

INFERIOR VENA CAVA (IVC) FILTERS

INDICATIONS, EVIDENCE, GUIDELINES, AND UPDATES

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CLINICAL BACKGROUND

Pulmonary embolism (PE) remains a major cause of morbidity and mortality

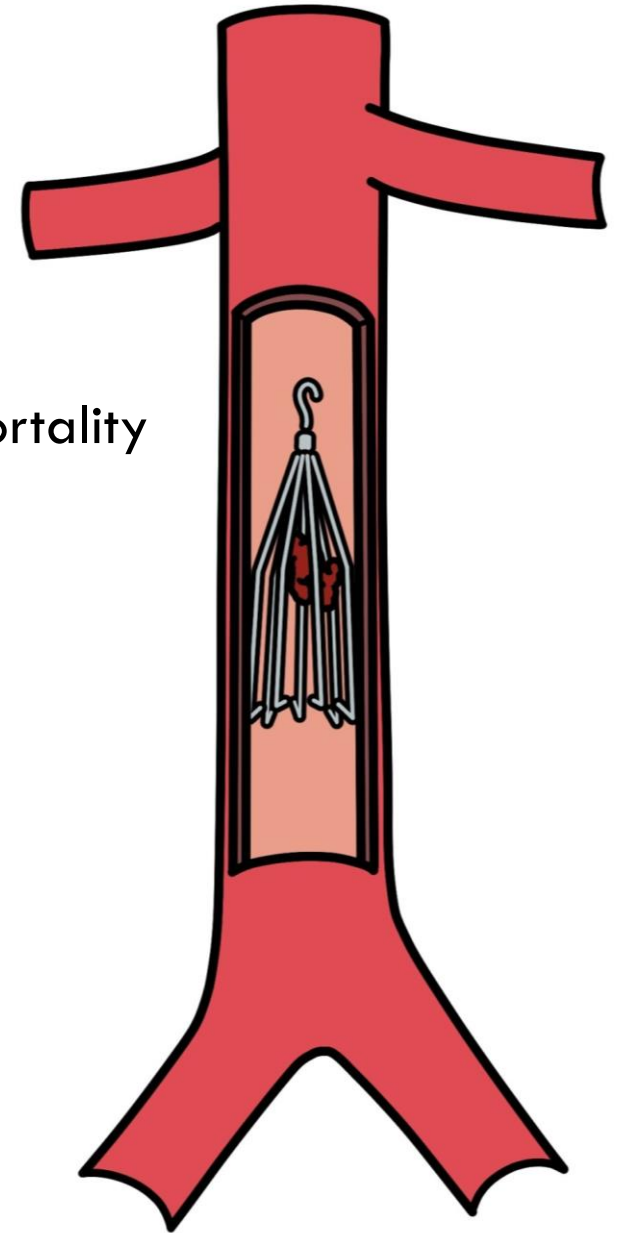
Anticoagulation is **first-line** therapy for VTE

IVC filters provide mechanical protection when anticoagulation is:

- Contraindicated
- Ineffective
- Temporarily unsafe

Their role has evolved with:

- DOACs
- Advanced PE therapies
- Increased awareness of long-term complications



WHAT IS AN IVC FILTER?

