

Torino 12-13 novembre 2021

Gestione e frequenza delle complicanze in
emergenza nel paziente in terapia anticoagulante:

Il ruolo dei filtri cavali

Pierluigi Muratore

Radiologia Vascolare

AOU Città della Salute e della Scienza di Torino

EPIDEMIOLOGY

- Venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is one of the most common cardiovascular diseases occurring for the first time in about 1 in 1000 people.
- Its incidence rises with increasing age, for example to about 5 per 1000 people among those over 70 years of age.
- VTE is associated with significant morbidity and mortality with the 30-day mortality rate in the absence of treatment of about 3 % for DVT and 31 % for PE.
- It is a leading cause of preventable hospital death in the United States.

White RH. Circulation 2003;107:14-18

Martinez C et al. Thromb Haemost. 2014;112:255-63

ISTH Steering Committee for World Thrombosis Day. Thromb Res. 2014;134:931-38

Søgaard KK, et al. Circulation. 2014;130:829-36

NOVITÀ IN COAGULAZIONE

attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

TREATMENT

- Anticoagulants are the mainstay treatment of VTE and are given in three phases of acute, long-term (in the first 3 months), and extended treatment.
- For many years initial treatment was started with a parenteral anticoagulant, low-molecular-weight heparin + vitamin K antagonist.
- The DOACs compared with conventional therapy as effective in prevention of VTE recurrence and associated with less bleeding.

*Kearon C et al. Chest. 2012;141:419–94
Kearon C et al. Chest. 2016;149:315–52*

PREVENTION

- Surgical Vena caval interruption (1893).
- Currently percutaneous (IVC) filter insertion, is largely used therapeutic option in the management of selected patients with VTE.
- Two general types of IVC filters currently available:
permanent and retrievable.
- Permanent filters have been used since the 1967 and are placed in patients with a long-term need for mechanical prophylaxis against PE and absolute contraindications to anticoagulation.

*Kinney TB. J Vasc Interv Radiol 2003;14:425–440
Greenfield LJ et al. Cardiovasc Surg 1995;3:199–205*

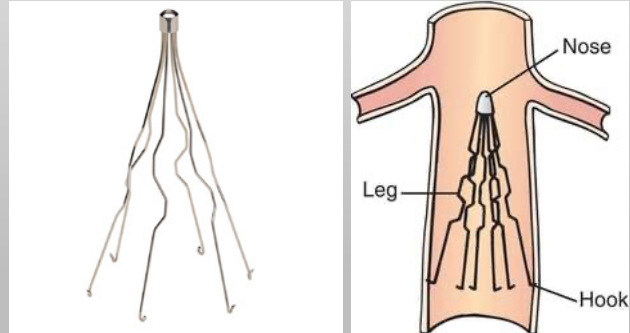
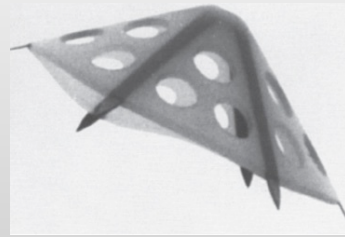
NOVITÀ IN COAGULAZIONE

attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

VENA CAVA FILTERS

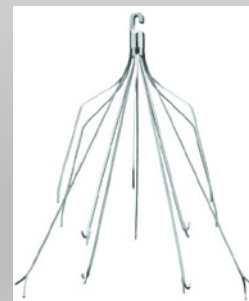
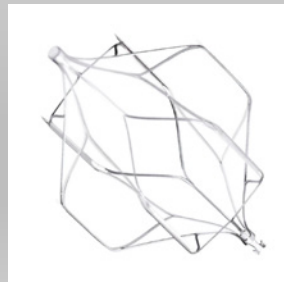
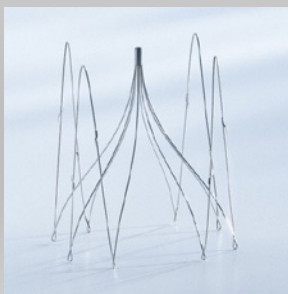
- Mobin-Uddin Filter 1967
The device was plagued by high rates of IVC occlusion (in over half of patients), pulmonary embolism (PE) and migration.
- It was replaced by the stainless steel Kimray-Greenfield filter in 1973, a device with lower complication rates.



*Kazi Mobin-Uddin et al. N Engl J Med 1972; 286:55-58
Greenfield LJ et al. Surgery. 1973;73:599-606*

VENA CAVA FILTERS

- Over the past 3 decades, use of the IVC filter has climbed steadily.
- Although only 2000 filters were placed in 1979, by 1990, over 120.000 Kimray- Greenfield filters had been implanted in the United States.
- By the 1990s, nearly 30.000 to 40.000 filters were placed annually.
- At the 90's decade's end, nearly 50.000 filters were being placed each year.
- In 2012 259.000 filters were placed in U.S.



*Stein PD et al. Arch Intern Med. 2004;164:1541-1545
Hann CL et al. Blood Rev. 2005;19:179-202
Christopher Molvar. Semin Intervent Radiol. 2012 Sep; 29: 204-217*






NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

PREVENTION

- Two general types of IVC filters currently available:
permanent and retrievable.

Inferior vena caval filter models







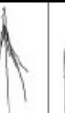
Permanent (nonretrievable)					
Type	Gianturco-Roehm Bird's nest	Simon Nitinol Filter (SNF)	TrapEase	Vena Tech LGM	Vena Tech LP
Diagram					
Maximum IVC diameter (mm)	40	28	30	28	28
Manufacturer	Cook	Bard	Cordis (J&J)	B. Braun Medical	B. Braun Medical
Required sheath size*	12 Fr	9 Fr	6 Fr	12 Fr	9 Fr
Insertion sites	Jugular; femoral	Jugular; femoral; subclavian; antecubital	Jugular; femoral; antecubital	Jugular; femoral; single system	Jugular; femoral
Material	304 stainless steel	Nitinol (Ni-Ti)	Elgiloy®	Phynox®	Phynox®

- Permanent filters have been used since the 1967 and are placed in patients with a long-term need for mechanical prophylaxis against PE and absolute contraindications to anticoagulation.

