Inferior Vena Cava Filter Malposition in a Paraspinal Vein

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Inferior vena cava (IVC) filtration is used in patients with deep venous thrombosis and/or pulmonary embolism who fail or are unfit for anticoagulation therapy. In the past, malposition was a relatively common event when vena cava filters were placed by surgeons without imaging guidance, especially when the internal jugular veins were used for access. Currently, complications are uncommon when filters are placed by interventional radiologists and malposition is exceedingly rare.

CASE REPORT

A 68-year-old man with lung cancer and intracranial metastases developed deep venous thrombosis and pulmonary emboli. The interventional radiology service was consulted and insertion of an IVC filter was planned.

The patient was brought to the interventional radiology suite and the right common femoral vein was catheterized using Seldinger technique. A 5F pigtail catheter was advanced to the junction of the common iliac veins. A venacavagram was performed, revealing a normal-caliber IVC without evidence of thrombus. Inflow from both renal veins and the left common iliac vein was identified (Fig. 1A).

An Amplatz Superstiff guide wire (Boston Scientific, Natick, MA) was advanced through the pigtail catheter to the suprarenal IVC. The pigtail catheter was exchanged over the guide wire for a Braun (Bethlehem, PA) IVC filter sheath, which was positioned immediately below the level of the renal veins. The guide wire and sheath dilator were removed and a filter was inserted into the base of the sheath in standard fashion. The filter was advanced to the tip of the sheath using the pusher included in the kit.

The pusher was then held in position while the filter was deployed by retracting the sheath under fluo-

roscopic monitoring. The filter remained unopened (Fig. 1B). A small amount of contrast was injected through the sheath, revealing wide patency of the IVC (Fig. 1C). Deducing the filter had been inadvertently deployed in a paraspinal vein, a decision was made to leave the filter in place rather than attempt to retrieve it. The sheath was repositioned and a second filter was deployed in the infrarenal IVC in standard fashion (Fig. 1D,E).

DISCUSSION

IVC filter insertion is a routine procedure that rarely results in complications when performed by interventional radiologists using image guidance. Technical complications are usually limited to insertion site hematomas or contrast reactions. Malposition is rare because direct image guidance facilitates precise placement.

In the patient presented above, a filter was malpositioned in an ascending paraspinal vein. This occurred because the Amplatz guide wire advanced through the pigtail catheter was inadvertently inserted in this vein as it was being advanced cephalad. This catheterization was unrecognized because the course of the vein was superimposed on the expected course of the IVC in the frontal projection (Fig. 2). When the filter deployment sheath was inserted over the wire, it followed the wire into this vein and the filter was deployed. Because the vein was quite small, the filter remained unopened.

Fortunately, malposition in a paraspinal vein is not likely to result in adverse sequelae if recognized because as in this case, a second filter can be deployed in appropriate position. It is possible that the paraspinal vein will thrombose but this is unlikely to cause symptoms. Malposition in a paraspinal vein can also occur if

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Figure 1 Deployment of an IVC filter in a paraspinal vein. (A) Inferior vena cavagram shows normal-caliber IVC. (B) Fluoroscopic image shows unopened filter. (C) Injection of contrast through filter sheath shows widely patent IVC. (D) Fluoroscopic image shows positioning of second filter. (E) Final fluoroscopic image shows good position of second filter.

the filter sheath is advanced in a cephalad direction into an ascending vein prior to filter deployment. This usually occurs because the tip of the deployment sheath is initially positioned too low in the IVC and is recognized after the guide wire has been removed, when the filter has already been loaded into the sheath. The final position is “adjusted” by pushing the entire apparatus

in a cephalad direction and a paraspinal vein is unexpectedly catheterized. The best manner to avoid this error is to advance the pigtail catheter used to perform cavography to the level of the suprarenal IVC before inserting the guide wire into the catheter. Advancing the pigtail catheter in this manner prevents inadvertent catheterization of small veins that can sometimes occur

Figure 2 Illustration depiction of filter deployment error. (A) IVC with paraspinal vein. (B) Pigtail catheter used to perform cavagram in infrarenal IVC. (C) Guide wire advanced through catheter inadvertently enters paraspinal vein. (D) Pigtail catheter removed, leaving wire in paraspinal vein.

when a guide wire is advanced cephalad without a catheter. The sheath should then be positioned at the level of the renal veins (or slightly below) and only retracted caudally if necessary prior to filter deployment. The sheath should never be advanced cephalad.

In general, filter malposition occurs more commonly when a jugular approach is used because the hepatic veins and renal veins are directed in a cephalad orientation (Fig. 3). Thus, catheters and guide wires directed caudally from the neck often unintentionally enter these veins. If real-time fluoroscopic imaging is used during filter insertion, accidental catheterization is

easily recognized. However, if filters are placed in an operating room without real-time imaging, malposition may result because inadvertent catheterization will not be seen. The filter is deployed and malposition is recognized only after the fact when an abdominal plain radiograph is obtained (Fig. 4). In these cases, it is usually advisable to attempt filter retrieval (although this may be impossible in many cases). In contrast, when a femoral vein approach is used, it is quite unusual to accidentally enter the hepatic or renal veins. In most people, accidental catheterization of a paraspinal vein is much less common. Therefore, malposition is rare.

Figure 2 (E) Filter deployment sheath advanced over guide wire into paraspinal vein. (F) Filter pushed to tip of sheath. (G) Filter deployed into paraspinal vein. (H) Sheath retracted leaving filter in paraspinal vein.

Figure 3 (A,B) Illustration of cephalad orientation of hepatic and renal veins.

Figure 4 Malpositioned filters. (A) Plain radiograph shows several struts of IVC filter malpositioned in the right renal vein. (B) Plain radiograph in different patient reveals IVC filter deployed entirely in right renal vein.