i-MEET

NEXT GENERATION

Multidisciplinary European Endovascular Therapy

Disclosure of Interest

Speaker name: F G BARRAL

- I do not have any potential conflict of interest

CAVAL FILTRATION

FG BARRAL

M PEOC'H

S GRANGE

Thrombosis Research Group – EA 3065
CICEC
Université Jean Monnet
Saint Etienne, France

Caval filtration in 2018

- From TROUSSEAU in 1863 (Paris)
- To bio-degradable devices in 2018

=> a lot of questionings

=> a few answers

So the debate is still going-on…

WHAT IS – ALMOST – ESTABLISHED?

Justification: To prevent Pulmonary Embolism

=> PE: an important cause of morbidity and mortality:

- 600 000 VTE/year in the US

240 000 deaths by PE.

-295,902 VTE/year in Europe

-10000 deaths by PE in France

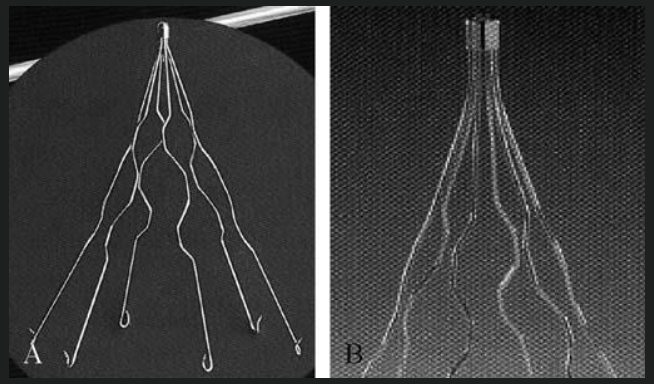
» Cohen A T et al Thromb Haemost 2007, 98, 756-764

» Crowther M A, the American Journal of Medicine 2007, 120 (108) S13-S17

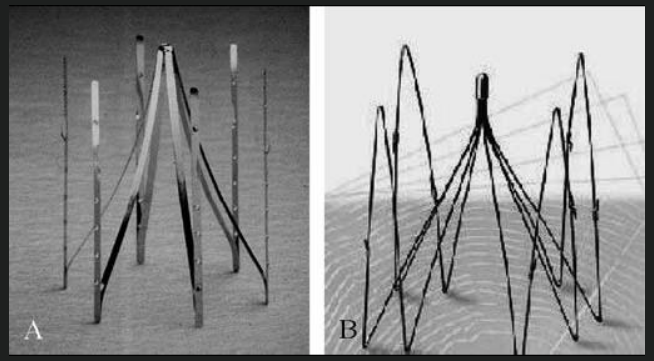
=> An extensive (but not exhaustive?) literature has showen that IVC filters are the less bad adjunctive tool beyond Anticoagulants to prevent PE or recurent PE.

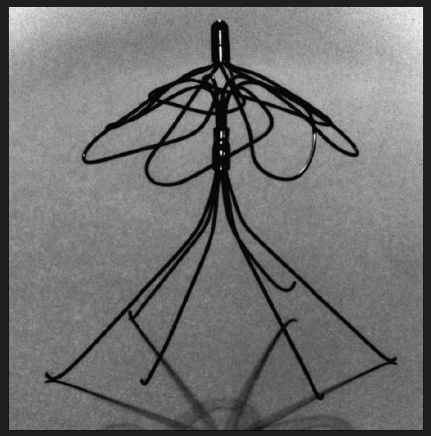
THREE TYPES OF VENA CAVA FILTERS

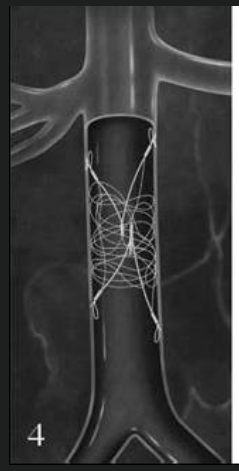
I- THE PERMANENT FILTERS:



- designed to be left a place for life
- not removable by percutanous approach

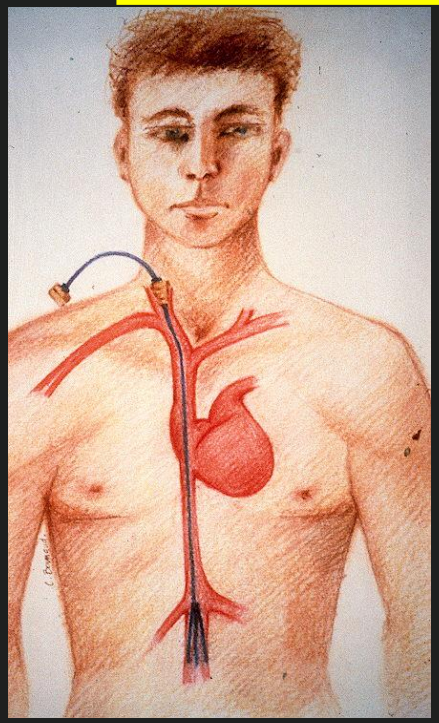






THREE TYPES OF VENA CAVA FILTERS

II – THE TEMPORARY FILTERS



Must be removed after 10 days or 3 months ?
(tempo filter II) -> Angel catheter

Require a catheter emerging through the skin to fix the device within the vena cava :

- Significant risk of septicemia and caval thrombosis.
- Very uncomfortable for the patient

Will probably be given in the futur or reserved for short peri surgical procedures.

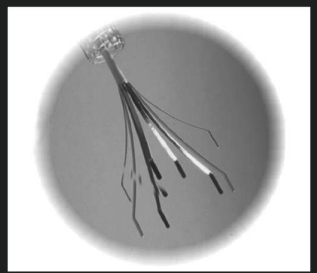
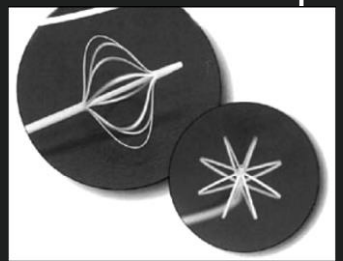


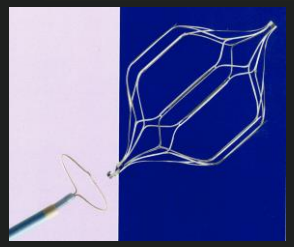
Fig. 1. The Angel Catheter. This filter is the only temporary filter approved in the United States. Designed for percutaneous ultrasound-guided bedside placement through common femoral vein access in critically ill patients, it must be removed by 30 days. (*Courtesy of* Bio2 Medical, Golden, CO; with permission.)

