When Would AngioVac Be the Best Tool

Epidemiology: VTE Incidence

- Overall ~1 Million VTE Events per Year in US
- DVT PE Total VTE
  - Fatal: 2,000 294,000 296,000
  - Non-Fatal: 376,000 237,000 613,000


Epidemiology: VTE Mortality

- Heart Disease: 595,000
- Cancer: 574,000
- VTE: 296,000
- COPD: 138,000
- Stroke: 130,000

Overall 300,000 VTE Deaths per Year in US - #3 cause


Evolution of Therapy

Case Example 1

HPI
- 72 y/o man with history of pancreatic cancer and DVT had an IVC filter placed 1 week prior presented with back pain and significant bilateral lower extremity edema
- Filter was placed in preparation for Whipple surgery

PMH
- HTN

Before Angiojet

After Angiojet

Residual Thrombus = More Severe PTS

Limitations of Thrombolysis and PMT

Effectiveness
- Only works on fresh clot but many VTEs have some chronic component
- Many patients have contraindications to thrombolysis
- Not always effective with large volume thrombus

Bleeding
- 10-15% Major
- 1-3% Intracranial or Fatal

Resource Utilization
- ICU care at many institutions
- Relatively long infusion times
- Several trips to interventional suite
- Prolonged hospitalization

AngioVac Cannula

- FDA 510(k) Approval - The AngioVac Cannula is indicated for use as a venous drainage cannula during extracorporeal bypass for up to 6 hours. The cannula is also indicated for removal of fresh, soft thrombi or emboli
- During extracorporeal bypass, the blood passes through a filter which traps thrombus and other particulate material before being recirculated to the patient
Use Gore 26 French Dry Seal Sheath for Introduction of the 22 French AngioVac Device

- 26 Fr Gore DrySeal Sheath
- Blood is recirculated to the patient via a 16 Fr sheath
- ACT is kept > 300
- Perfusionist monitors flow rate (up to 5 L/min)

Device Enhancements

- Proprietary Funnel Tip Design
  - Allows for optimal suction of the thrombus to the sheath
  - Angled tip aids in navigation for potentially easier placement within the vasculature
  - Radiopaque markers allow for visualization under fluoroscopic imaging

- Working Side Port, Touhy Insert
  - Y-Adapter with Touhy insert allows for over-the-wire capability through the working side port and accommodates up to an 18F adjunctive device
  - Hydrophilic coating on the obturator allows for easier insertion through the Y-Adapter and AngioVac cannula

Active Model

Case Example 2

HPI
- 72 y/o man with history of DVT and PE was initially treated with heparin. Two weeks later, patient developed gross hematuria as well as BRBPR, with a drop in hematocrit, leading to placement of IVC filter
- Colonoscopy showed a 5 cm ulcerating sigmoid mass
- 1 day after discharge, patient presented to ER with dizziness, presyncope, scrotal edema and bilateral lower extremity pain and swelling

PMH
- CAD
- BPH

Findings:
- Caval thrombosis to the level of the IVC filter
- Bilateral iliofemoral DVT
Occlusion of IVC to the level of the filter with a small amount of thrombus attached to the filter hook.

Thrombotic occlusion of the iliac and femoral veins.

AngioVac device advanced through 26 Fr DrySeal sheath placed via right IJV. Pt is on extracorporeal bypass with reinfusion cannula in the left IJV.

Thrombus aspiration of IVC via AngioVac catheter.

AngioVac requires blood flow to function properly.

Perfusionist - Need feedback regarding flow rates.

Thrombus aspiration of the bilateral iliac veins.
Case Example 3

HPI
- 46 year old man presented with 2-3 weeks of abdominal pain, increased abdominal girth, and profound bilateral lower extremity edema
- Patient had 20 pound weight gain during same period

PMH
- HTN

Outcome
- Significant thrombus removed
- Minimal blood loss
- Patient’s lower extremity and scrotal edema resolved

Workup

Labs:
- Transaminits \( \rightarrow \) AST 351, ALT 772

Imaging:
- Echo, Stress test, V/Q scan- Negative
- MRI- Large left adrenal mass with associated thrombus in IVC

Paracentesis:
- Massive ascites \( \rightarrow \) paracentesis \( \rightarrow \) High SAAG \( \rightarrow \) + Portal HTN

Courtesy of Kenneth Rosenfield, MGH
Abdominal Duplex

Occlusion of the IVC (with obstruction of the hepatic veins)
Hospital Course

- Plt 242 K to 50 K → Heparin induced thrombocytopenia (HIT, PF4 +) → Argatroban
- CT Guided Biopsy performed → Poorly differentiated adrenal cortical tumor, nonsecretory
- Planned AngioVac thrombectomy/tumor removal followed by staged surgical resection

AngioVac positioned from femoral vein approach

- Balloon inflated
- AngioVac advanced
- Flow/debris monitored
- RA reached, tumor and thrombus material aspirated, and flow rates maintained

Specimen from AngioVac Filter

IVC Patent
Flow to Right Atrium

Portal Vein Flow

Hepatic Vein Flow
Outcome

- Dramatic improvement LE edema and ascites
- LFTs normalized
  - AST: 666→507→324→190
  - ALT: 507→324→190→187
- Patient underwent staged surgical resection with left radical adrenalectomy, tumor resection left renal vein
- Remains on warfarin and undergoing chemotherapy

Other Pathologies Treated with AngioVac

- Catheter Related Thrombus
- Right Atrial Thrombus
- Tricuspid Endocarditis
- Right Atrial Tumor

How to Manage 26 French Venous Puncture?

1. Manual compression
2. Preclose vein (all you need is a single Proglide suture)
3. Purse-string sutures

What is the Data?

- There are no major studies looking at the efficacy of Angiovac for IVC/iliac vein thrombosis
- There are few case reports and small retrospective series

Material was aspirated in 86% (12/14)
- 79% (11/14) of patients achieved procedural success
  - 9/14 (64%) were completely successful
  - 2/14 (14%) were partially successful
- 1/14 (7%) thrombus beyond the reach of the catheter in PE
- 2/14 (14%) residual tricuspid valve vegetation
- Lack of success was most often due to thrombus beyond the site of catheter aspiration in a patient with PE or residual tricuspid valve vegetation in patients with endocarditis

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A NOVEL ENDOVENOUS APPROACH FOR TREATMENT OF MASSIVE CENTRAL VENOUS OR PULMONARY ARTERIAL THROMBUS, MASS, OR VEGETATION: THE ANGIOVAC SECTION CANNULA AND CIRCUIT
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- Complications: 1 procedure-associated pericardial effusion requiring treatment
- No procedure related symptomatic PE or death
- Conclusion: Endovenous mechanical aspiration with the AngioVac device appears safe and may be an effective therapy for appropriate patients with massive thromboemboli and right atrial vegetations
- Prospective clinical trials are necessary

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**Conclusion:**

**When Would AngioVac Be the Best Tool?**

- Removal of large volume of thrombus (i.e. iliocaval DVT)
- Contraindications to thrombolysis
- Significant persistent thrombus despite thrombolysis
- Potential for removal of chronic thrombus
- Removal of tumor thrombus
- Right atrial thrombus
- Potential for endocarditis

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Thank You!