**Name of Journal:** *World Journal of Clinical Cases*

**Manuscript NO:** 68187

**Manuscript Type:** CASE REPORT

**Successful management of infected right iliac pseudoaneurysm caused by penetration of migrated inferior vena cava filter: A case report**

Weng CX *et al*. Infected pseudoaneurysm cause by IVCF

Cheng-Xin Weng, Shu-Min Wang, Tie-Hao Wang, Ji-Chun Zhao, Ding Yuan

**Cheng-Xin Weng, Shu-Min Wang, Tie-Hao Wang, Ji-Chun Zhao, Ding Yuan,** Department of Vascular Surgery, West China Hospital of Sichuan University, Chengdu 610041, Sichuan Province, China

**Author contributions:** Weng CX, Wang TH, Zhao JC and Yuan D performed the surgery; Weng CX, Wang TH and Wang SM collected the information and followed the patient; Wang TH and Yuan D revised the paper; all authors read and approved the final manuscript.

**Supported by** the Sichuan Foundation of Science and Technology, No. 2020YFS0247.

**Corresponding author: Ji-Chun Zhao, MD, PhD, Doctor, Surgeon,** Department of Vascular Surgery, West China Hospital of Sichuan University, No. 37 Guoxue Lane, Wuhou District, Chengdu 610041, Sichuan Province, China. zhaojichundoc@163.com

**Received:** May 14, 2021

**Revised:** July 17, 2021

**Accepted:** August 30, 2021

**Published online:** October 26, 2021

**Abstract**

BACKGROUND

Indwelling inferior vena cava (IVC) filters might cause various complications, including filter penetration, filter fracture, filter migration, and thrombosis of the IVC. Penetration and migration complications are common, while a caudal migrated double-basket filter with associated infected iliac pseudoaneurysm has seldom been reported.

CASE SUMMARY

We report a 64-year-old female admitted for sudden onset of severe right abdominal pain after IVC filter placement for 3 mo. The patient had a history of failed endovascular IVC filter retrieval. Computed tomography showed that the retrieval hook of the filter penetrated the right common iliac artery and vein, leading to right iliac artery pseudoaneurysm accompanied by right ureteral obstruction with ipsilateral hydronephrosis, and bilateral iliac veins were occluded. Emergency open repair was performed to remove the IVC filter, the right iliac pseudoaneurysm, and the compromised segments of the iliac veins and IVC with right common iliac artery reconstruction. *Staphylococcus aureus* was isolated from the tissue culture. The patient was discharged on postoperative day 12 with anticoagulation therapy and antibiotic therapy after discharge. Six-month follow-up computed tomography revealed that the right common iliac artery was patent, and only mild hydronephrosis was detected.

CONCLUSION

An indwelling IVC filter, even ‘embedded’ within organized thrombus, could still cause life-threatening complications. Open procedures remain the last resort for IVC filters with severe complications.

**Key Words:** Inferior vena cava filter; Infected pseudoaneurysm; Hydronephrosis; Filter migration; Open repair; Antibiotic therapy; Case report

**©The** **Author(s) 2021.** Published by Baishideng Publishing Group Inc. All rights reserved.

**Citation:** Weng CX, Wang SM, Wang TH, Zhao JC, Yuan D. Successful management of infected right iliac pseudoaneurysm caused by penetration of migrated inferior vena cava filter: A case report. *World J Clin Cases* 2021; 9(30): 9211-9217

**URL:** https://www.wjgnet.com/2307-8960/full/v9/i30/9211.htm

**DOI:** https://dx.doi.org/10.12998/wjcc.v9.i30.9211

**Core Tip:** Few cases are reported about symptomatic penetration caused by double-basket indwelling inferior vena cava (IVC) filter. Herein, we report an unusual case of infected iliac pseudoaneurysm caused by penetration of an indwelling caudal migrated double-basket IVC filter. After open repair and antibiotic therapy, the patient had a good result at 6-mo follow up. This case demonstrated that an indwelling IVC filter in iliocaval confluence, even ‘embedded’ within organized thrombus, could still cause life-threatening complications, and a more aggressive strategy might be necessary for this situation. Open procedures remain the effective treatment for indwelling IVC filters with severe complications.