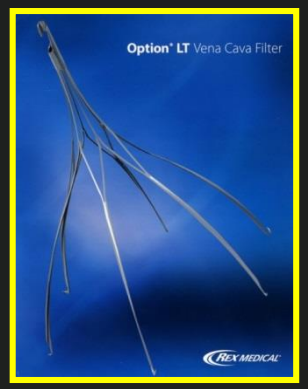


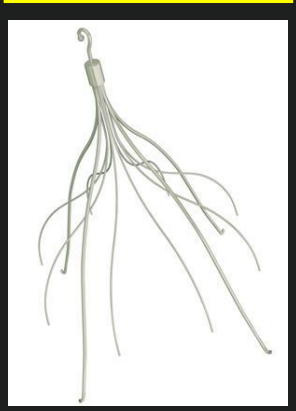
Ricco J.B., Cardiovasc.Surg.2000 ; 8 : 411-421

THREE TYPES OF VENA CAVA FILTERS

III- OPTIONAL (REMOVABLE) FILTERS







A new and promising concept

Named optional because they can either be removed or, if necessary, be left in situ, as permanent filter

No necessity of a catheter emerging through the skin (the device is fixed by its hooks) → No risk of septicemia

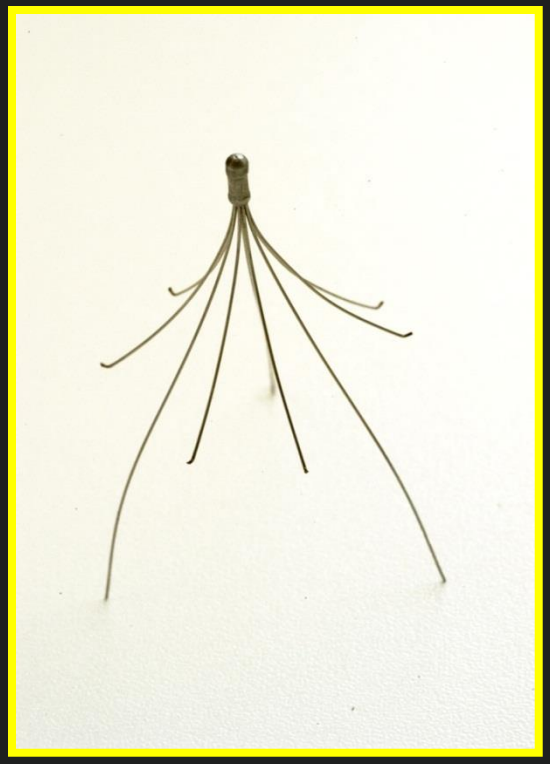
Can be removed from 23 days (Optease *) to more than to 24 months (ALN)

[Millward SF et al. *J Vasc Interv Radiol* 2001;12:1053-8
Murray R et al. *Rodiology* 2002;225:835-44
Pieri S et al. *Radiol Med* 2003;105:56-62]

OPTIONAL VENA CAVA FILTER ALN:

ALN experience in our department from 1999 up to now:

- 1002 implanted filters in 995 patients
- 354 removed filters
  with no major difficulty nor complication



OPTIONAL FILTERS: WHEN?

SIR Concensus / CIRSE / SFICV

Table 1 Classic, extended, and prophylactic indications for IVC filter placement

Patients with documented VTE and classic indications	Patients with documented VTE and expanded indications	Patients without VTE
Contraindication to anticoagulation	Iliocaval or large free-floating proximal DVT	Trauma patient with high risk of VTE
Complication of anticoagulation necessitating cessation	Inability to achieve/maintain adequate anticoagulation	Surgical procedure in a patient at high risk for VTE
Failure of anticoagulation	Massive PE with residual DVT in a patient at risk for further PE	Medical condition with high risk of VTE
Propagation/progression of DVT during therapeutic anticoagulation	Chronic venous thromboembolism treated with thromboendarterectomy	
	Thrombolysis of iliocaval DVT	
	VTE with limited cardiopulmonary reserve	
	Recurrent PE with IVC filter in place (filter failure)	
	Poor compliance with anticoagulation	
	High risk of complication of anticoagulation (e.g., high fall risk)	

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

PERMANENT FILTERS: WHEN?

-Definitive contra indication to AC

-Retrieval procedure not suitable:

* elderly patients
* terminal stage of disease (cancer…)

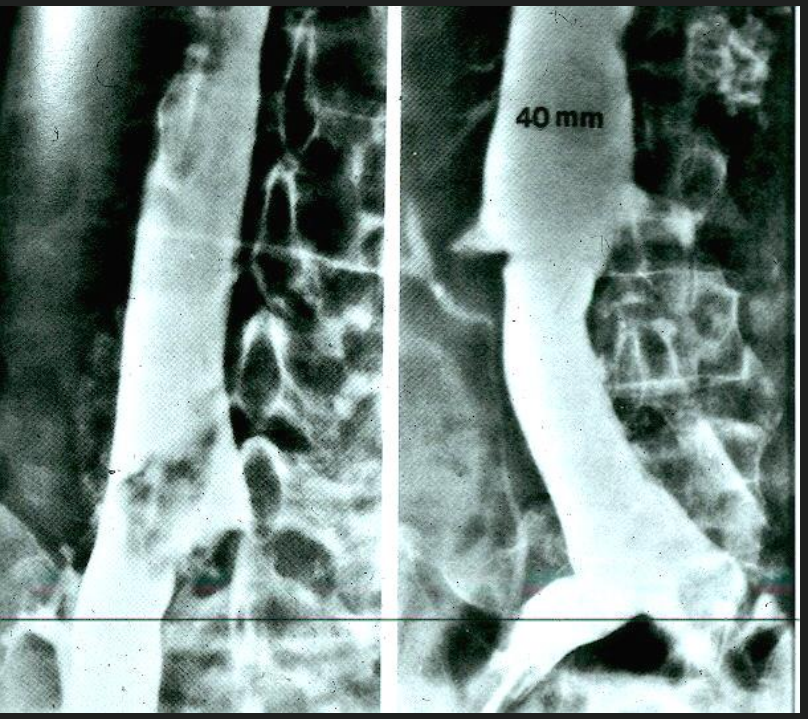
-Anatomical conditions:

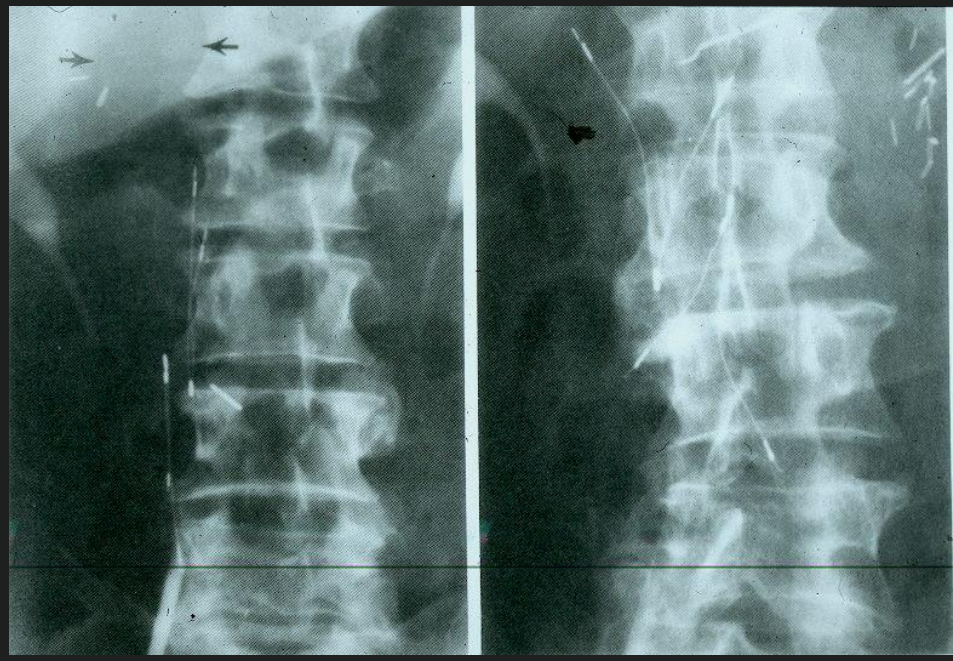
* mega vena cava (birdnest)
* tortuous vena cava (elderly patients)

