

Use of Inferior Vena cava Filters in Venous Thrombo Embolic Disease

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Division of Pulmonology

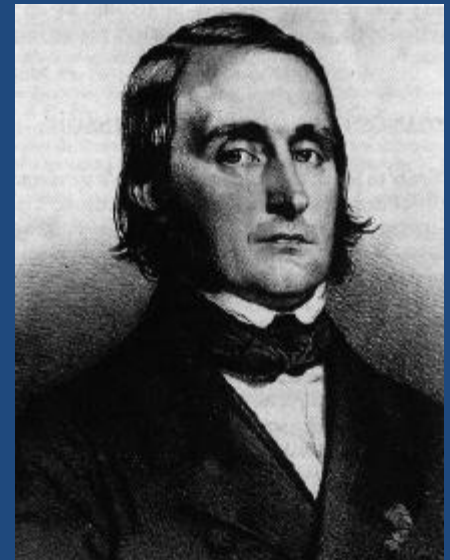
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Outline

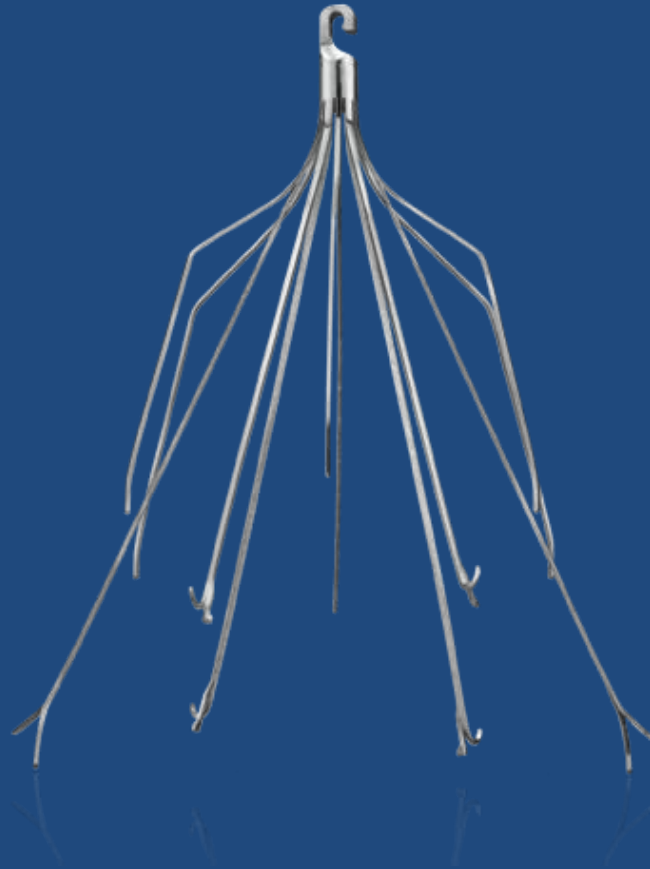
- History of the IVC filter
- Types of filter
- Complications
- Retrieval rate
- Indications
- PREPIC 1 and PREPIC 2
- Summary

History

- Dr Armand Trousseau (1801-1867) Paris
 - Malignancy and thrombosis
 - Trousseau's sign
 - Diagnosed his own gastric cancer from thrombophlebitis
 - First to suggest a barrier in the IVC



