International Journal of Radiology Research
www.radiologyjournal.in
E-ISSN: 2663-4562
Received: 14-05-2026, Accepted: 14-06-2026, Published: 29-06-2026
Volume 8, Issue 2, 2026, Page No. 45-52

Fluoroscopy-guided retrieval of Inferior Vena Cava filters using a four-loop snare system: A clinical case study

Minocha Dr. Pramod kumar, Kothwala Dr. Devesh kumar, Panzade Akash, Patel Tinkal kumar*, Tiwari Saurabh
Meril Medical Innovations Private Limited, Muktanand Marg, Chala, Vapi, Valsad, Gujarat, India
Corresponding Author: Patel Tinkalkumar
DOI: https://doi.org/10.66856/ijrr.2026.8.2.8020

Abstract

Background: Inferior vena cava (IVC) filter retrieval can be technically challenging in the presence of filter tilt, partial endothelialization, or unfavorable venous anatomy, where conventional single-loop snare techniques may fail to achieve secure engagement.

Methods: This case series describes five patients who underwent elective IVC filter retrieval using the Four-Loop Snare System, a minimally invasive endovascular device designed to enhance capture and control during retrieval. All procedures were performed under fluoroscopic guidance. Snare loop sizes ranging from 20 to 35 mm were selected based on individual anatomical considerations.

Results: Successful retrieval of all five IVC filters was achieved without filter fracture or device-related complications. Mild filter tilt and partial endothelialization were observed in selected cases; however, secure hook engagement and controlled retrieval were consistently achieved. No vascular injury, bleeding, residual thrombus, or adverse clinical events were reported. Both technical and clinical success rates were excellent in terms of main intended use of retrieval.

Conclusion: In this preliminary clinical experience, the Four-Loop Snare System demonstrated safe and effective retrieval of IVC filters. Its enlarged capture area and enhanced procedural control may offer advantages in standard and mildly challenging retrieval scenarios. Larger, prospective studies are warranted to further evaluate its clinical utility.

Keywords: Inferior Vena Cava (IVC) filter retrieval, Endovascular intervention, Snare retrieval device, Case series, Pulmonary embolism prevention, Fluoroscopic guidance, Filter tilt & Minimally invasive retrieval etc

Introduction

Inferior vena cava (IVC) filters are widely utilized in patients at increased risk of venous thromboembolism (VTE), particularly when anticoagulant therapy is contraindicated, poorly tolerated, or ineffective [1-3]. These intravascular devices function by capturing thrombi originating from the lower extremities, thereby preventing embolic migration into the pulmonary circulation and reducing the risk of potentially fatal pulmonary embolism [1, 4, 17].

With the expanding availability and clinical acceptance of optional and retrievable IVC filters, their use has increased substantially, especially in patients with recurrent thrombosis, traumatic injuries, major surgical interventions, or conditions requiring temporary thromboembolic protection [5–7].

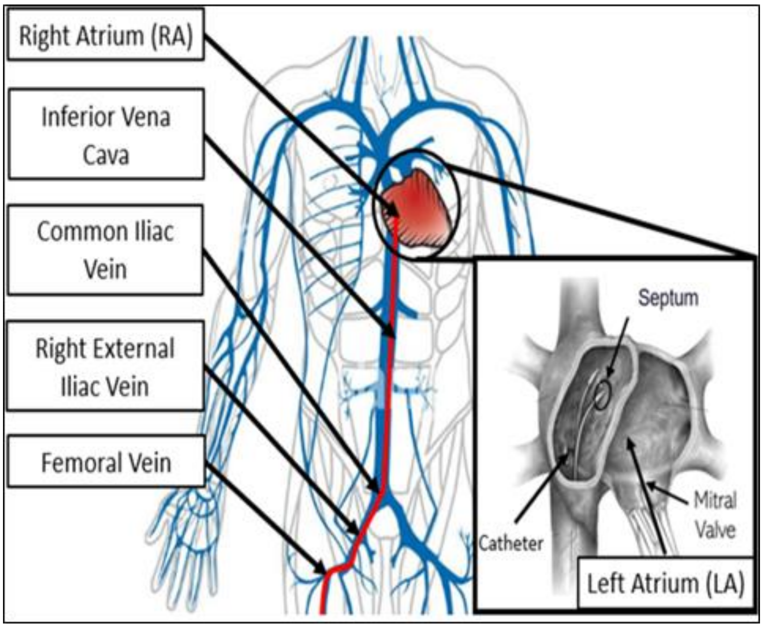


Fig 1: Snare-assisted retrieval of a fragmented intravascular catheter [2]