-Individual conditions:

* difficulty establishing AC
* poor compliance with AC
* difficulty establishing clinical follow-up

MEGA VENA CAVA





TORTUOUS VENA CAVA

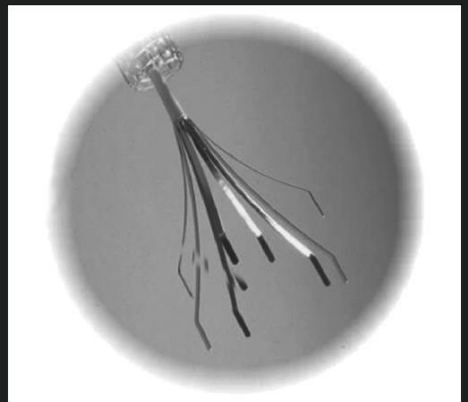
79 years old
female

TEMPORARY FILTERS: WHEN?

- Peri operative period: very short window of contra-indication to AC (simple withdrawal)

- in the last monthes of pregnancy (no hooks on the legs)

- as a protective system during medical or mechanical thrombolysis



WHAT ARE THE TRENDS?

1- A DECREASE IN WORLD-WIDE UTILISATION

- Despite a great variability between countries and centers
- An increasing number of publications of complications
- The effectiveness of new anticoagulants

2- A LONGER DWELL-TIME

3 – NEW DEVICES:

- Convertible filter
- SENTRY filter

4- EXPANDING INDICATIONS:

- Trauma patients
- Bariatic surgery
- Pregnant patients
- Pediatric patients

WHAT ARE THE TRENDS?

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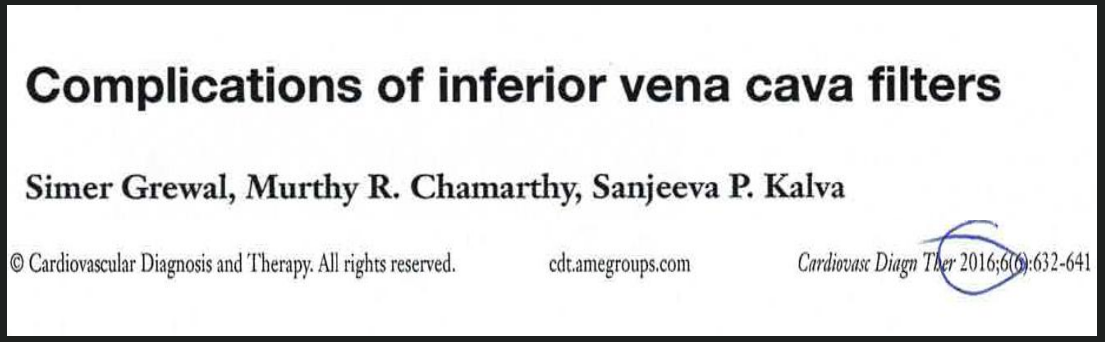
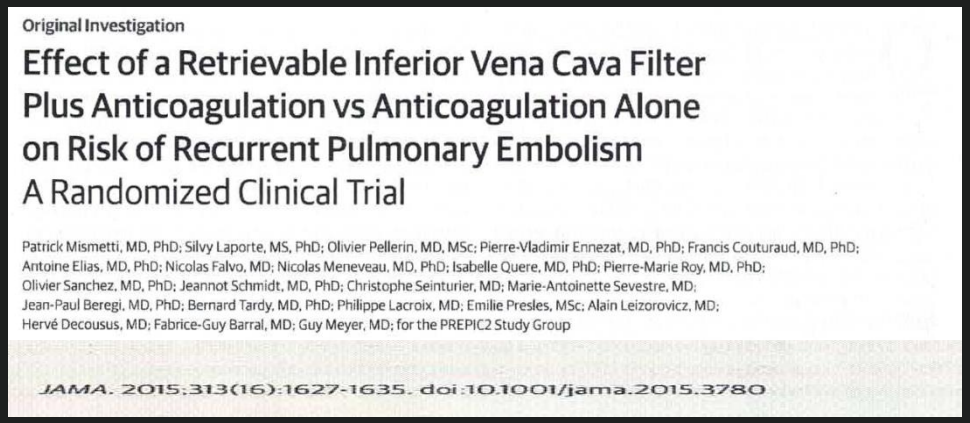


Complications of inferior vena cava filters

Simer Grewal, Murthy R. Chamarthy, Sanjeeva P. Kalva

 cdt.amegroups.com *Cardiovasc Diagn Ther* 2016;6(6):632-641



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; Silvy 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; Jeannot Schmidt, 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

JAMA. 2015;313(16):1627-1635. doi:10.1001/jama.2015.3780

PREPIC II

WHAT ARE THE TRENDS?

2- A LONGER DWELL-TIME

Cardiovasc Intervent Radiol (2018) 41:675–682
https://doi.org/10.1007/s00270-018-1880-9

CIRSE CrossMark

REVIEW

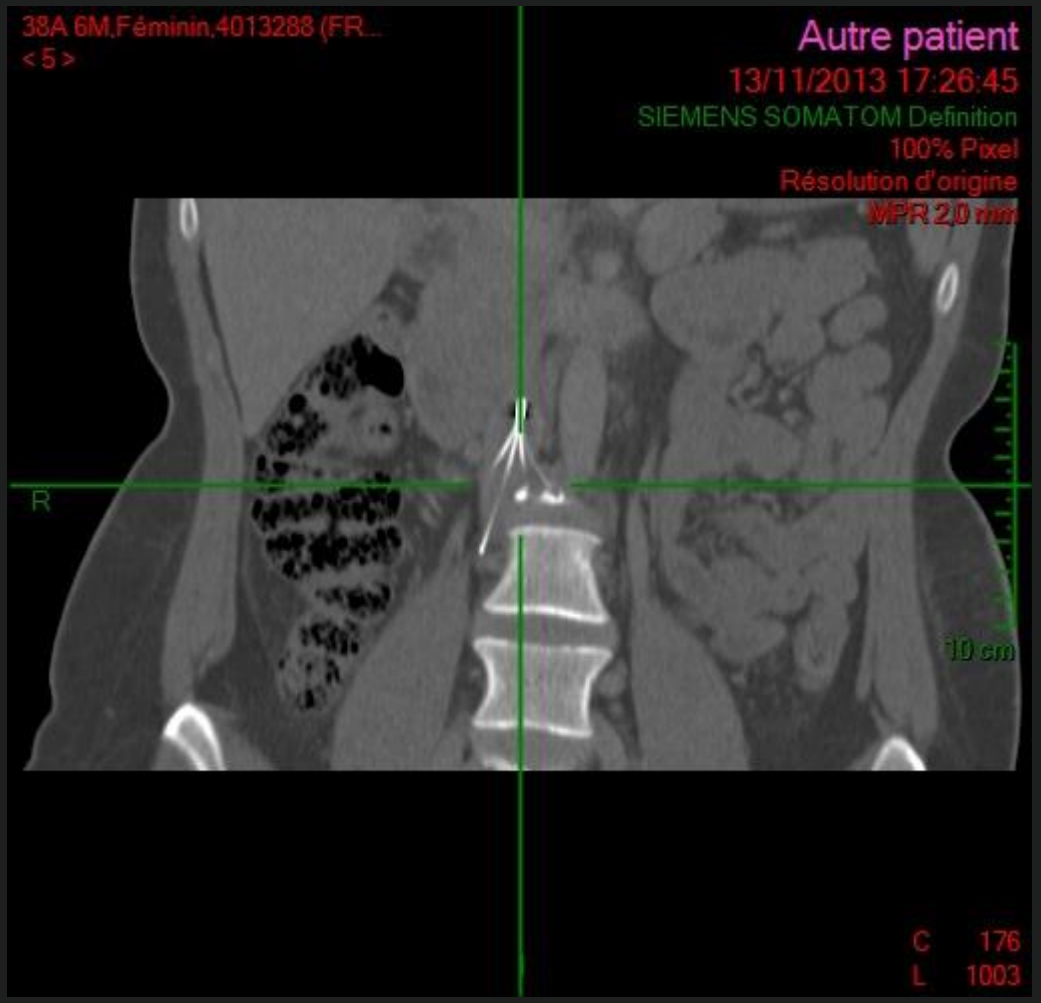
Utility of Retrievable Inferior Vena Cava Filters: A Systematic Literature Review and Analysis of the Reasons for Nonretrieval of Filters with Temporary Indications