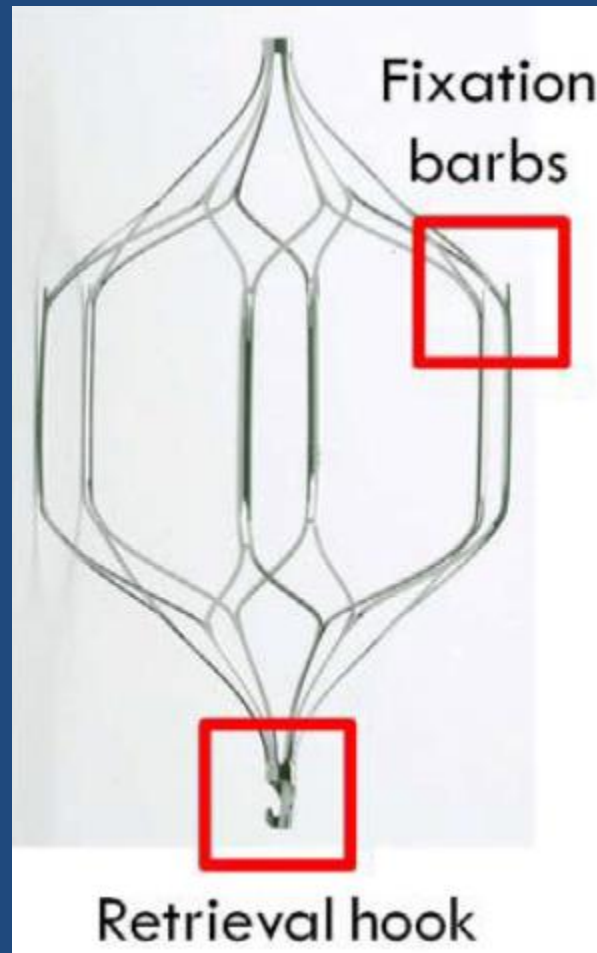
Bard filter



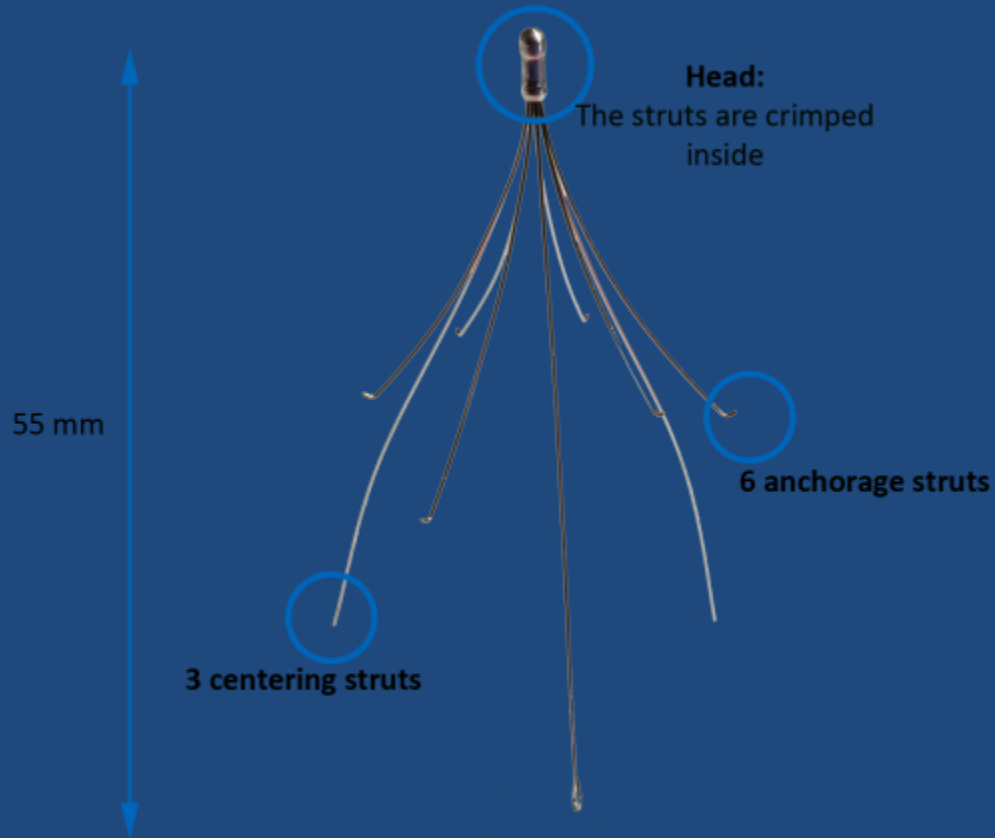
Celect



OptEase ...caudal hook



ALN filter



Complications

Retrievable IVC Filter Failure Modes



Migration

Caudal (Downward)
Cephalad (Upward directly towards the heart)



Tilts/Shifts

Prohibits removal – leads to loss of efficiency, fracture and tissue perforation leading to formation of scar tissue.