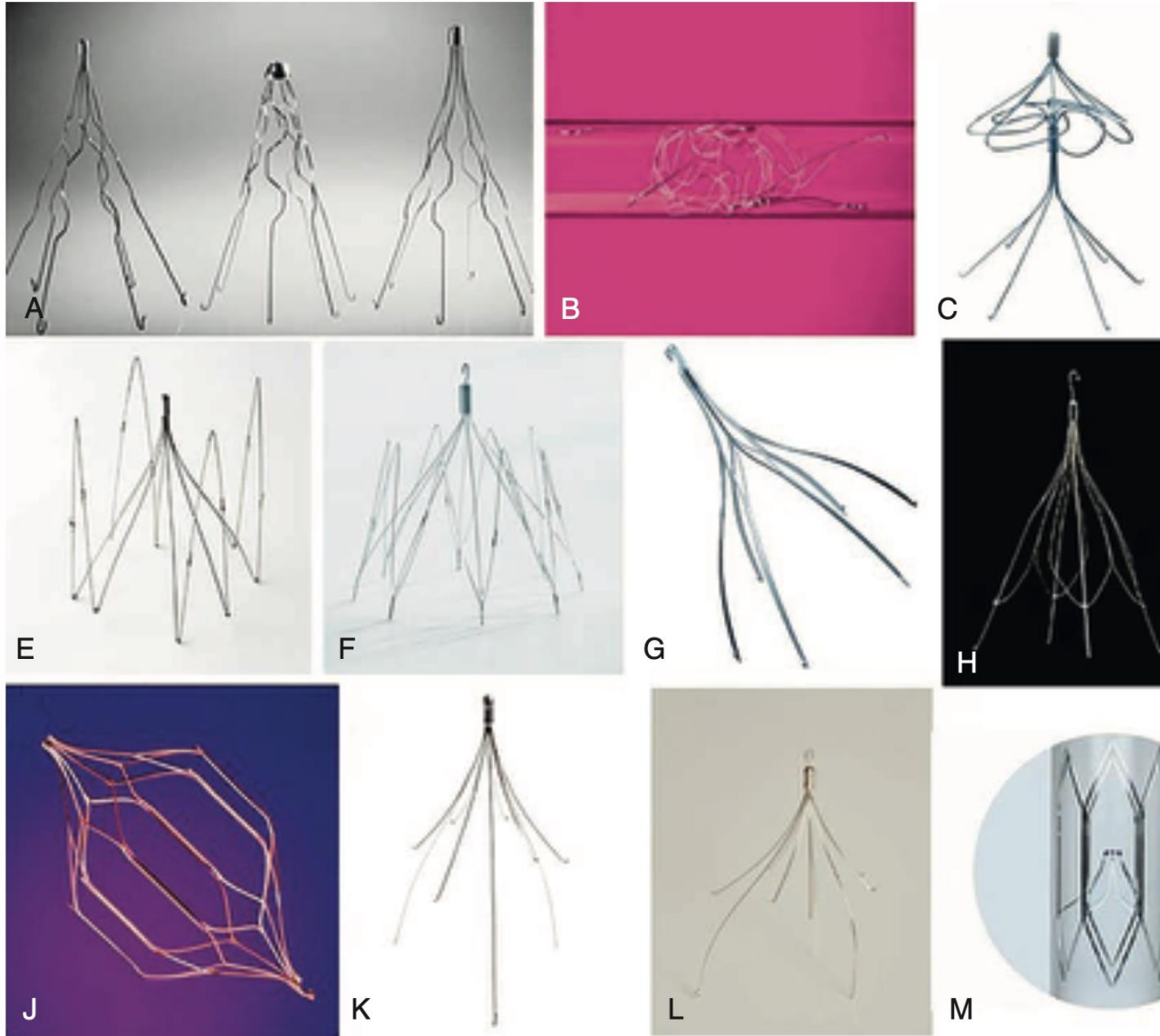
Intravascular device placed in the inferior vena cava

Designed to:

- Trap emboli from lower extremity/pelvic veins
- Prevent embolization to pulmonary arteries

Does not treat existing thrombosis

Does not replace anticoagulation when anticoagulation is feasible



IVC ANATOMY

Formed by common iliac veins at L5

- Diameter typically 20–30 mm

Key anatomic considerations:

- Renal veins (filter position usually infrarenal)
- Congenital anomalies (duplication, left-sided IVC, megacava)

Anatomy impacts:

