Our patient presented with severe CHF approximately six months after the onset of systemic sclerosis. She had four-chamber cardiac dilatation and severely depressed ventricular function. She never had evidence of significant arrhythmias. A right ventricular septal endomycocardial biopsy specimen demonstrated evidence of myocarditis and mild fibrosis. Her condition improved symptomatically with standard treatment of CHF with diuretics, digoxin, and afterload reduction. She was also treated with pulsed intravenous corticosteroids. Despite these measures, however, her symptoms of CHF returned and she died six weeks later of progressive heart failure.

Our patient also had moderate to severe hypothyroidism. Therapy with low-dose L-thyroxine was initiated. It remains unclear what role this may have been playing in the severe cardiac dysfunction. Although she had elevated muscle enzyme levels, there was no clinical evidence of myositis (normal strength and no pain or tenderness) as has been previously reported in the other cases of systemic sclerosis with myocarditis. We did not perform electromyography or muscle biopsy. Creatine kinase elevation could be attributable to either hypothyroidism or myositis.

Inflammatory myocarditis should be considered in patients with relatively recent onset of systemic sclerosis who present with either low cardiac output or congestive symptoms of CHF. Endomycocardial biopsy may be considered to document the presence of inflammatory myocarditis. Resolution of ventricular dysfunction following pulsed methylprednisolone therapy has been reported but such therapy must still be regarded as empiric.

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Diagnosis of Superior Vena Caval Obstruction by Transesophageal Echocardiography*
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Superior vena caval (SVC) syndrome may be caused by extravascular compression or intravascular obstruction. Knowing the mechanism of SVC syndrome enables the physician to choose appropriate treatment. Transesophageal echocardiography (TEE) is a safe bedside procedure that is excellent for evaluating the SVC and its surrounding structures. We report the valuable role of TEE in demonstrating the mechanism of SVC syndrome.

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uperior vena caval (SVC) obstruction may be caused by extravascular compression or intravascular obstruction. The threat posed by SVC obstruction demands prompt attention, but the mechanism of obstruction must be understood before appropriate therapy can be initiated. Transesophageal echocardiography (TEE) has been demonstrated to be an excellent tool for evaluating the heart and great blood vessels. The SVC is visible at several levels by TEE, and therefore, TEE may prove useful in demonstrating the mechanism of SVC obstruction. We report three cases in which TEE was able to demonstrate the mechanism of SVC obstruction.

CASE REPORTS

CASE 1
A 62-year-old man with metastatic adenocarcinoma of the lung developed progressive dyspnea and swelling of the face and upper extremities. A clinical diagnosis of SVC syndrome was made. A transthoracic echocardiogram was performed to evaluate cardiac function; it demonstrated normal left ventricular function but suggested right atrial compression by an extracardiac mass. A TEE was performed to better assess the right atrium and extracardiac mass. It demonstrated the mass compressing the right atrium at its junction with the SVC. At this site the SVC was severely narrowed, and color flow Doppler imaging failed to demonstrate flow within the lumen of the SVC, indicating compression. Proximal to this site, the SVC was dilated. Radiation therapy was begun, and the patient’s symptoms of SVC obstruction improved. The patient died one month later due to pneumonia.

CASE 2
A 67-year-old woman presented to the emergency room with the sudden onset of dyspnea and swelling of the face, neck, and upper extremities. She had undergone mitral valve replacement with a prosthetic St. Jude valve three weeks earlier for severe mitral regurgitation and had been discharged on long-term anticoagulative therapy. The prothrombin time on this admission was markedly prolonged at 45 seconds (control, 11 seconds). A transthoracic echocardiogram was performed to evaluate the prosthetic valve.

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Diagnosis of Superior Vena Cava Obstruction by TEE (Aiyala et al)
Prosthetic valve function was normal; however, a large, homogeneous echogenic mass within the pericardial cavity, compatible with thrombus, was visualized compressing the right atrium and right ventricle. A TEE was performed to better evaluate the right heart structures; it demonstrated an anterior mediastinal hematoma compressing the right atrium and SVC. As in case 1, the SVC was completely compressed, and flow at this site was absent. The patient was given fresh frozen plasma to reverse the anticoagulation. The patient's symptoms of SVC obstruction improved, and a follow-up transthoracic echocardiogram demonstrated resolution of the pericardial mass. The patient was discharged on low-dose therapy with warfarin sodium (Coumadin) and continues to do well.

**CASE 3**

A 63-year-old woman with large-cell carcinoma of the lung and a history of SVC syndrome (three months earlier) developed recurrent dyspnea, distended neck veins, and swelling of the face and upper extremities. A transthoracic echocardiogram was performed, which demonstrated a moderate pericardial effusion. A TEE was obtained to better evaluate the intracardiac structures; it demonstrated a dilated obstructed SVC with an intraluminal thrombus (Fig 1). Color flow Doppler imaging failed to detect flow within the lumen of the SVC, indicating complete obstruction. The patient was treated with intravenous heparin, and the symptoms of SVC obstruction improved. The patient died five weeks later from the underlying malignancy.

**DISCUSSION**

The SVC syndrome is most commonly caused by extracardiac compression; however, intravascular thrombosis from a central venous catheter or thrombosis associated with malignancy has been noted with increasing frequency. Parrish et al. in their series of 86 patients with SVC syndrome, reported malignancy as the most common cause of extracardiac compression but reported intravascular thrombosis as a cause in 7 percent of the patients. It is important to differentiate between intravascular thrombosis and extracardiac compression as the cause of SVC syndrome to direct appropriate therapy.

