VenaTech® Convertible™

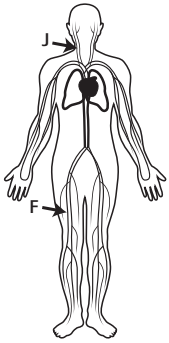
Vena Cava Filter System

CLINICAL STUDY SUMMARY

(Pages 11-17 of Instructions for Use)

Refer to Instructions for Use for relevant warnings, precautions, complications, and contraindications.

REF 05010028



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Rx only CV2049 9/17
Information from FN1947-A (February 2016)

CLINICAL STUDY SUMMARY

Study Design: A U.S. multi-center, prospective, single-arm, clinical study was conducted to assess the safety, performance, and convertibility of the VenaTech® Convertible™ Vena Cava Filter.

The primary objective of the study was to demonstrate that the rate of technical success is no lower than the rate (retrieval success) reported in the literature control. Technical success was defined as filter conversion without the loss of filter head components in the vasculature or incomplete opening of filtering legs. The objective performance criterion (OPC) for technical success was 80%. During the analysis, the sponsor did not count any filters as a 'technically' successful conversion when the operator was unable to snare the filter hook during an attempted conversion.

The secondary objective was to estimate the 6-month major device-related adverse event rate in subjects with a converted filter. Major adverse events are defined as:

- Pre-conversion: Documented symptomatic pulmonary embolism, symptomatic caval thrombosis, clinically significant filter migration, or IVC perforation.
- Post-conversion: Symptomatic caval thrombosis, clinically significant filter migration or IVC perforation.

The ancillary measure was to determine the device deployment success rate in subjects where there was an attempt to place a filter. The device was considered successfully deployed when it was advanced and implanted at its intended location in the IVC without:

- A delivery system failure
- Embolization of filter
- Extravascular perforation of IVC by guidewire or filter components
- Incomplete opening of stabilizing legs
- Inadequate distribution of filtering legs (i.e., filtering mechanism)
- Misalignment with axis of IVC (e.g., significant tilt)
- Significant filter migration

A total of 149 subjects underwent filter placement (80 male, 69 female; mean age 62.7 years; age range, 19.8 – 90.3 years) at 11 sites across the United States. All subjects were followed for 6-months post-implant including a clinical exam and KUB and Doppler or KUB and CT imaging. The standard of care baseline, implant procedure, and protocol-required 6-month radiographic imaging was reviewed by a central imaging core laboratory. In addition to the 6-month visit, converted subjects were also followed at 30-day and 3-months post filter conversion to assess for adverse events. All reported adverse events were reviewed and adjudicated by an independent physician Clinical Events Committee.

Indications for filter implant were recorded on the case report form by the investigators as presented in Table 1.

Table 1: Indication for Filter Placement

Condition/Risk Factor[1]	All Subjects (n=149)
Pulmonary thromboembolism when anticoagulants are contraindicated (%)	20.8% (31/149)
Failure of anticoagulant therapy in thromboembolic diseases (%)	12.1% (18/149)
Emergency treatment following massive pulmonary embolism where anticipated benefits of conventional therapy are reduced (%)	7.4% (11/149)
Chronic, recurrent pulmonary embolism where anticoagulant therapy has failed or is contraindicated (%)	0.7% (1/149)
Other (%)	59.1% (88/149)

[1] **Note:** Sites had the option to choose more than one indication for IVC filter placement, therefore, the sum of the numerators will not always add up to the denominator.

The majority of responses were categorized by the investigators as 'other', suggesting the investigators did not think the actual indication for filter placement was adequately described in one or more of the pre-defined categories listed on the caser report form. All 'other' responses were further categorized into groupings discussed with the CEC, as follows:

- Acute pulmonary embolism (1 subject)
- Current DVT (2 subjects)
- Current DVT with contraindication to anticoagulation (24 subjects)
- Pre/post surgery prophylaxis (16 subjects)
- Pre/post surgery prophylaxis with remote history of PE/DVT (31 subjects)
- Trauma (14 subjects)

Subject accountability is presented in Table 2.