Kinney TB. *J Vasc Interv Radiol* 2003;14:425-440
Greenfield LJ et al. *Cardiovasc Surg* 1995;3:199-205

PREVENTION

- Two general types of IVC filters currently available:
permanent and retrievable.

Optional (permanent or retrievable)							
Type	Denali	OptEase	Gunther tulip	Cook Collect	Option	ALN filter	Vena Tech Convertible
Diagram							
Maximum IVC diameter (mm)	28	30	30	30	30	32	28
Manufacturer	Bard	Cordis (J&J)	Cook	Cook	Argon Medical	ALN International	B. Braun Medical
Required sheath size*	8.4 Fr	6 Fr	8.5 Fr	7 Fr (LJ), 8.5 Fr (F)	6.5 Fr	7 Fr	12.9 Fr
Insertion sites	Jugular; subclavian; femoral	Jugular; femoral; antecubital	Jugular; femoral	Jugular; femoral; UniSet	Jugular; femoral	Jugular; femoral; basilic	Jugular; femoral
Material	Nickel-titanium alloy	Elgiloy®	Conichrome®	Conichrome®	Nitinol (Ni-Ti)	316 stainless steel	Cobalt chromium

Kinney TB. *J Vasc Interv Radiol* 2003;14:425-440
Greenfield LJ et al. *Cardiovasc Surg* 1995;3:199-205

NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

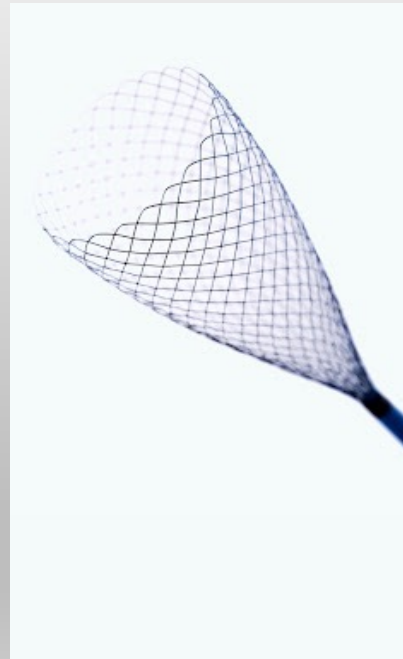
Types of inferior vena cava filters

	Maximum IVC diameter (mm)	Manufacturer	Required sheath size (O.D.)*	Insertion sites	Material
Permanent (nonretrievable)					
Gianturco-Roehm Bird's nest	40	Cook	12 Fr	Jugular, femoral	304 stainless steel
Simon Nitinol Filter (SNF)	28	Bard	9 Fr	Jugular, femoral, subclavian, antecubital	Nitinol (Ni-Ti)
TrapEase	30	Cordis (J&J)	6 Fr	Jugular, femoral, antecubital	Elgiloy [®]
Vena Tech LGM	28	B. Braun Medical	12 Fr	Jugular/femoral single system	Phynox [®]
Vena Tech LP	28	B. Braun Medical	9 Fr	Jugular, femoral	Phynox [®]
Optional (permanent or retrievable)					
Denali	28	Bard	8.4 Fr ^Δ	Jugular, subclavian, femoral	Nickel-titanium alloy
OptEase	30	Cordis (J&J)	6 Fr	Jugular, femoral, antecubital	Elgiloy [®]
Gunther tulip	30	Cook	8.5 Fr	Jugular, femoral	Conichrom
Cook Select	30	Cook	7 Fr (I), 8.5 Fr (F)	Jugular, femoral, UniSet	Conichrom
Option	30	Argon Medical	6.5 Fr	Jugular, femoral	Nitinol (Ni-Ti)
ALN filter	32	ALN International	7 Fr	Jugular, femoral, basilic	316 stainless steel
Vena Tech Convertible	28	B. Braun Medical	12.9 Fr	Jugular, femoral	Cobalt chromium

PREVENTION

- Peri-interventional filter (max 24 h)

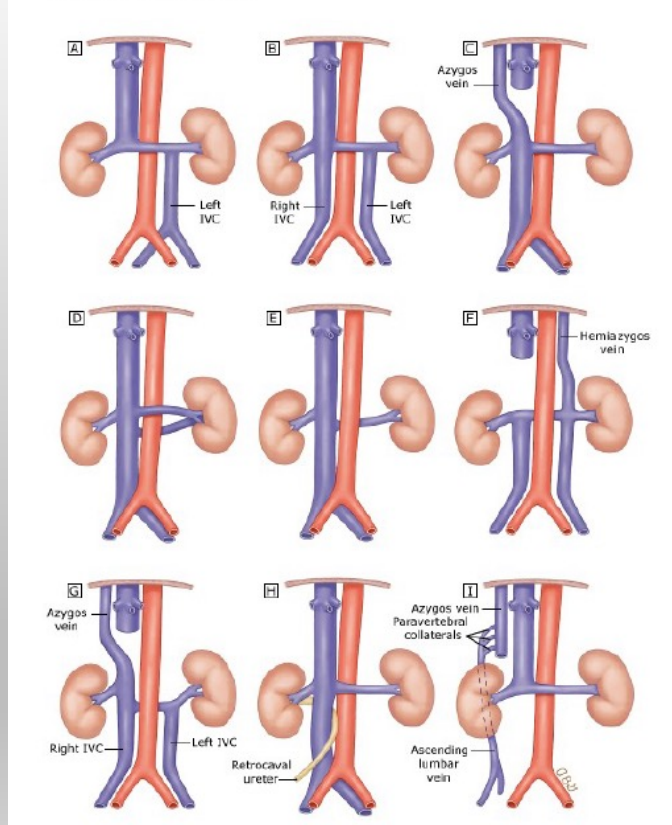
Capturex Straubb Medical



NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombotici

Torino, 12-13 novembre 2021

Vena cava variations



INDICATIONS

Classic

DOCUMENTED VTE

1. Absolute contraindication to anticoagulation

major bleeding diathesis (e.g., coagulation defects, severe thrombocytopenia [platelet count $<50,000\mu\text{L}$]), uncontrollable active bleeding (e.g., gastrointestinal bleeding from any cause), acute hemorrhagic stroke, cerebral lesions at high risk of bleeding, severe uncontrolled hypertension, severe renal and/or hepatic dysfunction.