Despite their clinical benefits, prolonged indwelling of IVC filters has been associated with delayed complications, including filter tilt, migration, endothelialization, penetration of the vena cava wall, fracture, and thrombotic occlusion [6, 8, 10]. Consequently, timely retrieval of retrievable filters is strongly recommended once the risk of pulmonary embolism has resolved in order to minimize long-term morbidity and device-related adverse events [6, 11] [14-16, 18]. Although conventional snare-based retrieval techniques demonstrate high technical success rates with low complication profiles, retrieval may become technically challenging in cases involving embedded filter hooks, significant filter tilt, or thrombus trapped within the filter struts [12, 13, 19]. Under such circumstances, advanced retrieval strategies—such as loop-snare techniques, multi-wire methods, forceps-assisted retrieval, and dedicated retrieval systems may be required to achieve successful filter removal [11-13].

In response to these challenges, innovative snare-based designs, including multi-loop retrieval systems such as the Four-Loop Snare System, have been developed to improve grasping efficiency and procedural control during complex IVC filter retrievals [12]. By increasing the effective capture area around the filter apex, multi-loop configurations may provide superior engagement and stabilization compared with traditional single-loop snares [12, 13]. Successful IVC filter retrieval ultimately depends on appropriate imaging guidance, careful device selection, and operator expertise [9-11]. In routine clinical practice, snare-based retrieval remains the most commonly employed minimally invasive technique, offering favorable safety profiles and reliable clinical outcomes [8-10]. This article discusses key clinical considerations related to IVC filter retrieval and presents representative cases demonstrating safe and effective retrieval using a four-loop snare system.

Material and Methods

The materials used in the design of a snare loop system play a crucial role to determine the device's performance, safety, and long-term durability. The loop material must be biocompatible, must possess sufficient elasticity to compress into the tubular delivery system, and must be able to generate adequate radial and capture force upon deployment to ensure reliable engagement of the filter hook or foreign body.

Metals Used for Loop Construction

Stainless Steel (316L)

316L stainless steel has historically been used because of its combination of elastic strength and corrosion resistance. Early-generation stainless-steel loops were manually loaded into the applicator immediately prior to use, and upon release would reliably return to their pre-set form. While this elasticity and bio-stability were desirable, stainless steel loops demonstrated limited flexibility, making them less suitable for tortuous anatomy. Their rigidity led to the development of alternative materials for advanced snare designs.

Nitinol (Nickel–Titanium Alloy)

Nitinol is now the preferred material for loop-snares. Composed of nearly equal atomic percentages of nickel and titanium, it exhibits two unique and clinically valuable properties:

1. Shape Memory Effect

Nitinol can deform significantly at lower temperatures while remaining in a martensitic phase. When heated above its transformation temperature, it returns to its original austenitic shape.

2. Super elasticity (Pseudo elasticity)

Nitinol can undergo large reversible strains (10–30× more than conventional metals) and instantly recover its original shape when the external force is removed. This makes it ideal for navigating curved or kinked vessels and for repetitive mechanical cycles.

Nitinol loops are manufactured to precise specifications and undergo shape-setting heat treatment, typically annealed at approximately 500 °C, followed by controlled cooling and preloading into the delivery system. As the loops are supplied sterile and ready for use within the applicator, no manual assembly is required, which may reduce the potential risk of contamination and contribute to shorter procedural times.

The high fatigue resistance, ductility, and flexibility of nitinol make it particularly well suited for snare systems intended for use in complex or tortuous vascular anatomy, where repeated deformation and controlled engagement are required.

Components of a Snare Retrieval System

Snare Loop

The snare loop is the primary capturing element of the retrieval system. It is typically fabricated from stainless steel or nitinol and configured in circular, oval, or multi-loop geometries to facilitate secure engagement of an IVC filter hook or intravascular foreign body. The loop's flexibility, radial force, and shape-memory characteristics are critical determinants of capture efficiency and retrieval success, particularly in cases involving filter tilt or endothelialization.

System Wire (Core Wire / Control Wire)

The system wire is a long, flexible metallic wire that connects the snare loop to the proximal handle assembly. It transmits axial (push–pull) and rotational forces from the operator to the distal snare loop, enabling controlled opening, closing, and directional manipulation within the vasculature. Appropriate wire stiffness and torque response are essential for precise loop positioning while maintaining atraumatic navigation through vessels.

Catheter (Snare Catheter / Sheath)

The catheter serves as the delivery conduit through which the snare loop and system wire are advanced to the target site. It provides mechanical support, directional guidance, and stability during deployment and retrieval within the inferior vena cava. Radiopaque markers located near the distal tip facilitate fluoroscopic visualization and accurate positioning during the procedure.

