Venous interventions in DVT

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Acute DVT – why do we need intervention

Current standard of care

Does not eliminate risk of PE
Does not remove existing clot

Reduce severity and duration of symptoms by preventing thrombus propagation/extension (only 6% resolve completely)

Reduce risk of recurrent thrombosis

Reduce risk of pulmonary embolism

LMWH ↔ Warfarin x 6m

ANTI-COAGULATION

Current standard of care
Acute DVT – why do we need intervention

Valvular incompetence
Residual venous obstruction

CHRONIC VENOUS INSUFFICIENCY

Oedema
Hyperpigmentation
Ulcer

Fibrotic change in venous wall and valve
Causes persistent high venous pressures
Post-thrombotic syndrome

Seen in 75% of patients with proximal DVT
More proximal = more severe

Oedema
Hyperpigmentation
Ulcer
Post-thrombotic syndrome

Traditional treatment: Compression stockings

Expensive, uncomfortable, poor patient compliance

Recent randomised trial (Kahn et al) showed no benefit

THE LANCET

Compression stockings to prevent post-thrombotic syndrome: a randomised placebo-controlled trial

Dr Susan R Kahn, MD, Stan Shapiro, PhD, Philip S Wells, MD, Marc A Rodger, MD, Michael J Kovacs, MD, David R Anderson, MD, Vicky Tagalakis, MD, Adrielle H Houweling, MSc, Thierry Ducruet, MSc, Christina Holcroft, ScD, Mira John PhD, Susan Solymoss, MD, Marie-José Miron, MD, Erik Yeo, MD, Reginald Smith, PharmD, Sam Schulman, MD, Jeannine Kassis, MD, Clive Kearon, MB, Isabelle Chagnon, MD, Turnly Wong, MD, Christine Demers, MD, Rajendar Hanmiah, MD, Scott Kaatz, DO, Rita Selby, MBBS, Suman Rathbun, MD, Sylvie Desmarais, MD, Lucie Opatrny, MD, Thomas L Ortel, MD, Jeffrey S Ginsberg, MD, for the SOX trial investigators

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Interpretation

ECS did not prevent PTS after a first proximal DVT, hence our findings do not support routine wearing of ECS after DVT.
Acute DVT: Moving towards aggressive thrombus removal

- Reduce incidence of post-thrombotic syndrome
- Reduce risk of recurrent thrombosis
- Improve quality of life

Goals of therapy
Acute DVT: Changing concepts

May-Thurner syndrome / Non Thrombotic Iliac Vein Lesion

Requires angioplasty / stent placement
May-Thurner syndrome / NIVL

- True incidence unknown
  - 22-32% cadavers
  - 18-40% in patients with left LL DVT

- May be as high as 70% on IVUS
May-Thurner syndrome / NIVL

- 3 stages:
  - Stage I: Asymptomatic compression
  - Stage II: Development of venous spur
  - Stage III: Development of ilio-femoral DVT

70% recurrence of DVT if left untreated
Acute DVT: Goals of therapy

- Early thrombus removal
- Reduces inflammatory response
- Preserves capacitance
- Prevents clot propagation
- Maintains axial flow – decreases stasis
- Restore venous patency
- Maintains pressure segmentation
- Prevents high ambulatory pressures
- Preserve valve function
- Decreases severity of PTS and prevents recurrence of thrombosis
Traditional indications for intervention

- Young or highly functional patients, with life expectancy > 2 years
  - Cancer not a contraindication
- Symptomatic acute ilio-femoral DVT
  - Phlegmasia cerulea dolens
  - Venous gangrene
- Propagation of DVT despite conventional therapy
- Symptomatic IVC thrombosis after filter placement
- Extensive thrombus burden
Traditional intervention - Surgical thrombectomy

• Surgical removal of thrombus +/- AV fistula
• Better patency rates, lower venous pressure