Fractures

Fractured components of an IVC retrievable filter (arms and legs) embolize and can travel to the heart, lung, kidney, liver, spine and nerves.



Perforation

Causes stresses that lead to fracture.
Fractured components can become embedded in tissue including organs and may not be removable.



R. Duszak Jr., L. Parker, D.C. Levin, V.M. Rao Placement and removal of inferior vena cava filters: national trends in the medicare population *J Am Coll Radiol*, 8 (2011), pp. 483–489.

- **Increased use due to retrievable filters:** From 1999 to 2008
- 111% increase in general use.
- Radiologists 122%
- 313% increase use by cardiologists
- 100% by surgeons.
- **Retrieval rate 1.2-5.1%**

Is the use of IVC justified?

Spencer A et al: A population-based study of inferior vena cava filters in patients with acute venous thromboembolism, *Arch Intern Med* 2010 Sep 13;170(16):1456-62

1547 pts with VTE: 13.1% received a filter

Panel decision on appropriate use

51% filter use – unanimous agreement

26% filter use – unanimous disagreement

23% - no consensus

Indications for IVC use

Contra indications to anticoagulation

Multiple trauma

Intra cerebral hemorrhage

Stroke – unknown cause

VTE in pregnancy with c/I to
anticoagulation, extensive lung clot burden

Active bleeding

Closed head injury with multiple fractures

Indications

- Complications of anticoagulation (bleeds)
- Failed Anticoagulation
 - Recurrent VTE despite adequate anticoagulation

Types of IVC filter use

- Permanent
- Temporary – insertion for a short period - days
- Retrievable – insertion for a period of weeks
- Infra renal placement
- Supra renal placement