- Filter choice
- Deployment safety
- Retrieval success

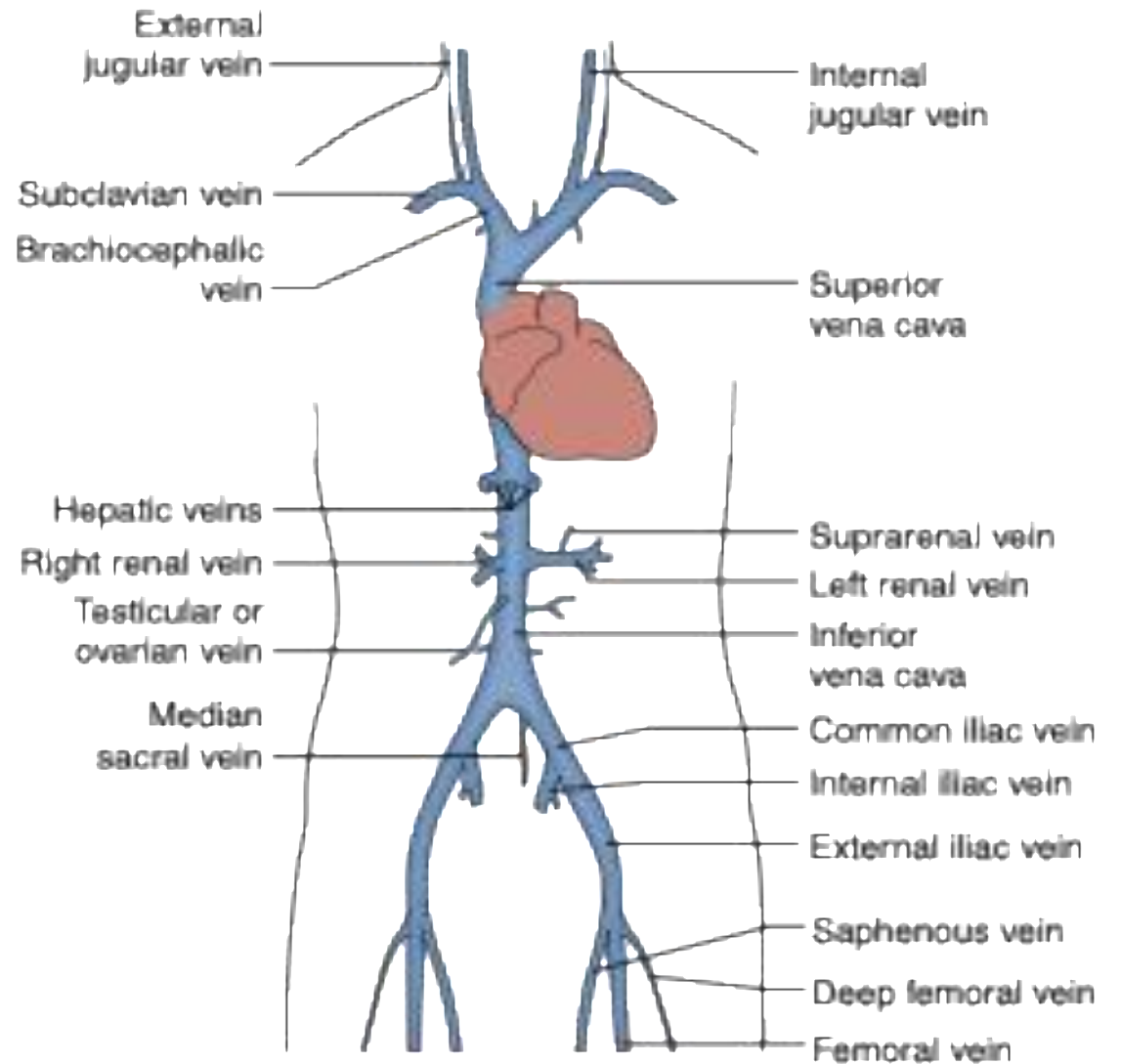


Figure 153.3 Normal inferior vena cava anatomy.

