Journal of Cardiovascular and Thoracic Research, 2012, 4(4), 119-122
doi: 10.5681/jcvtr.2012.028
http://jcvtr.tbzmed.ac.ir

Successful Thrombolysis of Occluded Inferior Vena Cava Filter with IVC Syndrome

BC Srinivas, Ajit Pal Singh*

Department of Cardiology, Sri Jayadeva Institute of Cardiovascular Sciences and Research, Bengaluru, India

ARTICLE INFO

Article Type:
Case Report

Article History:
Received: 21 June 2012
Accepted: 2 Oct 2012
ePublished: 30 Oct 2012

Keywords:
Inferior Vena Cava
IVC Filter Thrombosis
Catheter Directed Thrombolysis
Balloon Angioplasty

ABSTRACT

Thrombosis of Inferior Vena Cava (IVC) following filter insertion can occur in up to 30% of the cases. The optimal management of such cases is unknown. We describe a simple and less expensive method of achieving successful recanalization of the IVC in a 40 year old hypertensive man who developed recurrent pulmonary embolism after his orthopedic treatment. An IVC filter was inserted, which developed extensive thrombosis of the whole IVC and venous system of the lower limbs. Catheter directed thrombolysis using a multiple side-hole multipurpose catheter and balloon angioplasty was carried out in order to "crush and lyse" the IVC thrombi.

Introduction

Inferior Vena Cava (IVC) filters are commonly used as an alternative to anticoagulation in cases of recurrent Deep Vein Thrombosis (DVT) for prevention of Pulmonary Thromboembolism (PTE). However, IVC filter insertion may be associated with higher incidence of thrombotic complications such as vena cava thrombosis, insertion-site thrombosis, intravascular migration, vena cava perforation or penetration, and recurrent DVT.[1-3] IVC filter thrombosis is a known complication and has been reported in 2-10% of patients[4], rising to 30% of patients in some series.[5]

Little is known about the optimal management of such patients with extensive iliofemoral and IVC thrombosis especially when IVC filter is in situ. Current guidelines suggest Catheter directed thrombolysis as the standard care in the treatment of such patients.[6,7] We report a case of extensive IVC thrombosis with extension into bilateral iliofemoral veins treated with mechanical aspiration of the thrombus and the "crush and lyse" technique involving balloon angioplasty of the narrowed venous segments and catheter directed thrombolysis.

Case Report

A 40-year-old hypertensive, non-diabetic male presented to us with progressive swelling of both the lower limbs over the last 5 days. Two and a half months back, the patient had slipped in his house and hit his knee on a hard surface sustaining a patellar subluxation on the left side with associated ligament tear. Three days after he had sustained the injury, a successful internal fixation was performed for the injury and the patient was later discharged in a stable condition. Fifteen days after the discharge, he developed acute onset breathlessness for which a CT pulmonary angiogram was performed revealing a saddle pulmonary embolus of the main pulmonary artery. The patient underwent CDT (catheter directed thrombolysis) with Tenecteplase and a subsequent check angiogram revealed complete resolution of the thrombus.

Patient was discharged on anticoagulation maintaining INR (International Normalized Ratio) between 2-2.5. Twenty days after the discharge, the patient developed another similar episode of breathlessness and CT pulmonary angiogram revealed a thrombosis of the left lower lobe branch and a repeat CDT with Tenecteplase was considered which was successful. However, in view of recurrent episode of PTE despite adequate anticoagulation, the patient was advised IVC filter insertion and a permanent IVC filter (TrapEase, Cordis, J&J, Miami, FL, USA) was inserted into the infrarenal IVC. Ten days after the discharge, patient developed progressive decrease in urine output with azotemia, and diagnosed with acute renal failure. The patient underwent repeated sessions of hemodialysis and discharged after twenty days of hospital stay. One month later, he presented to us with a progressive lower limb swelling. Venous Doppler revealed thrombosis with partial recanalization of the IVC with extension into bilateral iliofemoral veins extending to the anterior and posterior tibial veins.