2. Complication of anticoagulation resulting in cessation of therapy

Spontaneous or significant unprovoked hemorrhage while on anticoagulant therapy is not uncommon in the elderly or in patients with comorbidities such as chronic kidney disease, in which the pharmacokinetics of anticoagulant drugs may be altered.

3. Failure of anticoagulation

Inability to reach or maintain therapeutic levels of anticoagulation and/or documented progression of DVT or recurrent PE while on therapeutic anticoagulation.

Kaufman JA et al. J Vasc Interv Radiol 2006;17:449–459
Levine MN et al. Chest 2001;119: 108S–121S

NOVITÀ IN COAGULAZIONE

attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

INDICATIONS

Relative

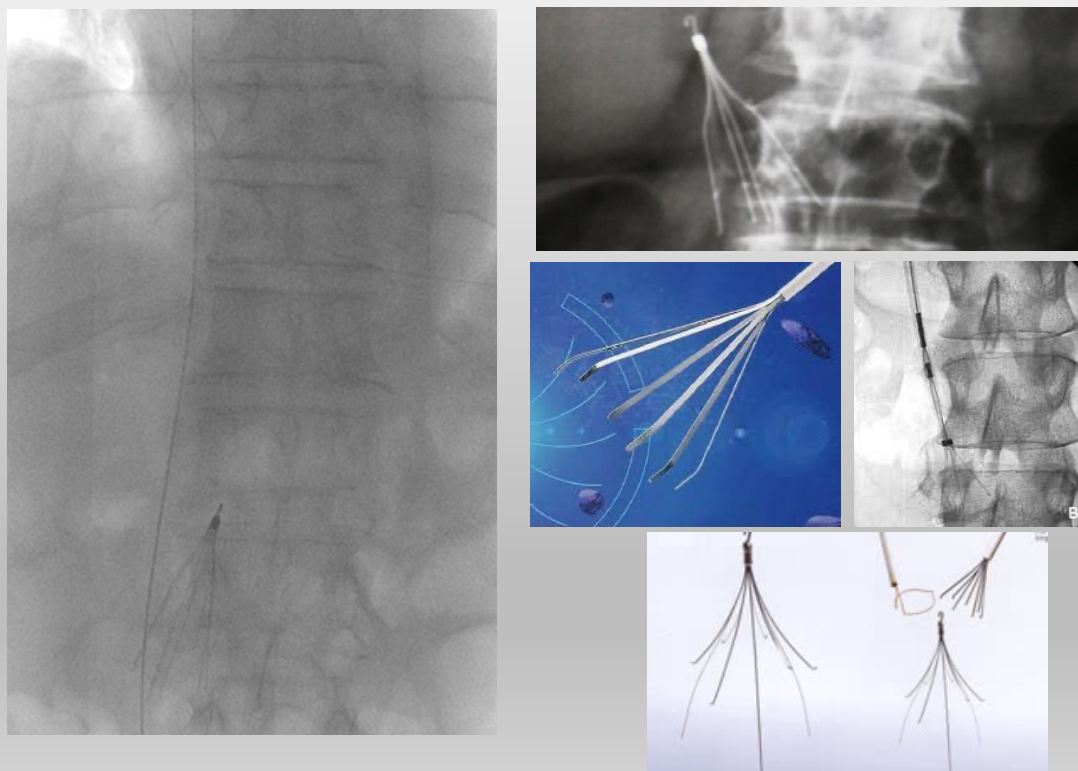
1. Iliocaval DVT or large, free-floating proximal DVT
2. Difficulty establishing therapeutic anticoagulation
3. Massive PE treated with thrombolysis/thrombectomy
4. Chronic PE treated with thromboendarterectomy
5. Thrombolysis for ilio caval DVT
6. VTE with limited cardiopulmonary reserve
7. Recurrent PE with filter in place
8. Poor compliance with anticoagulation
9. High risk of complication of anticoagulation (e.g., risk for frequent falls)

optional filters → lowering of thresholds for filter → placement retrievable

The rate of filter retrieval varies significantly among institutions with a recent systematic review noting on average a 34% retrieval rate.

Kaufman JA et al. J Vasc Interv Radiol 2006;17:449-459
Hann C et al. Blood Rev. 2005;19:179-202
Angel LF et al. J Vasc Interv Radiol. 2011;22

IVC FILTER RETRIVABLE



NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

INDICATIONS

Prophylactic

NO DOCUMENTED VTE

• **At risk of developing DVT and/or PE and no anticoagulation.**

1. Surgical procedure in patient at high risk of VTE
2. Severe craniospinal injury (prolonged immobilization or plegic limbs)
3. Pelvic/long-bone fractures
4. Intra-abdominal mass/hemorrhage compressing pelvic veins or the IVC

*Kaufman JA et al. J Vasc Interv Radiol 2006;17:449–459
Girard TD et al. Thromb Res 2003;112:261–267
Kaufman JA et al. J Vasc Interv Radiol 2009; 20:697–707*

TRAUMA PATIENTS

- (EAST) 2002 guidelines suggesting prophylactic IVC filters be considered for high-risk trauma patients with suspected prolonged immobilization who cannot receive prophylactic anticoagulation (*Glasgow Coma Score < 8, incomplete spinal cord injury, closed head injury, complex pelvic and long-bone fractures, and paresis*).
- A systematic review of prophylactic IVC filters, including 24 studies with 2,492 patients, cited a lack of conclusive data to support prophylactic use in trauma patients.