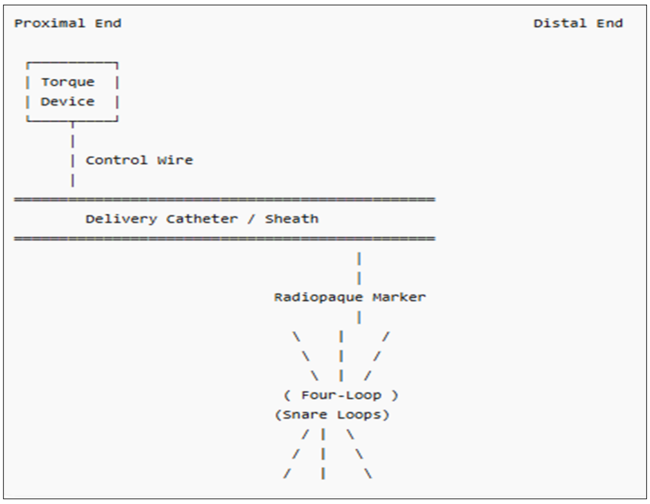
Delivery Tube (Insertion Tube)

The delivery tube is the outermost tubular component that houses the snare loop in a constrained, compressed configuration prior to deployment. It protects the loop during vascular access and advancement while allowing controlled, smooth expansion upon deployment. The design of the delivery tube is intended to minimize friction and ensure atraumatic interaction with the vessel wall during insertion and manipulation.

Torque Device (Handle / Rotational Control Mechanism)
The torque device is attached to the proximal end of the system wire and serves as the primary operator interface. It enables precise rotational control, loop opening and closure, and fine maneuvering of the snare within the vessel lumen. Effective torque transmission is particularly important for engaging tilted, embedded, or eccentrically positioned filter hooks and foreign bodies.

Device Details
The snare retrieval system is an endovascular device engineered for capturing and retrieving inferior vena cava (IVC) filters and intravascular foreign bodies. Its design focuses on flexibility, control, visibility, and atraumatic navigation through the venous system. The system consists of a nitinol or stainless-steel snare loop, a control wire, a guiding catheter, an inserting tube, and a torque control device. Each component plays a critical role in ensuring safe and effective retrieval under fluoroscopic guidance.

Device Specifications – Snare Retrieval System
Part 1: Schematic representation of the Four-Loop Snare Retrieval System and its major components:



The major components of the device are
- Torque Device (Handle)
- Control Wire
- Delivery Catheter
- Delivery Tube
- Radiopaque Marker Band
- Four Nitinol Loops
- Capture Zone
- Distal Tip

Here we also provide the description of all the critical components

Loop Wire Diameter
Typical Diameter Range
0.014″ – 0.035″ (0.36–0.89 mm), depending on snare size

Common Configurations
Small vessel snare: 0.014″–0.018″

Standard IVC / foreign body retrieval: 0.025″–0.035″

Loop Diameter (Expanded): 5 mm, 10 mm, 15 mm, 20 mm, 25 mm, 30 mm, 35 mm & 45 mm options

Material: Nitinol (preferred for super elasticity) or medical-grade stainless steel

Radiopacity Material
Primary Radiopaque Elements: Platinum–iridium or gold marker bands at the distal snare loop

Visibility: Clearly visible under fluoroscopy and digital subtraction angiography (DSA)

Sheath Compatibility
Compatible Introducer Sheath Sizes: 6 Fr, and 7 Fr (depending on snare loop size)

Guiding Catheter Compatibility: Standard angiographic guiding catheters and introducer sheaths

Working Lengths: 150 cm options for femoral or jugular access

Low-Profile Design: Minimizes vascular trauma and facilitates smooth navigation through tortuous venous anatomy.

Deployment Pressure / Torque Response Quantification
Torque Transmission: 1:1 torque response from proximal control handle to distal snare loop

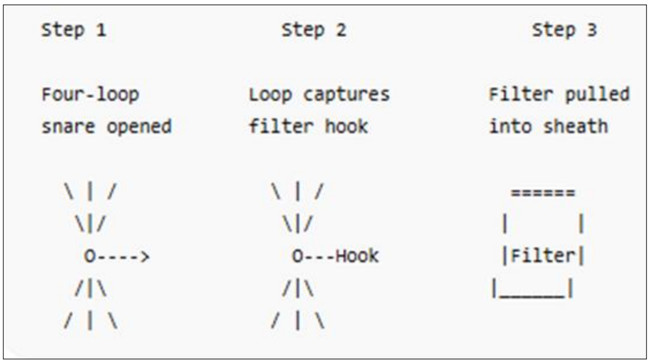
Control Handle: Ergonomic torque device allowing precise rotation and loop manipulation

