European Journal of Obstetrics & Gynecology and Reproductive Biology 222 (2018) 25–30

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Review article

Retrievable Inferior vena cava filters in pregnancy: Risk versus benefit?

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ARTICLE INFO

Article history:
Received 27 July 2017
Received in revised form 12 December 2017
Accepted 18 December 2017
Available online xxx

Keywords:
Retrievable IVC filter
Pregnancy
Venous thromboembolism

ABSTRACT

Objective: Venous thromboembolism remains one of the leading causes of maternal mortality in the developed world. Retrievable inferior vena cava (IVC) filters have a role in the prevention of lethal pulmonary emboli when anticoagulation is contraindicated or has failed [1]. It is unclear whether or not the physiological changes in pregnancy influence efficacy and complications of these devices. The decision to place an IVC filter in pregnancy is complex and there is limited information in terms of benefit and risk to the mother. The objective of this study was to determine the efficacy and safety of these devices in pregnancy and to compare these with rates reported in the general population.
Study design: The aim of this study was report three recent cases of retrievable IVC filter use in pregnant women in our department and to perform a systematic review of the literature to identify published cases of filters in pregnancy. The efficacy and complication rates of these devices in pregnancy were estimated and compared to rates reported in the general population in a recent review [2]. Fisher's exact test was used for statistical analysis.
Results: In addition to our three cases, 16 publications were identified with retrievable IVC filter use in 40 pregnant women resulting in a total of 43 cases. There was no pulmonary embolus in the pregnant group (0/43) compared to 57/6291 (0.9%) in the general population. Thrombosis of the filter (2.3% vs. 0.9%, p = 0.33) and perforation of the IVC (7.0% vs 4.4%, p = 0.44) were more common in pregnancy compared to the general population but the difference was not statistically significant. Failure to retrieve the filter is more likely to occur in pregnancy (26% vs. 11%, p = 0.006) but this did not correlate with the type of device (p = 0.61), duration of insertion (p = 0.58) or mode of delivery (p = 0.37).
Conclusion: Data for retrievable IVC filters in pregnancy is limited and there may be a publication bias towards complicated cases. This study shows that the filter appears to protect against PE in pregnancy but the numbers are small. Complications such as filter thrombosis and IVC penetration appear to be higher in pregnancy but this difference is not statistically significant. It is not possible to retrieve the device in one out of every four pregnant women. This has implications in terms of long term risk of lower limb thrombosis and post thrombotic syndrome. The decision to use an IVC filter in pregnancy needs careful consideration by a multidisciplinary team. The benefit and risk assessment should be individualised and clearly outlined to the patient.

Contents

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https://doi.org/10.1016/j.ejogrb.2017.12.035
0301-2115/

Introduction

Pulmonary embolism is a leading cause of maternal mortality in Ireland and the UK [3]. Treatment is usually with low molecular weight heparin administered subcutaneously [4]. The risk of thrombosis must be balanced against the risk of haemorrhage and is most challenging peripartum. Heparin is stopped for a period of time to allow delivery [5] but if the venous thrombus is recent, there is concern that clot migration and pulmonary embolus may occur. An inferior vena cava (IVC) filter may provide a mechanical means of preventing a lower extremity or pelvic venous thrombosis from embolising to become a potentially lethal pulmonary embolus. With advancements in technology, IVC filters [6,7] originally placed permanently, can now be temporary, optional or convertible. Temporary filters remain connected exteriorly via a sheath or catheter after insertion [8], optional are modified to allow retrieval transvenously and convertible are left in situ but are converted into a stent after the risk of thrombosis is over [2]. IVC filters have significant, although rare complications [9] that include trauma at insertion, fracture and/or migration, occlusion by thrombus or endothelialisation, penetration of the IVC and failed retrieval. The only universally accepted indications for filter placement are recent venous thromboembolism and a contraindication to anticoagulation or recurrent venous thromboembolism despite adequate anticoagulation [1].