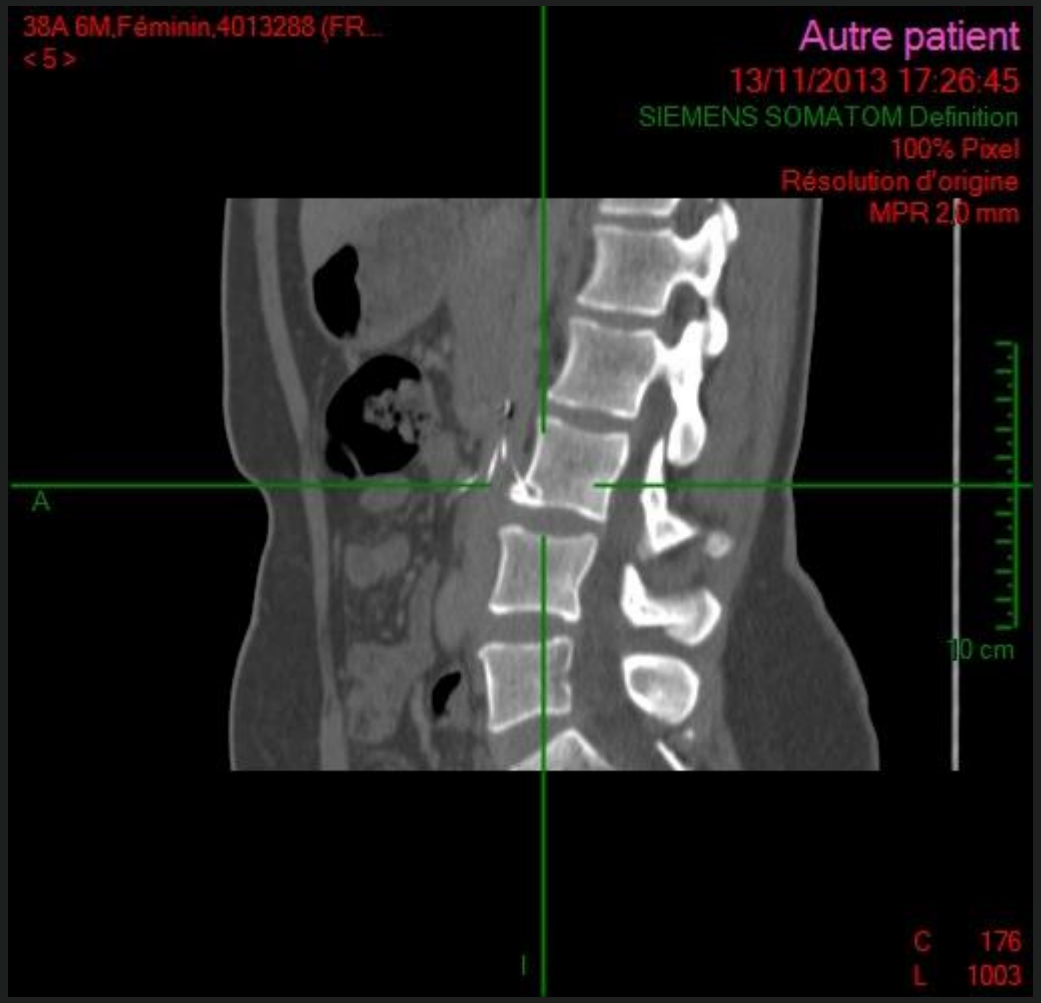
Zhongzhi Jia[1] · Tyler A. Fuller[2] · J. Mark McKinney[3] · Ricardo Paz-Fumagalli[3] · Gregory T. Frey[3] · David M. Sella[3] · Thuong Van Ha[4] · Weiping Wang[3]

Received: 4 September 2017 / Accepted: 8 January 2018 / Published online: 22 January 2018

♀ 26 years old

- Breast implant surgery 2001
- 2 days later: lower leg DVT no PE
- LMWH stopped because péri-prostetic bleeding
- ALN filter inserted
- LMWH -> vit K antagonists for 12 years !!!


38A 6M,Féminin,4013288 (FR...
< 5 >
Autre patient
13/11/2013 17:26:45
SIEMENS SOMATOM Definition
100% Pixel
Résolution d'origine
MPR 2,0 mm
R
10 cm
C 176
L 1003


