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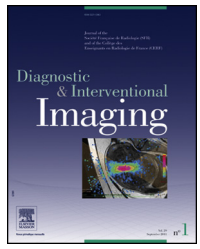

ORIGINAL ARTICLE / *Technique*

Sequential inferior vena cava filter insertion and peripherally inserted central catheter placement through upper extremity veins

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Abstract
Purpose: To report the sequential placement of inferior vena cava filter (IVCF) and peripherally inserted central catheter (PICC) using the same upper extremity venous access.
Material and methods: This is a retrospective study that reviewed the medical records of 379 consecutive patients who underwent IVCF insertion during a 39-month period at our center. Of these 379 patients, 28 patients had sequential insertion of an IVCF and a PICC through the same upper extremity venous access. The same vein entry site was used for placement of the IVCF followed by PICC insertion. Data collected included: indication and duration of IVCF and PICC placement, access site location, complications, and the type of IVCF.
Results: IVCFs were placed for prophylactic purposes in 15 patients (53.6%) and therapeutic purposes in 13 patients (46.4%). Right upper extremity veins were used for venous access in 27 patients (96.4%): brachial ($n = 16$), basilic ($n = 9$), and cephalic ($n = 2$). The left basilic vein was used in one patient (3.6%). IVCFs were temporary in 20 patients (71.4%) and permanent in 8 patients (28.6%). There were no procedural complications. The OptEase filter was used in 23 patients (82.1%) and the TrapEase filter was used in 5 patients (17.9%).

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Conclusion: Simultaneous IVCF and PICC insertion using the same upper extremity venous access was feasible and safe in our series. This combined technique provides the patient with central venous access for repeated blood collections and intravenous therapy.

Deep venous thrombosis leading to acute pulmonary embolism is a major source of morbidity and mortality worldwide. Patients with conditions at risk for thromboembolic disease may benefit from prophylactic inferior vena cava filter (IVCF) placement while those with the diagnosis of thromboembolism profit from therapeutic temporary or permanent IVCFs [1]. The traditional access sites for IVCFs insertion are through the common femoral, subclavian, and internal jugular veins. The development of small diameter low profile IVCFs have broadened the venous access options for their insertion.

Occasionally, patients may have comorbidities or restrictions that make IVCF insertion through traditional access sites difficult (e.g., existing venous thrombosis, cervical collar, endotracheal intubation, severe cervical arthritis, fecal and/or urinary incontinence, and the concern for higher risk of puncture site infections). In these patients, IVCF placement may be achieved through upper extremity venous access [2—6]. Furthermore, hospitalized patients requiring IVCF placements often require extended intravenous access as well as those that are discharged to extended care facilities for recovery and rehabilitation. Therefore, placement of an IVCF and a catheter for central venous access in one setting through the same upper extremity vein appears practical and cost-effective. This combined approach is of value for patients with anticipated prolonged hospitalizations or those who will be discharged and require a central venous access. Here, we report our experience with sequential IVCF placement followed by peripherally central catheter (PICC) insertion using the same upper extremity vein.

Materials and methods

Patient demographics and data collection

This is an institutional review board approved retrospective study that includes the medical records of 379 consecutive patients who underwent IVCF insertion during a 39-month period at our center. Of these 379 patients, 28 patients (18 male, mean age = 44.0 ± 21.6 years [range 18 to 85 years]) had simultaneous insertion of an IVCF and a PICC through the same upper extremity venous access. Parameters measured were IVCF and PICC placement indications, access site location, complications associated with IVCF and PICC placement (line infections, post-procedural bleeding or hematoma formation, upper extremity venous thrombosis or thrombophlebitis, or access point venous thrombosis), and the type of IVCF.

Procedural technique

One of two commercially available low profile delivery system IVCFs were used in all patients: the OptEase filter (Cordis endovascular, Johnson and Johnson, Warren, New Jersey) or the TrapEase filter (Cordis endovascular, Johnson and Johnson, Warren, New Jersey); and 5-F PICC set (Pro-PICC CT 5-F Dual PICC; Medcomp, Harleysville, Pennsylvania). The puncture of the upper extremity vein was guided by ultrasound followed by insertion of the 0.018″ guidewire (Fig. 1a). The sheath of the PICC set was inserted over the wire to gain access to the vein (Fig. 1b). The dilator was removed and a second 0.035″, 145 cm J-wire was inserted in parallel through the sheath into the superior vena cava and taken caudally to the inferior vena cava (Fig. 1c). The 0.035″ J-wire was used for IVCF insertion while the 0.018″ wire secured at the side of the venipuncture. The 5-F PICC sheath was removed without peeling it away and reserved for later use. The 8-F IVCF dilator sheath was inserted over the 0.035″ wire and taken caudally to the distal inferior vena cava (Fig. 1d). A venacavogram preceded IVCF deployment. The IVCF was deployed below the renal veins and the IVCF sheath removed. The PICC peel-away sheath was reinserted over the 0.018″ wire left aside during IVCF insertion. The wire was introduced until its tip was in the distal superior vena cava or atriocaval junction. The length of the wire was marked with a hemostat and the wire removed from the vein leaving the vascular sheath in the vein lumen. The wire length was measured and the PICC catheter cut at the same length (Fig. 1e). The 5-F PICC catheter was inserted through the vascular sheath into the upper extremity vein leaving its tip in the distal superior vena cava or atriocaval junction (Fig. 1f).

Results

IVCFs were placed for prophylactic purposes in 15 multitrauma patients (53.6%) and for therapeutic indications — to prevent initial or recurrent embolic phenomena — in 13 patients (46.4%) (deep venous thrombosis [*n* = 8] and pulmonary embolism [*n* = 5]). Right upper extremity veins were used for venous access in 27 patients (96.4%): brachial (*n* = 16), basilic (*n* = 9), and cephalic (*n* = 2). The left basilic vein was used in one patient (3.6%) (Fig. 2a,b,c). IVCFs were temporary in 20 (71.4%) patients and permanent in 8 patients (28.6%). Data on the total duration of PICC line usage was available in 12 patients (42.9%; trauma [*n* = 7], pulmonary embolism [*n* = 3], and deep venous thrombosis [*n* = 2]) (mean duration of 23.8 days [range 1 to 98 days]); all these patients remained admitted during the course of their PICC insertion and subsequent removal. Eleven of these 12 patients were admitted to the intensive care unit and had PICC placement for extended intravenous access and the remaining patient with deep venous thrombosis had a PICC inserted for chemotherapy. In these patients, there were no cases of line infections, thrombophlebitis, or access point