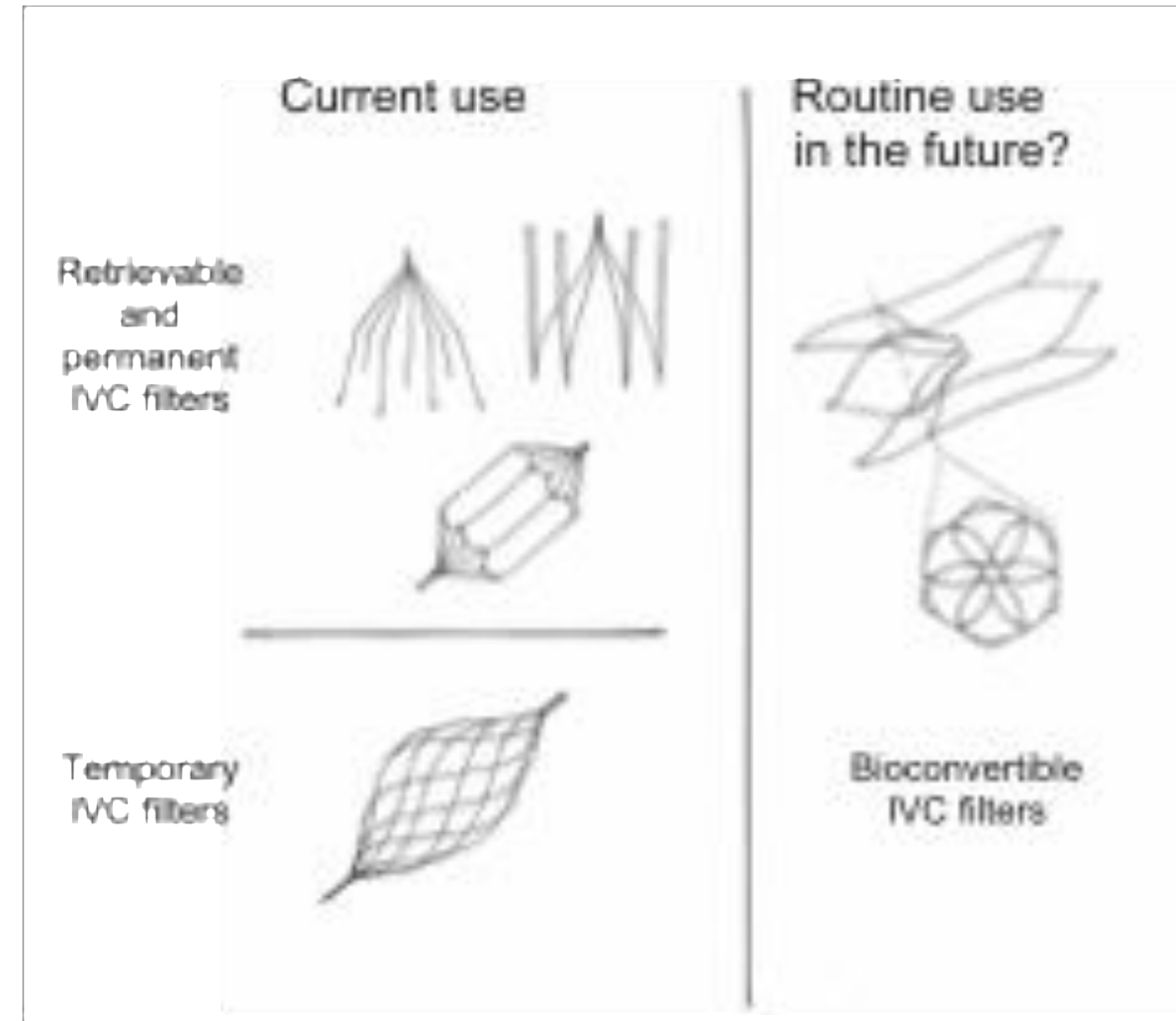
TYPES OF IVC FILTERS

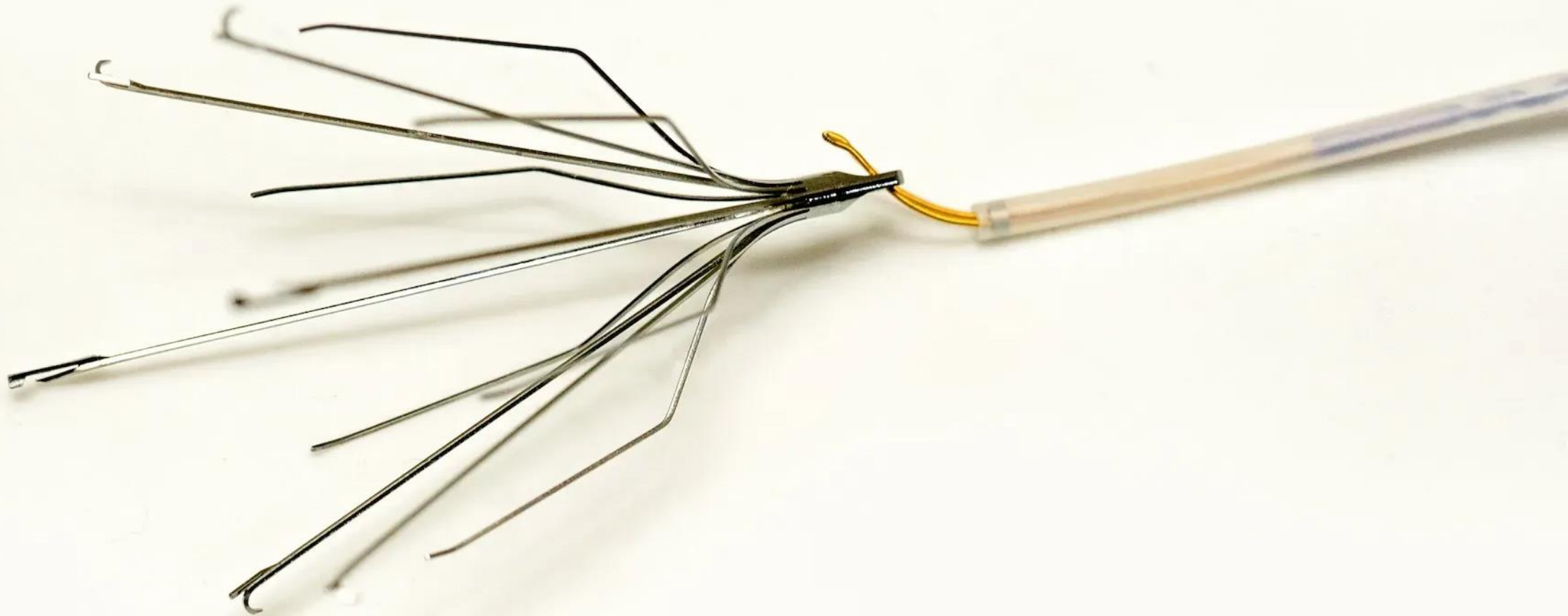
1. Permanent
2. Retrievable (optional)
3. Temporary (tethered)
4. Convertible / bioconvertible
5. Experimental: fully bioabsorbable

Current practice

Retrievable filters are most commonly used

Long-term indwelling retrievable filters behave like permanent filters





GUIDELINES

Indications and contraindications

INDICATIONS

BOX 153.1

Evidence-Based Guidelines, Relative Expanded Indications, and Contraindications to Vena Cava Filter Placement

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Evidence-Based Guidelines

- Documented VTE with contraindication to anticoagulation
- Documented VTE with complications of anticoagulation
- Recurrent PE despite therapeutic anticoagulation
- Documented VTE with inability to achieve therapeutic anticoagulation

