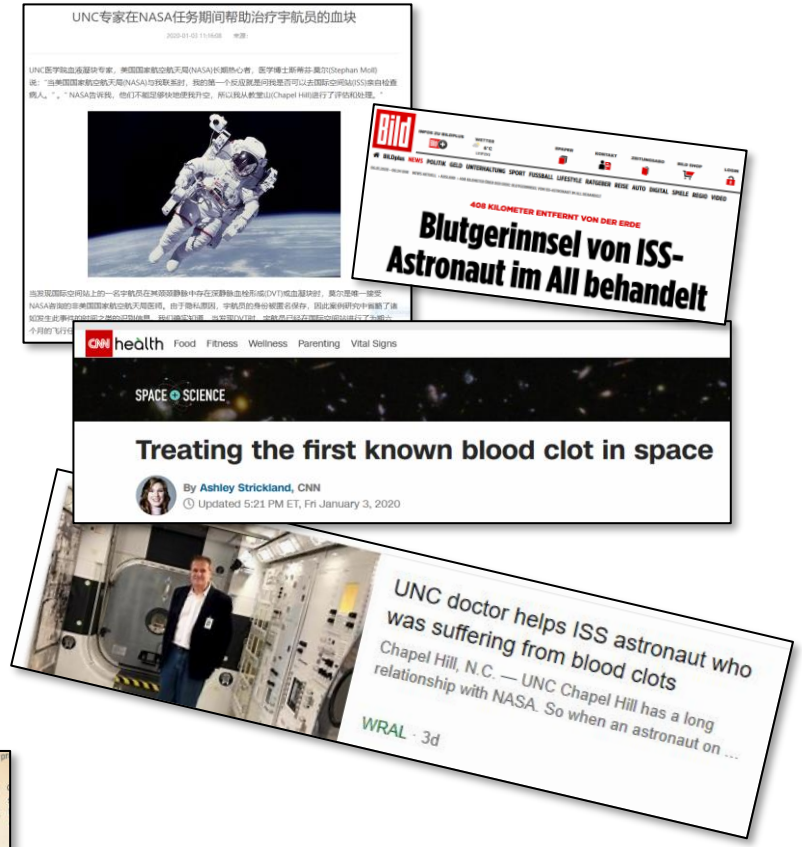


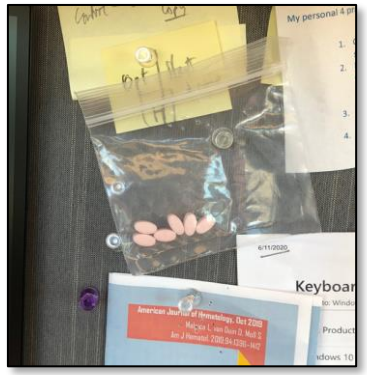
Astronaut with Neck Vein Clot

The NEW ENGLAND JOURNAL of MEDICINE

[Auñón-Chancellor S et al. NEJM 2020;382:89-90]

[Surveillance for jugular venous thrombosis in astronauts. Pavela J et al. J Vasc Med. 2022 Aug;27(4):365-372]