Sterilization Process
Primary Sterilization Method: Ethylene Oxide (EtO)

Packaging: Single-use, sterile, double-barrier packaging

Shelf Life: Typically, 3–5 years, validated through accelerated aging studies

Part 2: Retrieval Mechanism



Components used for Retrieval
- IVC Filter Hook
- Four-Loop Snare
- Retrieval Sheath
- Direction of Withdrawal

Biocompatibility Standards
Compliance Standard: ISO 10993 series for biological evaluation of medical devices
Key Tests Performed:
ISO 10993-5: Cytotoxicity
ISO 10993-10: Sensitization and irritation
ISO 10993-11: Systemic toxicity
ISO 10993-4: Haemo-compatibility (blood-contacting device)

Material Safety
All patient-contacting materials are non-toxic, non-pyrogenic, and hem compatible

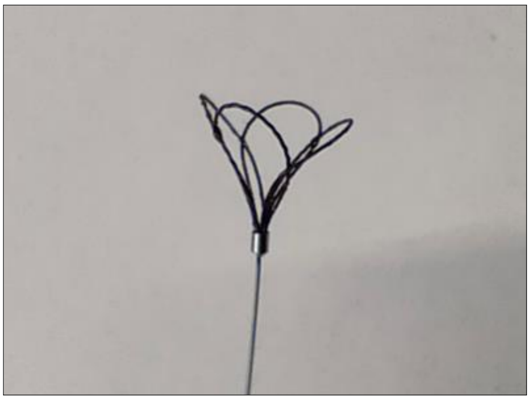


Fig 2: A Four-Loop Snare device Crafted through the manual braiding of nitinol-platinum wires

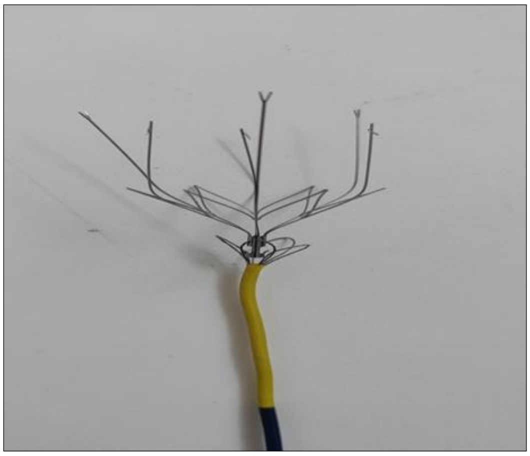


Fig 3: The Snare is on the verge of capturing IVC Filter

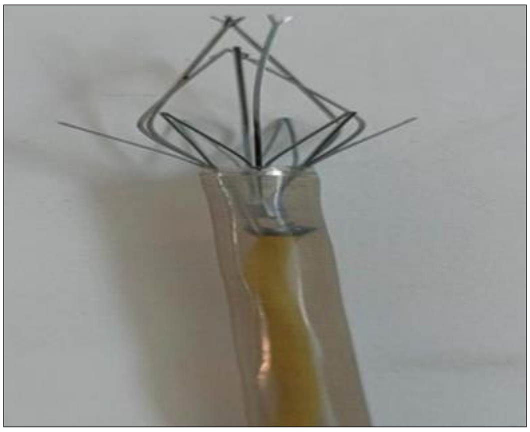


Fig 4: Safely withdrawing the IVC filter through the snare loop into the retrieval sheath

The snare retrieval system is manufactured in multiple loop diameters and catheter configurations to ensure compatibility with diverse anatomical presentations and procedural requirements. The detailed size matrix is presented below.

Table 1: Snare Working Diameter and Catheter Size Reference

Snare Working Diameter	Snare Length (Guide Wire)	Catheter Length	Catheter French Size
4 mm	175 cm	150 cm	3.2 F
8 mm	175 cm	150 cm	3.2 F
10 mm	175 cm	150 cm	6 F
15 mm	175 cm	150 cm	6 F
20 mm	175 cm	150 cm	6 F
30 mm	175 cm	150 cm	7 F
45 mm	175 cm	150 cm	7 F

Advantages of Four-Loop Configuration Over Conventional Single-Loop Snares
Compared with conventional single-loop snares, the Four-Loop Snare System provides a larger effective capture area and multiple engagement pathways around the filter apex. This configuration may reduce the number of catheter manipulations required to engage the retrieval hook, potentially shortening fluoroscopy time and improving procedural efficiency. The multiple loop geometry also distributes capture forces more uniformly around the target structure, which may enhance stability during retrieval and minimize the risk of loop slippage. In situations involving mild filter tilt, eccentric positioning, or partial endothelialization, the expanded capture profile may increase the likelihood of successful engagement when compared with a single-loop design.
The comparison can be summarized in the following table:

Parameter	Conventional Single-Loop Snare	Four-Loop Snare
Capture Area	Limited	Expanded
Hook Engagement	Single capture path	Multiple capture paths
Stability During Retrieval	Moderate	Improved
Performance in Mild Filter Tilt	Moderate	Improved
Fluoroscopic Manipulation	Higher	Potentially Reduced

Clinical Evaluation Methodology
Patient Selection
This clinical assessment included five patients who underwent elective inferior vena cava (IVC) filter retrieval using the Four-Loop Snare System under fluoroscopic guidance. All patients had previously received IVC filters for the management of recurrent venous thromboembolism or due to contraindications to anticoagulant therapy, and filter retrieval was performed after the risk of pulmonary embolism had resolved.

Case 1
A 38-year-old male with a history of recurrent deep vein thrombosis (DVT) despite therapeutic anticoagulation underwent inferior vena cava (IVC) filter placement for pulmonary embolism prophylaxis. Following resolution of the acute thromboembolic risk, elective IVC filter retrieval was planned. Under fluoroscopic guidance, a 30-mm

endovascular snare loop was advanced and successfully engaged with the filter hook, allowing controlled withdrawal of the filter into the retrieval sheath. The device was retrieved intact without evidence of fragmentation, retained thrombus, or vascular injury. The patient tolerated the procedure well and experienced an uneventful post-procedural recovery with no complications.

Fig 5: Elective retrieval of IVC filter from patient-1 using a 30-mm Four-Loop Snare

Case 2

A 30-year-old male with ongoing venous thromboembolism despite adequate anticoagulation underwent prophylactic inferior vena cava (IVC) filter placement. After resolution of the clinical indication for filter protection, elective retrieval was performed under fluoroscopic guidance using a 30-mm snare loop. The filter hook was successfully engaged, and the device was withdrawn intact into the retrieval sheath. No bleeding, vascular injury, procedural pain, or residual thrombus was observed. The patient tolerated the procedure well and demonstrated an excellent clinical outcome without complications.

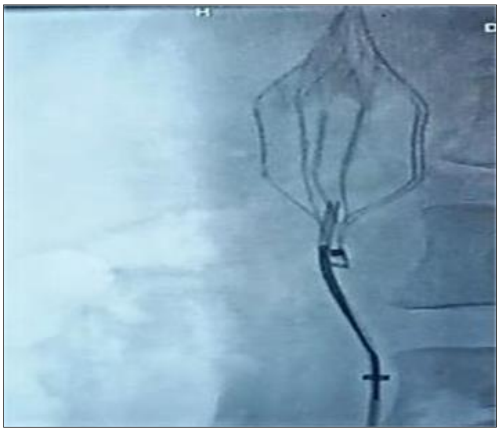


Fig 6: Elective retrieval of IVC filter from patient-2 using a 30-mm Four-Loop Snare

Case 3

A 45-year-old female with venous thrombo-embolism despite adequate anticoagulation underwent placement of a prophylactic inferior vena cava (IVC) filter. Following resolution of the embolic risk, elective filter retrieval was planned. Under fluoroscopic guidance, a 20-mm endovascular snare loop was advanced, successfully engaged with the filter hook, and the device was withdrawn intact into the retrieval sheath. No filter fragmentation, bleeding, vascular injury, or residual thrombus was observed. The procedure was well tolerated, and the patient experienced an uneventful recovery.

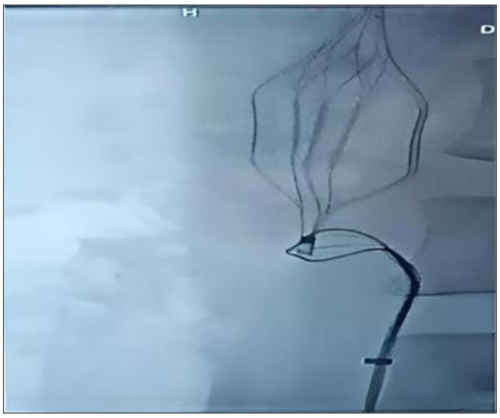


Fig 7: Elective retrieval of IVC filter from patient-3 using a 20-mm Four-Loop Snare

Case 4

A 52-year-old male with venous thromboembolism despite adequate anticoagulation underwent placement of a prophylactic inferior vena cava (IVC) filter. Following a reduction in the risk of pulmonary embolism, elective filter retrieval was performed. Under fluoroscopic guidance, a 35-mm endovascular snare loop was used to securely engage the filter hook, enabling intact withdrawal of the device into the retrieval sheath. No bleeding, vascular injury, residual thrombus, or post-procedural pain was observed. The patient tolerated the procedure well and experienced an uneventful recovery.