• However...
  • Anaesthesia risks
  • Large incision
  • Slow recovery / ambulation
  • Bleeding with anticoagulation
  • High recurrence
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Balance of risk of intervention vs severity of disease
Traditional indications for intervention

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Systemic thrombolysis

- 3x better lysis / recanalisation than anticoagulation
- High doses required
- 4x increased risk of bleeding
Catheter directed thrombolysis (CDT)

- High dose delivery of thrombolytic agent directly into the thrombus
- Less systemic effect
- Less bleeding complications
- 2x patency rates
- 80% success rate
Catheter directed thrombolysis

70yo female, DVT with phlegmasia cerulea dolens
Femoropopliteal and infra popliteal DVT

US guided pedal vein puncture, 4F catheter up peroneal vein

24 hrs
Catheter directed thrombolysis

70yo female, DVT with phlegmasia cerulea dolens
Femoropopliteal and infra popliteal DVT

4F infusion catheter up popliteal vein

24 hrs
Catheter directed thrombolysis

70yo female, DVT with phlegmasia cerulea dolens
Femoropopliteal and infra popliteal DVT

24 hrs
48 hrs
72 hrs
Problems with CDT

• Prolonged infusion (48-72 hrs)
• Systemic effect of drug
  • Bleeding risk with prolonged infusion
    • (~5-11% risk of major bleeding)
• Prolonged ICU / HDU monitoring
• Contraindicated in:
  • Uncontrolled HT
  • Recent trauma
  • Active/recent hemorrhage
  • Coagulopathy
  • Recent major surgery
Ultrasound aided CDT

- EKOS Endowave infusion system
  - Reduces infusion time
    - (median 22 hrs)
  - Reduces bleeding risk
    - (3.8% risk of major bleeding)
Mechanical / pharmacomechanical thrombectomy

- Suction thrombectomy
- Rotarex device
- AngioJet
- Trellis system
Trellis system
Trellis system
AngioJet

Bernoulli Effect

Low Pressure
(Venturi Effect)

Pressurized Saline

Exhaust Lumen
(Suction)
AngioJet
Angiojet Technique

- Prone position
- Popliteal vein or SSV access
  - Micropuncture set (21G)
  - 7F sheath inserted
  - 5F Ber catheter / Glidewire
  - Change to 0.035 Teflon wire
- DVX AngioJet kit
To filter or not to filter

• Debatable
  • PEVI trial showed reduced PE risk but no change in mortality
  • May Thurner lesion? Protective

• Indications
  • Iliocaval DVT without obstructive lesion
  • DVT + PE
  • Poor cardiopulmonary reserve

• Retrievable, remove within 6-8 weeks
To stent or not to stent

• Ideally needs IVUS to make the decision
• Use of angioplasty/stent

  • Obstructive lesion at/below inguinal ligament
    Angioplasty only

  • Obstructive lesion above inguinal ligament:
    Self-expandable stent
    Stent big (14-18mm)
    Stent long (external iliac to IVC)
Complications of PMT

- Hemolysis
- Hemoglobinuria
- Temporary renal impairment
- Bradyarrhythmia
- Venous injury
- Pulmonary embolism
Results : PEARL Registry
Peripheral Use of Angiojet Rheolytic Thrombectomy with Mid-length Catheters

• PMT is effective
  • Immediate improvement in 90% of treated veins

• PMT is safe
  • >99% adverse events are minor

• Suggests that PMT can:
  • Reduce need for post procedure CDT (41%)
  • Reduce CDT infusion time (76% <24 hrs)
  • Reduce risk of bleeding from CDT
  • Reduce need for ICU bed
  • May reduce risk of post-thrombotic syndrome (80% freedom from rethrombosis @ 1 yr)
Interventions in DVT

• Proximal DVT needs more aggressive treatment → Long term goals to prevent post-thrombotic syndrome

• Mechanical and pharmacomechanical thrombectomy is the quickest and safest way to clear the clot

• Iliac venous compressive lesions are very common → Prepare to stent for durable results