Delayed Recurrent Massive Thromboembolism through a Vena Caval Clip after Pulmonary Embolectomy

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A case of recurrent massive pulmonary embolization through a modified Miles’ clip two weeks after successful emergency pulmonary embolectomy is reported. Vena caval ligation is probably a safer alternative in these critically ill patients.

The interruption of the inferior vena cava with a Teflon clip has recently been advocated as the best available method for preventing pulmonary embolism after a cardiac procedure, usually pulmonary embolectomy.1,2 We recently successfully performed emergency pulmonary embolectomy and clipping of the inferior vena cava in a patient six days after left radical mastectomy, only to have recurrent massive pulmonary thromboembolism terminate in the patient’s death 13 days later.

CASE REPORT

A 57-year-old woman was admitted to the general surgery service at the University of Texas Medical Branch Hospitals for evaluation of a mass in her left breast. Her medical history revealed hypertension, adult-onset diabetes mellitus, and recurrent pyelonephritis. Past surgical procedures included an appendectomy and partial hysterectomy.

A 3 x 3 cm mass in the upper inner quadrant of the left breast was associated with fixation and retraction of the nipple. Two days after admission, the patient underwent a left radical mastectomy for an infiltrating ductal carcinoma. Metastatic tumor was present microscopically in one of four level-one lymph nodes. The patient did well until the sixth postoperative day, when she developed acute respiratory insufficiency. An emergency pulmonary scan revealed multiple segmental areas of decreased perfusion compatible with pulmonary embolization.

While the patient was being transported from the radiology department back to the intensive care unit, she suffered cardiorespiratory arrest. She was immediately intubated, and closed chest cardiac massage was begun. Analysis of blood gas levels revealed an oxygen pressure of 11 mm Hg. With administration of high doses of catecholamines and continuing external cardiac massage, the systemic pressure could only be maintained in the range of 20 to 50 mm Hg systolic.

The patient was then rushed to the operating suite, where emergency femoral-femoral bypass was instituted within 20 minutes of the arrest. Femoral venous pressure was 50 mm Hg systolic at the time of cannulation, which was double the coincident arterial pressure. A median sternotomy was then performed, and the patient was placed on total cardiopulmonary bypass. A vertical pulmonary arteriotomy was made, and no thrombus was identified in the main pulmonary artery. Both pleural cavities were then opened, and the lungs were massaged and suctioned for over 100 ml of clot from both sides (Fig 1). The pulmonary arteriotomy was closed; and after aspiration of air from both ventricles, the patient came off bypass without difficulty. The peritoneum was then opened in the lower portion of the incision, and the abdomen was explored. The gall bladder was acutely inflamed, filled with stones, and connected to the common duct by a cystic duct containing a stone that was 10 mm in diameter. The duodenum was reflected medially, exposing the vena cava, as recently de-

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Figure 1. Large volume of bilateral pulmonary arterial clot extracted at time of pulmonary embolectomy.

Figure 2. Massive pulmonary re-embolization, leading to death three weeks after radical mastectomy and two weeks after emergency pulmonary embolectomy.
scribed by Moran. A serrated Teflon Miles' clip (Richards model 190011) was then placed on the inferior vena cava between the entrance of the right ovarian vein and the renal veins. A cholecystectomy was performed; the abdominal incision was closed without drainage, and the median sternotomy was closed over two mediastinal tubes.

After surgery, the patient was initially somnolent but had no localizing neurologic signs. She initially required isotropic support with dopamine but subsequently did well and was fully alert and ambulatory without assistance when transferred out of the intensive care unit on the seventh postoperative day. Analysis of blood gas levels with the patient breathing room air at that time showed a pH of 7.49, a carbon dioxide tension of 30 mm Hg and an oxygen pressure of 70 mm Hg. Further evidence of the patient’s excellent perfusion was the healing of the large triangular free flap of skin and subcutaneous tissue between the oblique incision of the radical mastectomy and the vertical median sternotomy. She continued to do well until the 13th postoperative day, when she again developed tachypnea and dyspnea, followed quickly by cardiac arrest, from which she could not be resuscitated. Emergency measurement of the arterial oxygen pressure was less than 10 mm Hg.

At autopsy, the cause of death was found to be massive pulmonary embolism (Fig 2). A large grumous venous thrombus was found in the right common iliac vein. The endothelial lining of the right atrium and ventricle was smooth and glistening, showing no evidence of damage or recent attachment of thrombus. The only abnormality of the heart was a minor focal interstitial infiltration of lymphocytes and plasma cells just beneath the epicardium. The veins of both arms were normal, with the exception of adherent thrombus in the left internal mammary vein beneath the most medial extension of the incision of the radical mastectomy for the tumor in the upper inner quadrant. The emboli found in the pulmonary arteries could easily have passed through the in situ vena caval clip. The thin anterior and posterior serrated bars did not appose, thus leaving an oval lumen through which large clots could easily pass (Fig 3). This clip differs from the original Miles’ clip, which had no serrations* and was more rigid.

There was no evidence of metastases from the carcinoma of the breast. Neopatohologic examination revealed very mild frontal cerebral atrophy. Serial coronal sections of the cerebral hemispheres at 1-cm intervals revealed distinct demarcation between gray and white matter. There were no areas of hemorrhage, antemortem necrosis, calcification, or neoplasia. The only vascular cerebral abnormality was congenital persistence of the right trigeminal artery.

**DISCUSSION**

Extension of the incision for the median sternotomy to the umbilicus, as performed in this case, is an effective and expedient method of obtaining good exposure and control of the inferior vena cava after completion of a pulmonary embolectomy.1,2 However, this case also illustrates the failure of a serrated Teflon clip of a modified Miles’ type to sufficiently occlude the inferior vena cava to avoid recurrent massive pulmonary embolization. Bernstein1 recently reviewed a large series of various plication procedures for preventing embolization through the inferior vena cava and found that in about 70 percent of the cases, the vessel will remain patent after vena caval clipping. While continued patience may reduce problems of stasis in the legs, it can be considered advantageous only if the sieving effect is sufficient to prevent recurrent major pulmonary embolism. An inferior vena cava umbrella is a possible alternative to clipping or ligation,3 but to avoid renal venous impaction or improper positioning and to achieve precise placement just below the renal veins requires injection of contrast material under fluoroscopic control and the use of a radiolucent table, which are often not available in emergency situations.

In view of the failure of the serrated Teflon clip to successfully obstruct the inferior vena caval lumen to the passage of lethal volumes of clot in this case, it is suggested that ligation of the inferior vena cava be performed to ensure definite caval interruption in these desperately ill patients. Use of a more occlusive clip of the original Miles’ design would be our second choice.

**REFERENCES**


**Isolated Right Ventricular Mechanical Alternans in Right Ventricular Infarction**

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The phenomenon of isolated mechanical alternans of the right ventricle is described in the setting of right ventricular infarction. We also discuss the resemblance of right ventricular infarction to cardiac tamponade or pericardial constriction.

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