BARIATRIC SURGICAL PATIENTS

- Review 2015: there is conflicting evidence and heterogeneous data about prophylactic IVC filter placement in this population. As is true for other subpopulations, there are no good prospective, randomized trials, and additional data are needed.

Prophylactic indications now account more than half of all filter!

*Rogers FB et al. J Trauma 2002;53:142–164
Kidane B et al. Injury 2012;43:542–547
Rowland SP, et al. Ann Surg 2015;261:35–45
Kaufman JA et al. J Vasc Interv Radiol 2009; 20:697–707*

NOVITÀ IN COAGULAZIONE

attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

PREGNANT PATIENTS

- The first reported IVC filter placed in a pregnant patient occurred in 1981
- The Royal Society of Obstetricians and Gynaecologists VTE guidelines recommend to consider use of a temporary IVC filter in the peripartum period for patients with iliac vein VTE or in patients with proven DVT and who have recurrent PE despite adequate anticoagulation.
- SIR guidelines recommend suprarenal IVC filter placement in pregnant patients, if the filter is clinically indicated.

Optimally, retrieval should be performed as soon as appropriate in the postpartum period!!

*Scurr J et al. Br J Obstet Gynaecol 1981; 88:778–780
Royal College of Obstetricians and Gynaecologists. Green-top guideline. 2009
Aburahma AF et al. J Vasc Surg 2001;33:375–378
Kaufman JA et al. J Vasc Interv Radiol 2006;17:449–459*

PREGNANT PATIENTS

Same Indications

- Contraindication to anticoagulation.
- Failure of medical therapy for VTE despite adequate anticoagulation.
- Complications of anticoagulation (heparin-induced thrombocytopenia, heparin allergy, significant bleeding during anticoagulation).

SUPRARENAL PLACEMENT PREFERRED

- The IVC can be compressed by the gravid uterus, which could displace the filter particularly when contracting (*migration/fracture of the filter or damage to the IVC wall*).
- Suprarenal placement also provides additional protection from thrombus that has developed in the dilated ovarian veins.
- Additionally, with the volume of renal blood flow, there is the added advantage of accelerated venous flow, which should promote lysis of trapped thrombi.
- Jugular access preferred.

CESARIAN SECTION RECOMMENDED

- Lower risk of EP.
- Shorter time without anticoagulation.
- Difficulties in vaginal delivery as a result of swelling of the lower extremities.
- Contractions experienced during labor are more likely to cause filter complications such as migration, tilt, or fracture.

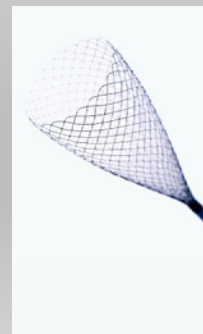
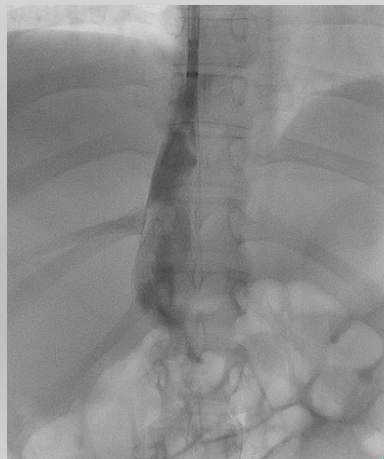
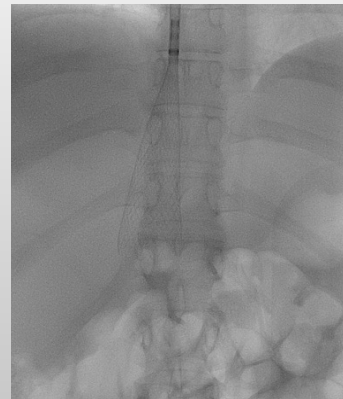
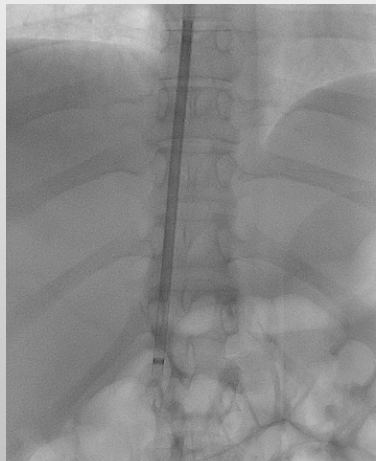
*Neill AM et al. Br J Obstet Gynaecol 1997; 104:1416–1418
Cheung MC et al. J Thromb Haemost 2005; 3: 1096–1097
Hux CH et al. Am J Obstet Gynecol 1986; 155:734–737
Ricciotti HA et al. J Reprod Med 1995; 40:404–406
Kawamata K et al. J Vasc Surg 2005; 41:652–656
Ganguli S et al. J Vasc Interv Radiol 2006;17:107-11
Liu Y et al. J Vasc Surg 2012;55:1042-7*

NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

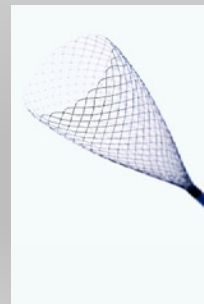
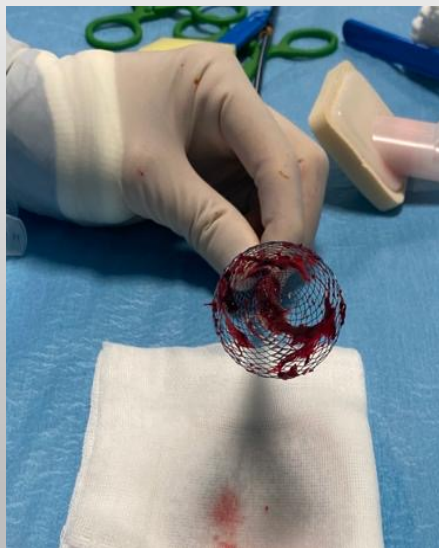
PREGNANT PATIENTS