38A 6M,Féminin,4013288 (FR...
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Autre patient
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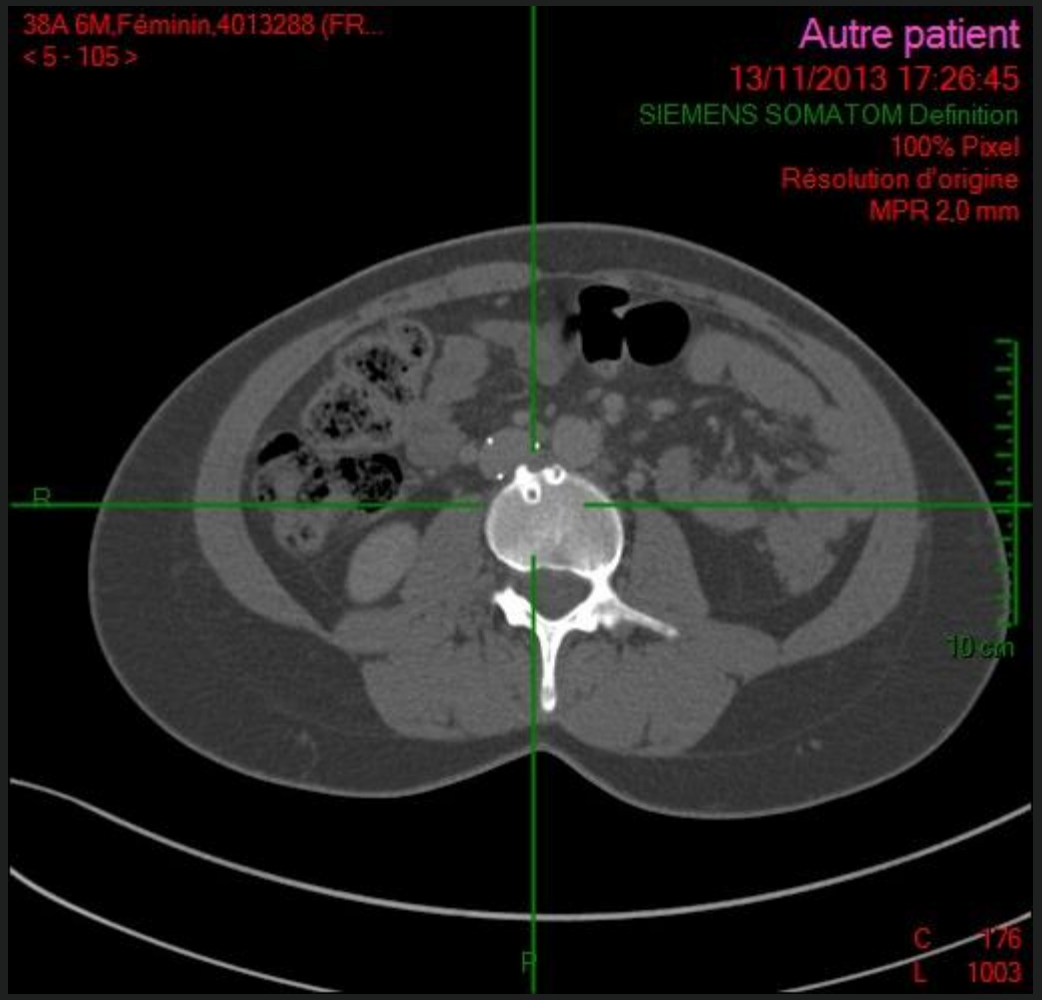
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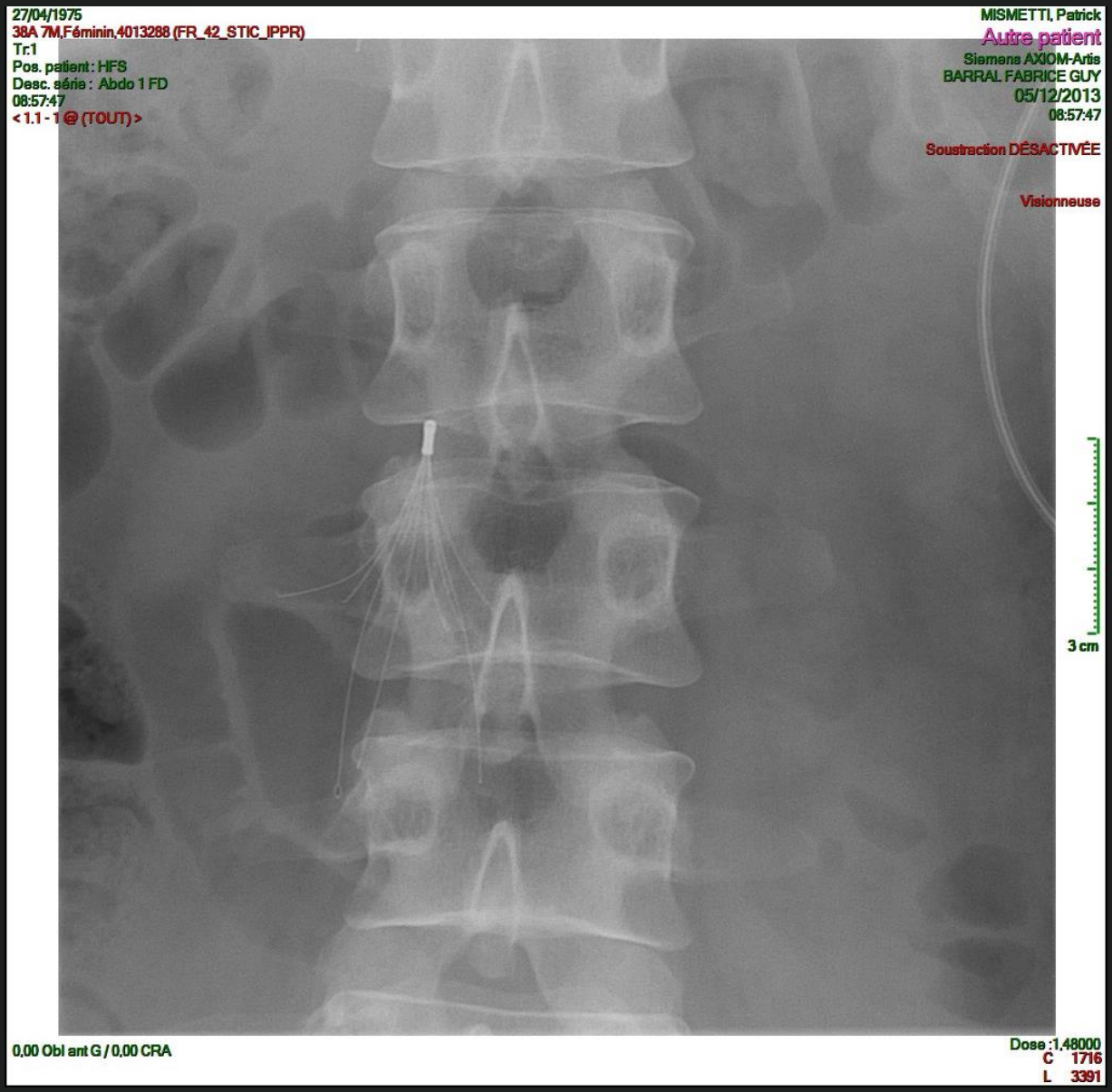
13/11/2013 17:26:45
SIEMENS SOMATOM Definition
100% Pixel
Résolution d'origine
MPR 2,0 mm
10 cm
C 176
L 1003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Tr:1
Pos. patient : HFS
Desc. série : Abdo 1 FD
08:57:47
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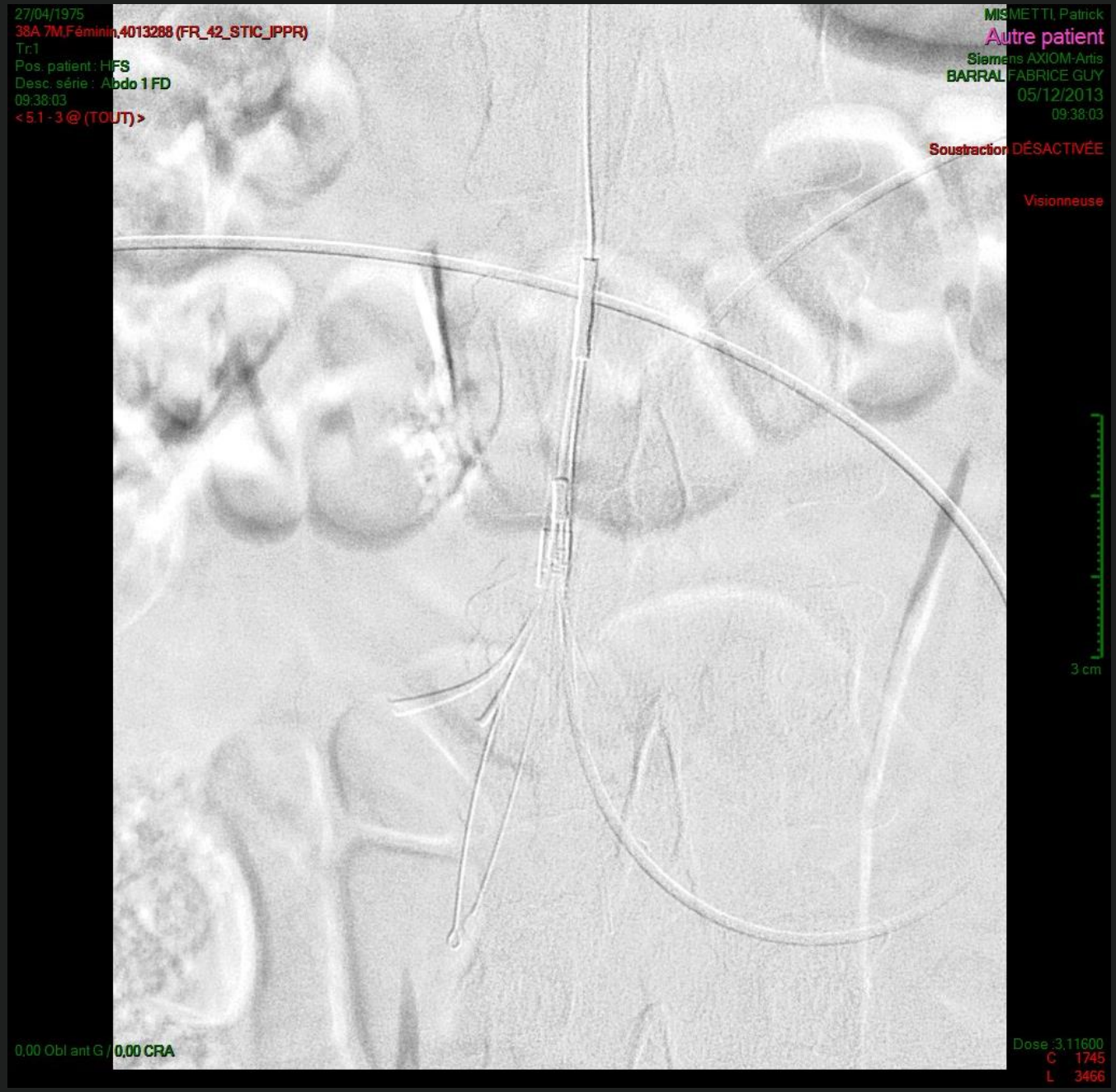
MISMETTI, Patrick
Autre patient
Siemens AXIOM-Artis
BARRAL FABRICE GUY
05/12/2013
08:57:47
Soustraction DÉSACTIVÉE
Visionneuse
3 cm
0,00 Obl ant G / 0,00 CRA
Dose :1,48000
C 1716
L 3391