**INTRODUCTION**

Caval interruption *via* inferior vena cava (IVC) filter for the prevention of fatal pulmonary embolization was acceptable in selected patients with venous thromboembolism concomitant with contraindication to anticoagulation or failed anticoagulation therapy. According to the Society of Interventional Radiology, routine removal of retrievable IVC filter was recommended once the risk of pulmonary embolization was mitigated because indwelling IVC filters might cause various complications, including filter penetration, filter fracture, filter migration, and thrombosis of the IVC. Penetration complications were widely reported in previous studies, with a reported rate of 0%–40%[1], and the clinical manifestations varied considerably. Symptomatic penetrations of the surrounding structures were reported in some previous studies, which were relatively more common in conical IVC filters[2]. Most IVC filters could be retrieved *via* endovascular approaches, while open surgery was the last resort when endovascular approaches failed or were inappropriate in patients with severe complications caused by IVC filters[3]. The present study reports an unusual case of infected right iliac pseudoaneurysm with hydronephrosis caused by penetration of indwelling caudally migrated double-basket IVC filter (a type of non-conical filter) that was successfully treated *via* open procedure and antibiotic therapy.

**CASE PRESENTATION**

***Chief complaints***

A 64-year-old female with IVC filter placement 3 mo ago was presented to our institution with severe right abdominal pain for 1 d.

***History of present illness***

The patient was admitted to a local hospital for deep venous thrombosis of the left lower extremity 3 mo ago. A double-basket retrievable IVC filter (Visee WXF-32, Shandong Visee Medical Devices Company Limited, China) was placed in infrarenal IVC through the right femoral vein, and anticoagulation therapy was applied. Endovascular retrieval of the IVC filter through the femoral vein approach with standard technique failed 10 d later in the local hospital. Imaging follow-up ceased due to the COVID-19 pandemic.

The patient presented to our institution 3 mo later with severe right abdominal pain for 1 d. The patient had no fever or chills. She denied melena, but her urine was reddish.

***History of past illness***

The patient had history of scoliosis and poorly controlled diabetes mellitus.

***Personal and family history***

The patient was addicted to smoking and alcohol.

***Physical examination***

After admission, the patient had a heart rate of 97 bpm, a respiratory rate of 23 breaths per minute, and a blood pressure of 126/73 mmHg. Physical examination revealed diffused abdominal tenderness and rebound tenderness. The right lower limb was slightly swollen, and the pulse in the right femoral artery was weak.

***Laboratory examinations***

Laboratory tests showed no hepatic or kidney dysfunction, with hemoglobin of 101 g/L, leukocyte count of 14.74 × 109/L, and neutrophilic granulocyte percentage of 91.0%. During the surgery, partial pseudoaneurysm was extracted for tissue culture. *Staphylococcus aureus* was isolated from the tissue culture, which was sensitive to moxifloxacin.

***Imaging examinations***

Computed tomography angiography showed that the retrieval hook of the filter penetrated the right common iliac artery (CIA), leading to a 52 mm × 48 mm × 55 mm right iliac artery pseudoaneurysm, accompanied by right ureteral obstruction with ipsilateral hydronephrosis (Figure 1A and B). Bilateral iliac veins and lower part of the IVC were completely occluded, with substantial pelvic varicosities (Figure 1C).

**FINAL DIAGNOSIS**

The final diagnosis of the presented case was *Staphylococcus aureus* infected right iliac pseudoaneurysm and hydronephrosis caused by penetration of the migrated IVC filter.

**TREATMENT**

Considering right iliac artery pseudoaneurysm caused by the IVC filter and occlusion of bilateral iliac vein, an emergency open repair was conducted immediately. A midline transperitoneal approach was performed under general anesthesia. A pseudoaneurysm with abscess was found in the pelvic cavity, without intestinal perforation (Figure 2A). The right CIA, internal iliac artery, and external iliac artery were controlled after heparinization. Subsequently, the pseudoaneurysm associated with the surrounding infected tissues were debrided. The crevasse was located at the distal part of the right CIA, and right ureteral obstruction was found (Figure 2B). The IVC and bilateral common iliac veins were completely obstructed by the organized thrombus (Figure 2C). Then, the IVC filter was completely removed (Figure 2D). After that, the right CIA was revascularized through a directed *in situ* anastomosis, and then right ureterolysis was performed. The right dorsal pedal arterial pulses were palpable without any sign of limb ischemia, and the swollenness of the right lower limbs did not aggravate after surgery. Postoperative pathology indicated a large amount of inflammatory cell infiltration and necrosis in the wall of the pseudoaneurysm and the organized thrombus in the IVC (Figure 3A). Antibiotic therapy with ceftriaxone was initiated before operation considering the signs of peritonitis. Moxifloxacin was used after the results of culture and sensitivity test were available.

