Figure 4. Pacing-induced conversion of tachyarrhythmia to bifocal rhythm. Atrial pacing artifacts \((P)\) occur at 300-msec intervals. \(P_1\), \(P_2\), and \(P_3\) do not conduct, due to atrial refractoriness. \(P_4\) and \(P_5\) conduct through atrium, leaving it refractory to \(S_4^*\) and \(S_5^*\), but are blocked at atrioventricular node (AVN) due to refractoriness. Because conduction of \(S_4^*\) and \(S_5^*\) is interrupted, ventricular escape allows \(S_v\) to cause ventricular depolarization \(V^{**}\) in temporal isolation from any \(S_4\); and, hence, atrial escape after \(V^{**}\) allows \(S_4\) to occur in temporal isolation from ventricular depolarization. Even if \(P_5\) had not occurred, bifocal rhythm would ensue, because \(S_4\) would have conducted in usual fashion, with prolonged A-H and H-V intervals, and \(S_v\) would intervene to cause \(V^{**}\) in temporal isolation from \(S_4\). Following \(V^{**}\): there is retrograde His spike which is blocked and is irrelevant to reestablishment of rhythm. AE, Right atrial electrogram; HBE, His bundle electrogram; \(A\), atrium; \(H\), His bundle depolarization; HPS, His-Purkinje system; and \(V\), ventricle.

should be measured by atrial pacing in any patient who is a candidate for a bipolar pacemaker. Alternatively, before implantation, the atrial escape interval can be lengthened by shortening the atrioventricular sequential interval, as described by Fields et al., to prevent these arrhythmias in two patients. If a bifocal demand pacemaker is to be utilized, the physician must be aware of this tachyarrhythmia, in order to avoid unnecessary pharmacologic therapy and to take measures before implantation to prevent the occurrence of the tachyarrhythmia.

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REFERENCES

**Spontaneous Rupture of a Coronary Artery with False Aneurysm Formation**

**Successful Surgical Repair**

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A patient with diffuse atherosclerotic coronary arterial disease was demonstrated to have a spontaneous rupture of the proximal right coronary artery, with formation of an aneurysm. The patient was treated successfully with surgical repair.

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a false aneurysm. This was recognized at angiographic study, and the patient subsequently underwent a revascularization operation with suture ligation of the aneurysm.

Coronary arterial aneurysm was first described by Morgagni in 1761, and the earliest specific case report was made by Bougon in 1812. Postmortem reviews have been published by Griffith, by Packard and Wechsler, by Scott, and by Daoud. The first antemortem diagnosis of a coronary arterial aneurysm was made by Sherkat, and since that time, 57 additional cases have been described and reviewed by Oliveras et al, by Wilson et al, by Berkoff and Rowe, by Markis et al, and by Lipton et al. The causes of coronary arterial aneurysms include atherosclerosis, congenital malformation, trauma, neoplasm, dissection, inflammation, and the mucocutaneous lymph node syndrome. We wish to report a case of spontaneous rupture of a coronary artery due to atherosclerosis, with formation of a false aneurysm, and its surgical repair.

Case Report

The patient is a 55-year-old white man who developed symptoms of orthostatic hypotension and shortness of breath on Oct 21, 1975. He was hospitalized at another hospital and was found to be anemic secondary to bleeding from a large gastric ulcer. The patient received two units of blood, was started on a medical regimen for the ulcer, and was discharged after a three-day hospitalization. On Oct 24, 1975, he developed dull, substernal chest pain radiating to his left arm, accompanied by shortness of breath and diaphoresis. The pain lasted approximately 30 minutes and recurred once or twice daily without a definite relationship to exertion. A graded treadmill exercise test was performed on Oct 29, 1975. Chest pain developed after four minutes of exercise, coincident with 3 mm of ST-segment depression and multifocal ventricular premature contractions. The patient was hospitalized for cardiac catheterization on the next day. Risk factors for coronary arterial disease included a 12-year history of hypertension, a 30-pack-year history of cigarette smoking, and diabetes mellitus of adult-onset.

Findings from physical examination were unremarkable, except for blood pressure of 158/98 mm Hg and a fourth heart sound. The initial electrocardiogram was normal, except for an anterior fascicular block. The chest x-ray film was normal. Coronary angiographic studies revealed the right coronary artery to have severe diffuse aneurysmal dilatation along most of its course, with several significant areas of luminal narrowing. Approximately 4 cm from its origin, and in a region of relatively normal caliber, a rupture was present, with formation of a false aneurysm measuring 1.5 x 2.0 cm (Fig 1). High-grade lesions (80 percent or greater) were noted in the left main, the proximal left anterior descending, and the proximal circumflex coronary arteries. The first diagonal branch of the left anterior descending coronary artery was totally occluded at its origin. The distal right and first diagonal branches filled retrograde from the left anterior descending coronary artery. The left ventricular pressure was 170/14 mm Hg.