Capturex Straubb Medical



PREGNANT PATIENTS

Capturex Straubb Medical



NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

ACR/SIR GUIDELINES

Patients with documented VTE	No documented VTE
Absolute or relative contraindication to anticoagulation	Severe trauma without documented PE or DVT
Complication of anticoagulation	Closed head injury
Recurrent PE despite adequate therapy	Spinal cord injury
Inability to achieve/maintain adequate anticoagulation	Multiple long-bone or pelvic fractures
Propagation/progression of DVT during therapeutic anticoagulation	Patients at high risk (e.g., immobilized or in an intensive care unit)
Massive PE with residual DVT in a patient at risk for further PE	
Severe cardiopulmonary disease and DVT (e.g., cor pulmonale with pulmonary hypertension)	

Abbreviations: ACR, American College of Radiology; DVT, deep venous thrombosis; IVC, inferior vena cava; PE, pulmonary embolism; SIR, Society of Interventional Radiology; VTE, venous thromboembolism.

AHA GUIDELINES

- Adult patients with any acute proximal DVT (or acute PE) with contraindications to anticoagulation or active bleeding complications should receive an IVC filter (Class I; Level of Evidence B).
- Anticoagulation should be resumed in patients with an IVC filter once contraindications to anticoagulation or active bleeding complications have resolved (Class I; Level of Evidence B).
- Patients who receive retrievable IVC filters should be evaluated periodically for filter retrieval within the specific filter's retrieval window (Class I; Level of Evidence C).
- For patients with recurrent PE despite therapeutic anticoagulation, it is reasonable to place an IVC filter (Class IIa; Level of Evidence C).
- For IDVT patients who are likely to require permanent IVC filtration (e.g., long-term contraindication to anticoagulation), it is reasonable to select a permanent nonretrievable IVC filter device (Class IIa; Level of Evidence C).
- For IDVT patients with a time-limited indication for an IVC filter (e.g., a short-term contraindication to anticoagulant therapy), placement of a retrievable IVC filter is reasonable (Class IIa; Level of Evidence C).
- For patients with recurrent DVT (without PE) despite therapeutic anticoagulation, it is reasonable to place an IVC filter (Class IIb; Level of Evidence C).
- An IVC filter should not be used routinely in the treatment of IDVT (Class III; Level of Evidence B).

Abbreviations: AHA, American Heart Association; DVT, deep venous thrombosis; IDVT, iliofemoral deep venous thrombosis; IVC, inferior vena cava; PE, pulmonary embolism; VTE, venous thromboembolism.

ESC GUIDELINES

Indicated for
Documented VTE and contraindication to anticoagulation
Recurrent PE despite anticoagulation
Not recommended for
Prophylactic placement
Free-floating thrombus
Prior to systemic thrombolysis, surgical embolectomy, or pulmonary thromboendarterectomy

ACCP GUIDELINES

- Vena caval filters for the initial treatment of DVT: for patients with acute proximal DVT, if anticoagulant therapy is not possible because of the risk of bleeding, placement of an IVC filter is recommended (grade 1C).
- In children weighing >10 kg with lower-extremity DVT and a contraindication to anticoagulation, placement of a temporary IVC filter is suggested (grade 2C).
- Vena caval filters for the initial treatment of PE: in patients with acute PE, if anticoagulant therapy is not possible because of risk of bleeding, placement of an IVC filter is recommended (grade 1C).
- For patients with CTPH undergoing pulmonary thromboendarterectomy, placement of a permanent vena caval filter before or at the time of the procedure is suggested (grade 2C).

Abbreviations: CTPH, chronic thromboembolic pulmonary hypertension; DVT, deep venous thrombosis; IVC, inferior vena cava; PE, pulmonary embolism.

BRITISH COMMITTEE FOR STANDARDS IN HAEMATOLOGY GUIDELINES

IVC filter indicated
For patients with VTE and contraindication to anticoagulation
Consider IVC filter placement
In select patients with PE despite anticoagulation
In pregnant patient with VTE and contraindications to anticoagulation (including estimated delivery within 2 wk)
Preoperatively (retrievable) for patients with recent VTE (1 mo) and need to stop anticoagulation therapy for surgery
IVC filters not recommended for
Unselected patients with VTE who can receive anticoagulation
Free-floating thrombus
Thrombolysis

Abbreviations: IVC, inferior vena cava; PE, pulmonary embolism; VTE, venous thromboembolism.



Recommendations	Class ^a	Level ^b
IVC filters should be considered in patients with acute PE and absolute contraindications to anticoagulation.	IIa	C
IVC filters should be considered in case of recurrence of PE, despite therapeutic levels of anticoagulation.	IIa	C
Routine use of IVC filters in patients with PE is not recommended.	III	A

[Evidence-Based Medicine]



Antithrombotic Therapy for VTE Disease CHEST Guideline and Expert Panel Report



Clive Kearon, MD, PhD; Elie A. Akl, MD, MPH, PhD; Joseph Ornelas, PhD; Allen Blaivas, DO, FCCP; David Jimenez, MD, PhD, FCCP; Henri Bounameaux, MD; Menno Huisman, MD, PhD; Christopher S. King, MD, FCCP; Timothy A. Morris, MD, FCCP; Namita Sood, MD, FCCP; Scott M. Stevens, MD; Janine R. E. Vintch, MD, FCCP; Philip Wells, MD; Scott C. Wolter, MD; and COL Lisa Moores, MD, FCCP



RUOLO DEL FILTRO CAVALE IN ASSOCIAZIONE ALLA TERAPIA ANTICOAGULANTE IN CASO DI TVP E EP

- 17. In pazienti con TVP acuta o EP trattati mediante terapia anticoagulante non è raccomandato l'uso del filtro cavale (Grado 1B)

NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021

PREPIC - 1

The New England
Journal of Medicine

© Copyright, 1998, by the Massachusetts Medical Society

VOLUME 338 FEBRUARY 12, 1998 NUMBER 7

A CLINICAL TRIAL OF VENA CAVAL FILTERS IN THE PREVENTION OF PULMONARY EMBOLISM IN PATIENTS WITH PROXIMAL DEEP-VEIN THROMBOSIS

Eight-Year Follow-Up of Patients With Permanent Vena Cava Filters in the Prevention of Pulmonary Embolism
The PREPIC (Prévention du Risque d'Embolie Pulmonaire par Interruption Cave) Randomized Study

The PREPIC Study Group*

TABLE 3. PRINCIPAL END POINTS DURING THE TWO-YEAR FOLLOW-UP PERIOD IN THE FILTER AND NO-FILTER GROUPS.*

EVENT AND TIME OF OCCURRENCE	FILTER number (percent)	NO FILTER number (percent)	ODDS RATIO (95% CI)*	P VALUE
Symptomatic pulmonary embolism†				
Enrollment-3 mo	2	6		
>3 mo-1 yr	0	4		
>1-2 yr	4	2		
All‡	6 (3.4)	12 (6.3)	0.50 (0.19-1.33)	0.16

TABLE 2. PRINCIPAL END POINTS WITHIN THE FIRST 12 DAYS AFTER RANDOMIZATION TO THE FILTER OR NO-FILTER GROUP.

END POINT	FILTER number (percent)	NO FILTER number (percent)	ODDS RATIO (95% CI)*	P VALUE
Pulmonary embolism				
Symptomatic†	2	5		
Asymptomatic	0	4		
All‡	2 (1.1)	9 (4.8)	0.22 (0.05-0.90)	0.03
Major bleeding	9 (4.5)	6 (3.0)	1.49 (0.53-4.20)	0.44
Death	5 (2.5)	5 (2.5)	0.99 (0.29-3.42)	0.99

Decousus Het al. *N Engl J Med*. 1998 Feb 12;338:409-15.
Circulation 2005 Jul 19;112:416-22.

because of the observed excess absence of any effect on mortality among patients receiving filters, their systemic use cannot be recommended

PREPIC - 2

Original Investigation

Effect of a Retrievable Inferior Vena Cava Filter Plus Anticoagulation vs Anticoagulation Alone on Risk of Recurrent Pulmonary Embolism
A Randomized Clinical Trial

Patrick Mismetti, MD, PhD; Sily Laporte, MS, PhD; Olivier Pellerin, MD, MSc; Pierre-Vladimir Ennezat, MD, PhD; Francis Couturaud, MD, PhD; Antoine Elias, MD, PhD; Nicolas Falvo, MD; Nicolas Meneveau, MD, PhD; Isabelle Quere, MD, PhD; Pierre-Marie Roy, MD, PhD; Olivier Sanchez, MD, PhD; Joannot Schriener, MD, PhD; Christophe Seinturier, MD; Marie-Antoinette Sevestre, MD; Jean-Paul Beregi, MD, PhD; Bernard Tardy, MD, PhD; Philippe Lacroix, MD; Emilie Presles, MSc; Alain Leizorovicz, MD; Hervé Decousus, MD; Fabrice-Guy Barral, MD; Guy Meyer, MD; for the PREPIC2 Study Group

Table 3. Clinical Outcomes For Patients With at Least 1 Event in the PREPIC2 Trial

Clinical Outcomes	Group, No. With Events (%)		Relative Risk, % (95% CI)	P Value ^b
	Filter (n = 200) ^a	Control (n = 199)		
At 3 Months				
Recurrent pulmonary embolism (primary efficacy outcome) ^c	6 (3.0)	3 (1.5)	2.00 (0.51-7.89)	.50
Fatal	6 (3.0)	2 (1.0)		
Nonfatal	0 (0.0)	1 (0.5)		
Recurrent deep vein thrombosis	1 (0.5)	1 (0.5)	1.00 (0.06-15.9)	>.99
Recurrent venous thromboembolism	7 (3.5)	4 (2.0)	1.75 (0.52-5.88)	.36
Major bleeding	8 (4.0)	10 (5.0)	0.80 (0.32-1.98)	.63
Death	15 (7.5)	12 (6.0)	1.25 (0.60-2.60)	.55
At 6 Months				
Recurrent pulmonary embolism ^c	7 (3.5)	4 (2.0)	1.75 (0.52-5.88)	.54
Fatal	6 (3.0)	3 (1.5)		
Nonfatal	1 (0.5)	1 (0.5)		
Recurrent deep vein thrombosis	1 (0.5)	2 (1.0)	0.50 (0.05-5.47)	>.99
Recurrent venous thromboembolism	8 (4.0)	6 (3.0)	1.33 (0.47-3.77)	.59
Major bleeding	13 (6.5)	15 (7.5)	0.87 (0.42-1.77)	.69
Death	21 (10.6)	15 (7.5)	1.40 (0.74-2.64)	.29

The use of a retrievable inferior vena cava filter plus anticoagulation compared with anticoagulation alone did not reduce the risk of symptomatic recurrent pulmonary embolism at 3 months. These findings do not support the use of this type of filter in patients who can be treated with anticoagulation.

Jama 2015 Apr 28;313:1627-35.



Society of Interventional Radiology Clinical Practice Guideline for Inferior Vena Cava Filters in the Treatment of Patients with Venous Thromboembolic Disease

Developed in collaboration with the American College of Cardiology, American College of Chest Physicians, American College of Surgeons Committee on Trauma, American Heart Association, Society for Vascular Surgery, and Society for Vascular Medicine

John A. Kaufman, MD, MS, Geoffrey D. Barnes, MD, MSc, Rabih A. Chaer, MD, MSc, Joseph Cuschieri, MD, Robert T. Eberhardt, MD, Matthew S. Johnson, MD, William T. Kuo, MD, Susan Murin, MD, Sheena Patel, MPH, Anita Rajasekhar, MD, MS, Ido Weinberg, MD, and David L. Gillespie, MD

ABSTRACT

Purpose: To provide evidence-based recommendations on the use of inferior vena cava (IVC) filters in the treatment of patients with or at substantial risk of venous thromboembolic disease.