Astronaut …

UNC HEALTH

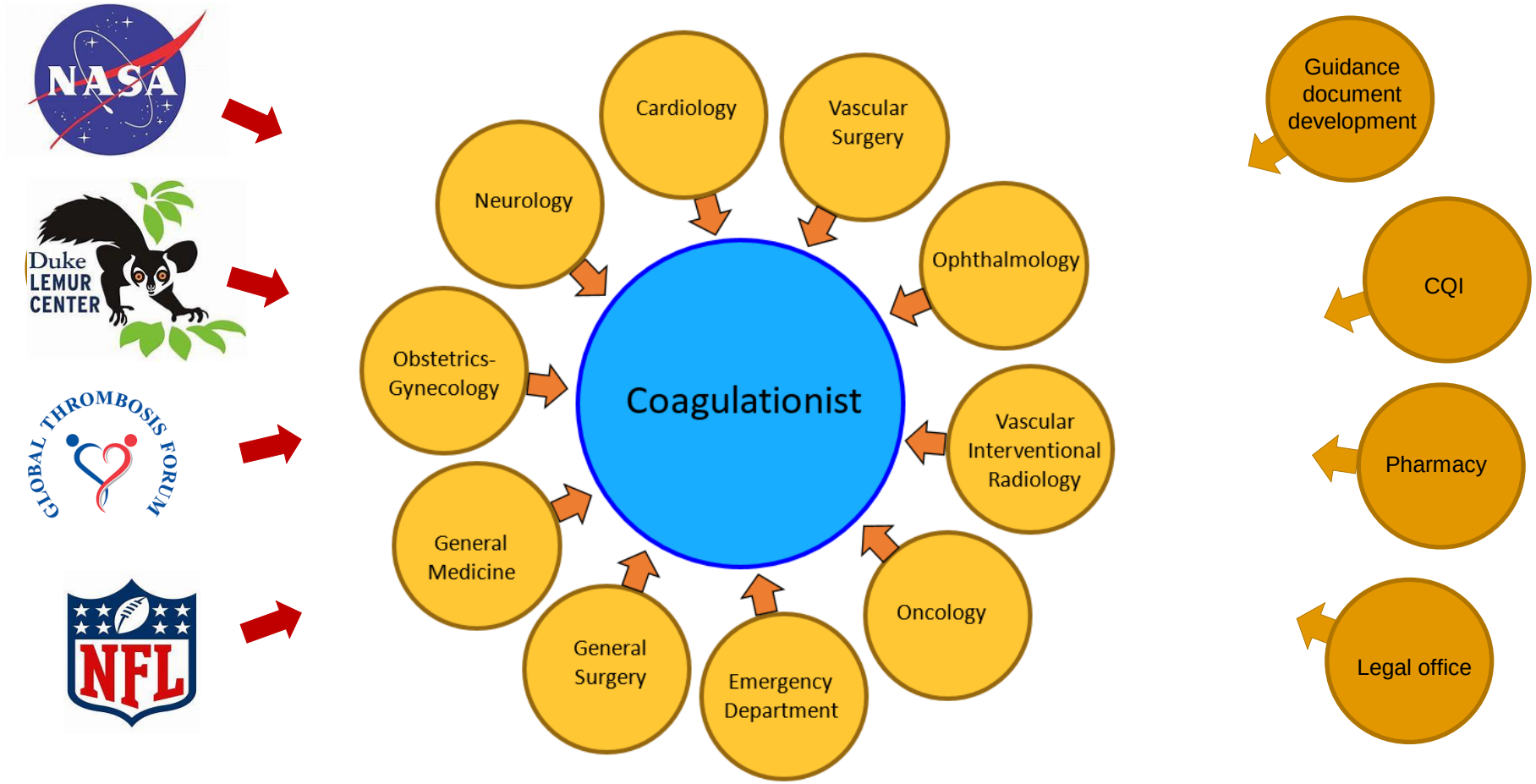
Recent New Coverage - Well Done!

Dr. Moll –

Just a brief note to thank you for your work at UNC and th

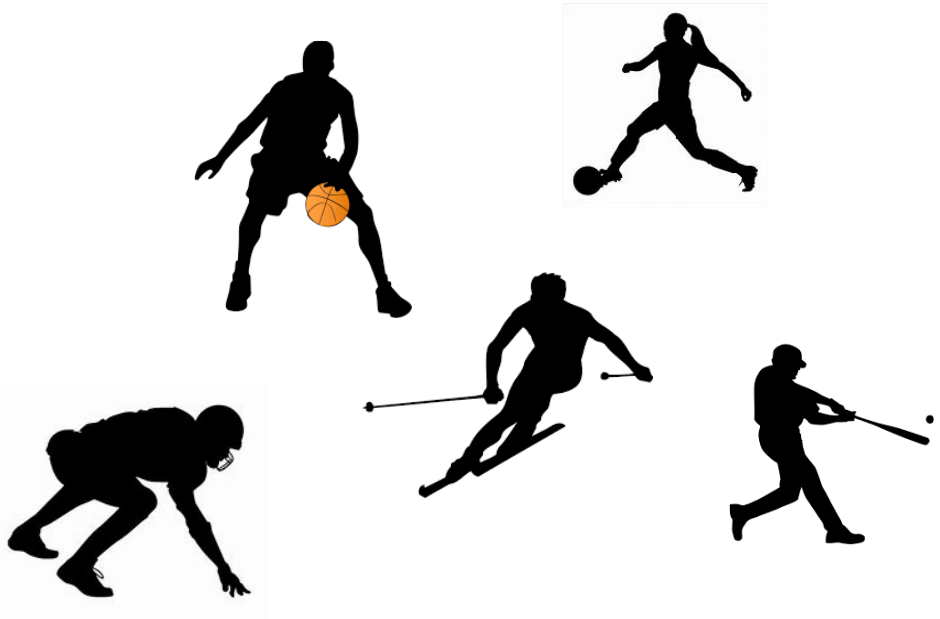
with NASA. Your work makes us all proud to be part of UN