INDICATIONS

Relative Recommendations for Vena Cava Filter Use as Venous Thromboembolism Prophylaxis, Including High-Risk Patient Factors and/or High-Risk Situation Combined with an Increased Bleeding Risk

Prophylaxis in High-Risk Patients

- Critically ill
- Previous DVT
- Family history of DVT
- Morbid obesity
- Malignancy
- Known hypercoagulable state
- Prolonged immobility

Prophylaxis in Trauma

- Multiple traumatic injuries
- Spinal cord injury
- Closed head injury
- Complex pelvic fractures
- Multiple long-bone fractures

Increased Bleeding Risk

- Major operation
- Intracranial hemorrhage
- Solid intra-abdominal organ injury
- Pelvic or retroperitoneal hematoma
- Ocular injury
- Medical problems (cirrhosis, end-stage renal disease, peptic ulcer disease, medication, coagulation disorder)

RELATIVE/SELECTIVE INDICATIONS

Relative Expanded Indications

- Poor compliance with anticoagulation
- Free-floating ilio caval thrombus
- Renal cell carcinoma with renal vein extension
- Venous thrombolysis/thromboembolectomy
- Documented VTE and limited cardiopulmonary reserve
- Documented VTE with high risk for anticoagulation complications
- Recurrent PE complicated by pulmonary hypertension
- Documented VTE – cancer patient
- Documented VTE – burn patient
- Documented VTE – pregnancy
- VTE prophylaxis – high-risk surgical patients
- VTE prophylaxis – trauma patients
- VTE prophylaxis – high-risk medical condition

Rutherford, 10th Edition

CONTRAINDICATIONS

Contraindications

- Chronically occluded vena cava
- Vena cava anomalies
- Inability to access the vena cava
- Vena cava compression
- No location in the vena cava available for placement

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COMPARISON OF GUIDELINES

Guideline / Society	Year of Guideline	Indications for IVC Filter Placement (as stated or endorsed)
ACCP / CHEST (Antithrombotic Therapy for VTE)	2016	<ul style="list-style-type: none">• Acute proximal DVT or PE with absolute contraindication to anticoagulation (strong recommendation)• Against routine filter placement in patients who can receive anticoagulation• Against filter placement for recurrent VTE without addressing anticoagulation failure
American Heart Association (AHA)	2011 Scientific Statement	<ul style="list-style-type: none">• Acute DVT or PE with contraindication to anticoagulation or active bleeding (Class I, LOE B)• Recurrent PE despite therapeutic anticoagulation (Class IIa–IIb)

COMPARISON OF GUIDELINES

Guideline / Society	Year of Guideline	Indications for IVC Filter Placement (as stated or endorsed)
European Society of Cardiology (ESC)	2019 PE Guidelines	<ul style="list-style-type: none">• Acute PE or DVT with absolute contraindication to anticoagulation(Class IIa, LOE C)• Recurrent PE despite adequate anticoagulation(Class IIa)• No recommendation for routine or prophylactic use
NICE (UK)	2020	<ul style="list-style-type: none">• Acute VTE with contraindication to anticoagulation• Recurrent VTE despite anticoagulation• Emphasizes lack of high-quality evidence and discourages routine use

