

Long-Term Outcome of Inferior Vena Cava Filter Placement in Patients Undergoing Gastric Bypass

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Background: It has been well established that inferior vena cava (IVC) filter placement at the time of open gastric bypass (OGB) surgery in patients with a body mass index of more than 55 kg/m² reduces both the pulmonary embolism rate and the perioperative mortality. However, little is known about the long-term effects of IVC filter placement in this particular group of patients.

Methods: Over an 8-year period, a total of 571 morbid obese patients underwent OGB procedures, and 58 (10%) of them required placement of an IVC filter before their procedure. All IVC filters were placed percutaneously through a femoral vein approach using a portable OEC fluoroscope. Types of IVC filters used in our study included the TrapEase ($n = 35$), Simon-Nitinol ($n = 9$), Greenfield ($n = 2$), and Bard Recovery ($n = 12$).

Results: Of the 58 patients who required an IVC placement, 56 remained free of any thromboembolic phenomena over the 8-year period (range, 1-8 years). The remaining two patients developed deep venous thrombosis. One patient was successfully treated with intravenous heparin and a 6-month course of Coumadin. She had complete resolution of her deep venous thrombosis and was incidentally noted to have a prothrombin 20210 gene mutation. The other patient, who had multiple gastric bypass complications, could not be successfully treated with intravenous heparin and thus progressed on to complete IVC thrombosis. She developed *phlegmasia cerulea dolens* and required bilateral above-the-knee amputations. She subsequently died 3 months after her procedures.

Conclusion: It appears that IVC filter placement at the time of OGB surgery is a relatively benign intervention with a maximal benefit. A note of caution should be exerted for those obese patients who have a hypercoagulable disorder and for those who have complications related to the gastric bypass. An aggressive posture, which may consist of immediate anticoagulation after their procedures (only when it is deemed safe), should be advocated in this small sub-group of morbid obese patients.

INTRODUCTION

The importance of inferior vena cava (IVC) filter placement in a select group of high-risk super-obese patients undergoing gastric bypass surgery has been previously established.¹⁻⁵ IVC filter placement prevents pulmonary embolism and indirectly the morbidity and mortality associated with this untoward event.^{1,2} Our previous work prospectively matched super morbidly obese patients with body mass indices (BMI) greater than 55 kg/m² to either preoperative IVC filter placement versus no intervention just before open gastric bypass (OGB)

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Ann Vasc Surg 2010; 24: 946-949

DOI: 10.1016/j.avsg.2010.05.004

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Table I. Comparison of PE-related morbidity and mortality rates in morbidly obese patients (BMI = >55) receiving an IVC filter versus a matched control group

Group	Number of patients	BMI >55 kg/m ²	IVC filters	PE rate (%)	PE mortality (%)
IVC filter	17	17	17	0	0
Control	18	18	0	28	11

PE, pulmonary embolism; BMI, body mass index; IVC, inferior vena cava.

surgery performed between 2003 and 2005. The control group included 18 patients, with 5 (28%) developing a pulmonary embolus (PE) and 2 (11%) dying from a PE. The group treated with IVC filters had no PEs or PE-related deaths (Table I).² These observations helped establish a survival benefit for super morbidly obese (BMI = >55 kg/m²) patients receiving a preoperative IVC filter during the perioperative period.

Despite the apparent short-term perioperative benefits of IVC filter placement, the procedure has several potential disadvantages including filter migration, perforation, thrombosis, and recurrent small emboli syndrome.^{6,7} These long-term complications are influenced by both patient and device characteristics. Several well-established reports have determined the safety and efficacy of IVC filter placement in a variety of clinical situations involving trauma victims and pediatric patients.^{6,7} There have been no reports on morbid obese patients undergoing OGB surgery.

Our objective was to report on the long-term effects of IVC filter placement on super-obese patients who underwent an OGB surgery.

METHODS

Placement of IVC Filter

All patients in whom IVC filters were placed at the time of their open Roux-en-Y gastric bypass surgery between 1999 and 2005 had a BMI of more than 55 kg/m², or a history of deep venous thrombosis (DVT), PE, or pulmonary hypertension, and they were placed on a Skytron Heavy Duty 6500 fluoroscopic table that was reversed (Skytron, Grand Rapids, MI). A cephalad extension was added to the "head" ("original foot") of the table to permit imaging of the patient's abdomen. Imaging was performed using a portable OEC 9800 digital fluoroscope (GE, Wauwatosa, WI). A transfemoral puncture was made with an 18-G needle, and a Magic Torque (Boston Scientific, Watertown, MA) wire was fluoroscopically guided into the IVC. The needle was then exchanged for a 6F, 7F, or 12F sheath supplied by the TrapEase (Cordis,

Warren, NJ), Simon-Nitinol (Nitinol Medical Technologies, Boston, MA), Greenfield (Boston Scientific) or Bard Recovery (Nitinol Medical Technologies) IVC filter systems, respectively. Vena cavography was performed to measure IVC diameter, confirm patency, and identify the confluence of the iliac veins. Selective left and right renal venography was then performed using a Cobra 1 (C1) catheter (Cook, Bloomington, IN). A TrapEase ($n = 35$), Simon-Nitinol ($n = 9$), Greenfield ($n = 2$), or Bard Recovery ($n = 12$) filter was then deployed into the infrarenal IVC under fluoroscopic control. Completion venography after IVC filter deployment confirmed filter position as well as patency of the IVC and renal veins.

Study Design

Indications for IVC filter placement included a BMI of more than 55 kg/m², a previous history of DVT, PE, or pulmonary hypertension (mean pulmonary artery pressure = >40 mm Hg) as measured by noninvasive echocardiography or Swan-Ganz catheterization.¹⁻⁵ These indications for IVC filter placement were selected on the basis of previous work conducted by our group and others.¹⁻⁵ On the basis of these indications, 58 (10%) patients had IVC filters placed at the time of surgery.

All the patients in our study underwent routine pre- and postoperative lower extremity venous duplex examination and postoperative abdominal radiographs. Two bariatric surgeons and three vascular surgeons performed all of the OGB procedures and IVC filter placements. Additionally, all of the patients received systemic compression devices, and weight-adjusted subcutaneous heparin (50 U/kg of actual body weight) injection preoperatively and every 12 hours postoperatively until they were ambulating for more than 4 hours/day. Routine perioperative pulmonary angiography, spiral computed tomography scanning, or ventilation-perfusion scanning was performed if the patient showed clinical after-effects of a PE. Pulmonary emboli were documented by carrying out a spiral tomography, ventilation-perfusion scan, or

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