The ideal DVT therapy anno 2015

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Epidemiology DVT

- 1-2 / 1,000 individuals develop a DVT yearly in the Western World
- High association with age
- Other risk factors
  - Thrombophilia
  - Prolonged bed rest
  - Pregnancy
  - Cancer
  - A history of deep vein thrombosis or pulmonary embolism
  - Birth control pills or hormone replacement therapy
  - Surgery

Why DVT causes PTS

Venous Hypertension:

- CVI (Maximal < 90 mmHg)
- CVO !! (> 200 mmHg) Higher incidence of severe PTS

Valves
- Rare
- 10-20 %
- Many

Supine

walking
Pathophysiology of PTS

- We know that iliofemoral DVT causes 100% more frequent PTS:

- Due to:
  - **Obstruction !!**
    - Due to the calf pump
      - Venous pressures can get much higher at the lower leg due to obstructed outflow
        - > 200 mmHg
      - Incompetence can cause only an hydrostatic pressure increase
        - (Only) 90 mmHg
    - Pressure relates to damage! (white cell trapping, cuffing, tissue malnutrition and oxygenation etc. etc.)
Treadmill pilot study:

- Intravenous pressure measurements
  - CFV both sides
  - Dorsal foot vein both sides
  - Arm vein (control)
- Treadmill walking test
Pressure results CFV:

Pressure CFV (healthy)

Pressure CFV (iliac obstruction)

European Venous Centre; Aachen-Maastricht
Complications of standard (level 1 evidence) DVT treatment:
- Pulmonary embolism (5% lethality)
- Recurrent thrombosis (30%)
- Overall 25% PTS within 1 year.

Iliofemoral thrombosis is associated with a twofold increased risk of developing PTS >> 50%.  

Early thrombolysis may decrease incidence PTS.

1: Kahn, Ginsberg. Arch Intern Med 2004
Diagnostics in DVT

- Due to changed therapeutic options there is a need to change diagnostics in DVT
  - 2 point compression ultrasound (not enough!!)
- Complete venous roadmap !!
  - Full duplex examination
  - MRV
  - CTV
A Standardized classification

LET (Lower extremity thrombosis) classification:

- **Class I: calf vein thrombosis**
  - Limited to the calf veins
  - Good recanalisation
  - Good outflow / collaterals
  - Low PTS

- **Class II: femoro-popliteal thrombosis**
  - Popliteal vein, Femoral vein, Deep femoral vein
  - Good recanalisation
  - Good outflow / collaterals
  - Medium PTS

- **Class III: femoro-iliac thrombosis**
  - Common femoral vein, iliac veins
  - Bad recanalisation
  - Impaired outflow / bad collaterals
  - High PTS

- **Class IV: inferior vena cava thrombosis**
  - Inferior vena cava
  - Bad recanalisation
  - Impaired outflow / bad collaterals / bilateral
  - High PTS
A Standardized classification

LET (Lower extremity thrombosis) classification:

Veines-QoL/Sym significant lower in higher LET classes
P=0.003 (n=1349)
DVT: intervention

• Why intervention:
  • Reduction symptoms (acute stage)
  • Reduction recurrent DVT
  • Reduction PTS (by recanalisation and valve preservation)

• In whom:
  • Iliofemoral (cava) thrombosis (Completely swollen leg!!)
    • Poor recanalisation causing:
      ■ Venous hypertension (95%)
      ■ DVI (90%)
      ■ Calve muscle pump dysfunction (50%)
      ■ Venous claudication (15%)
      ■ Ulcers (15%)
      ■ >50 %PTS
Invasive treatment options: DVT

- Conservative
- Thrombolysis
  - Systemic (obsolete)
  - CDT
    - PTS 14.4% ARR
    - CaVenT study
  - EKOS
  - Trellis
  - Angiojet

All 80-95% successful recanalisation
Treatment options: DVT

- Trials
  - CaVenT 2013
  - Attract 2017
  - CAVA 2017

- Will probably show sub-optimal results due to less successful thrombus removal tools

- But if successful it will cause a significant improved outcome (PTS, recurrent DVT and QoL)
Treatment options: DVT

- If so we will need better dedicated devices
  - Ideally as a 1 hour out patient procedure
  - Without thrombolytics!!
    - Complications ☐
    - No Medium/High care admission
    - Costs ☐ ☐
    - Malignancies can be treated !
    - Postoperative patients can be treated !

= About 25 %
Treatment options: DVT

- New dedicated venous thrombus removal devices:
  - Removal of thrombi with local lytic therapy
    - Covidien (Trellis II)
  - Remove thrombi without lytic agents!!
    - Lazarus
      - Thrombectomy device (4F)
    - Angiodynamics
      - New Thrombectomy device (14F)
      - Angiovac (22F)
Treatment options: DVT

- An example of a new dedicated venous thrombus removal device:
  - A basket introduced at the popliteal vein will dilate the vein maximally
  - dislodge the cloth from the wall
  - Fragment the cloth and removed it while the device is slowly advanced to the IVC
  - If necessary a second run is performed.
  - From distal to proximal to prevent valve damage
Treatment options: DVT

- An example of a new dedicated venous thrombus removal device:
Treatment options: DVT

- New dedicated venous thrombus removal device:
  - In vitro
Treatment options: DVT

- New dedicated venous thrombus removal device:
  - In vitro: successful
  - In vivo:
    - cloth model in pigs (3 weeks old) (n=8)
    - Iliac and IVC
    - Successful thrombi removal
    - No damage to the wall
  - Clinical studies will follow shortly
Conclusion:

- What is new in DVT treatment:
  - Etiology: PTS, Obstruction!!!
  - Diagnostics: venous roadmap!
  - Scoring systems: LET score
  - Treatment Options: New mechanical devices?!
Conclusion:

○ What is new DVT treatment:

- Potential impact on practice to treat DVT and prevent PTS:
  - DVT 1-2/1000/year
    - 25 % ilio-femoral → 40/100.000/year
    - Europe (850 Million people): 320.000 / year

Major impact if this treatment become routine
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anno 2015

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