COMPARISON OF GUIDELINES

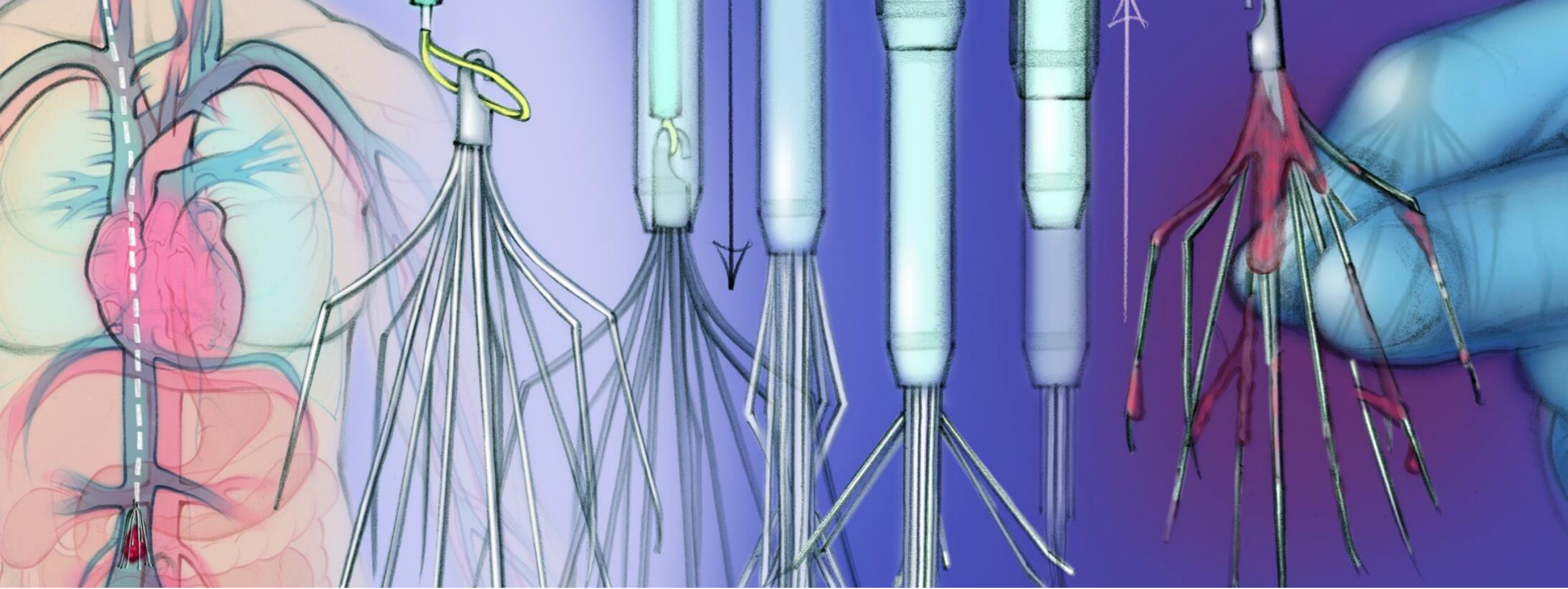
Guideline / Society	Year of Guideline	Indications for IVC Filter Placement (as stated or endorsed)
Society of Interventional Radiology (SIR)	2020 (reviewed/updated through 2025)	<ul style="list-style-type: none">• Acute PE with contraindication to anticoagulation• Acute DVT without PE with contraindication to anticoagulation• Contraindication developing during anticoagulation with ongoing high PE risk• Selective use during advanced PE or DVT therapies(thrombolysis, thrombectomy)• Against routine or prophylactic placement• Routine retrieval and structured follow-up recommended

COMPARISON OF GUIDELINES

Guideline / Society	Year of Guideline	Indications for IVC Filter Placement (as stated or endorsed)
SurgicalCriticalCare.net / Trauma-focused guideline	2024 update	<ul style="list-style-type: none">• Proximal DVT with contraindication to anticoagulation (Level 2)• Temporary IVC filters when PE risk is very high and expected to be < 2 weeks• Against routine prophylactic use in trauma patients (ISS < 15)

MAJOR GUIDELINES: SUMMARY

Society	Core Recommendation
ACCP	Filter only if anticoagulation contraindicated
ESC	Contraindication or recurrent PE
AHA	Acute DVT/PE + bleeding risk
SIR	Selective use; structured follow-up
NICE	Contraindication or recurrence



STUDIES (RCTS & META-ANALYSES)

PREPIC TRIAL

Year: 1998 (8-year follow-up published 2005)

Design: Randomized controlled trial

Population: Patients with proximal DVT

Intervention: Permanent IVC filter + anticoagulation vs anticoagulation alone

Key Findings

↓ Pulmonary embolism (PE) in filter group (early benefit)

↑ Recurrent DVT in filter group (long-term harm)

No mortality benefit at 2 or 8 years

Clinical Impact

First high-quality evidence showing PE reduction but increased DVT

Established that routine filter use is not benign

Foundation for restrictive guideline recommendations

PREPIC-2 TRIAL

Year: 2015

Design: Multicenter randomized controlled trial

Population: Acute PE + lower-limb DVT, all eligible for anticoagulation

Intervention: Retrievable IVC filter + anticoagulation vs anticoagulation alone

Key Findings

No reduction in recurrent PE at 3 or 6 months

No mortality benefit

Filter retrieval successful in ~90%

Clinical Impact

Definitively showed no role for filters in anticoagulated patients

Major driver of modern guideline statements against routine use

Often cited as the most important contemporary RCT

FILTER-PEVI TRIAL

Year: 2012

Design: Randomized controlled trial

Population: Patients undergoing catheter-directed thrombolysis or thrombectomy for massive DVT

Intervention: Prophylactic IVC filter vs no filter

Key Findings

↓ Procedure-related PE

No long-term outcome benefit

Increased device-related issues

Clinical Impact

Supports selective, short-term procedural use only

Not a justification for routine prophylaxis

TRAUMA PROPHYLACTIC IVC FILTER TRIAL

Year: 2019 (NEJM)

Design: Multicenter randomized controlled trial

Population: Severely injured trauma patients with contraindication to anticoagulation