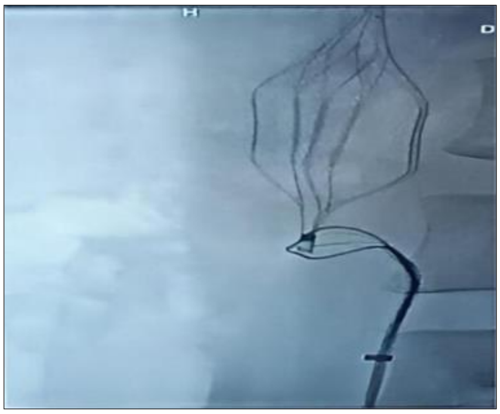


Fig 8: Elective retrieval of IVC filter from patient-4 using a 35-mm Four-Loop Snare

Case 5

A 42-year-old male with venous thromboembolism despite adequate anticoagulation underwent placement of a prophylactic inferior vena cava (IVC) filter. After the risk of pulmonary embolism had decreased, elective filter retrieval was performed. Under fluoroscopic guidance, a 30-mm endovascular snare loop was used to securely engage the filter hook, enabling intact withdrawal of the device into the retrieval sheath. No bleeding, vascular injury, residual thrombus, or post-procedural pain was observed. The patient tolerated the procedure well and experienced an uncomplicated recovery.

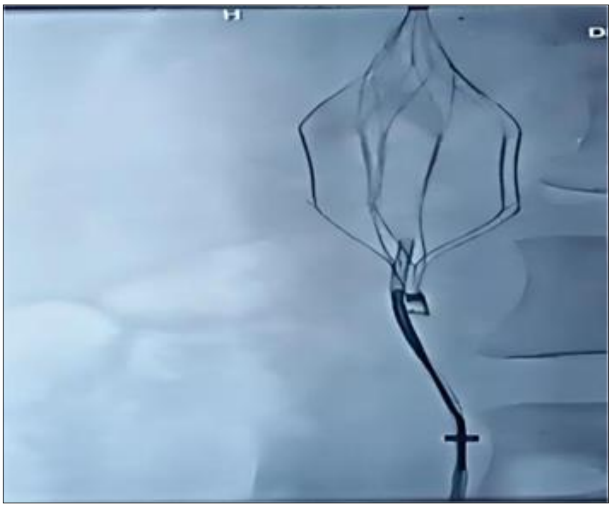


Fig 9: Elective retrieval of IVC filter from patient-5 using a 30-mm Four-Loop Snare

Result

Table 2: Case-wise Clinical Description for Elective Retrieval of an IVC Filter Using Four-Loop Snare System

Cases	Age / Sex	Clinical Indication	Snare Loop Size	Procedural Description	Outcome
Case-1	38 / M	Recurrent DVT despite anticoagulation	30 mm	Elective retrieval after resolution of PE risk. Under fluoroscopic guidance, the snare loop securely engaged the filter hook and enabled intact withdrawal into the sheath without fragmentation or vascular injury.	Successful retrieval; no complications
Case-2	30 / M	Persistent VTE despite adequate anticoagulation	30 mm	Preventive IVC filter retrieved electively. The filter hook was captured using a 30-mm snare loop and removed intact without bleeding, pain, or residual thrombus.	Successful retrieval; uncomplicated recovery
Case-3	45 / F	VTE refractory to anticoagulation	20 mm	Following reduction in embolic risk, retrieval was performed using a 20-mm snare loop. The filter hook was successfully engaged and withdrawn smoothly into the sheath without vessel trauma.	Successful retrieval; uneventful recovery
Case-4	52 / M	Venous thrombosis despite anticoagulation	35 mm	A 35-mm snare loop was used to firmly engage the filter hook, allowing intact removal under fluoroscopic guidance. No bleeding, vascular injury, or post-procedural pain was observed.	Successful retrieval; no adverse events
Case-5	42 / M	VTE despite adequate anticoagulation	30 mm	Elective retrieval after reduction of PE risk. Under fluoroscopic guidance, the 30-mm snare loop securely engaged the filter hook and enabled intact withdrawal into the sheath without bleeding, vascular injury, or residual thrombus.	Successful retrieval; uncomplicated recovery

This study included five patients (four males and one female) aged 30 to 52 years who had previously undergone placement of a temporary inferior vena cava (IVC) filter for the prevention of pulmonary embolism. Elective retrieval of the IVC filter was planned once the clinical indication had resolved and anticoagulation therapy was optimized. Individual patient demographics, procedural details, and outcomes are summarized in Table 2.

