manometer.

In the previously-mentioned cooperative study on cardiac catheterization involving 12,367 consecutive procedures, serious infectious complications occurred in only 13 patients, an incidence of 0.1 percent of all studies and 2.9 percent of all complications. Ten of these 13 patients developed localized infections of the catheterization site within 24 hours of the procedure. Seven of these 10 patients were children under the age of two years. Staphylococcus and Escherichia coli were the most common isolates.

Three patients in the study developed bacterial endocarditis soon after catheterization (Table 1). One of these three, as our patient, had a staphylococcal infection of the catheter-insertion site, and developed multiple systemic emboli as a sequel of endocarditis.

Our patient is the fifth reported case of infective endocarditis occurring after cardiac catheterization. She had an extremely aggressive form of acute endocarditis, as often results from the staphylococcal form of the disease, and eventually succumbed as a consequence of coronary embolization with infarction, cardiac rupture and tamponade. Table 1 summarizes this and the other reported cases of catheterization-related endocarditis.

Antibiotic prophylaxis during cardiac catheterization has been recommended; however, Kreidberg and associates have demonstrated ineffectiveness of penicillin prophylaxis. Furthermore, hypersensitivity reactions are reported in 1 to 4 percent of patients receiving penicillin, a figure significantly higher than the 0.1 percent incidence of endocarditis complicating catheterization. Thus, the risk of allergic drug reaction would appear to outweigh the benefit from antibiotic prophylaxis.

The catheter-insertion site was the probable portal of bacterial entry in at least two of the five reported patients with postcatheterization endocarditis, and is the most common locus of other serious catheterization-related infections. The skin is also the usual source of sepsis from indwelling intravenous lines and was the likely origin of the staphylococcal endocarditis reported after Swan-Ganz pulmonary artery pressure monitoring. The frequent participation of skin flora in infections after both prolonged venous intubation and routine cardiac catheterization should redirect attention to the recommendations of Maki et al regarding local skin and catheter care, and emphasize the need for meticulous maintenance of strict aseptic technique during cardiac catheterization.

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Mediastinal Thymic Cyst after Open Heart Surgery*

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A benign thymic cyst seen six years after valvular heart surgery is described, and the question of the possible role of previous surgical trauma in the development of the cyst is raised.

In 1897, congenital mediastinal thymic cyst was first recorded by Lopault; and there have been only occasional reports of these relatively uncommon tumors since then; however, the case described herein is the second to be noted after open heart surgery.

CASE REPORT

A 44-year-old white man, who had had mitral valvular replacement and aortic commissurotomy six years previously, came to the Deborah Heart and Lung Center, Brown Mills, NJ, for evaluation of a mediastinal mass seen on the x-ray film. Following his previous operation, the patient had returned to full-time employment and had initially enjoyed relative well-being; however, seven months prior to his present admission, progressive exertional dyspnea and ultimately frank congestive heart failure developed. The patient was given therapy with digitalis and diuretic agents, with marked clinical improvement. Chest x-ray films taken annually after

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the previous surgery had not shown any evidence of a mediastinal mass until the film before this admission.

Physical examination revealed an afibrile man with an irregular pulse of 114 beats per minute and blood pressure of 120/70 mm Hg. There was jugular venous distention. The chest was clear. There was a left ventricular heave and distant prosthetic clicks in the mitral area. A grade 3/6 pansystolic murmur was present at the apex, and a grade 2/6 early diastolic rumble was heard at the lower sternal border. The liver was palpable below the right costal margin.

The chest roentgenogram revealed a lobulated mass in the right anterior superior mediastinum above the hilum, with no calcification detectable. There was mild cardiomegaly. A Beall prosthetic valve was present in the mitral position. The electrocardiogram showed atrial fibrillation with rapid ventricular response.

The initial impression was a hilar mass of unknown etiology. The findings from bronchoscopic examination were normal, and tomograms confirmed the mass to be anterior.

Angiographic studies ruled out a vascular lesion of the pulmonary artery or ascending aorta. Data from cardiac catheterization indicated a mild gradient across the prosthetic Beall mitral valve and dynamic aortic regurgitation. The clinical diagnosis at this time was neoplastic disease of the anterior mediastinum with involvement of the pericardium.