Table 2: Accountability

Time Point	Eligible for Visit (N)	Visit Completed (N, %)	Death (N)	Lost to Follow-Up (N)	Withdrawal (N)
Baseline / Implant	149	149, 100%	0	0	0
Permanent Filtration 6-Month	40	39, 97.5%	11	1	3
Converted	96	96, 100%	0	0	0
Converted 30-Day	92	91, 98.9%	1	1	0
Converted 3-Month	91	89, 97.8%	1	0	1
Converted 6-Month	90	89, 98.9%	0	0	0

Results: The protocol ancillary measure was to determine the device deployment success rate in subjects where there was an attempt to place the filter. All filter implant attempts were successful (100% 149/149) with no reports of filter malposition. Of the 149 enrolled subjects, 121 were assessed for filter conversion eligibility. Filters remained unconverted for a variety of reasons, similar to the reasons retrievable filters are not retrieved, including subject withdrawals due to death, physician or subject preference, continued risk of pulmonary embolism, withdrawal of consent, or lost to follow-up. The primary objective was met demonstrating the technical success of filter conversion exceeded the OPC of 80%. There have been 96 filter conversion attempts reported, 89 of which have no associated technical complications affecting the primary endpoint, resulting in a 92.7% conversion success rate (lower 97.5% confidence limit 85.6%). There were no reports of loss of filter head components in the vasculature, four (4) reports of incomplete opening of the filtering legs immediately post conversion after use of ancillary tools, and three (3) reports of inability to convert the filter due to the user being unable to snare the filter hook. Details of the technical complications associated with conversion procedures are as follows.

Converted with incomplete opening of the filter legs (4):

- In subject 001-003, the investigator was unable to disengage the filter cap easily (81days post-implant). The investigator used extra maneuvers to disengage the cap, which involved a second access from the subject's groin. The investigator used a cobra catheter to push the filter cap from below while pulling the cap from above at the jugular access. Once the cap was disengaged, accessories were used to convert the filtering legs to an open configuration (balloon inflation and reverse curve catheter). The "majority" of the legs deployed into the expected "stent" (open) configuration. (Note: the core lab confirmed the investigator's assessment and said the filter legs are tethered together but the core lab could not tell if the legs were apposed to the IVC because of the cavogram view.) No thrombus or filling defect was identified in the filter or elsewhere in the IVC. No adverse events were reported associated with this conversion procedure.
- In subject 004-004, the investigator converted the filter (158 days post implant). According to the investigator, "the head was easy to snare and release but was difficult to disengage from the filter. The struts did not open at all. A cobra catheter, tip deflecting wire, and balloon were used to partially open the struts." The core lab agreed with the investigator's assessment confirming the legs did not open completely. No adverse events were reported associated with this conversion procedure.
- In subject 005-001, the investigator converted the filter 169 days post implant. The filter hook was successfully snared and the filter head components successfully retrieved, however all filter legs did not completely open to a stent like position even after use of an SOS catheter. Per the core lab's review of the 6-month imaging (CT), the technical complication is resolved and the legs are fully open (apposed to IVC wall). No adverse events were reported associated with this conversion procedure.

- In subject 007-019, the investigator converted the filter 207 days post implant. The filter hook was successfully captured and the filter head components successfully retrieved, however all filter legs did not completely open into a stent-like position even after use of a variety of ancillary tools including a compliant balloon, RIM catheter, and deflecting tip wire, which was used to attempt to try to free three of the legs. The remaining legs appeared to be embedded within the wall of the IVC. The core lab reviewed the subject's 6-month post-conversion follow-up visit imaging and noted "the filter is nearly at full IVC wall apposition on latest images". No adverse events were reported associated with this conversion procedure.

Inability to convert the filter (3):