Being a Coagulationist



"What Identity crisis?";
ASH's *The Hematologist* 2019

Athletes and Blood Clots



Risk of recurrent clot

Risk for beeding

Patient preference

Temporary interruption of blood thinners

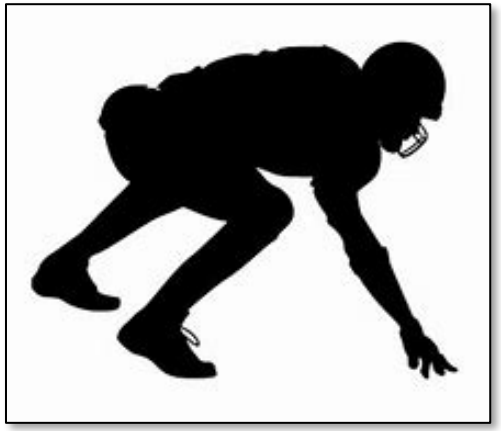
[Douketis JD et al. JAMA Intern Med. 2019;179(11):1469-1478]

Take-home points

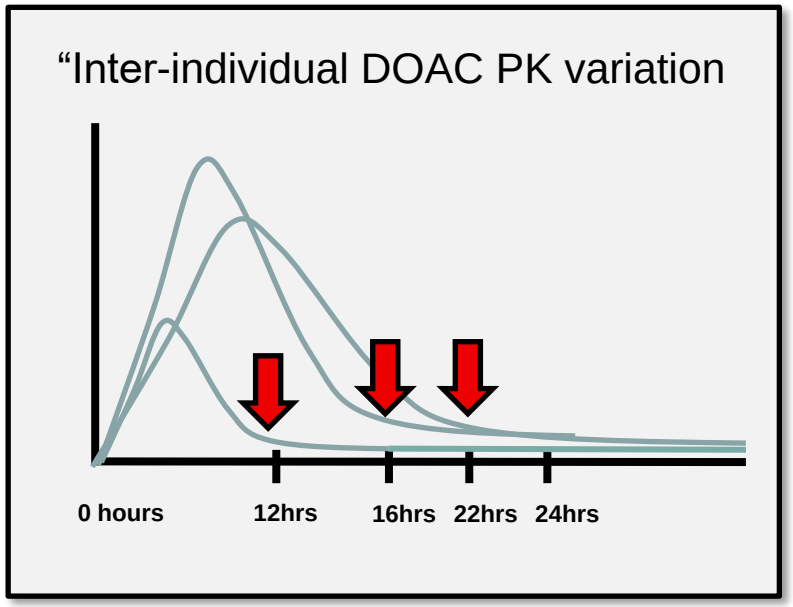
3x t½ = 36 hrs (1.5 days)

5x t½ = 60 hrs (2.5 days

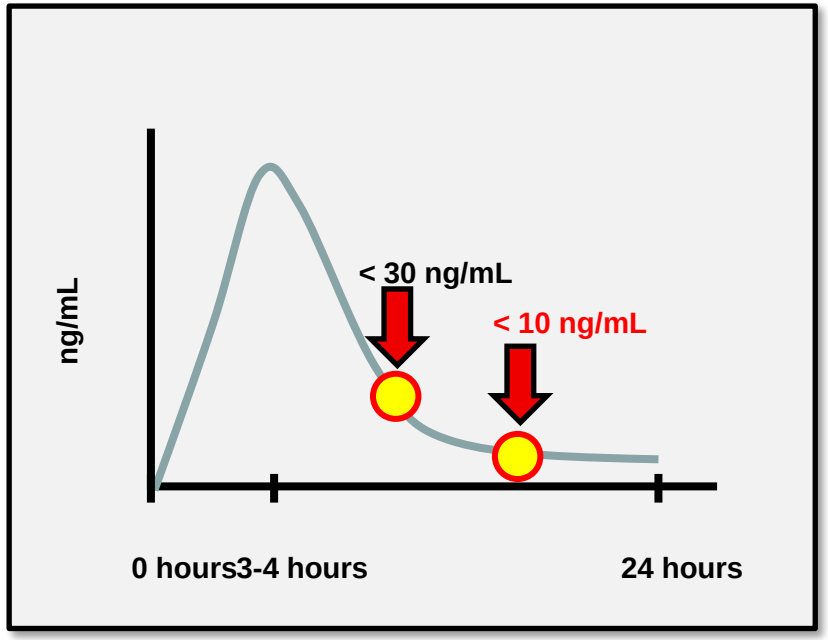
Patient Preference



Athletes on Blood Thinners



[Samuelson BT et al. Chest 2017;151:127-138]



“Safe” DOAC level unknown

Intermittent anticoagulation strategy

Intermittent Anticoagulation Strategy

Needs to be off blood thinners (Eliquis® 2.5 mg 2x/day) for **at least 13 hrs** before engaging in significant contact activities

	Su	Mo	Tue	Wed	Thu	Fri	Sat
AM	Yes	no	yes	no	yes	no	yes
		3 PM practice		3 PM practice		3 PM practice	
PM	Yes	?	yes	?	Yes	?	yes

Green fields indicate that pt will take **Eliquis® 2.5**

Red field indicates he will not take **Eliquis® 2.5**

Orange fields indicates: unclear whether he should take **Eliquis® or not; it depends on whether he had** any trauma/significant trauma during practice.

