CASE REPORT

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Death During Percutaneous Insertion of an Intraaortic Balloon Pump*

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ABSTRACT: Intraaortic balloon counterpulsation is currently the most widely used mechanical technique for temporary support of the circulation. We report a rare fatal case of perforation of the right common iliac artery during percutaneous insertion of an IABP.

KEYWORDS: forensic science, forensic pathology, intraaortic balloon counterpulsation, vascular complications, sudden death, iatrogenic disease

Since the introduction of the percutaneous approach to insertion of the intraaortic balloon pump (IABP), it has been used with increased frequency in patients with left ventricular dysfunction and intractable angina. Vascular complications occur predominantly in patients with sclerotic arteries whose circulation is further compromised by catheter encroachment on the arterial lumen (1).

We report a case of a patient with severe generalized atherosclerosis associated with occlusive double coronary artery disease who died during percutaneous insertion of an IABP for intractable angina and left ventricular dysfunction. To the authors' knowledge, this is only the second report of a fatality occurring from a perforated common iliac artery during insertion of an IABP.

Case Report

A 72-year-old Hispanic man was admitted to the hospital with chest pain and diaphoresis of two hours' duration. Twenty-one and nineteen months earlier, he suffered inferior and posterior wall myocardial infarctions, respectively, and had since complained of angina and 3-pillow orthopnea. He had a history of hypertension, a 75 to 100 pack/year history of cigarette smoking, and five episodes of pneumonia.

On physical exam, he was diaphoretic, weighed 180 lb, and was in mild discomfort. His blood pressure was 130/85 mm Hg, the pulse 60/min and regular, respirations 24/min, and temperature 99°F. Crackles were heard at the left lung base. A II/VI systolic murmur was auscultated at the left lower sternal border, radiating to the apex. There was 1+ pedal edema, bilaterally. Creatine kinase was within normal limits without elevation of the MB-fraction. Other laboratory values were unremarkable. The electrocardiogram showed inferolateral ischemia and old inferior and posterior myocardial infarcts. The chest X-ray showed cardiomegaly without infiltrates or effusions. An echocardiogram revealed normal anteroseptal wall motion with inferior wall dyskinesis.

The patient had multiple episodes of chest pain despite maximal medical therapy. On hospital day 12, a new harsh holosystolic murmur was heard and, because of crescendo angina, an intraaortic balloon pump (IABP) was emergently inserted in the left femoral artery via the percutaneous approach. Three days later, a chest X-ray revealed that the tip of the IABP was not correctly positioned and it was decided to replace the IABP via the right femoral artery approach. Within minutes of reinsertion, the patient became hypotensive and the IABP would not inflate. The patient expired within 15 min despite resuscitative efforts. An autopsy was ordered to determine the cause of death.

A postmortem abdominal X-ray revealed the tip of the IABP to be lying freely in the left upper quadrant of the peritoneal cavity (Fig. 1). On opening the abdominal cavity, a severely atherosclerotic right common iliac artery was found to be lacerated, resulting in a 1200 mL hemoperitoneum (Fig. 2). Other significant autopsy findings included severe generalized atherosclerosis, cardiomegaly (550 g), occlusive double coronary artery disease, and multiple myocardial infarcts of varying ages, including an acute myocardial infarct involving the anterior papillary muscle. There were rheumatic stigmata of the mitral and aortic valves. The manner of death was classified as an accident.

Discussion

Intraaortic balloon pump counterpulsation is used for temporary support of the circulation at a lower level of myocardial work and oxygen demand until the acute ischemic insult can be reversed and independent cardiac function is restored (2,3). The balloon is inflated in diastole, beginning with closure of the aortic valve, and remains inflated until the onset of ventricular systole, when it is rapidly deflated. The inflation of the balloon displaces intraaortic blood toward the coronary tree in order to augment coronary perfusion pressure and blood flow. The IABP causes systolic unloading due to rapid balloon deflation and augments diastolic intraaortic pressure more than 70% by balloon inflation. This leads to an increase in cardiac index by 10 to 15% and a decrease in pulmonary capillary wedge pressure of the same magnitude. The deflation of the balloon creates a ''sink'' which decreases the impedance of left ventricular afterload (4).