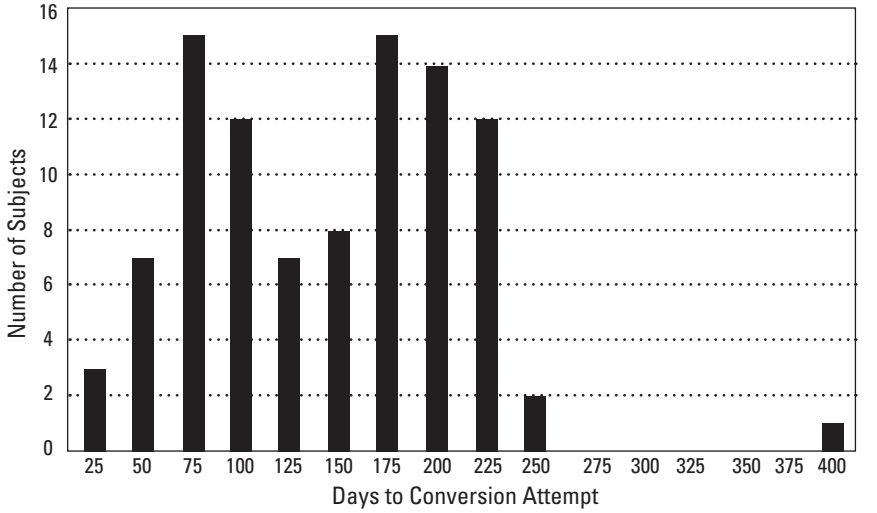
- In subject 001-016, the investigator attempted to convert the filter (180 days post implant) and was unable to snare the hook. The filter remains unconverted. Neither the site nor the core lab reported significant filter tilt or misalignment. The absolute cause of the technical complication (inability to snare and subsequently convert filter) is unknown but may be due to hook endothelialization. A conversion-related adverse event of 'back pain' was reported.
- In subject 007-011, the investigator attempted to convert the filter (159 days post implant) and was unable to snare the filter hook due to investigator reported hook endothelialization (however, the core lab reported there was no evidence of endothelialization based on the images received). Neither the investigator nor the core lab reported filter tilt. The filter remains unconverted. No adverse events were reported associated with this conversion attempt.
- In subject 009-016, the investigator attempted to convert the filter (212 days post implant) and was unable to snare the filter hook; the filter remains unconverted. Neither the site nor the core lab reported significant filter tilt or misalignment. No adverse events were reported associated with this conversion attempt.

Five (5) conversion procedures were classified by investigators as 'difficult', as follows:

- Subject 001-003 – Inability to easily disengage the filter cap.
- Subject 001-019 – Per investigator, due to angulation (7 degrees) of filter, the hook had endothelialized and had to be moved from the caval wall with a balloon so the filter head could be removed.
- Subject 004-004 – Per investigator, the head was easy to snare and release but it was difficult to disengage from the filter. The struts did not spontaneously open. A cobra catheter, tip deflecting wire, and balloon were used to partially open the struts of the filter.
- Subject 006-003 – Per investigator, fibrin sheath was present on the filter requiring multiple maneuvers to open filter legs.
- Subject 007-019 – Inability to secure full wall apposition of filtering legs despite use of multiple accessories.

The mean days to filter conversion was 130.7 days (range 15 to 391 days). The average reported conversion procedure time was 30.7 minutes (the conversion procedure duration was defined as the time the introducer is placed to the time all ancillary accessories were removed). In 82.3% of conversion procedures, accessory tools were used to assist including guiding catheters, guidewires and angioplasty balloons (as allowed per the instructions for use). Figure 1 presents days to conversion attempt.

Figure 1. Days to Filter Conversion Attempt



Adverse Events & Technical Complications: The literature supported expected rate for the secondary endpoint of major device-related adverse event rate is 3 – 6 %. There were no major device-related adverse events reported for converted subjects through 6-months. The estimated rate of device related major adverse events is therefore 0.0% with 95% binomial exact confidence limits of 0.0% to 4.1%.

Table 3 and **Table 4** present reported technical complications and relevant adverse events. There have been no reports of device or procedure-related major adverse events post-conversion (defined as symptomatic caval thrombosis or caval occlusion, perforation of the IVC and/or adjacent organs or vertebral bodies, pulmonary embolism, or filter migration). There have been no reports of spontaneous filter conversion or loss of the filter head during the conversion procedure.

In summary, the results of this study demonstrated that the placement and conversion of the VenaTech® Convertible™ Vena Cava Filter can be performed safely with relatively high rates of procedural and clinical success. For patients who are no longer at risk for thromboembolism, the VenaTech Convertible filter can be implanted for several months and then safely converted. These data demonstrates the safety and effectiveness of the placement and conversion of the VenaTech Convertible filter system in a clinically relevant patient population when used according to the instructions for use.