IVC filter retrieval was successfully performed in all five patients using the Four-Loop Snare System. Snare loop diameters of 20 mm, 30 mm, and 35 mm were selected based on inferior vena cava anatomy and filter orientation, as detailed in Table 2. All procedures were performed under fluoroscopic guidance using standard venous access. In each case, the filter hook was securely engaged, and the filter was withdrawn smoothly into the retrieval sheath without the need for adjunctive retrieval techniques or alternative devices.

All IVC filters were removed intact, with no evidence of deformation or fragmentation. Mild filter tilt and early endothelialization were observed in selected cases; however, these findings did not interfere with successful retrieval, as reflected in the procedural outcomes summarized in Table 2. No procedural or post-procedural complications were observed, including bleeding, vascular injury, residual thrombus, or filter embolization. All patients experienced an uncomplicated recovery and required no additional intervention.

Overall, the Four-Loop Snare System demonstrated consistent and reliable performance across all cases. Its enlarged capture area and multi-loop configuration facilitated effective filter hook engagement, including in cases with mild filter tilt, enabling controlled and a traumatic retrieval of the IVC filters.

Discussion

The findings of this case series suggest that the Four-Loop Snare System is a safe and effective option for the retrieval of inferior vena cava (IVC) filters in standard and mildly challenging clinical scenarios. Successful and intact filter retrieval was achieved in all five cases without procedure-related complications, including vascular injury, bleeding, filter fragmentation, or residual thrombus. These outcomes support the reliability of a multi-loop snare configuration for routine clinical use.

Selection of appropriate snare loop size appeared to play an important role in procedural success. Loop diameters of 20 mm, 30 mm, and 35 mm provided an effective balance between flexibility and radial force, enabling secure engagement of the filter apex, even in cases with mild filter tilt or early endothelialization. Larger loop diameters increased the effective capture area, facilitating hook engagement and controlled filter withdrawal. These observations are consistent with previously reported data indicating that multi-loop snare designs may improve retrieval efficiency and stability compared with conventional single-loop devices.

The Four-Loop Snare System also demonstrated favorable handling characteristics and operator control. The nitinol construction of the snare loops offers superelasticity and shape-memory properties, allowing the device to conform to the anatomy of the inferior vena cava while maintaining structural integrity during repeated manipulation. This feature may be particularly advantageous in the presence of minor caval angulation or anatomical variation. The absence of complications in this series further supports the safety profile of the device when used under fluoroscopic guidance.

Timely retrieval of retrievable IVC filters remains critical to reducing the risk of long-term complications such as migration, penetration, thrombosis, and fracture. The present findings reinforce that, in patients without severe filter tilt or significant embedment, snare-based retrieval using a multi-loop configuration can be performed safely and effectively as a first-line approach.

This study is limited by its small sample size and retrospective, single-center design. Nevertheless, it provides preliminary clinical evidence supporting the use of the Four-Loop Snare System for standard and mildly complex IVC filter retrievals. Future studies involving larger patient cohorts and more challenging retrieval scenarios—including filters with prolonged dwell times, significant tilt, or embedded hooks—are ongoing to further define the clinical utility and safety of this device.

Conclusion

The Four-Loop Snare System demonstrated safe and effective performance for the retrieval of inferior vena cava (IVC) filters in standard clinical scenarios, achieving excellent technical and clinical success without procedure-related complications in this case series. Snare loop diameters of 20 mm, 30 mm, and 35 mm provided adequate capture area, consistent filter hook engagement, and controlled device manipulation during sheath-assisted retrieval.

Use of the Four-Loop Snare System may facilitate timely elective IVC filter removal, thereby reducing the risk of long-term complications associated with prolonged filter dwell time. The multi-loop configuration offers enhanced capture efficiency and procedural control compared with conventional single-loop snares, particularly in cases with mild filter tilt or early endothelialization.

Although limited by a small sample size, these findings provide preliminary clinical evidence supporting the Four-Loop Snare System as a reliable first-line retrieval device. Further prospective studies with larger patient populations and more complex retrieval conditions are ongoing to confirm its clinical utility and to refine loop size selection across varying anatomical and pathological presentations.

Conflict of Interest

All the authors are an employee of Meril Medical Innovations Private Limited, Vapi, Gujarat – India and declare no competing interests related to this study.