27/04/1975
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Tr:1
Pos. patient : HFS
Desc. série : Abdo 1 FD
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MISMETTI, Patrick
Autre patient
Siemens AXIOM-Artis
BARRAL FABRICE GUY
05/12/2013
09:38:03
Soustraction DÉSACTIVÉE
Visionneuse
3 cm
0,00 Obl ant G / 0,00 CRA
Dose :3,11600
C 1745
L 3466


27/04/1975
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Autre patient
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BARRAL FABRICE GUY
05/12/2013
09:38:19
Soustraction DÉSACTIVÉE
Visionneuse
3 cm
87,70 Obl ant D / 0,00 CRA
Dose :14,40500
C 1763
L 3484


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Autre patient
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BARRAL FABRICE GUY
05/12/2013
09:45:12
Soustraction DÉSACTIVÉE
Visionneuse
5 cm
0,00 Obl ant G / 0,00 CRA
Dose :16,87000
C 1763
L 3484

WHAT ARE THE TRENDS?

3 – NEW DEVICES:

- Convertible filter
- SENTRY filter

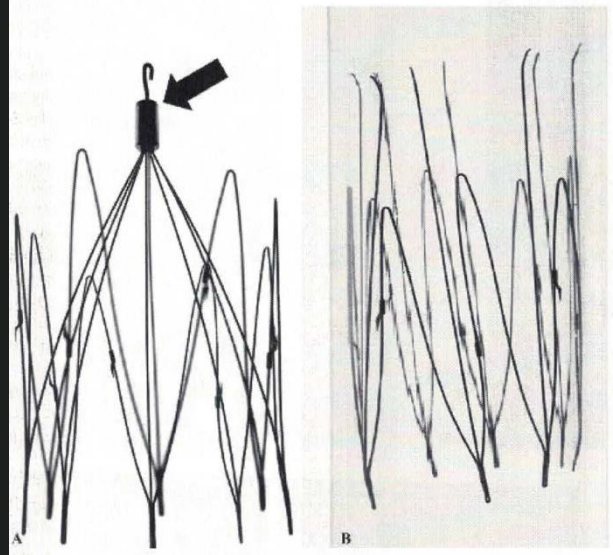

Figure 3. Convertible filter in development by B. Braun Venatech (Bethlehem, PA). *A*, Filter in closed, active state. Note the apical cap (*arrow*) with attached hook. *B*, Converted filter. The apical cap is removed with a snare, allowing the filter elements to open.

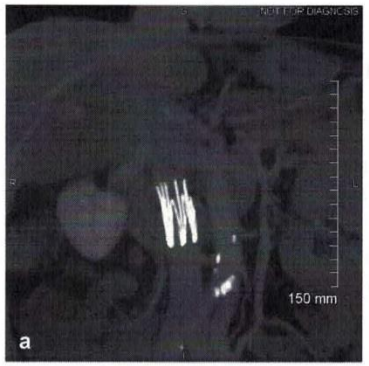

Figure 6. Anteroposterior **(a)** and lateral **(b)** CT reformatted images of a converted filter. Images were obtained 6 months after conversion (346 d after implant).

CLINICAL STUDY

Multicenter Trial of the VenaTech Convertible Vena Cava Filter

Eric J. Hohenwalter, MD, James R. Stone, MD, Paul V. O'Moore, MD, Steven J. Smith, MD, J. Bayne Selby, MD, Robert J. Lewandowski, MD, Shaun Samuels, MD, Paul M. Kiproff, MD, David W. Trost, MD, David C. Madoff, MD, Jeremy Handel, MD, Eric J. Gandras, MD, Athanasios Vlahos, MD, and William S. Rilling, MD

From the SIR 2015 Annual Scientific Meeting.

J Vasc Interv Radiol 2017; ■:1–10

http://dx.doi.org/10.1016/j.jvir.2017.06.032

WHAT ARE THE TRENDS?