Materials and Methods: A multidisciplinary expert panel developed key questions to address in the guideline, and a systematic review of the literature was conducted. Evidence was graded based on a standard methodology, which was used to inform the development of recommendations.

Results: The systematic review identified a total of 34 studies that provided the evidence base for the guideline. The expert panel agreed on 18 recommendations.

Conclusions: Although the evidence on the use of IVC filters in patients with or at risk of venous thromboembolic disease varies in strength and quality, the panel provides recommendations for the use of IVC filters in a variety of clinical scenarios. Additional research is needed to optimize care for this patient population.

J Vasc Interv Radiol 2020; 31:1529-1544

In addition to lack of benefit, IVC filters are associated with complications!

Immediate complications

- Misplacement (1.3%)
- Pneumothorax (0.02%)
- Haematoma (0.6%)
- Air embolism (0.2%)
- Carotid artery puncture (0.04%)
- Arteriovenous fistula (0.02%)

Early complications

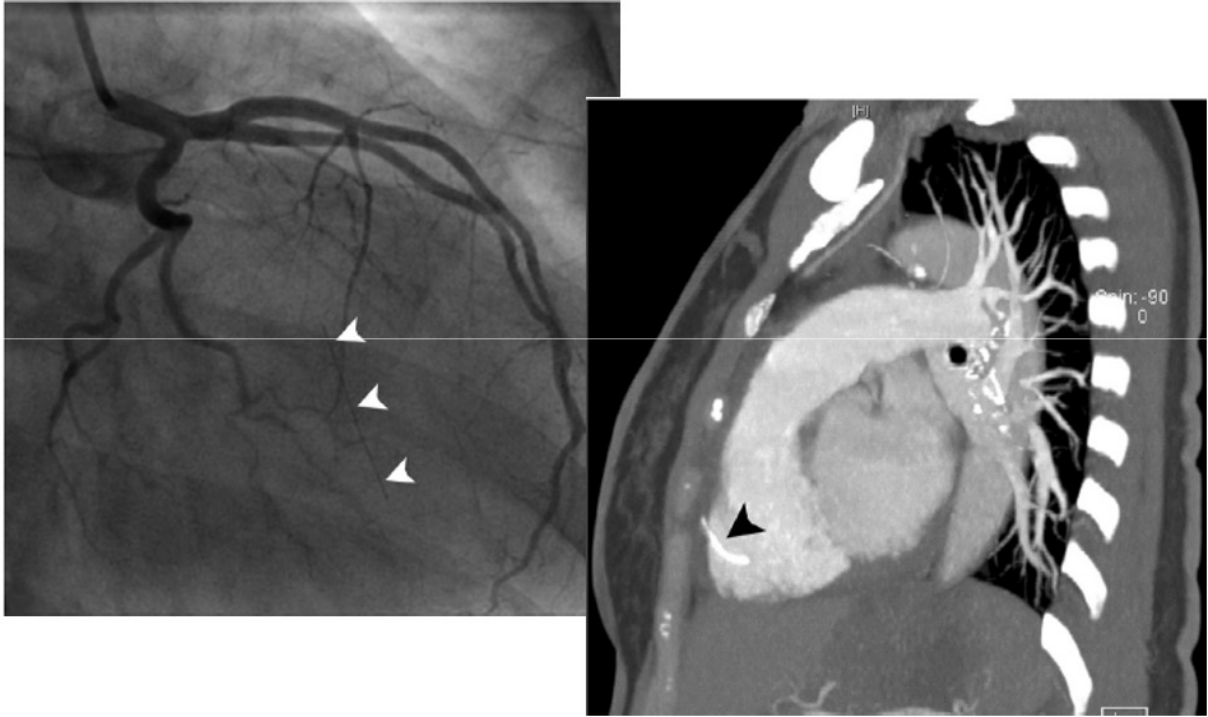
- Insertion site thrombosis (8.5%)
- Infection

Late complications

- Recurrent DVT (21%)
- IVC thrombosis (2–10%)
- Post-thrombotic syndrome (15–40%)
- IVC penetration (0.3%)
- Filter migration (0.3%)
- Filter tilting and fracture
- Entrapment of guidewires