**Surgical Findings**

The patient underwent right exploratory thoracotomy. A "solid" mass measuring 9 × 6 × 5 cm was seen lying anterolateral to the great vessels, close to, but not invading, the superior vena cava, ascending aorta, and right atrium. The mass was removed in toto with the adjacent pericardium (Fig 1 and 2).

Pathologically, the mass was a multilocular cyst containing greasy dark-greenish fluid. Microscopically, the cystic wall contained Hassall's corpuscles within lymphoid aggregates, indicating an involuted thymic cyst (Fig 3). The cystic lining varied from flat cuboidal to stratified columnar to squamous epithelium, with areas showing cholesterol clefts and foreign-body giant cells.

The patient was discharged on a regimen of digitalis, diuretics, and anticoagulants. At the follow-up examination two months later, his heart failure was compensated, and chest x-ray films showed disappearance of the wide anterior mediastinal shadow.

**DISCUSSION**

In 1897, Loupalt1 recorded the first congenital mediastinal thymic cyst, which was found at necropsy in an 18-year-old woman. The first American report was that of Spees5 in 1938, who found a thymic cyst in a 25-year-old man at necropsy. Although thymic cysts have been recognized for a long time, they are a rare lesion that represents only approximately 1 percent of all mediastinal masses.3,4

The prognosis for thymic cysts is excellent. Total surgical removal is recommended. No local recurrence has ever been reported. There has also been no report of malignant degeneration in a congenital thymic cyst.

Nevertheless, preoperative diagnosis is almost never made. Indeed, sometimes only after pathologic examination of the surgical specimen is the diagnosis of thymic cyst actually made. There are no specific diagnostic measures that can positively make a diagnosis. Selective angiographic studies5-7 are helpful in excluding lesions springing from the cardiovascular system or occurring secondary to previous cardiovascular surgery, such as aneurysm of the aorta, which has been reported after open-heart surgery.

Review of the literature discloses only 48 cases of congenital thymic cysts reported through 1964. Of these, 32 were situated within the anterior mediastinum. The
The Efficacy of Trapezoidal Wave Forms for Ventricular Defibrillation

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The purpose of this study was to evaluate the efficacy of a trapezoidal wave form for ventricular defibrillation. Overall efficacy showed the trapezoidal waveform to be effective for defibrillation, including patients weighing over 100 kg (220 lb). We concluded that (1) the trapezoidal waveform is an effective defibrillatory pulse and (2) the trapezoidal waveform offers pulse characteristics less deleterious than other established wave forms.

Methods

This study was conducted prospectively at Marion County General Hospital, Indianapolis, on 108 patients documented to have electrocardiographic criteria for ventricular fibrillation. The data were obtained from patients who were found to have ventricular fibrillation when emergency paramedical technicians arrived or who developed ventricular fibrillation in the period before hospitalization. Documentation of ventricular fibrillation was established by direct recording of the patient's electrocardiogram at the site, as well as by a physician's interpretation of the telemetered ECG. For all patients, telemetric transmission from the site of the patient was utilized, employing conventional portable transmitters and mobile repeaters (Motorola Communications Inc.). Thus, the hospital-based physician had access to simultaneous ECGs. Defibrillation was conducted on the physician's orders by registered paramedical technicians. A defibrillator (Amb-Pak, Medical Research Laboratories) delivering a truncated descending-ramp trapezoidal waveform having a maximum of 250 w-sec and a peak current of 2.4 amp (standardized against a 50-ohm load). Delivered energy was held constant for varying thoracic impedance by employing transthoracic load compensation. Since the energy content of a defibrillatory pulse is a function of the load (thoracic impedance), it follows then that the delivered energy would fall as the thoracic impedance rose. Furthermore, the energy content of the defibrillatory pulse is a function of pulse width, so that prolongation of pulse duration correspondingly increases the energy content. Since the waveform employed in these studies was a truncated trapezoidal waveform, it lends itself to alteration of energy content by changing pulse duration. Load compensation is then achieved by measuring the integrated current flow through the patient and terminating the pulse at the appropriate time, thereby delivering the precise energy desired.

The defibrillating paddles were placed in the conventional anterior-lateral location. Paddle size was 12 cm each. Defibrillation was defined as conversion of ventricular defibrillation to any rhythm other than ventricular fibrillation, regardless of the patient's outcome. The efficacy of the defibrillatory pulse was then compared to the patient's body weight in kilograms.