On Oct 30, 1975, the patient underwent saphenous vein bypass grafting to the distal left anterior descending, the marginal circumflex, and the distal right coronary arteries. The false aneurysm of the right coronary artery was ligated with sutures proximally and distally. The aneurysm was not opened. Specimens of the right coronary artery and aorta taken at the graft sites of anastomosis showed severe and mild atherosclerosis, respectively. After surgery, the patient developed high-output renal failure, which resolved over a two-week period. The patient experienced no further chest pain.

Discussion

The first report of spontaneous rupture of a coronary artery is credited to Morgagni by Olcott in a review of the subject in 1931. Thirty-one cases of spontaneous rupture of a coronary artery were found. Fifteen of the cases had a ruptured coronary arterial aneurysm, and sixteen cases ruptured without evidence of an aneurysm. The underlying cause of rupture in a nonaneurysmal coronary artery has been attributed to atherosclerosis, infection, or inflammatory conditions (such as syphilis, rheumatic carditis, and connective tissue disease), and several cases had an unknown etiology. Pathologic findings vary with the underlying process, but all reported cases had marked destruction of the media. Rupture usually occurs into the pericardium but has been noted in the myocardium of the right atrium and the left and right ventricles.

In 1970, Hallen et al reviewed the reported cases of spontaneous rupture of a coronary artery without aneurysms and found 28 cases including his own. Rupture of a coronary artery has been described in blunt chest trauma and after closed heart massage in a patient with a mitral valve prosthesis.

Daoud estimated the postmortem prevalence of coronary aneurysm to be 1.4 percent in 694 consecutive autopsies. In patients referred for coronary angiographic studies, the incidence has been 0.3 to 1.2 percent. No distinctive clinical features have been elucidated. In addition to rupture, a coronary arterial aneurysm may be subject to dissection, embolization, and thrombosis. A coronary arterial "steal" syndrome has been described. In 29 patients with a follow-up of only 24 months, the mortality was the same as in pa-
tients with similar coronary arterial disease without aneurysm.11

In our case, rupture had occurred, with formation of a false aneurysm. Surgical intervention was believed to be imperative to prevent rupture into the pericardium. To our knowledge, this is the first reported case of a spontaneous rupture of a coronary artery, with formation of a false aneurysm and with successful surgical repair. The etiology is believed to be atherosclerosis. Whether there was a limited dissection prior to rupture cannot be ascertained. The aneurysm was not excised, and the exact mechanism of rupture is not known. With the advent of coronary angiography, antemortem recognition of this problem is possible and will lead to further clarification of the natural history and prognosis.

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Respiratory Tract Burns after Aspiration of Hot Coffee*

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We present the findings in a patient with acute thermal burn to the upper and lower airway who developed mucosal edema followed by patchy areas of granuloma-like lesions in the trachea and bronchi. A four-month follow-up showed resolution of the gross lesions, but functional alterations remained. This patient illustrates the necessity for repeated direct observation and functional evaluation of the lower airway following thermal injury, which can be a life-threatening disorder.

Injury to the respiratory tract due to inhalation has been extensively documented.1-4 Commonly, the insulting agent is either smoke and its noxious products or chemical gases. The pulmonary complications following the aspiration of gastric contents and liquid chemical agents have also been extensively reported.4 Direct injury to the airway and lung following aspiration of thermal liquid agents and, particularly, the consequences thereof are not well recorded. We are reporting the case of a patient who received a direct burn to the upper and lower airway from the aspiration of hot coffee. Serial direct visualization of the airway via bronchoscopic examination and follow-up studies of pulmonary function to detect residual effects on the respiratory tract are presented to emphasize that direct thermal burn to the lower airway can occur in appropriate circumstances.

Case Report

The patient is a 28-year-old black woman who entered the medical center on Feb 7, 1975, after having ingested an indeterminate amount of mepergan, barbiturates, and other medications following a spell of mental depression. She was found in a semicomatose state by a relative early on the day of admission. An attempt was made to induce vomiting by offering vinegar mixed with mustard followed by milk. The patient refused the "cocktail." Next, hot coffee was poured into the patient's mouth. When all of these attempts failed to revive the patient, she was rushed to a local hospital.

On initial examination, the patient's mouth, lips, and tongue were markedly edematous and erythematous, requiring

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