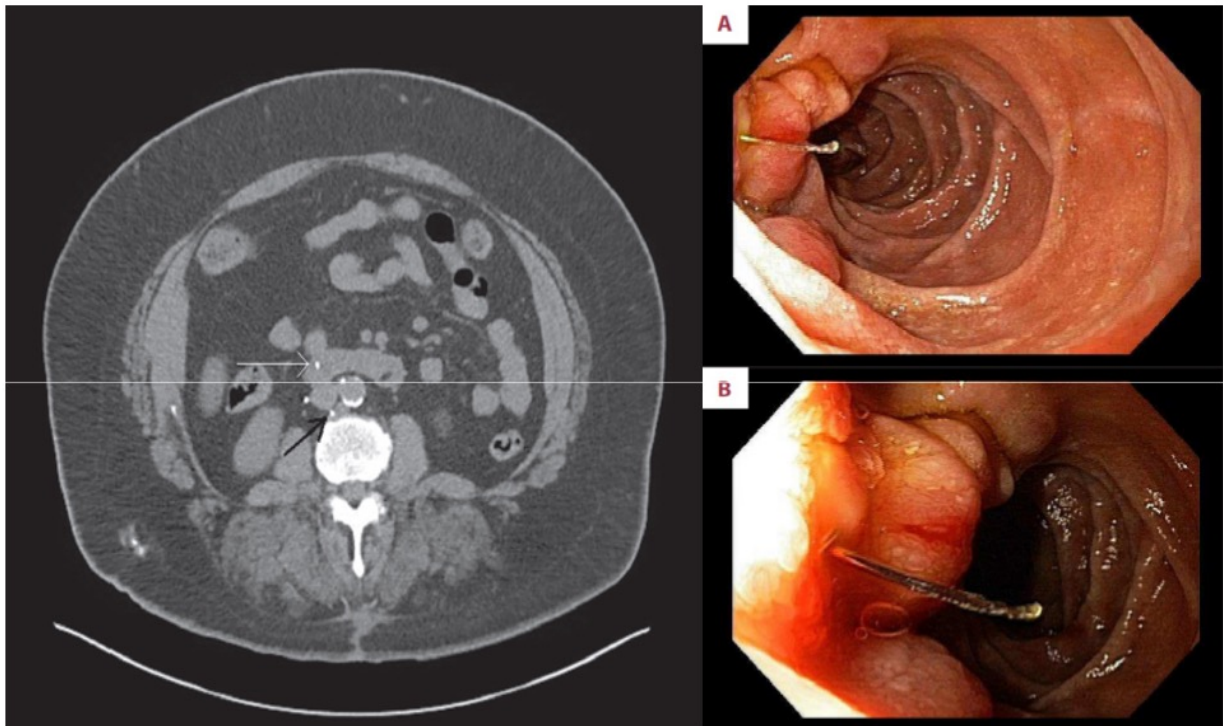
Caplin DM et al. *J Vasc Interv Radiology* 2011;22:1499–506
Hann CL et al. *Blood Reviews*, 2005;19, 179–202
Streff, MB. *Blood*, 2000;95, 3669–3677
Crochet DP et al. *J Vasc Interv Radiol*, 1999;10, 137–142

COMPLICATIONS



Piercecchi CW. *Heart Lung Circ.* 2016 Sep 5

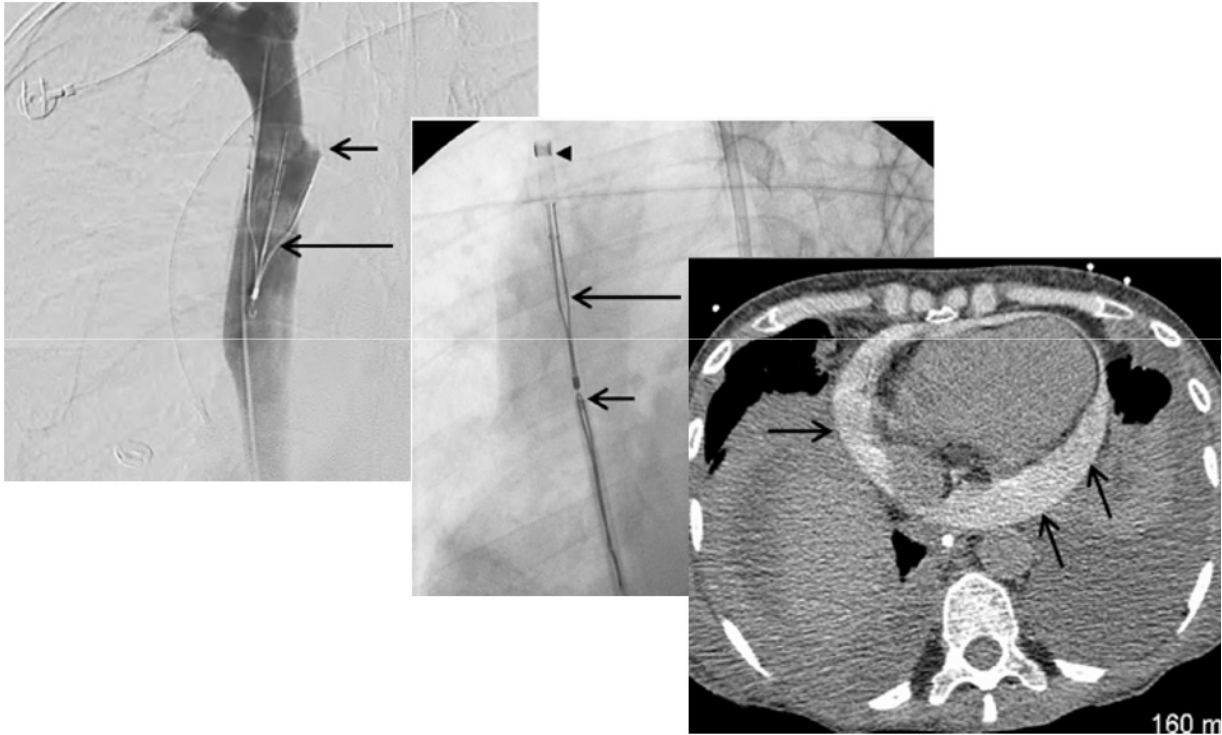
COMPLICATIONS



NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombotici

Torino, 12-13 novembre 2021

COMPLICATIONS



Dalvie PS et al. *J Vasc Interv Radiol.* 2015 Jun;26:929-3:

CONCLUSIONS

- *Theoretically inferior vena cava filter should work. Placed between the main source of venous emboli and the right side of the heart, the IVC filter should capture a blood clot before it reaches the pulmonary circulation.*
- *30 years publications: this theory has never been validated by empirical studies.*
- *2 RCT's: IVC filter no benefit....not applicable to common clinical practice*
- *Complications...rare but....*

Recommendations	Class ^a	Level ^b
IVC filters should be considered in patients with acute PE and absolute contraindications to anticoagulation.	IIa	C
IVC filters should be considered in case of recurrence of PE, despite therapeutic levels of anticoagulation.	IIa	C
Routine use of IVC filters in patients with PE is not recommended.	III	A



Haddadian B et al. *Clin Cardiol.* 2008 Feb;31(2):84-7.

NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021



Grazie dell'attenzione!!

NOVITÀ IN COAGULAZIONE
attraverso i centri emostasi e trombosi

Torino, 12-13 novembre 2021