REVIEW ARTICLE

Inferior Vena Cava Filters in Pregnancy: A Systematic Review

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ABSTRACT

During pregnancy, patients have an increased risk of venous thromboembolism (VTE). This is an important cause of maternal mortality. Inferior vena cava (IVC) filters can be used to prevent pulmonary embolism in complicated cases of VTE during pregnancy. The present systematic review includes all patients reported in the literature who had an IVC filter placed during pregnancy. The indications for IVC filters are discussed, along with practical considerations for placement during pregnancy, filter effectiveness, and maternal and fetal mortality and morbidity. IVC filters can be used safely when appropriate during pregnancy, with complication rates similar to those in nonpregnant patients.

ABBREVIATIONS

DVT = deep vein thrombosis, IVC = inferior vena cava, MeSH = Medical Subject Heading, PE = pulmonary embolism, VTE = venous thromboembolism

During pregnancy, patients are more predisposed to thromboembolic events because of hypercoagulability caused by adaptations in the hemostatic system in preparation for the hemostatic challenge of delivery, venous stasis caused in part by the pressure effect of the enlarging uterus, and vascular endothelial damage caused by distension or surgical injury. Venous thromboembolism (VTE) is the third most common direct cause of maternal mortality in the United Kingdom, occurring in 0.79 per 100,00 maternities in 2005–2008 (1). The standard treatment is anticoagulation with low molecular weight heparin until at least 6 weeks postpartum (2). Warfarin is avoided in pregnancy because it can cross the placental barrier and lead to fetal complications, including malformations and death (3). There are now increasing numbers of reported use of inferior vena cava (IVC) filters during pregnancy.

The first reported IVC filter placed in a pregnant patient occurred in 1981 (4). Initially, permanent filters were used. However, in pregnancy, the patient normally has a long life expectancy and the increased risk of VTE is generally temporary, so removable filters are attractive (5). The present systematic review will collate the information on the use of IVC filters during pregnancy.

MATERIALS AND METHODS

This systematic review was performed in accordance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (6). The focus of the review was pregnant patients who had an IVC filter placed during pregnancy, excluding those who had an IVC filter before conception or in the postpartum period. Outcome measures included maternal and fetal morbidity and mortality.

PubMed, Cochrane database, Embase and Ovid Medline databases were searched using a search strategy developed to identify all papers about IVF filter placement in pregnancy regardless of study design as follows: (filter, inferior vena cava [Medical Subject Heading (MeSH) Terms]) AND (pregnancy [MeSH Terms]) OR (obstetrics [MeSH Terms]). The search included all articles published through December 2014.

The titles and abstracts of the resulting articles were reviewed and screened for relevance. Duplicate publications, articles not published in English, and abstracts from conferences were removed. All references of included

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Table E1 is available online at www.jvir.org.

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manuscripts were manually searched to identify related articles that had not been identified.

Data were extracted to compile a database of all reported pregnancies in which an IVC filter was placed. When possible, patient age, parity, indication for IVC filter placement, IVC filter position, gestation at insertion, filter type, time of retrieval, mode of delivery, fetal outcome, and maternal morbidity and mortality were recorded.

RESULTS

The database search located 332 publications. After screening, 52 publications were located. After review of their references, a further three were found. Full texts were then examined for eligibility. This resulted in 11 exclusions: conference abstracts, reports of postpartum IVC filter insertion and superior vena cava filter insertion, and inability to identify the pregnant patients in a series. The remaining 44 articles were case reports or case series from a particular institution. There were no randomized controlled trials, and consequently no studies were amenable to pooling for meta-analysis.

From these manuscripts, 135 pregnancies in which an IVC filter was inserted were identified. However, a case series of 18 patients (7) overlapped with and included all 11 patients in an earlier series (8). Therefore, the present review includes a total of 124 pregnancies (**Table E1**, available online at *www.jvir.org*) (4,5,7–48).

Indications

The Society of Interventional Radiology (SIR) recognizes absolute and relative indications for filter placement in confirmed VTE in addition to prophylactic indications (49). In the cases identified, the rationale for IVC filter placement is not always clear, but the most common indications were selected and considered in these categories.

As in nonpregnant patients, IVC filters were inserted for the absolute indications of failure of medical therapy for VTE despite adequate anticoagulation (5,8,10–23) and complications of anticoagulation, including heparin-induced thrombocytopenia (7,15,23,24), heparin allergy (25), significant bleeding during anticoagulation (7,8,20,23,26), and contraindication to anticoagulation as a result of recent neurosurgery (27).

In some articles, the only stated reason for IVC filter placement was extensive deep vein thrombosis (DVT) during pregnancy with concerns about the risk of pulmonary embolism (PE) during delivery, when anticoagulation was to be stopped (13,26,28–35). This was particularly true when the clot was ileofemoral and delivery was in the following 2–3 weeks (7). This centers on the need to discontinue anticoagulation medication during vaginal and caesarean delivery to reduce the risk of bleeding and epidural hematoma (50) at a time when the risk of PE is particularly high (51). This is not acknowledged as a relative indication specifically by SIR but could be considered an extension of "high risk of complication of anticoagulation" (49).

Other publications referred to the relative indications of unstable, floating, large DVTs near the time of delivery (4,7,8,15,32,33,36–43) or threatened preterm labor (16) and those with clots in or extending into the IVC (44). More recently, IVC filters have been inserted as protection against PE during endovascular procedures (45–47) or thrombolysis (48) carried out during pregnancy.

No prophylactic indications have been reported, but one group (17) suggested that, in patients with high-risk thrombophilias, prophylactic placement of a temporary IVC filter could be performed before labor; however, we are aware of no studies that support this.

The British Society for Haematology IVC filter guidelines (52) state that "insertion may be considered in pregnant patients who have contraindications to anticoagulation and develop extensive VTE shortly before delivery (within 2 weeks)." This does not encompass the range of indications seen in the present review. The Royal Society of Obstetricians and Gynaecologists VTE guidelines (2) recommend to "consider use of a temporary IVC filter in the peripartum period for patients with iliac vein VTE or in patients with proven DVT and who have recurrent PE despite adequate anticoagulation," which is more reflective of the current literature.

Placement

IVC filters have been placed in primigravid and multigravid women with success, and patients with filters left in situ have gone on to have successful pregnancies (16). IVC filters have been placed in all trimesters of pregnancy, ranging from 7 weeks' (20) to 41 weeks' gestation (34), and even during the latent stage of labor (39). The gravid uterus has not been found to prevent accurate IVC filter placement via the jugular (5) or femoral route (36).

A patient in latent labor at 39 weeks' gestation had an IVC angiogram demonstrating complete effacement of the infrarenal IVC by the gravid uterus; however, with the patient positioned in the left lateral decubitus position, the infrarenal IVC was decompressed and the filter was successfully deployed infrarenally with no filter complications (39). In one patient, the planned infrarenal placement was not possible because of IVC compression by the gravid uterus (12). For a number of reasons, it is often thought that suprarenal placement is preferred in pregnancy and in young women who have the potential to become pregnant. Below the level of the renal veins, the IVC can be compressed by the gravid uterus, which could displace the filter particularly when contracting, leading to migration or fracture of the filter or damage to the IVC wall (32).