

Metastatic Renal Cell Carcinoma–Associated Pleural Effusion After Coronary Artery Bypass Grafting

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Pleural effusions after coronary artery bypass grafting (CABG) occur in up to 89% of patients undergoing the procedure. Effusions present days to months after surgery, and fluid characteristics relate to timing factors. Most of the effusions are left-sided and resolve spontaneously. Pleural effusions requiring treatment occur in a small percentage of patients who have undergone CABG. Post-CABG pleural effusions in temporal relation to malignant effusions are not widely reported. This report describes a 50-year-old man presenting with a malignant left-sided pleural effusion 3 months after CABG, with characteristics resembling a late post-CABG effusion.

Pleural effusions after coronary artery bypass grafting (CABG) occur in 42% to 89% of patients undergoing the procedure. Effusions are exudative and predominantly left-sided. Early effusions present in the first postoperative month, are bloody, contain mostly erythrocytes, and respond well to treatment. Late effusions present 30 to 120 days after surgery, are yellow, predominantly lymphocytic, and tend to recur after treatment. Most effusions resolve spontaneously. One half to four percent require interventions, including thoracentesis and pleural surgery. Post-CABG pleural effusions in temporal relation to malignancy are not widely reported. We report a case of malignant pleural effusion presenting in the setting of coronary artery bypass grafting.

Report of Case

A 50-year-old man presented with a left pleural effusion. Three months before, the patient underwent CABG using the left internal mammary artery. Postoperative course was unremarkable. He complained of dyspnea and decreasing exercise tolerance. Two thoracenteses drained 4 L of hemorrhagic fluid. Fluid analysis, including white and red blood cell counts, lactate dehydrogenase (LDH) and protein values, cytology,

bacterial culture, and acid-fast bacilli smear failed to reveal a definitive diagnosis. He was admitted for chest tube drainage and pleural biopsy. Past medical history included diabetes, hyperlipidemia, and cigarette smoking.

Physical examination revealed a chronically ill-appearing white man. Breath sounds were diminished on the left. There was a 3-cm fixed nodule on the right arm. Laboratory data (serum) were white blood cell count, 9000/ μ L (80% segmented neutrophils); hemoglobin, 11.2 g/dL; sedimentation rate, 30 mm/h; complete metabolic profile, within normal limits; total protein, 7.0 g/dL; LDH, 170 U/L; and urinalysis, moderate blood.

Pleural fluid analysis results were red blood cell count, 130,000/ μ L; white blood cell count, 2000/ μ L (70% lymphocytes); pH, 8.0; total protein, 5.1 g/dL; LDH, 254 U/L; glucose, 264 mg/dL; amylase, 18 U/L; carcinoembryonic antigen, <0.5 ng/mL; and cytology, negative for malignancy.

Cope needle pleural biopsy showed chronic fibrinous pleuritis with atypical cells suspicious for malignancy. Bronchoscopy localized a fungating lesion in the lingula. Pathology confirmed poorly differentiated non-small cell carcinoma with spindle cell features. Computed tomography of the chest showed irregular nodules of the left pleura and right-sided pulmonary nodules. An abdominal computed tomographic scan revealed an irregular mass arising from the lower pole of the left kidney. The nodule on the right arm was metastatic renal cell carcinoma. The diagnosis was primary renal cell carcinoma with metastases to lung, pleura, and skin.

Discussion

Exudative pleural effusions after CABG are well-described and occur in 42% to 89% of patients undergoing the procedure.¹⁻³ Eighty-nine percent of post-CABG pleural effusions are left-sided or larger on the left.⁴ They reach maximal size from 1 day to 4 months postoperatively.⁴ Effusion characteristics correlate with timing.^{1,2,4}

Early effusions present within 1 month of surgery (mean, 12.6 days).⁴ Pleural fluid is bloody with many erythrocytes (>20,000/ μ L). They are frequently eosinophilic with mononuclear cells, including mesothelial cells. Lactate dehydrogenase levels are more than three times the upper limit of serum levels. Early effusions likely represent bleeding into the pleural

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Table
Comparison of Effusion Characteristics