3 – NEW DEVICES:

- Convertible filter
- SENTRY filter

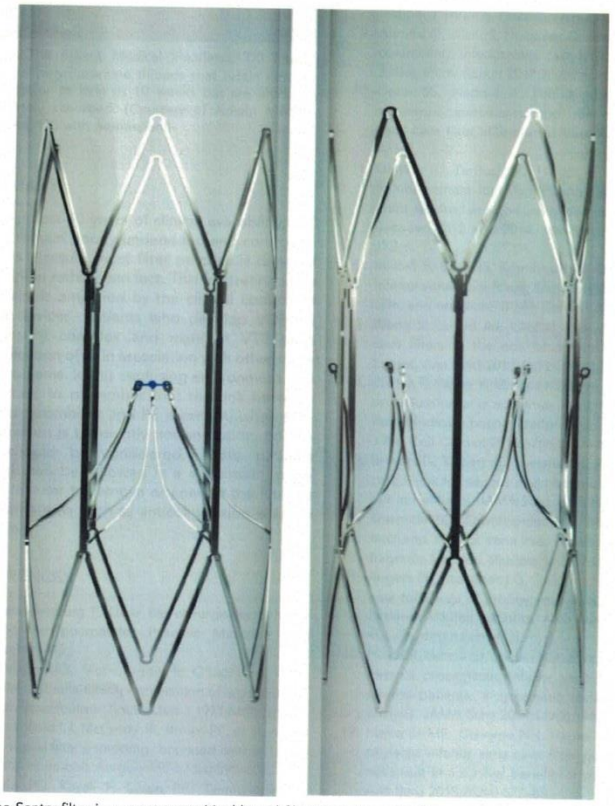

Fig. 2. The Sentry filter is a permanent nitinol-based filter that automatically converts to an open IVC stent at a minimum of 60 days. (*Courtesy of* Novate Medical, Galway, Ireland.)

NEWS • INTERVENTIONAL | ISET 2018

'Bioconvertible' IVC Filter Does Its Job Then Moves On: SENTRY Trial

By 12 months, no patients had developed symptomatic PE and no complications were detected on imaging.

By Caitlin E. Cox | February 15, 2018

WHAT ARE THE TRENDS?

4- EXPANDING INDICATIONS:

- Trauma patients
- Bariatic surgery
- Pregnant patients
- Pediatric patients

Table 5 Summary of British Committee for standards in hematology IVC filter guidelines[34]

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.

Table 7 EAST guidelines for prophylactic IVC filter placement in trauma patients

Prophylactic IVC filter insertion should be considered in very high-risk trauma patients:
1. Who cannot receive anticoagulation because of increased bleeding risk and
2. Who have an injury pattern rendering them immobilized for a prolonged period of time, including the following:
A. Severe closed head injury (GCS < 8)
B. Incomplete spinal cord injury with paraplegia or quadriplegia
C. Complex pelvic fractures with associated long-bone fractures
D. Multiple long-bone fractures

Abbreviations: EAST, Eastern Association for the Surgery of Trauma; GCS, Glasgow Coma Scale; IVC, inferior vena cava.

4- EXPANDING INDICATIONS:

- Trauma patients

Original Investigation

The Effectiveness of Prophylactic Inferior Vena Cava Filters in Trauma Patients

A Systematic Review and Meta-analysis

Elliott R. Haut, MD; Luis J. Garcia, MD; Hasan M. Shihab, MBChB, MPH; Daniel J. Brotman, MD; Kent A. Stevens, MD, MPH; Ritu Sharma, BSc; Yohalakshmi Chelladurai, MBBS, MPH; Tokunbo O. Akande, MBBS, MPH; Kenneth M. Shermock, PharmD, PhD; Sosena Kebede, MD, MPH; Jodi B. Segal, MD, MPH; Sonal Singh, MD, MPH

JAMA Surg 2014

WHAT ARE THE TRENDS?

4- EXPANDING INDICATIONS:

- Trauma patients
- Bariatic surgery

INDICATIONS WHEN :

- Venous stasis disease
- Body mass index ≥ 60
- Truncal obesity
- Obesity hypoventilation syndrome/sleep apnea syndrome
- History of VTE

From :

RF/BARIATRIC SURGERY

* Sapala JA (5.554 patients) Obes.Surg.2003
* Rectenwald JE Sem.Vasc.surg. 2005

BARIATRIC SURGICAL PRACTICE AND PATIENT CARE
Volume 13, Number 1, 2018

DOI: 10.1089/bari.2017.0036

ORIGINAL ARTICLE

Safety of Retrievable Inferior Vena Cava Filter Placements in High-Risk Bariatric Surgery Patients

Marcoandrea Giorgi, MD,[1] Beth A. Ryder, MD,[2] Tec Chong, MD,[1] Junaid Malek, MD,[1] Suma Sangisetty, MD,[1] Gary Dean Roye, MD,[2] Todd Stafford, MD,[1] and Sivamainthan Vithiananthan, MD[2]

WHAT ARE THE TRENDS?

4- EXPANDING INDICATIONS:

- Trauma patients
- Bariatric surgery
- Pregnant patients

J Matern Fetal Neonatal Med. 2018 Apr 2:1-9. doi: 10.1080/14767058.2018.1456521. [Epub ahead of print]

Retrievable inferior vena cava filter utilization in obstetric patients.

Rottenstreich A[1], Kalish Y[2], Elchalal U[1], Klimov A[3], Bloom AI[3].

Author information

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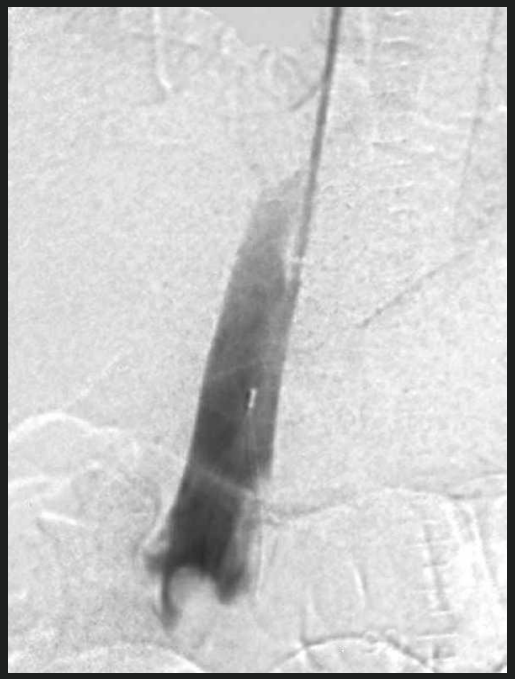
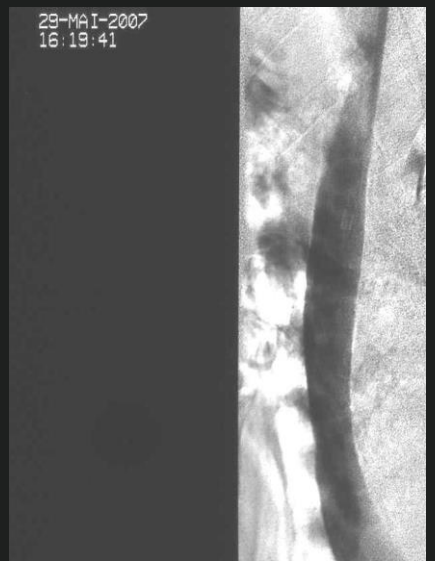
2 b Department of Hematology , Hadassah-Hebrew University Medical Center , Jerusalem , Israel.
3 c Department of Radiology , Interventional Radiology Section, Hadassah-Hebrew University Medical Center , Jerusalem , Israel.

