

# Penetrated inferior vena cava filter retrieved by open surgery with deep hypothermic circulatory arrest

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## Abstract

A 42-year old man with thrombophilia (prothrombin gene mutation) required the insertion of an inferior vena cava filter because of recurrent gastrointestinal bleeding associated with oral anticoagulation. However, it penetrated through the retro-hepatic vena cava into the liver, being manifested by constant, blunt abdominal pain. Endovascular retrieval was considered of extreme risk, though a surgical approach was performed under cardiopulmonary bypass with deep hypothermic circulatory arrest. The patient has recovered uneventfully with complete symptom relief.

## Penetrated inferior vena cava filter retrieved by open surgery with deep hypothermic circulatory arrest

### Running head: Inferior vena cava filter penetration

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## Unstructured abstract

A 42-year old man with thrombophilia (prothrombin gene mutation) required the insertion of an inferior vena cava filter because of recurrent gastrointestinal bleeding associated with oral anticoagulation. However, it penetrated through the retro-hepatic vena cava into the liver, being manifested by constant, blunt abdominal

pain. Endovascular retrieval was considered of extreme risk, though a surgical approach was performed under cardiopulmonary bypass with deep hypothermic circulatory arrest. The patient has recovered uneventfully with complete symptom relief.

Indications of vena cava filters are presence of venous thromboembolic events with contraindication or failure of anticoagulation. Although indications are usually an exception rather than the rule, inferior vena cava (IVC) filters are placed frequently in patients with weak or no guideline-supported indications for filter placement. Wassef and colleagues<sup>1</sup> found that no contraindication to anticoagulation was present in only 20.7% of insertions. Moreover, there is a high variation between hospitals<sup>2</sup> in vena cava filter use for venous thromboembolism, indicating that indications do not follow a strict criteria.

Complications of inferior vena cava filters are relatively common, and they vary according to different filter types and designs. Possible complications are caval penetration, filter migration (including the lungs), thrombosis, and filter fracture. Strut penetration of the vena cava wall into an adjacent organ can lead to acute abdominal syndrome, pain and hemorrhage<sup>3,4</sup>. Unintended vena cava penetration is frequently under-recognized, since only nearly 10% of all penetrations are symptomatic, being pain the most predominant clinical manifestation<sup>5</sup>.

An inferior vena cava filter penetrated into the liver parenchyma (Figure 1 – panels A and B) causing relentless, constant right upper quadrant pain in a 42-year old man with thrombophilia (prothrombin gene mutation) that presented bleeding complications with oral anticoagulation. The Figure 1 shows that the filter had fractured and most of the struts perforated the vena cava wall into the liver. Endovascular filter retrieval was initially considered since it is the treatment of choice in symptomatic patients. However, two endovascular surgeons turned down the case, because they judged to be of extreme risk of leaving fractured struts outside the IVC and causing vein laceration. The patient was submitted to open surgical approach (Figure 1 – C) with the aid of cardiopulmonary bypass with deep hypothermic circulatory arrest. The retro-hepatic IVC was longitudinally opened and the filter was easily removed. The patient has recovered uneventfully with complete symptom relief.

In symptomatic penetrated vena cava filters in which endovascular retrieval is not feasible, a surgical approach with appropriate planning is a safe and effective treatment.

Recommendation: Fernando A. Atik (performed the surgical procedure, concept/design, drafting article); Claudio Ribeiro da Cunha (part of surgical team, concept/design, drafting article), Murilo T. Macedo (part of the surgical team, Figures); Guilherme U. Monte (cardiologist, drafting article, concept/design).

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Figure 1 – Penetrated vena cava filter in the retro-hepatic vena cava. A. *Computed tomography reconstruction posterior view: fragment vena cava filter (FVCF), vena cava filter (VCF)*, B. *Computed tomography anterior view: fragment (FVCF), vena cava filter (VCF)* C. *Surgical findings: liver (L), inferior vena cava (IVC) , vena cava filter (VCF) perforation.*