Table 3: All Reported Technical Complications
(Shaded rows represent no reported event)

Technical Complications	All (n=149)
Deployed at unintended position	0.0% (0)
Embolization of filter or filter components	0.7% (1)[1]
Filter fracture	0.0% (0)
Filter implanted upside down	0.0% (0)
Filter migration, significant (> 20 mm)	0.7% (1)[1]
Inadequate distribution of filtering legs	0.0% (0)
Incomplete opening of filtering legs during conversion procedure	2.7% (4)
Incomplete opening of stabilizing legs during deployment	0.0% (0)
Misalignment with axis of IVC / tilt (> 15°)	0.7% (1)
Spontaneous conversion of filter	0.0% (0)
Other	4.0% (6)[2]

[1] One un-converted subject experienced an unanticipated adverse device effect (UADE), significant filter migration resulting in atrial perforation. The DSMB believes this event was related to the "sail effect" of a large clot burden reaching the filter and carrying the filter with it to the heart, based on the large clot in the filter, and the associated significant PE. This event resulted in repeat surgical explant procedures to retrieve filter remnants. Of the total eight related serious adverse events reported in the study, seven occurred in this subject. Complications include pulmonary embolism, right atrial thrombus, right ventricle thrombus, right ventricle perforation, compromise of cardiac valve function due to filter embolization, mitral valve regurgitation and valve repair.

[2] Other reported technical complications:

- Unable to convert filter (n=3).
- Post conversion cavogram demonstrated a small filling defect along the lateral wall of the IVC at the superior margin of the device, likely representing a small dissection flap – not flow limiting per investigator. A balloon was reinserted and inflated (n=1).
- One left sided filter strut tilted toward center of IVC; identified by core laboratory on 6-month imaging (n=1).
- One report of IVC penetration < 3 mm (n=1). IVC penetration (a chronic process) defined as post-implant penetration of the IVC wall by one or more filter components that extends > 3 mm outside the wall of the IVC as documented by cross-sectional imaging when there is a clinical or radiographic suggestion that penetration may have occurred.

  Note: This study distinguished between IVC penetration and IVC perforation. IVC extravascular perforation (an acute process) is defined as during placement of the filter, a guidewire or filter component pierces and extends outside the IVC wall by more than 3 mm as documented by radiographic imaging. There were no reports of IVC perforation (see Table 4).

Table 4: Relevant Adverse Events

(Shaded rows represent no reported event)

	Overall		Device Related		Implant Procedure Related		Conversion Procedure Related	
Anticipated Events	**Events N**	**% of Subjects (n/N)**	**Events N**	**% of Subjects (n/N)**	**Events N**	**% of Subjects (n/N)**	**Events N**	**% of Subjects (n/N)**
Access site thrombosis	1	0.7% (1/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Air embolism	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Cardiac arrhythmia due to filter embolization	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Caval thrombosis or caval occlusion	5	3.4% (5/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Compromise of cardiac valve function due to filter embolization	1	0.7% (1/149)	1[1]	0.7% (1/149)	0	0.0% (0/149)	0	0.0% (0/96)
Damage to inferior vena cava	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Death	13	8.7% (13/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Deep vein thrombosis (DVT)	23	10.1% (15/149)	0	0.0% (0/149)	1	0.7% (1/149)	0	0.0% (0/96)
Hematoma at access site or conversion site	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Infection, including access site infection	4	2.0% (3/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Nerve injury at access site or conversion site	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
IVC perforation and/or perforation of adjacent organs or vertebral bodies > 3 mm^2	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Pulmonary embolism	1	0.7% (1/149)	1[1]	0.7% (1/149)	0	0.0% (0/149)	0	0.0% (0/96)
Tissue damage caused by extravasation of contrast material at time of venacavogram	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Venous insufficiency	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/149)	0	0.0% (0/96)
Other			6[1,2]	1.3% (2/149)	2[3]	1.3% (2/149)	3[4]	3.1% (3/96)

[1] Five of six device-related 'other' adverse events occurred in the subject described above in Table 1, footnote 1.

[2] Thrombus above the filter (n=1).

[3] Loss of vascular access during filter implant (n=1) and minor bruising at insertion site without hematoma (n=1).

[4] Back pain (n=1), epidermoid cyst at conversion access site (n=1), and soreness at access site post-conversion (n=1).