**OUTCOME AND FOLLOW-UP**

The patient recovered uneventfully postoperatively. The bilateral dorsal pedal arterial pulses were palpable, and the swollenness of the right lower limbs was alleviated. The bacterial culture of peritoneal drain was negative on postoperative day 7. Computed tomography urography and single-photon emission computed tomography renal radionuclide imaging revealed that the right urinary tract was incompletely obstructed, while the bilateral renal function was normal. The patient was discharged on postoperative day 12. She received anticoagulation therapy with 20 mg rivaroxaban *quaque die* and a total of 6 wk antibiotic therapy with 0.4 g moxifloxacin *quaque die* after discharge.

Six-month follow-up showed the patient recovered well without abdominal pains or claudication, and the edema in the right lower limb improved. Laboratory tests showed no signs of infection with normal levels of procalcitonin. Computed tomography angiography revealed that the right external iliac artery and internal iliac artery were patent, and only mild hydronephrosis was detected (Figures 3B and C).

**DISCUSSION**

Current evidence suggested a high prevalence of IVC penetration in the long-term follow-up of IVC filter, reaching approximately 15%-70%[4]. However, IVC penetrations tend to be asymptomatic in most situations, with a reported rate of 0.4%-8.0% for symptomatic penetration[3,4]. Moreover, few cases in the literature reported symptomatic penetration caused by double-basket IVC filter (a type of non-conical filter). In a systematic review involving 70 longitudinal studies of different types of IVC filter, the caval penetration rate was 5.5% for non-conical IVC filters, but no penetration was detected in double-basket filters, including TrapEase and OptEase filters, similar to the case of the present study[3]. The high risk of fracture in double-basket filters might have contributed to the penetrated complications according to a previous study[4]. However, the filter remained intact in our case, and the penetration was believed to be associated with caudal migration of the IVC filter, which was rather rare in clinical practice, as it was against the direction of blood flow.

To the knowledge of the authors, five cases with caudal migration of the IVC filter have been reported previously[5,6] and only one with double-basket filter, which was thought to be associated with venous thrombectomy using Fogarty embolectomy catheter without fluoroscopy monitoring. A caudal migrated double-basket filter with associated infected iliac pseudoaneurysm has seldom been reported previously. Considering the surgical history of previously failed endovascular retrieval and that no risk factors of filter migration was detected[5,6], the reason for the caudal migration in our case might be iatrogenic, which could result in an abnormal filter position.

Infected pseudoaneurysm was another relatively rare but intractable complication of IVC filter[7]. In our case, *Staphylococcus aureus*, which is a Gram-positive coccus, was isolated from resected pseudoaneurysm, and massive inflammatory cell infiltration was found in the tissues of the pseudoaneurysm and thrombus in IVC. The findings of tissue culture and pathology examination suggested that the IVC filter might be a potential source of infection. Besides, because the patient had right ureteral obstruction with ipsilateral hydronephrosis caused by pseudoaneurysm, this infection might originate from the urinary tract.

We hypothesize that the caudal migration resulted in abutting of the retrieval hook in the wall of CIV that induced a persistent inflammatory response, and then vascular damage was presented. The filter-associated chronic iliocaval thrombosis somehow ‘fixed’ the IVC filter in the abnormal position with the retrieval hook against the pulsating right iliac artery resulting in the pseudoaneurysm formation. The right iliac pseudoaneurysm, which occurred with the compression of the right urinary tract, caused ipsilateral hydronephrosis. In addition, the concurrent infection made it more intractable.

According to current guidelines, indwelling retrievable IVC filters should be routinely removed in patients with mitigated pulmonary embolization risk[8,9]. However, the general IVC filter retrieval rates remained low. Thus, the decision for filter placement should be cautiously considered.

