Systematic review of the use of retrievable inferior vena cava filters
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CRD summary
This review found that retrievable inferior vena cava filters could help prevent pulmonary embolism, but there were concerns about their long-term risks and complications, and low retrieval rates. The authors' conclusions on the benefits of the filters should be treated with caution, given the limitations in the review methods.

Authors' objectives
To examine the effectiveness and risks of retrievable inferior vena cava (IVC) filters in the prevention of pulmonary embolism.

Searching
The authors searched MEDLINE for studies in English, from 1966 to 2011. They reviewed the lists of references of potentially relevant studies. They searched for complications reported to the US Food and Drug Administration (FDA) in the Manufacturer and User Facility Device Experience (MAUDE) database, from January, 2000 to December, 2010. The search terms were reported.

Study selection
To be eligible, studies needed to be of retrievable IVC filters. Case reports were excluded, but case series were included if they reported a complication of the filters or the technique of insertion.

The included studies assessed seven different retrievable filters. Over half of the filters were placed for prophylaxis, and the rest were for therapy. Placement through the femoral vein was more common than through the internal jugular vein.

It was unclear how many reviewers were involved in the selection of studies for the review.

Assessment of study quality
Studies were assessed for suitability on four criteria: appropriate device, application, and patient group, and acceptable report or data collection. The contribution of each study to the assessment of device safety and performance was determined by its appropriate design, outcome measures, duration of follow-up, statistical significance, and clinical significance. The study's suitability and contribution were rated as high, intermediate or low.

It was unclear how many reviewers were involved in the assessment of quality.

Data extraction
One reviewer extracted descriptive, effectiveness and safety data, using a standardised form. Complications were categorised as short-term (≤30 days after placement) or long-term (>30 days after placement). A second reviewer checked the extracted data.

Methods of synthesis
The authors presented a narrative synthesis, grouped by outcome. The results were reported overall and by device type.

Results of the review
Thirty-seven studies were included in the review (6,834 retrievable IVC filter placements). None of the studies was randomised. Eleven were of high suitability and 26 were of intermediate suitability. All studies were graded as intermediate for data contribution. The average follow-up was 9.9 months (range two to 25). There were 842 MAUDE reports of complications.

There were no reports of any serious procedural complications during placement in the 37 clinical studies. In 21 of the 30 studies that investigated the placement of one type of retrievable IVC filter (nine studies did not report pulmonary embolism), the overall rate of pulmonary embolism was 1.3%; rates varied between 0.7% and 4.0% according to type...
of filter. The overall rate of deep vein thrombosis was 5.4% (13 studies; range 0.0 to 18.0 by filter). The overall incidence of significant migration of the filter was 1.3% (16 studies; 0.0 to 4.5 by filter). The overall incidence of vena cava thrombosis or stenosis was 2.8% (15 studies; 0.6 to 8.0 by filter). Retrieval rates ranged from 12% to 45%, with a mean of 34%.

Of the 842 complications reported to the MAUDE database, 7% occurred during the first 30 days after filter placement.

**Authors' conclusions**
The benefits of retrievable IVC filters in preventing pulmonary embolism were equivalent to those reported for medical therapy, but concerns remained about the long-term risks and complications, and the low retrieval rates.

**CRD commentary**
This review had broadly defined inclusion criteria. The inclusion of reports from the MAUDE database allowed further investigation of safety issues, but this database only provided a sample of the complication rates and was not comprehensive. Searching was based on one database, with reference checking, and restricted to studies reported in English; some studies could have been missed.

Quality was assessed for the suitability of each study and its data contribution, rather than its conduct. It was unclear if more than one reviewer was involved in the selection of studies for the review and in quality assessment, which could minimise bias and error. A narrative synthesis appears to have been appropriate, given the diversity of the studies. The authors highlighted limitations in the quality and reporting of the included studies.

The authors’ conclusions relating to the benefits of retrievable IVC filters should be treated with caution, given the limitations with the methods that were identified.

**Conflict of interest:** Two authors reported a financial relationship with BiO₂ Medical, manufacturer of the Angel Catheter, which includes a retrievable IVC filter and provides prophylaxis against pulmonary embolism and access to the central venous system, in critically ill patients.

**Implications of the review for practice and research**
**Practice:** The authors did not specifically state any implications for practice.

**Research:** The authors recommended prospective studies to address prophylactic indications for the use of IVC filters and to compare the available devices, the risks and benefits of retrieval, and the long-term outcomes.

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