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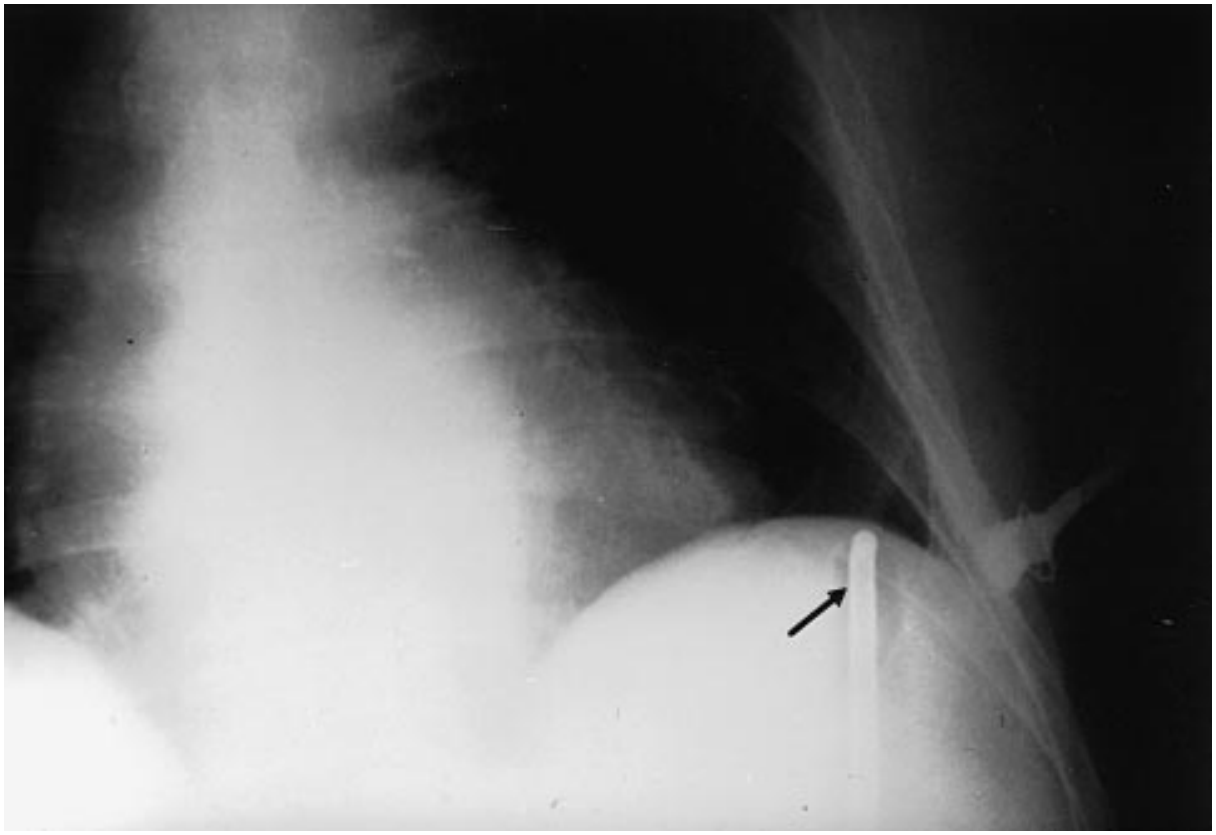

FIG. 1—*Postmortem abdominal X-ray showing tip of IABP lying free beneath the left dome of diaphragm (arrow).*

FIG. 2—*Reflected abdominal wall showing the IABP (arrow) loose in the abdominal cavity after perforating atherosclerotic right common iliac artery. A 1200 mL hemoperitoneum resulted from the arterial injury.*

Since the first intraaortic ballon pump (IABP) was successfully deployed by Kantrowitz in 1967 (5), it has been used with increasing frequency in patients with cardiogenic shock, postoperative left ventricular failure and/or difficulty weaning from cardiopulmonary bypass, unstable angina refractory to medical therapy, cardiac rupture, post-infarction angina, refractory ventricular tachyarrhythmia, and for preoperative stabilization in high-risk cardiac surgical patients (6–9). IABP complications contribute to death in less than 1% of patients and cause permanent residual deficits in 3% of patients (10). Complications have been estimated to occur in as much as 35% of patients and include: vascular (hemorrhage, limb ischemia, thrombosis, dissection, aneurysm) and infection (wound, mycotic aneurysm) (1,8,11). An autopsy study of 45 patients revealed that the most common injury after balloon counterpulsation was retrograde dissection originating in the external iliac artery (12). Vascular complications are most common and were found to be higher in women and patients with diabetes mellitus, hypertension, and peripheral vascular disease (10,13–15). Complications related to thrombosis and infection were found to be related to duration of IABP therapy, whereas limb ischemia was more a function of the atherosclerotic status of the common femoral artery and the diameter of the balloon (3,16). It should be noted that patients requiring IABP support are often hypotensive and critically ill; therefore the detection of post-insertion complications may be difficult to recognize.

In 1979, the percutaneous technique for insertion of IABP was introduced (17,18). The percutaneous method allowed for the rapid institution of circulatory support and broadened its applications since surgeons were no longer required for its insertion. Several studies comparing the percutaneous and surgical methods found that percutaneous insertion was associated with a higher incidence of vascular complications, the majority of which required Fogarty thrombectomy after balloon pump removal (6,8). Skillman (19) reported an incidence of 11.5% for operative repair for vascular complications due to IABP. Single reports of other rare vascular complications included balloon entrapment following arterial perforation (20,21) and arterial helium embolism from a ruptured IABP (22).

In the case reported herein, percutaneous insertion of the IABP lacerated the severely atherosclerotic right common iliac artery, causing hemoperitoneum, acute hemodynamic collapse and death within 15 min. To our knowledge this is the second report of sudden death due to accidental perforation of the common iliac artery during percutaneous IABP insertion (23). Although percutaneous insertion has become the usual approach, this case illustrates the importance of using fluoroscopic guidance where complications related to the IABP have already occurred, in order to avoid future catastrophes.

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