There are several methods available for diagnosing the cause of SVC obstruction. Contrast venography, due to its invasive nature and associated bleeding complications, recently has been supplemented by computerized tomographic scanning; however, computerized tomographic scanning must incorporate contrast enhancement for it to accurately assess the cause of SVC obstruction. Schwartz et al. used computerized tomographic scanning with contrast enhancement in 18 patients with SVC syndrome and demonstrated only one false-negative result, which was due to inadequate contrast injection. The main limitation of computerized tomographic scanning with contrast enhancement is its use of contrast material, which can have potential detrimental effects on renal function and can induce allergic reactions.

Transthoracic echocardiography is of limited value in evaluating the SVC. In all three of our cases, we could not visualize the SVC well enough by transthoracic echocardiography to recognize the mechanism of obstruction. The TEE was able to clearly visualize the SVC at several levels, including its junction with the right atrium, establishing the mechanism of obstruction in all three patients. This is similar to a case illustrated by Mugge and co-workers in a series describing the utility of TEE in the evaluation of cardiac mass lesions.

The ability to safely perform TEE at the bedside, even in critically ill patients, makes TEE an ideal tool to evaluate patients with suspected SVC obstruction. Although computed tomographic scanning is necessary for optimal assessment of the tumor mass that can cause SVC obstruction, TEE can elucidate the mechanism of SVC obstruction and can also provide additional information with regard to related cardiac pathology. Furthermore, currently available biplane TEE imaging allows the SVC to be visualized in its long axis, better delineating its relationship with the interatrial septum and right atrium. This will enhance the recognition of obstruction or compression of the SVC. Our report demonstrates that TEE is excellent in accurately differentiating between intravascular obstruction and extravascular compression as the cause of the SVC syndrome. This will aid in choosing appropriate therapy, be it radiation or anticoagulation therapy.
Incarceration of Existing Inguinal Hernia as a Complication of Pulmonary Function Testing*

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Pulmonary function testing (PFT) has not been listed as a risk for development of incarceration in an existing inguinal hernia. We report two patients who developed this complication after routine preoperative PFT. We also present data of our retrospective review of eight patients with inguinal hernia who were referred for preoperative PFT. Two out of eight patients suffered incarceration of an existing inguinal hernia. We found no significant difference in mean age, weight, smoking habits, number of forced expiratory maneuvers, time of sustained forced expiratory maneuver, or any PFT data between the groups with and without incarceration. Thus, incarceration of inguinal hernia could not have been predicted prior to PFT and was not related to other factors such as obesity or more severe airway obstruction.

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Preoperative pulmonary function testing (PFT) is an integral part of preparing many patients for surgery. The goal is to identify patients at increased risk of perioperative morbidity and mortality.1 Indications for preoperative PFT include patients with a history of smoking, chronic cough or dyspnea, age over 70 years, known pulmonary disease, obesity, previous history of postoperative complications, and proposed thoracic or upper abdominal surgery.1 Forced expiratory spirometry, arterial blood gas value analysis, and regional lung function assessment are the tests most commonly performed in this setting. Forced expiratory spirometry is a relatively simple procedure with almost no associated complications. Review of the literature fails to show any definite listed complications or contraindications for spirometry. Conceivably, patients with recent acute myocardial infarction, superior vena cava syndrome, pneumothorax, or hemothysis could be at increased risk for complications during PFT. We encountered two patients with inguinal hernia who were referred to our pulmonary laboratory for preoperative PFT and who subsequently suffered incarceration of their existing reducible hernias. This report describes these two cases and our retrospective review of inguinal hernia patients referred to our laboratory for PFT. We attempted to identify predisposing factors which could lead to incarceration, and to elucidate possible mechanisms for this complication.

CASE REPORTS

Patient 1

A 63-year-old white man was admitted to the surgical service with the chief complaints of right-sided lower abdominal pain and swelling of one week's duration. He gave a history of asthma, cigarette smoking (two to three packs per day for 30 years), chronic cough, and left inguinal herniorrhaphy in 1969. Physical examination was unremarkable except for expiratory wheezes bilaterally and an easily reducible right inguinal hernia. Four hours after the patient performed preoperative spirometry, he developed unbearable pain in the right groin area. The hernia was nonreducible despite sedation. Emergent surgery was performed because of the possibility of incarceration. At surgery, a large hernia sac containing blood-tinged fluid and a loop of viable bowel was found. The patient tolerated the procedure, had an uncomplicated postoperative course, and was discharged on the fifth postoperative day.

Patient 2

An 80-year-old man with a history of right inguinal hernia for more than one year came to the emergency room with complaints of pain and swelling in the right groin area. Physical examination was unremarkable except for a nontender reducible right inguinal hernia. The patient was referred for preoperative PFT. During spirometry, the patient complained of abdominal pain but was able to perform the forced expiratory maneuvers without difficulty. Two hours later he was found to have an irreducible hernia and was taken to the operating room for surgery. Operative findings revealed a large hernia sac containing viable-appearing bowel. The hernia was repaired and the patient had an uncomplicated postoperative course. He was discharged on the fourth postoperative day.

Retrospective Study

We retrospectively reviewed the records of all eight patients with inguinal hernia referred to our PFT laboratory for preoperative spirometry between July 1988 and July 1989. We defined two groups of patients: group 1 included six men who did not suffer hernia incarceration, and group 2 included the two men just described as patients 1 and 2. On comparison between the two groups, we did not find any statistically significant differences in the following parameters: age (50 ± 12 vs 71 ± 12 years); weight (81 ± 18 vs 83 ± 8 kg); smoking habits (5/6 vs 2/2 patients were smokers); number of forced expiratory maneuvers (8 ± 1 vs 7 ± 1); average duration of forced expiratory maneuvers (11.6 ± 1.3 vs 12.3 ± 0.4s); FVC (75 ± 20 vs 83 ± 50 percent of predicted); FEV1;