Under Ultrasound/Doppler guidance, the right popliteal vein was cannulated with a 7F sheath. Later, a 6F multipurpose catheter(Cordis) with multiple side holes

***Corresponding author:** Ajit Pal Singh, Email: ajitpal11@yahoo.com
Copyright © 2012 by Tabriz University of Medical Sciences

Archive of SID

www.SID.ir

was introduced into the popliteal vein, guided over a 0.032 Terumo hydrophilic guide-wire (Terumo Interventional Systems) and positioned 5 cm below the IVC filter (Figure 1).

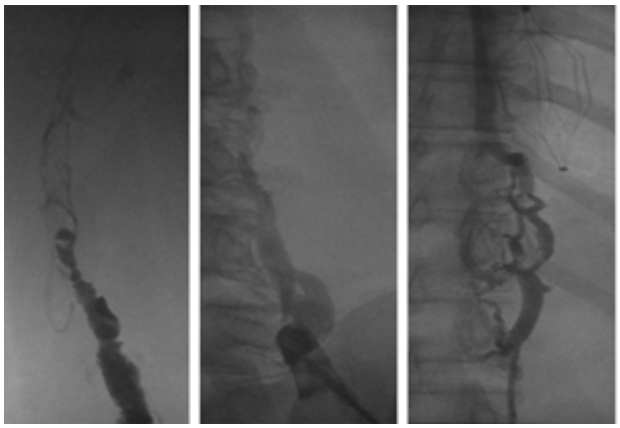

Figure 1. Initial venous angiogram obtained after injection from the left popliteal vein. a) Contrast injection through the popliteal vein into the femoral vein showing long segment thrombus containing lesion. b) Left common Iliac vein draining into IVC showing extensive thrombus burden. c) Thrombus containing IVC filter with total occlusion just below the filter.

Streptokinase infusion was started at the rate of 30000 IU/hr through the sheath port and 70000 IU/hr through the multipurpose catheter. Later, the catheter was gradually withdrawn by 4cm every 4 hours. Intermittent thrombosuction was attempted with a 6F multipurpose catheter-syringe system and significant amount of thrombus was removed. Check angiogram was performed each day to assess the clearance of the thrombus and the catheter was repositioned according to the position of maximum thrombus burden proximal to the catheter (Figure 2). On day 4, the patient developed fever with chills and rigor for which antihistamine injection was given and the infusion was changed to Urokinase at the dose of 100000 IU/hr through the catheter and 50000 IU/hr through the sheath. The Urokinase infusion was continued for 2 days – a total thrombolytic infusion of 140 hours! On day 5 of the infusion, a balloon angioplasty was performed through the most narrowed portions of the venous system using a 5 X 40 mm ATLAS balloon. The end result was a good recanalization of the affected venous system with the complete resolution of the swelling of both lower limbs (Figure 3). The patient was able to walk and weight-bear on his legs. The patient is maintained on anticoagulation with close monitoring of the INR which is now targeted at 2.5-3.5 assuming a thrombophilic state; however, the evaluation shall be pursued after 6 months of follow-up. Thigh-high support hose compression stockings were advised. A venous Doppler confirmation of recanalization of the venous system was obtained at the one month follow-up visit.

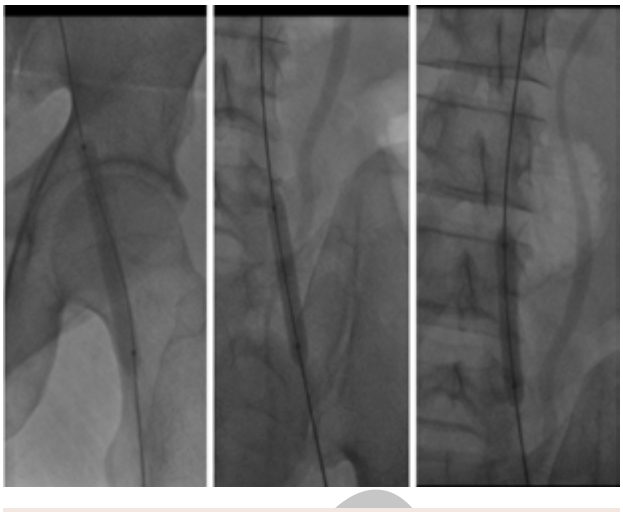

Figure 2. Balloon angioplasty of the most narrowed segments

Figure 3. End result showing good recanalization of the venous system on the left side. a) Popliteal vein drainage into the femoral vein showing good clearance of thrombus burden. b) Common iliac vein draining into IVC showing good flow. c) IVC segment below the filter showing complete clearance of thrombus.