For filters unable to be retrieved *via* standard techniques, advanced endovascular techniques were recommended, with high success and low procedure-associated complication rates[9]. In addition, open retrieval was suggested in certain scenarios, including cardiac or pulmonary migration, pseudoaneurysm, and persistent symptoms after failed endovascular retrievals[8,10]. As the migrated IVC filter caused infected pseudoaneurysm with ureteral obstruction and chronic iliocaval thrombosis, an emergency open procedure was appropriate in our case. Debridement of the compromised segment of vessels and hematoma in combination with *in situ* revascularization was applied to the infected pseudoaneurysm, and the compression symptoms were relieved, which was difficult to achieve *via* endovascular approaches.

Antibiotic therapy is another important part of infected aneurysm treatment. As for the duration, the optimal length of antibiotic therapy for infected pseudoaneurysm was controversial and should be individualized, but antibiotic therapy for at least 6 wk to 6 mo postoperatively may be considered according to current consensus[11,12]. In our case, the choice of moxifloxacin was based on the results of culture and sensitivity tests of the resected pseudoaneurysm, which was an effective and relatively safe option for the treatment of patients with intra-abdominal infections. The infected tissue was debrided with no prosthetic material used, and the bacterial culture of peritoneal drain turned negative on postoperative day 7 and day 9. After a 6-wk antibiotic therapy, the patient had no fever, and the laboratory tests indicated normal levels of procalcitonin and leukocyte count, thus, the antibiotic therapy ceased.

The current study indicated that asymptomatic patients with failed endovascular IVC filter retrieval do not require open surgical filter removal the majority of the time, even in the presence of significant filter penetration[13], and the filter-associated thrombus was the major cause of filter retrieval failure[14]. But there is no reliable way to evaluate whether a filter in the iliocaval confluence, even within chronic thrombosis, would result in symptomatic filter penetration. Thus, the decision to leave the filter “permanent” should not be applied lightly, as permanent filters are not permanently harmless for patients.

**CONCLUSION**

This case demonstrated that an indwelling IVC filter in iliocaval confluence, even ‘embedded’ within organized thrombus, could still cause life-threatening complications, and an improper filter retrieval procedure might be the trigger of all problems. Patients with indwelling IVC filters should undergo regular follow-up, and a more aggressive strategy might be necessary for those patients with filters in an abnormal position to reduce the risk of long-term filter-associated complications. Open procedures remain the effective treatment for indwelling IVC filter with severe complications.

**REFERENCES**

1 **Caplin DM**, Nikolic B, Kalva SP, Ganguli S, Saad WE, Zuckerman DA; Society of Interventional Radiology Standards of Practice Committee. Quality improvement guidelines for the performance of inferior vena cava filter placement for the prevention of pulmonary embolism. *J Vasc Interv Radiol* 2011; **22**: 1499-1506 [PMID: 21890380 DOI: 10.1016/j.jvir.2011.07.012]

2 **Marron RM**, Rali P, Hountras P, Bull TM. Inferior Vena Cava Filters: Past, Present, and Future. *Chest* 2020; **158**: 2579-2589 [PMID: 32795479 DOI: 10.1016/j.chest.2020.08.002]

3 **Jia Z**, Wu A, Tam M, Spain J, McKinney JM, Wang W. Caval Penetration by Inferior Vena Cava Filters: A Systematic Literature Review of Clinical Significance and Management. *Circulation* 2015; **132**: 944-952 [PMID: 26169756 DOI: 10.1161/CIRCULATIONAHA.115.016468]

4 **Ayad MT**, Gillespie DL. Long-term complications of inferior vena cava filters. *J Vasc Surg Venous Lymphat Disord* 2019; **7**: 139-144 [PMID: 30126794 DOI: 10.1016/j.jvsv.2018.01.022]

5 **Chen L**, Zhang J, Yang Z. Inferior Vena Cava Filter Migration to the Left Internal Iliac Vein. *Ann Vasc Surg* 2020; **65**: 289.e13-289.e16 [PMID: 31863954 DOI: 10.1016/j.avsg.2019.12.012]

6 **Bélénotti P,** Sarlon-Bartoli G, Bartoli MA, Benyamine A, Thevenin B, Muller C, Serratrice J, Magnan PE, Weiller PJ. Vena cava filter migration: An unappreciated complication. about four cases and review of the literature. *Ann Vasc Surg* 2011; **25**: 1141.e9-1141.e14 [DOI: 10.1016/j.avsg.2011.03.016]

7 **Assifi MM**, Bagameri G, Dimuzio PJ, Eisenberg JA. Management of infected caval filter with simultaneous aortic pseudoaneurysm and retroperitoneal perforation: a case report and literature review. *Vascular* 2012; **20**: 225-228 [PMID: 22688925 DOI: 10.1258/vasc.2011.cr0310]