| High-Performance Hematology: Elite Athletes and Weekend Warriors |

Elite athletes and anticoagulant therapy: an intermittent dosing strategy

Stephan Moll,[1] Joshua N. Berkowitz,[2,3] and Christopher W. Miars[4,5]

[Moll S , Berkowitz J, Miars C. 2018;Hematology 2018, ASH Education Program:412-417]

[Berkowitz J, Moll S. J Thromb Haemost 2017;15:1051-4]

High-Level Athletes

Athletes and Blood Clots Program

The "*Athletes and Blood Clots Program*" at the University of North Carolina has three objectives:

1. To offer state-of-the art multi-specialty medical care (Hematology [Dr. Stephan Moll] plus Sports Medicine [D
   Josh Berkowitz]) to high level active athletes with deep vein thrombosis (DVT) or pulmonary embolism (PE);
2. To provide education and information to athletes, physicians, the general public and the media about DVT an
   in athletes;
3. To perform and support clinical and basic research that addresses open questions about cause, prevention a
   best management of DVT and PE in athletes.

No such specialty program currently exists in the U.S.

Clinic Scheduler

For clinic appointment inquiries, contact hematology clinic scheduler Erin Pfeuffer or Dr. Stephan Moll.

Erin Pfeuffer

Hematology clinic scheduler

The Rest of Our Team

Josh Berkowitz, MD

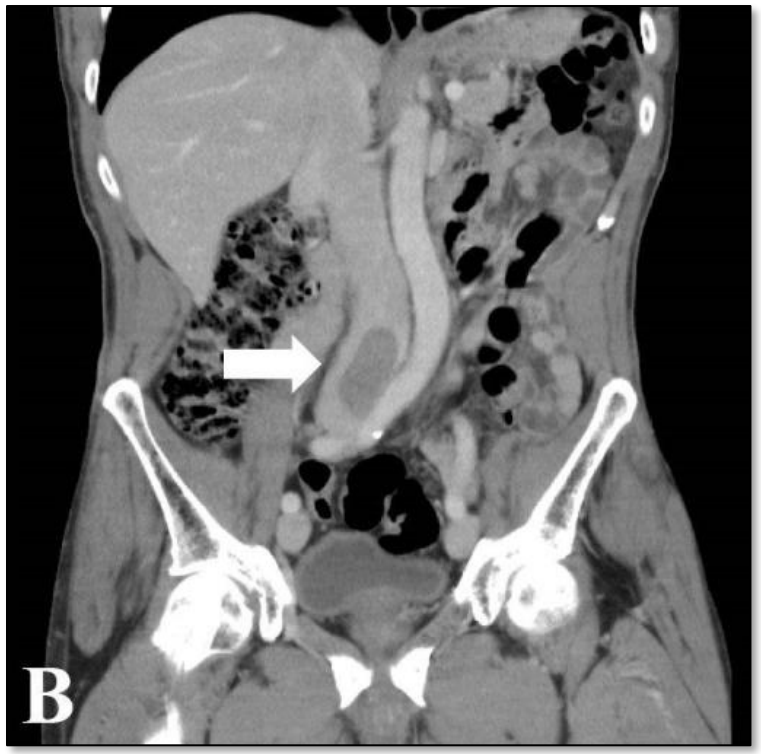
UNC Sports Medicine

Stephan Moll, MD

Professor of Medicine, Department of Medicine
Hematology

https://www.med.unc.edu/htcenter/patient-care/clotting-disorders/athletes-and-blood-clots-program/

Athletes and Blood Clots …



[Imanishi J et al. Intern Med 2018;57:2517-2521]

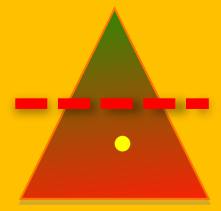
Weightlifting belt

Finally…

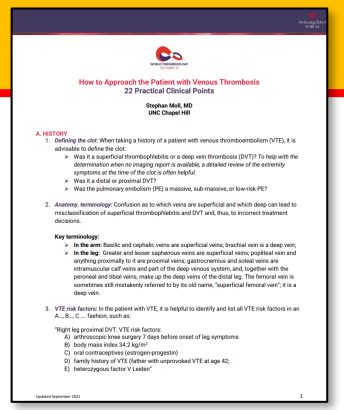
Jan 25th, 2020: InterContinental Hotel Buckhead, Atlanta

Summary

1. Define the blood clot
2. List the blood clot risk factors: A...., B…., C….
3. Try the “Recurrence Triangle”
4. Blood thinner “Hate Factor”



5. 22 Teaching Points



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   D) family history of VTE (father with unprovoked VTE at age 42;
   E) heterozygous factor V Leiden"

Updated September 2021 1

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PROFESSOR OF MEDICINE
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