Pregnant women with an acute thrombus, who are at risk of bleeding, may be considered for an IVC filter with removal following delivery. The efficacy and complications of these devices are well documented in the general population [2] but may not be the same in pregnancy. Insertion via the internal jugular vein (IJV) is preferable [10] to minimise fetal radiation exposure and pregnancy is one of the few indications for suprarenal placement because the uterus may be compressing the infrarenal IVC [11]. Several clotting factors are increased and there is augmented endothelial activation [12,13]. Intraabdominal and IVC pressures alter with active pushing in the second stage of labour and delivery of the baby. All of these factors may influence placement, tilting, fracture, migration and thrombosis. Evidence to inform clinicians of the safety and efficacy of IVC filters in pregnancy is lacking. We performed a literature review to identify published reports of retrievable inferior vena cava filters in pregnancy and added three cases recently managed in our department. We aimed to determine the efficacy and safety of these devices in pregnancy and to compare these with rates reported in the general population.

Methods

We describe three cases of retrievable IVC filter use in pregnancy recently managed at our hospital. A systematic review of the literature was performed searching PubMed and Medline using the terms 'IVC filter', 'pregnancy', 'optional IVC filter' and 'retrievable IVC filter' up to 31/12/2016. Papers were included if retrievable filters in pregnancy were described and we limited the review to papers published in English. Permanent or temporary filters were not included because they have been largely replaced by retrievable devices. The publications identified were case reports and case series. One large series [14] describing the use of retrievable filters in the general population was reviewed to assess if data from pregnant women could be extracted but this was not possible.

Indication for placement of the filter, type of filter, mode of insertion, duration of insertion, efficacy and complications were determined for pregnancy. Due to the small sample size in our study, Fisher's exact test was used to determine if complications were associated with type of filter, duration of insertion and mode of delivery. Complication rates of retrievable IVC filters in the general population were determined from a recent large review [2]. These were compared to the complication rates in pregnancy accrued from our study, using Fisher's exact test with a p-value of <0.05 considered statistically significant.

Results

The case reports were as follows:

Case 1: A 38 year old multiparous woman, presented with a large volume pulmonary embolus at 38 weeks and mild pre-eclampsia. She was treated with twice daily subcutaneous Enoxaparin 1 mg/kg. It was anticipated that she would require induction of labour for pre-eclampsia (should her clinical condition deteriorate), or labour spontaneously at any time, and a decision was taken to place a retrievable filter (Celect, Cook). The filter was placed suprarenally via the right IJV. Low molecular weight heparin was discontinued for 24 h before and for 6 h post procedure. Labour was induced ten days later following a non-substantial antepartum haemorrhage and resulted in the spontaneous vaginal delivery (SVD) of a healthy baby. Blood loss was minimal and heparin was recommenced six hours post-delivery. The filter was retrieved without complication five days postnatally and she was anticoagulated with warfarin for a further six months (Table 1).

Case 2: A 31 year old multiparous woman had a 'floating' right external iliac vein thrombus diagnosed incidentally at 26 weeks by abdominal ultrasound performed for recurrent antepartum haemorrhage. A large retroplacental clot was also noted. Anticoagulation with heparin was contraindicated because of recurrent bleeding and a retrievable IVC filter (Celect, Cook) was placed in the infrarenal IVC via the right IJV. Recurrent antepartum haemorrhage persisted and placental abruption and disseminated intravascular coagulation developed at 30 weeks. A healthy baby boy was delivered by emergency caesarean section (CS). Massive blood transfusion was required. Retrieval of the filter was attempted 13 days later (40 days after insertion) and although snared successfully, it could not be removed because it had penetrated the IVC wall and was jutting into the right renal vein. The filter was left in situ and the patient was anticoagulated with warfarin for three months postpartum.

Case 3: A 41 year old multiparous woman presented with a massive saddle pulmonary embolus at 35 weeks diagnosed at CT pulmonary angiogram with echocardiographic evidence of right ventricular strain. The decision was made to place a retrievable IVC filter (Celect, Cook) suprarenally via the right IJV. A healthy baby