Intervention: Early IVC filter vs no filter

Key Findings

No reduction in symptomatic PE or mortality at 90 days

Small signal of PE reduction only in very high-risk subgroup

Retrieval rates suboptimal

Clinical Impact

Strong evidence against routine prophylactic use in trauma

Influenced trauma-specific guideline downgrades

SUMMARY OF TRIALS

Trial	Filter Type	Benefit	Harm	Mortality
PREPIC	Permanent	↓ PE	↑ DVT	No
PREPIC-2	Retrievable	None	Device risks	No
FILTER-PEVI	Temporary	↓ peri-procedural PE	Device risks	No
Trauma RCT	Retrievable	None (overall)	Retrieval failure	No

META-ANALYSES & OBSERVATIONAL DATA

~50% reduction in PE risk

~70% increase in DVT risk

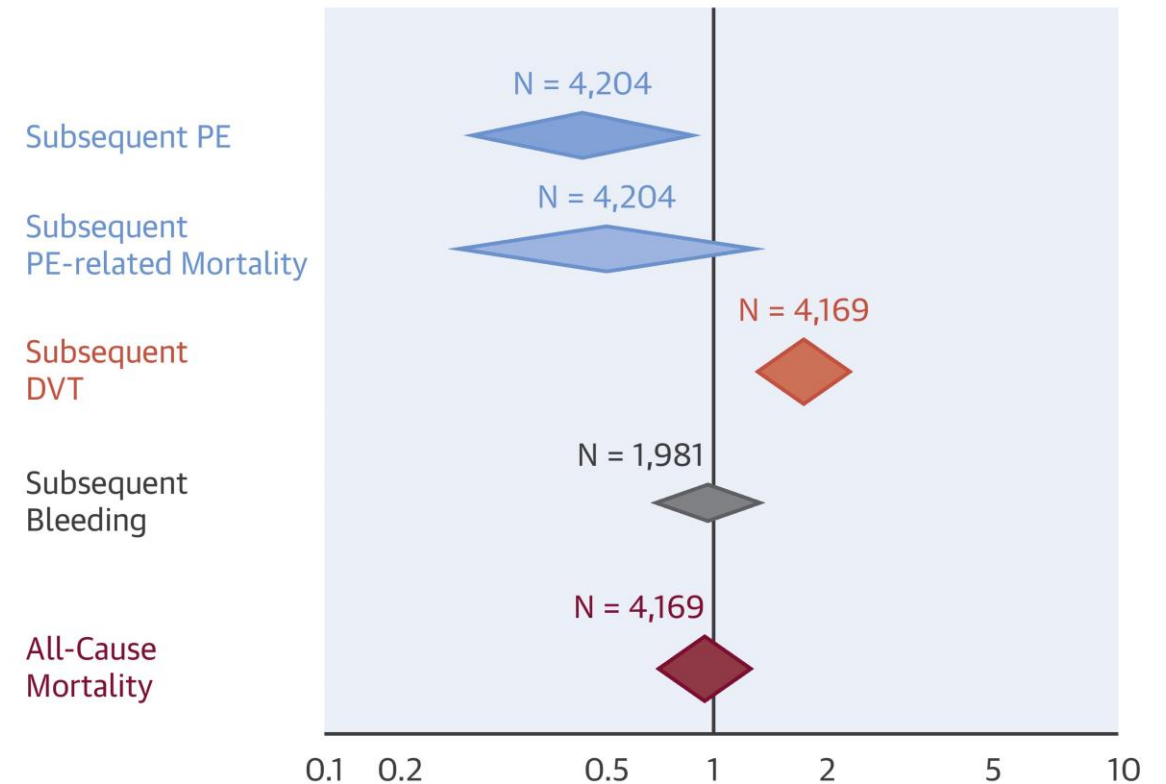
No consistent reduction in:

- PE-related mortality
- All-cause mortality

Possible benefit in:

- Patients with active bleeding
- Hemodynamically unstable PE (observational)

CENTRAL ILLUSTRATION: Use of IVC Filters Compared With Controls



Bikdeli, B. et al. J Am Coll Cardiol. 2017;70(13):1587-97.