8 **Expert Panel on Interventional Radiology:.**, Minocha J, Smith AM, Kapoor BS, Fidelman N, Cain TR, Caplin DM, Eldrup-Jorgensen J, Farsad K, Gupta A, Lee MH, McBride JJ, Moores LK, Rochon PJ, Lorenz JM. ACR Appropriateness Criteria® Radiologic Management of Venous Thromboembolism-Inferior Vena Cava Filters. *J Am Coll Radiol* 2019; **16**: S214-S226 [PMID: 31054748 DOI: 10.1016/j.jacr.2019.02.010]

9 **Kaufman JA**, Barnes GD, Chaer RA, Cuschieri J, Eberhardt RT, Johnson MS, Kuo WT, Murin S, Patel S, Rajasekhar A, Weinberg I, Gillespie DL. 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. *J Vasc Interv Radiol* 2020; **31**: 1529-1544 [PMID: 32919823 DOI: 10.1016/j.jvir.2020.06.014]

10 **Charlton-Ouw KM**, Afaq S, Leake SS, Sandhu HK, Sola CN, Saqib NU, Azizzadeh A, Safi HJ. Indications and Outcomes of Open Inferior Vena Cava Filter Removal. *Ann Vasc Surg* 2018; **46**: 205.e5-205.e11 [PMID: 28602896 DOI: 10.1016/j.avsg.2017.05.038]

11 **Chakfé N**, Diener H, Lejay A, Assadian O, Berard X, Caillon J, Fourneau I, Glaudemans AWJM, Koncar I, Lindholt J, Melissano G, Saleem BR, Senneville E, Slart RHJA, Szeberin Z, Venermo M, Vermassen F, Wyss TR, Esvs Guidelines Committee, de Borst GJ, Bastos Gonçalves F, Kakkos SK, Kolh P, Tulamo R, Vega de Ceniga M, Document Reviewers, von Allmen RS, van den Berg JC, Debus ES, Koelemay MJW, Linares-Palomino JP, Moneta GL, Ricco JB, Wanhainen A. Editor's Choice - European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections. *Eur J Vasc Endovasc Surg* 2020; **59**: 339-384 [PMID: 32035742 DOI: 10.1016/j.ejvs.2019.10.016]

12 **Wilson WR,** Bower TC, Creager MA, Amin-Hanjani S, O’Gara PT, Lockhart PB, Darouiche RO, Ramlawi B, Derdeyn CP, Bolger AF, Levison ME, Taubert KA, Baltimore RS, Baddour LM. Vascular Graft Infections, Mycotic Aneurysms, and Endovascular Infections: A Scientific Statement from the American Heart Association. 2016 [DOI: 10.1161/CIR.0000000000000457]

13 **Pratt WB**, Sandhu HK, Leake SS, Jamshidy I, Sola CN, Afifi RO, Safi HJ, Charlton-Ouw KM. Asymptomatic patients with unsuccessful percutaneous inferior vena cava filter retrieval rarely develop complications despite strut penetrations through the caval wall. *J Vasc Surg Venous Lymphat Disord* 2020; **8**: 54-61 [PMID: 31231059 DOI: 10.1016/j.jvsv.2019.03.017]

14 **Jia Z**, Fuller TA, McKinney JM, Paz-Fumagalli R, Frey GT, Sella DM, Van Ha T, Wang W. Utility of Retrievable Inferior Vena Cava Filters: A Systematic Literature Review and Analysis of the Reasons for Nonretrieval of Filters with Temporary Indications. *Cardiovasc Intervent Radiol* 2018; **41**: 675-682 [PMID: 29359241 DOI: 10.1007/s00270-018-1880-9]

**Footnotes**

**Informed consent statement:** All study participants, or their legal guardian, provided informed written consent prior to study enrollment.