Discussion

IVC filter use has been on an increasing trend ever since the introduction of the original Greenfield IVC filters in 1973. The current guidelines recommend the use of IVC filters in patients with acute PTE or proximal DVT, if anticoagulation is contraindicated or there is active bleeding. IVC filter is also indicated in cases of recurrent PTE despite therapeutic anticoagulation. Late complications of IVC filter placement include recurrent DVT (21%), IVC thrombosis (2% to 10%), IVC penetration (0.3%), filter migration (0.3%) and rarely IVC filter fractures.[8] Catheter directed thrombolysis has been effective in recanalization of iliofemoral DVT and achieving an 80-85% clinical success.[9] Bleeding complications in up to 25% of cases may be seen especially due to longer thrombolytic infusion times.[9,10]

Copyright © 2012 by Tabriz University of Medical Sciences

Archive of SID

www.SID.ir

Suffering greater thrombotic burden and often extensive iliofemoral involvement, patients with IVC thrombosis require higher thrombolytic doses to be infused over longer duration of time which is associated with more risks and patient discomfort. Our patient received the infusions for almost 140 hours without interruption. No major bleeding complication except for mild hemoptysis was noted. Patient was maintained on prophylactic doses of injectable Ceftriaxone throughout hospital stay. No local site infection was observed.

IVC thrombosis presents as a progressive lower limb swelling due to reduced venous flow from the lower extremities. At later stages, the resultant edema can affect both the arterial and venous circulations leading to phlegmasia cerulea dolens, with associated gangrene and finally major limb loss. Our patient presented at an early stage of just 5 days of symptom onset; he, however, had severe bilateral lower limb swelling with the tense overlying skin.

Optimal management for IVC thrombosis especially after filter insertion has not been established. Therapeutic aims include symptomatic relief, patency of the IVC and draining veins, prevention of PTE and post-thrombotic syndrome. Anticoagulation therapy alone achieves a clot regression rate of <50% and complete clot resolution in <5% cases.[11,12] All patients develop venous valve insufficiency at 5 years of follow up.[13]

Aggressive therapeutic management aims at providing immediate symptomatic relief and prevention of incipient valvular insufficiency and post-thrombotic syndrome. Indications for pharmaco mechanical thrombectomy include (i) extensive or proximal (iliofemoral or IVC) DVT, (ii) young or highly functional patients who are at increased risk of developing post-thrombotic syndrome, (iii) associated arterial ischemia and phlegmasia cerulea dolens, (iv) patients at high risk for fatal Pulmonary Embolism (PE), (v) propagation of DVT despite therapeutic conventional therapy, (vi) symptomatic IVC or filter thrombosis, (vii) high likelihood of underlying anatomical abnormality such as compression by pelvic tumor or May–Thurner syndrome.[5]

Combined percutaneous mechanical thrombectomy with CDT, known as pharmacomechanical thrombectomy, is believed to achieve better clot removal and vessel recanalization with less thrombolytic doses.[5,14,15] Mechanisms of the Thrombectomy devices include rheolytic activity, mechanical aspiration or ultrasonic thrombolysis. There is limited data on optimal management of patients with IVC thrombosis with filter in situ.

In developing countries, due to cost restraints and unavailability of the thrombectomy devices, other options need to be explored. Our case demonstrates the use of a similar approach, however, with use of limited and inexpensive resources available. We propose the use of "crush and lyse" technique, wherein we used balloon angioplasty with a peripheral ATLAS balloon to crush the thrombus within the most narrowed segments, aspirate the thrombus fragments with a simple syringe-multipurpose catheter assembly, and then perform CDT with gradual withdrawal of the catheter from the central vessel to the periphery.