COMPLICATIONS & RETRIEVAL

EARLY COMPLICATIONS

Access-site bleeding or hematoma

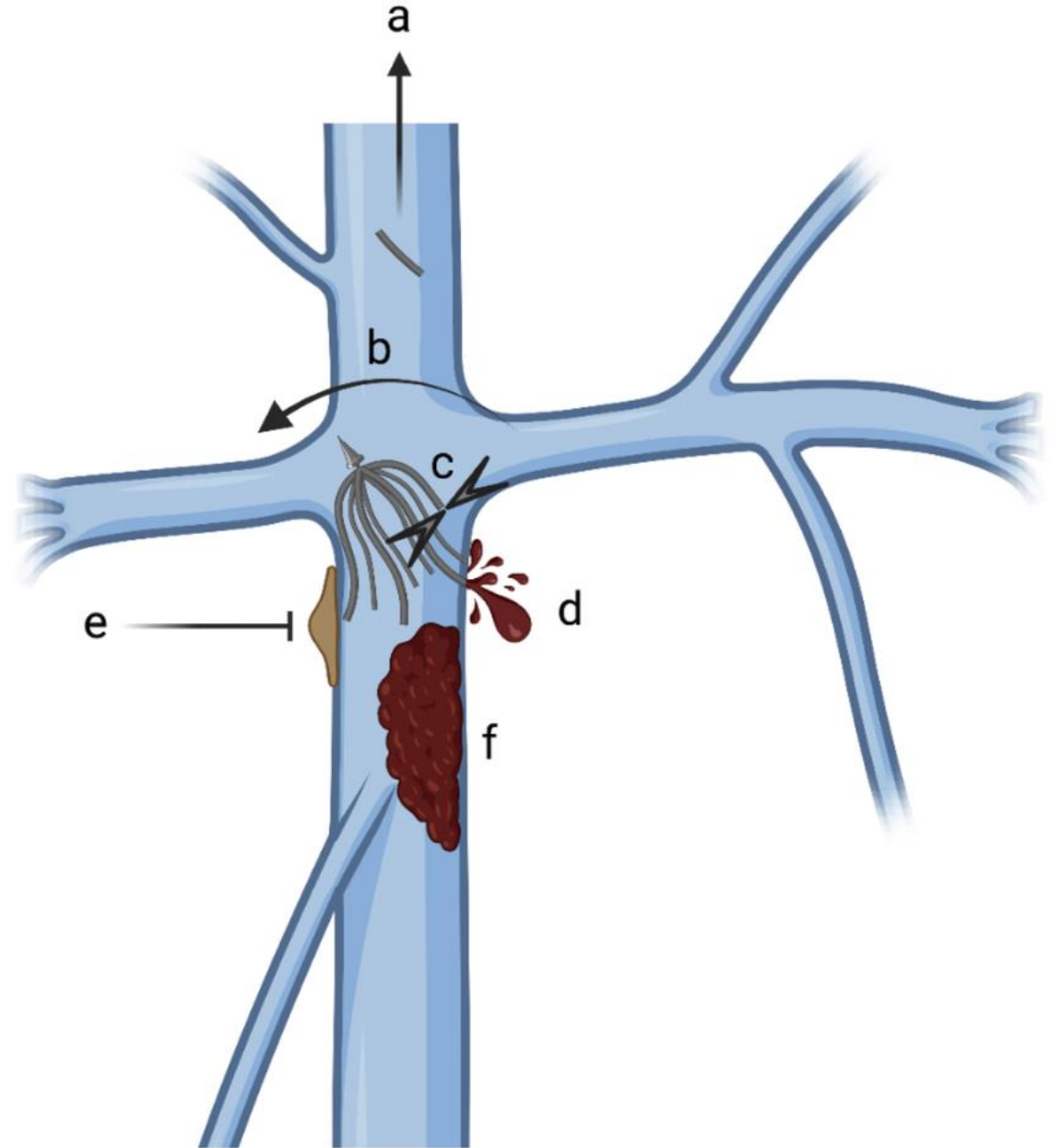
Infection

Malposition or incomplete expansion

IVC penetration

Guidewire entrapment

Arteriovenous fistula (rare)



LATE COMPLICATIONS

DVT below the filter

IVC thrombosis or occlusion

Filter migration

Filter fracture

IVC wall perforation

Chronic venous insufficiency

Increased complexity of delayed retrieval

FILTER RETRIEVAL

Should be planned at the time of insertion

Recommended once:

- Anticoagulation can be resumed
- PE risk has resolved

Retrieval techniques:

- Standard snare
- Advanced endovascular techniques
- Rarely surgical

Structured follow-up improves retrieval rates

SPECIAL POPULATIONS

No routine prophylaxis

Bariatric surgery patient

Data inconsistent 24,25

Pediatric patient
No specific
recommendations 17,26

Pregnant patient
IVC filters are safe 23

Rare, Specialist decision

Politrauma patient
IVC filter may be
considered 29-32

Selective, not routine

Cancer patient
No specific
recommendations 18, 19

Specialist decision



TAKE-HOME MESSAGES

1. Anticoagulation remains first-line therapy
2. IVC filters do not reduce overall mortality
3. Use only for clear, guideline-supported indications
4. Prefer retrievable filters with planned removal
5. Structured follow-up is essential
6. Overuse leads to avoidable long-term harm

CLINICAL DECISION-MAKING FRAMEWORK

1. Is VTE present?
2. Is anticoagulation contraindicated?
3. Is PE risk immediately life-threatening?
4. Is the indication temporary?
5. Is retrieval planned and tracked?

**Thank
You!**