References

1. Minocha P, Kothwala DM, Solanki HR, Divakar SR. *In Vitro* Assessment: “A Study on the Performance of a Developed Four Loop Snare System in Retrieving Inferior Vena Cava Filters.” International Journal of Scientific Research Publications, 2023, 13(12). https://doi.org/10.29322/IJSRP.13.12.2023.p14435
2. Zhang X, Sridhar A, Ha XT, *et al*. Path tracking control of a steerable catheter in transcatheter cardiology interventions. International Journal of Computer Assisted Radiology and Surgery,2024:19:757-766. https://doi.org/10.1007/s11548-024-03069-3
3. Nuffer Z, Ramis P, Rohren EM, Horn G. Variability in Inferior Vena Cava (IVC) Filter Retrieval Rates and Adherence to Guidelines: A Multi-Center Retrospective Analysis. Journal of Clinical Medicine,2025:14(12):4034. https://doi.org/10.3390/jcm14124034
4. Schuchardt P, Kis L, Goloubev A, *et al*. Safety and efficacy of inferior vena cava filter retrieval: a 5-year single center retrospective review from a tertiary care center. CVIR Endovascular,2022:5:39. https://doi.org/10.1186/s42155-022-00316-z
5. Kethidi N, Barsoum K, Shukla PA, Kumar A. Inferior vena cava filter retrievals using advanced techniques: a systematic review. Diagnostic and Interventional Radiology,2023:29(3):500-508. doi:10.4274/dir.2022.22908
6. Wassef A, Lim W, Wu C. Indications, complications and outcomes of inferior vena cava filters: A retrospective study. Thrombosis Research,2017:153:123-128. https://doi.org/10.1016/j.thromres.2017.02.013
7. Wang SL, Siddiqui A, Rosenthal E. Long-term complications of inferior vena cava filters. Journal of Vascular Surgery: Venous and Lymphatic Disorders,2017:5(1):33-41. https://doi.org/10.1016/j.jvsv.2016.07.002
8. Complex Inferior Vena Cava Filter Retrievals: Success Rate and Predictors of Adverse Events at a Large Specialized Referral Center. American Journal of Roentgenology,2023:220(3):389-397. https://pubmed.ncbi.nlm.nih.gov/36169541/
9. Complications Associated with Inferior Vena Cava Filter Retrieval: A Systematic Review. Cureus, 2024, 16(2). https://pubmed.ncbi.nlm.nih.gov/38550500/
10. Benedetti R, *et al*. Inferior Vena Cava Filters: A Clinical Review and Future Perspectives. Journal of Clinical Medicine, 2024, 13(6). https://www.mdpi.com/2077-0383/13/6/1761
11. Ip S, *et al*. Predictors of Inferior Vena Cava Filter Retrieval in a Large Cohort, 2025. https://pubmed.ncbi.nlm.nih.gov/40581334/

12. Kethidi N, Barsoum K, Shukla PA, Kumar A. Inferior vena cava filter retrievals using advanced techniques: a systematic review. Diagnostic and Interventional Radiology,2023:29(3):500-508. https://doi.org/10.4274/dir.2022.22908
13. Chick JFB, Stavropoulos SW, Shin BJ, *et al*. Contemporary techniques for difficult inferior vena cava filter retrieval. Radiographics,2016:36(6):1896-1910. https://pubmed.ncbi.nlm.nih.gov/27815107/
14. Sutphin PD, Reis SP, McKune A, *et al*. Improving inferior vena cava filter retrieval rates with a structured follow-up program. Journal of Vascular and Interventional Radiology,2015:26(4):491-498. https://pubmed.ncbi.nlm.nih.gov/25636673/
15. Bajda J, Park AN, Raj A, Raj R, Gorantla VR. Inferior Vena Cava Filters and Complications: A Systematic Review. Cureus,2023:15(6):40038. https://doi.org/10.7759/cureus.40038
16. Rodriguez AK, Goel A, Gorantla VR. Complications Associated with Inferior Vena Cava Filter Retrieval: A Systematic Review. Cureus,2024:16(2):55052. https://doi.org/10.7759/cureus.55052
17. Ivanics T, Williams P, Nasser H, Leonard-Murali S, Schwartz S, Lin JC. Contemporary management of chronic indwelling inferior vena cava filters. Journal of Vascular Surgery: Venous and Lymphatic Disorders,2021:9(1):163-169. https://doi.org/10.1016/j.jvsv.2020.06.017
18. Kaufman JA, Barnes GD, Chaer RA, Cuschieri J, Eberhardt RT, Johnson MS, *et al*. 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. Journal of Vascular and Interventional Radiology,2020:31(10):1529-1544. https://doi.org/10.1016/j.jvir.2020.06.014
19. Bikdeli B, Chatterjee S, Desai NR, Kirtane AJ, Desai MM, Bracken MB, *et al*. Inferior Vena Cava Filters to Prevent Pulmonary Embolism: Systematic Review and Meta-Analysis. Journal of the American College of Cardiology,2017:70(13):1587-1597. https://doi.org/10.1016/j.jacc.2017.07.775