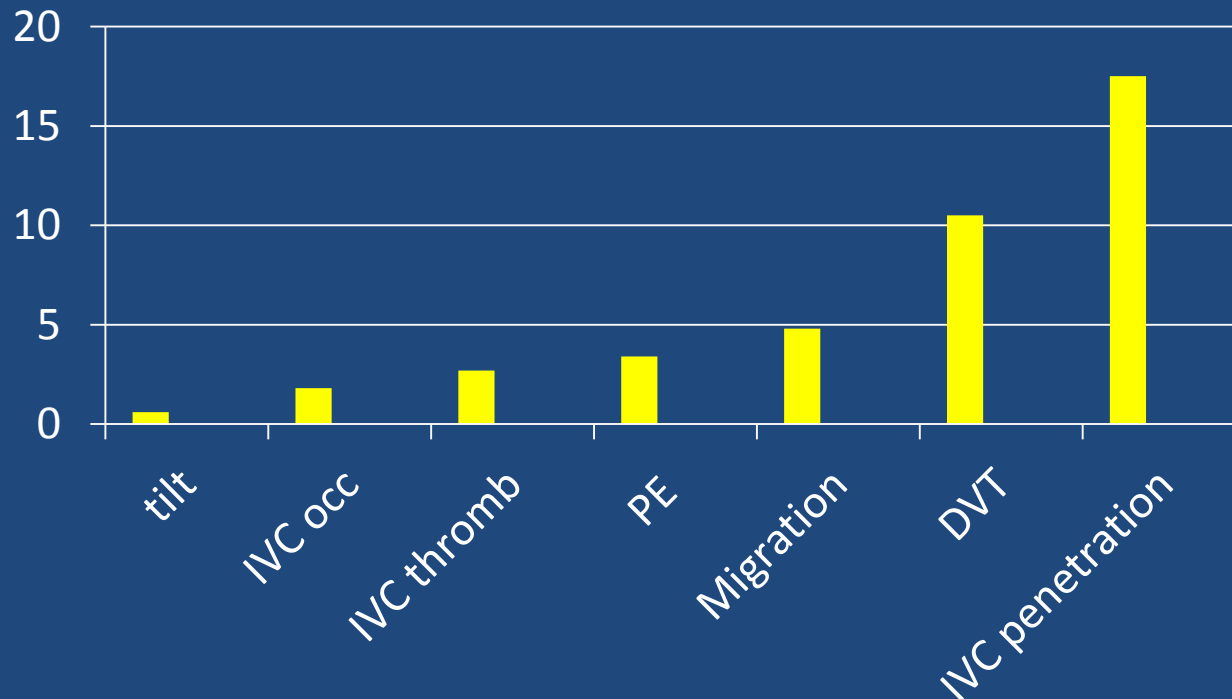
Supra renal placement in IVC thrombosis

- **Suprarenal Inferior Vena Cava Filters: A 20-Year Single-Center Experience Kalva SP, Chlapoutaki C, Wicky S , Greenfield A, et al**
- *J Vasc Interv Radiol 2008; 19:1041–1047*
- IVC narrowed below renal vein
- Thrombosis below renal vein
- Thrombosis in renal vein
- 70pts followed 543d, 94% VTE, (60% DVT, 25% PE, 15% PE and DVT)
- PE recurrence in 1 pt CTPA, Renal function worsened in 1 patient
- Suprarenal placement not deleterious for the kidneys

Complications of IVC filters

Tsui B et al J Vasc Intervention March 2016

516 filters (Option – Elite) 7/12 follow up
88% successful retrieval from 16% population
remainder kept their filters for permanent reasons.



Low retrieval rate ??

- Previous study 1.2-5.1% (Duzak et al)

37 studies – Angel L et al retrieval rate of 37%¹

Boston Medical center: 952pts with retrievable filters - 8% filters removed².

1. Angel L et al Systematic review of use of retrievable inferior vena caval filters: J Vasc Interv Radiol: 2011;22(11)1522-1530.e.3
2. Sarosiek et al Jama April 2013;173(7):513-517

Reason for poor retrieval

- Gyang E, et al Factors impacting follow-up care after placement of temporary inferior vena cava filters. *J Vasc Surg* 2013; 58 (2): 440-5
 - Poor follow up in certain pt categories
 - Filter insertion not from a vascular surgeon
 - CNS pathology (Bleed, spinal fractures)
 - Pts sent to rehabilitation facilities – low return rate for follow up.

Prophylactic IVC Filter use in spinal surgery¹

219 pts high risk for PE (previous VTE, Malignancy, GA > 8hrs) had filter compared to 122 matched controls.

All got heparin by day 3 through 7

Filter group: PE 3.6%

Control: 13,1%

1 McClendon J, et al: Spine 2012: 37(13) June; 1122-1129

PREPIC 1 trial ¹

Prévention du Risque d'Embolie Pulmonaire par Interruption Cave

- First RCT trial – non blinded – Filter benefit with anticoagulation?
- 400 pts proximal DVT +/- PE, high risk for PE: idiopathic VTE, malignancy, previous VTE, iliac DVT – permanent filter 8yr follow up
- All had 3 months anticoagulation
- PE rate: filter 6.2% - no filter 15.1%
- No mortality benefit
- DVT risk 2yrs: 35.7% filter – 27.5% non filter

1. PREPIC Study Group, *Circulation* 2005 Jul 19;112(3):416-22

Consequences of PREPIC 1.

- VTE 2009 guidelines
- Filter recommended for high risk PE or recurrent PE.
- Not for general use.
- PE reduction offset by high DVT with no mortality benefit.

PREPIC 2



- Differences to PREPIC 1
 - Retrievable Filters (ALN)
 - All pts had a PE vs 38% in PREPIC 1
 - At least 6 months anticoagulation – not 3 months, anticoagulation continued by discretion.
 - Filter retrieval planned at 3 months (93%)
- Same no. pts followed for same time (8yrs)
- Pts also were high risk for further PE.

PREPIC 2 results

@ 3 months:

PE in filter group 3% - all fatal

PE in control 3% - 2/3 fatal

@ 6 months:

no difference in PE rate or mortality.

Game changer:

**Filter no longer recommended in stable pts
at high risk for PE who can tolerate anticoagulation**

Summary

- Indications in trauma, failed anticoagulation, complications of anticoagulation.
- - remove IVC filter if indication no longer applies.
- Poor retrieval rate.
- Stable patients who tolerate anticoagulation – no need for IVC filter even in high risk PE pts.
- Unstable patients may benefit from IVC filter placement – which should be later removed.
- Cost of a filter placement: \$37 000