Variable	Early-Onset Effusion	Late-Onset Effusion	Malignant Effusion
Timing after CABG	0-30 days	30-120 days	No association
Risk factor	Internal mammary artery graft	Internal mammary artery graft	Malignancy
Etiology	Bleeding into pleural space	Immune reaction, trauma during surgery, interruption of lymphatics	Tumor involvement of pleura
Laterality	Left	Left	Left or right
Appearance of fluid	Bloody	Yellow	Bloody
Erythrocyte count (cells/mm ³)	>20,000	<30,000	>100,000
Leukocyte count (cells/mm ³)	500-6500	20-3200	500-2500
Predominant cell type	Mesothelial and mononuclear cells	Lymphocytes	Lymphocytes
LDH	High	Low	Low
CEA	Low	Low	Low or high
Treatment modalities	Thoracentesis, NSAIDs	Thoracentesis, NSAIDs, pleural surgery	Diagnose and treat underlying cancer
Response to treatment	Good	Poor	Poor

CABG indicates coronary artery bypass grafting; LDH, lactate dehydrogenase; CEA, carcinoembryonic antigen.

space. Most early effusions resolve spontaneously or after thoracentesis.

Late effusions present more than 1 month after surgery (mean, 48.8 days).⁴ Pleural fluid is yellow and contains predominantly lymphocytes. Lactate dehydrogenase levels are low.^{1,4} Pleural biopsy reveals inflammation and fibrosis. Late effusions are thought to represent an immune reaction or may be related to trauma during surgery, with interruption of lymphatics.⁴ Late effusions tend to recur and require more aggressive treatment strategies.

Most post-CABG effusions resolve spontaneously. One-half to four percent of effusions require intervention.⁴ Thoracentesis is recommended for symptomatic relief and definitive diagnosis. Treatment with nonsteroidal anti-inflammatory agents is indicated. If the effusion recurs, a second thoracentesis should be performed and oral prednisone administered. Metastatic workup of post-CABG effusions is rarely done.

One study described effusions that occupied more than

one fourth of the hemithorax and persisted after two or more thoracenteses. They required pleural surgery, including pleurodesis, decortication, and pleurectomy.² Thoracoscopy should be considered only when fluid analysis differs from expected findings.¹

Post-CABG pleural effusions are unrelated to time spent in the operating room, operating surgeon, duration of time on the heart-lung pump, or number of grafts.⁴ They are also unrelated to atelectasis, placement of chest tubes, and enlarged cardiac silhouette.³

An association exists between post-CABG effusions and use of internal mammary artery grafts.^{5,6} Effusions occur nearly twice as often in patients with internal mammary artery grafts than those with saphenous vein grafts (84% versus 47%).⁷ Harvesting of the internal mammary artery requires pleurotomy, resulting in trauma to the pleural cavity.³ The pleura becomes inflamed and less effective at reabsorbing fluid.⁶ Other factors include reduction in blood supply to the inter-

costal muscles, a greater incidence of injury to the phrenic nerve, and interruption of the lymphatic system.³

Despite the high incidence of post-CABG pleural effusions, other underlying etiologic factors must be considered. Most effusions with specific etiologic factors in the months after CABG are from congestive heart failure, pericarditis, pulmonary embolism, and postpericardectomy syndrome.⁴ Other reported etiologic factors include pneumonia, valve replacement, rheumatoid arthritis, and drug reactions. One study identified malignancy as the etiology of a post-CABG pleural effusion.¹

Unilateral exudative pleural effusions unrelated to coronary artery bypass grafting are most commonly related to pneumonia, tuberculosis, and malignancy. One fourth of patients with pleural effusions in a hospital setting are secondary to malignancy.⁸ Malignant effusions are usually bloody, with more than 100,000 erythrocytes/ μ L. The white blood cell count ranges from 500 to 2500/ μ L, and the differential reveals mostly mature lymphocytes. The carcinoembryonic antigen and amylase concentrations may be elevated. Low glucose levels and fluid pH less than 7.3 indicate more extensive disease and poorer prognosis.⁹ Definitive diagnosis is obtained through cytology and biopsy, if necessary. The *Table* compares post-CABG and malignant pleural effusion characteristics.

Conclusion

This report emphasizes the importance of recognizing that pleural effusions commonly occur after coronary artery bypass grafting and that it must be a diagnosis of exclusion. Early and late effusions demonstrate distinct characteristics. This

case resembled the clinical course of a late post-CABG pleural effusion in terms of timing, fluid characteristics, and aggressiveness. Complete evaluation led to the diagnosis of malignant pleural effusion secondary to metastatic renal cell carcinoma, an association rarely reported.

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