CHAPTER 9
INDICATIONS FOR INFERIOR VENA CAVA INTERRUPTION

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Introduction

The majority of **blood clots** that develop in the **veins** (**venous thrombosis**) occur in the **deep veins** of the pelvis and the legs. The standard treatment for **venous thrombosis** is **anticoagulation** using **heparin**, a **blood thinner** given in your **veins** or into the fat of your abdomen, to immediately prevent more clotting and changed to a drug given by mouth (**Warfarin** or **Coumadin**) for the long term treatment. This therapy successfully reduces the potential for life threatening **pulmonary embolism** (**PE**), **blood clots** moving to the lungs, by a factor of over 100 times. Unfortunately not all people are able to follow this standard pathway. Those unable to use standard medicines typically fall into one of four groups. These are:

1) Contraindications (reasons not) to use **anti-coagulant therapy** (**blood thinners**) (example: **bleeding** stomach ulcer).
2) **Bleeding** that starts while using **blood thinners** to the point that **blood thinners** can not be used.
3) New **pulmonary embolism** or more **venous thrombosis** which happens while on **blood thinners**.
4) Individuals having a massive **PE**, **clot** in the lung, that brings the person near death if something more is not done.

Failure of medical treatment plans for the reasons just noted makes your doctor consider other methods protecting you from **pulmonary embolus**. This treatment involves a **filter** (screen) inserted into the biggest vein in your abdomen to prevent **blood clots** moving from the legs into your lungs.

Surgical Treatment Advances

One way to prevent **blood clot** from moving from the legs to the lungs is by tying off the main vein in the abdomen (**vena cava**) but that resulted in too many problems for very sick people. Then methods were made to partly interrupt, by sutures or staples, the **vena cava**. These had better success but still needed an opening of the abdomen in the ill patient to place the sutures or staples. Directly opening the abdomen to work on the **vena cava** was little used after devices called **vena cava filters** could be placed into a distal **vein** and passed into the **vena cava** to do the same thing. With information gained from animal and then human studies, the **Greenfield filter** (a cone shaped device used to catch **blood clots** traveling in the **vein** blood) was the first to offer this protection of decreased risk of **PE** in addition to providing a low risk of death and surgical complications for the patient. Continued improvements in **filter** design have decreased the size of the devices and the easy of placing the filters by x-ray or with ultrasound (sound

wave) guidance today. The device used to place the **filter** is typically smaller than a soda straw. When placed in the **vena cava**, the **filter** acts as a screen that allows continued passage of normal blood flow back towards the heart but is able to trap **clots** less than an eighth of an inch in size.

The **filter** placement is done with the patient on an x-ray table. The groin or neck is clean to make it sterile and a needle is used to gain entrance into the **femoral** or **jugular vein**. A small wire is then placed into the **vein** over which is placed a catheter (tube) which can be pushed into the **vena cava** under x-ray or sound wave viewing to the proper place in the **vena cava**. The **filter** is place through the catheter to the correct place and its spring loaded design allows it to rapidly open and stick to the **vena cava**. Once properly placed, the devices used to get the **filter** to the correct place are removed and gentle finger pressure is held over the site of **vein** stick to stop any **bleeding**. The patient may resume normal activity by the next day.

As it became easier to place these **filters**, the number of reasons for **inferior vena cava filter** use has increased beyond the traditional means as mentioned above. Several **filter** designs are now available for clinical use **(Figure 1)**. Most are made of stainless steel or a nickel-titanium alloy. All **filter** designs allow for capturing of **blood clots** from the legs or pelvis. This provides a markedly reduced risk of a catastrophic loss of life from a large **blood clot** causing **PE** and the inability to supply oxygen to the blood. Recent advances have included **filter** placement in the intensive care unit setting using **ultrasound (sound wave) guidance**. Further advancement in design has included the ability to place and then remove the **filters** at a later time after the risk of **PE** has been reduced or eliminated.

While an **inferior vena cava filter** can significantly reduce the risk of a life ending **PE**, recurrent **PE** risk remains in two to three percent of patients. Therefore when possible, continuation of **anticoagulant** medication after **filter** placement remains an important part of the continued treatment for **venous thrombosis** and prevention of **PE**.

Conclusion

Blood clots from the large **veins** of the legs and pelvis can produce life threatening **PE** if left untreated such as when standard therapy cannot be used. **PE** management has evolved over decades and the current state of the art treatment includes placement of an **inferior vena cava filter** which has very minimal risk. While extremely effective in preventing **PE**, it does not reduce the risk to zero nor does it treat the underlying venous clotting problem. Therefore continued **anticoagulant** therapy (**blood thinners**) if possible, should be used when possible.

Commonly asked questions

Is it safe to leave the filter in and does it has to stay there for my lifetime?

Once placed, **inferior vena cava filters** are very safe and well tolerated. Over 92% of vena cava **filters** are present for a lifetime without major problems. The stainless steel and other metals used to make **filters** cause little reaction in the body. They are safe to go through airports and will not trigger metal detectors. Most are safe for x-ray studies and metal alloy **filters** can be

used in Magnetic Resonance scanning devices. Recent filter design advances allow for removal at a later time when the threat of **PE** has been eliminated.

Can the filter be placed for blood clots in the arms rather than the legs?

Yes, the filter can be positioned in an up-side-down position in the **superior vena cava** (biggest **vein** in the chest) to allow for successful trapping of **blood clots** from the arms or the neck. While this is not a common problem, it is not normally needed but when needed can be placed much as one placed a **filter** in the abdomen **vena cava**.

With so many filter types which one is the best for me?

Filter selection is based on what your doctor thinks is best, on your particular body shape and the particular design of each filter. The choice of which **filter** to use is best selected when all these factors are taken into consideration.

Figure 1: Various filters are designed to work much like the spokes of an umbrella without the material on it. They will allow for trapping of a blood clot below the cone of the filter. They work because of the particular flow within the vena cava which funnels the majority of blood clots to the center of the vessel. The advantage of this open metal design allows for continued blood flow through the filter while being very effective at trapping clot.