Supra renal positioning





2 nd preg.under LMWH

Hemorrhage during the placental stage

WHAT IS THE (NEXT?) FUTURE?

- The bio-degradable filters

- A better management of retrieval procedures

Safety and Efficacy of an Absorbable Filter in the Inferior Vena Cava to Prevent Pulmonary Embolism in Swine

Author List

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BASIC RESEARCH STUDIES

Pilot in vivo study of an absorbable polydioxanone vena cava filter

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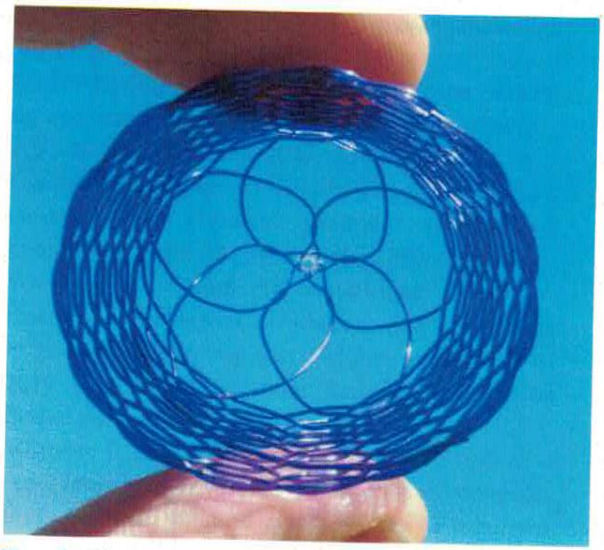

Fig. 3. The Adient Medical (Pearland, TX) filter is made of polydioxanone threads that retain filtration integrity for as long as 10 weeks but are ultimately completely absorbed. (*Courtesy of* Adient Medical, Pearland, TX; with permission.)

WHAT IS THE (NEXT?) FUTURE?

- The bio-degradable filters

- A better management of retrieval procedures

A Dedicated Inferior Vena Cava Filter Service Line: How to Optimize Your Practice

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CLINICAL INVESTIGATION VENOUS INTERVENTIONS

The CIRSE Retrievable IVC Filter Registry: Retrieval Success Rates in Practice

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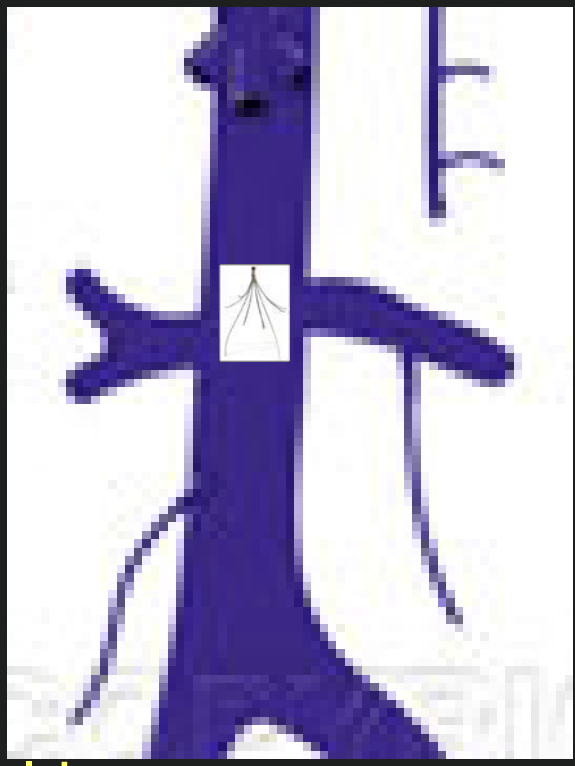
CONCLUSIONS:

- Experimented teams
- Follow the manufacturer's instructions for placement / retrieval procedures
- AC as soon as possible
- New studies warranted
- But « Please don't throw the Baby out with the Bath water »

Alistair J KENT

JAMA Surg 2017

OPTIONAL VENA CAVA FILTER, THE HOLY GRAIL ?



In conclusion, the optional vena cava filter could become the « holy grail » if it was possible for it to disappear right after it is not usefull anymore …
Just like this ..

Table 2 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	
Free-floating iliofemoral or IVC thrombus	
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.

Table 3 American College of Chest Physicians guidelines

1. 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)
2. In children weighing >10 kg with lower-extremity DVT and a contraindication to anticoagulation, placement of a temporary IVC filter is suggested (grade 2C)
3. 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)
4. 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.

Table 4 AHA guidelines on IVC filter placement

1. Adult patients with any acute proximal DVT (or acute PE) with contraindications to anticoagulation or active bleeding complication should receive an IVC filter (Class I; Level of Evidence B)
2. 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)
3. 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)
4. For patients with recurrent PE despite therapeutic anticoagulation, it is reasonable to place an IVC filter (Class IIa; Level of Evidence C)
5. For IFDVT 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)
6. For IFDVT 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)
7. For patients with recurrent DVT (without PE) despite therapeutic anticoagulation, it is reasonable to place an IVC filter (Class IIb; Level of Evidence C)
8. An IVC filter should not be used routinely in the treatment of IFDVT (Class III; Level of Evidence B)

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

Table 6 European Society of Cardiology Guidelines on venous filters

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

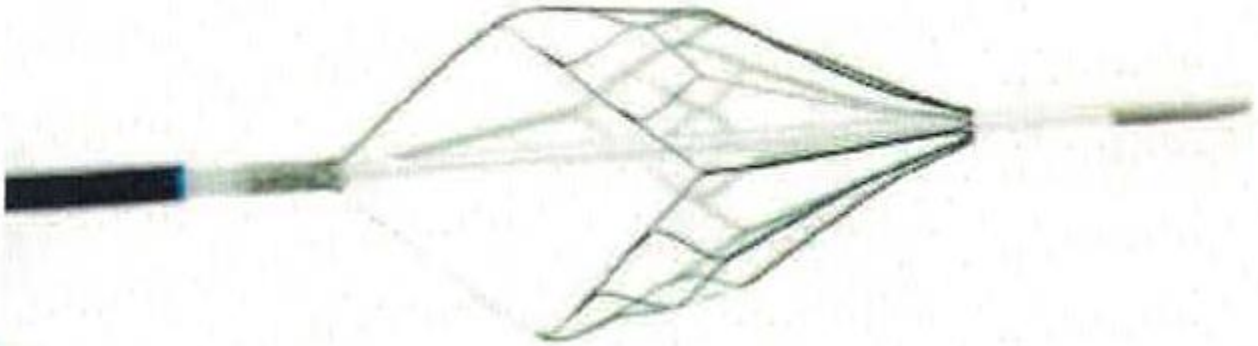


Fig. 1. The Angel Catheter. This filter is the only temporary filter approved in the United States. Designed for percutaneous ultrasound-guided bedside placement through common femoral vein access in critically ill patients, it must be removed by 30 days. (*Courtesy of* Bio2 Medical, Golden, CO; with permission.)