Although slightly more time-consuming, our method achieved good technical success without any major complications. The relative ease and simplicity of the method needs to be emphasized. Also the safety of long duration high-dose thrombolytic therapy needs to be mentioned which to our experience in previous similar cases has been free of any major bleeding complications. However, such a strategy may only be useful in similar cases wherein an IVC filter is in situ to prevent possible migration of small thromboemboli to the pulmonary circulation.

References

1. Joels CS, Sing RF, Heniford BT. Complications of inferior vena cava filters. **Am Surg** 2003; 69:654-9.
2. Streiff MB. Vena caval filters: a comprehensive review. **Blood** 2000; 95:3669–77.
3. Patel SH, Patel R. Inferior vena cava filters for recurrent thrombosis: current evidence. **Tex Heart Inst J** 2007;34:187-94.
4. Grassi CJ, Swan TL, Cardella JF, Meranze SG, Oglevie SB, Omary RA, et al. Quality improvement guidelines for percutaneous permanent inferior vena cava filter placement for the prevention of pulmonary embolism. **J Vasc Interv Radiol** 2003; 14:S271-5.
5. Yan BP, Kiernan TJ, Gupta V, Ajani AE, Schainfeld RM. Combined pharmacomechanical thrombectomy for acute inferior vena cava filter thrombosis. **Cardiovasc Revasc Med** 2008; 9:36-40.
6. Protack CD, Bakken AM, Patel N, Saad WE, Waldman DL, Davies MG. Long-term outcomes of catheter directed thrombolysis for lower extremity deep venous thrombosis without prophylactic inferior vena cava filter placement. **J Vasc Surg** 2007; 45:992-7.
7. Alesh I, Kayali F, Stein PD. Catheter-directed thrombolysis (intrathrombus injection) in treatment of deep venous thrombosis: a systematic review. **Catheter Cardiovasc Interv** 2007; 70:143-8.
8. Jaff MR, McMurtry MS, Archer SL, Cushman M, Goldenberg N, Goldhaber SZ, et al. Management of massive and submassive pulmonary embolism, iliofemoral deep vein thrombosis, and chronic thromboembolic pulmonary hypertension: a scientific statement from the American Heart Association. **Circulation** 2011; 123:1788-830.
9. Mewissen MW, Seabrook GR, Meissner MH, Cynamon J, Labropoulos N, Haughton SH. Catheter-directed thrombolysis for lower extremity deep venous thrombosis: report of a national multicenter registry. **Radiology** 1999; 211:39-49.
10. Vedantham S, Vesely TM, Parti N, Darcy MD, Pilgram TK, Sicard GA, et al. Endovascular Recanalization of the Thrombosed Filter-bearing Inferior Vena Cava. **J Vasc Interv Radiol** 2003; 14:893-903.
11. Comerota AJ, Aldridge SC. Thrombolytic therapy for deep venous thrombosis: a clinical review. **Can J Surg** 1993; 36:359-64.

Copyright © 2012 by Tabriz University of Medical Sciences

Archive of SID

www.SID.ir

12. Killewich LA, Bedford GR, Beach KW, Strandness DE Jr. Spontaneous lysis of deep venous thrombi: rate and outcome. **J Vasc Surg** 1989; 9: 89–97.
13. Akesson H, Brudin L, Dahlström JA, Eklöf B, Ohlin P, Plate G. Venous function assessed during a 5 year period after acute ilio-femoral venous thrombosis treated with anticoagulation. **Eur J Vasc Surg** 1990; 4:43–8.
14. Cynamon J, Stein EG, Dym RJ, Jagust MB, Binkert CA, Baum RA. A new method for aggressive management of deep vein thrombosis: retrospective study of the power pulse technique. **J Vasc Interv Radiol** 2006; 17:1043-9.
15. Lin PH, Zhou W, Dardik A, Mussa F, Kougias P, Hedayati N, ae al. Catheter-direct thrombolysis versus pharmacomechanical thrombectomy for treatment of symptomatic lower extremity deep venous thrombosis. **Am J Surg** 2006; 192:782-8.

Archive of SID

 Copyright © 2012 by Tabriz University of Medical Sciences

www.SID.ir