**Conflict-of-interest statement:** Authors certify that there is no conflict of interest related to the manuscript.

**CARE Checklist (2016) statement:** The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

**Open-Access:** This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/Licenses/by-nc/4.0/

**Manuscript source:** Unsolicited manuscript

**Peer-review started:** May 14, 2021

**First decision:** July 6, 2021

**Article in press:** August 30, 2021

**Specialty type:** Medicine, research and experimental

**Country/Territory of origin:** China

**Peer-review report’s scientific quality classification**

Grade A (Excellent): 0

Grade B (Very good): B

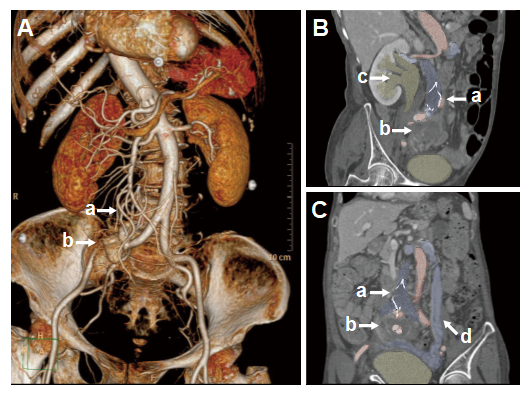
Grade C (Good): C

Grade D (Fair): D

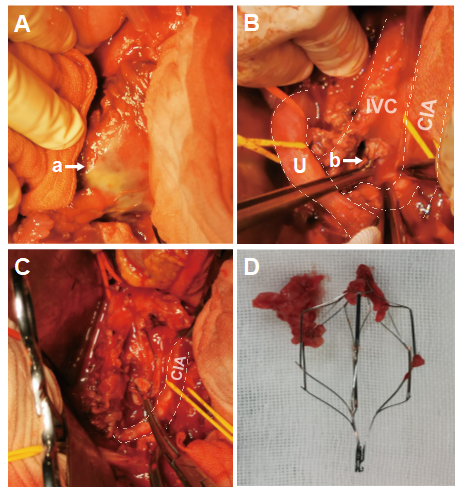
Grade E (Poor): 0

**P-Reviewer:** Ho CM, Marickar F **S-Editor:** Wang LL **L-Editor:** Filipodia **P-Editor:** Yu HG

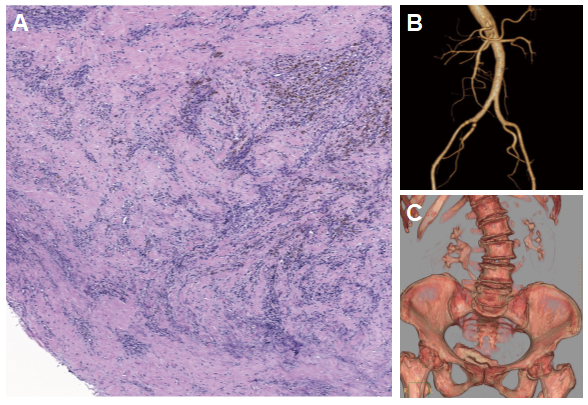
**Figure Legends**



**Figure 1 Preoperative computed tomography of patient.** A: Preoperative computed tomography indicated the retrieval hook of inferior vena cava filter (arrow a) penetrated into the right common iliac vein and artery causing pseudoaneurysm (arrow b). Scoliosis was also found in the computed tomography scan; B: The right ureteral was compressed by the pseudoaneurysm (arrow b) with ipsilateral hydronephrosis (arrow c); C: The infrarenal inferior vena cava and bilateral common iliac veins were occluded with significant pelvic varicosities (arrow d).

****

**Figure 2 Intraoperative images of patients.** A: Right iliac pseudoaneurysm with abscess (arrow a); B: The indwelling inferior vena cava filter (arrow b) penetrated the right common iliac vein and artery, and the ureter was dilated; C: The inferior vena cava filter was embedded in the organized thrombus. The inferior vena cava was open, while no back-bleeding of lumbar veins were found; D: The double-basket Visee WXF-32 IVC filter. Image designations: U: Ureter; IVC: Inferior vena cava; CIA: Common iliac artery.

****

**Figure 3 Surgical pathology and 6-mo follow-up computed tomography.** A: Organized thrombus of inferior vena cava with massive inflammatory cell infiltration; B: Computed tomography urography indicated mild right hydronephrosis; C: Computed tomography angiography indicated patency of bilateral iliac arteries.



Published by **Baishideng Publishing Group Inc**

7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

**Telephone:** +1-925-3991568

**E-mail:** bpgoffice@wjgnet.com

**Help Desk:** https://www.f6publishing.com/helpdesk

https://www.wjgnet.com



**© 2021 Baishideng Publishing Group Inc. All rights reserved.**