Detection of a False Left Ventricular Aneurysm by First-pass Radionuclide Ventriculography

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A false left ventricular aneurysm complicating an inferior myocardial infarction was successfully identified by computerized first-pass radionuclide ventriculography using a multicrystal gamma camera. The aneurysmal chamber exhibited paradoxical systolic expansion, a pattern of contraction confirmed by contrast cineangiography. Because of the propensity of false aneurysms to rupture, early noninvasive firm diagnosis is desirable and may be accomplished by first-pass radionuclide angiography.


Left ventricular aneurysms are a common cause of recurrent symptoms in patients with previous myocardial infarction. The most common is the “true aneurysm” with a wide neck and a wall formed of scattered myocardial elements and fibrous tissue. False, or “pseudoaneurysms” are rare and are caused by a small rupture of the heart contained by pericardial adhesions. They usually have narrow necks and walls containing no myocardial elements.

Recent reports have demonstrated the ability of dynamic radionuclide imaging techniques to detect true aneurysms and to differentiate aneurysmal from diffusely hypokinetic ventricles. This report describes a false aneurysm detected by first-pass radionuclide ventriculography, correlations with contrast cineangiography, and the outcome of surgery.

CASE REPORT

A 63-year-old man was admitted to hospital with acute dyspnoea, expectorating frothy sputum. In the previous weeks he had noticed mild chest pains on exertion. Examination showed pyrexia of 38.5°C, an irregular pulse at 160 beats per minute, and normal blood pressure. The jugular venous pressure was raised 3 cm; the liver was 5 cm enlarged. Bilateral basal rales and a pericardial friction rub were audible. Electrocardiogram showed atrial fibration with small Q waves in leads II, III, and aVF. Chest radiograph showed pulmonary venous congestion and cardiomegaly. White-cell count (WBC) was raised, with a polymorphonuclear leucocytosis. ESR was 27 mm per hour. Serial SGOT and LDH rose to 115 and 800 i.u./liter, respectively.

He improved on bed rest, digoxin, and furosemide, and reverted to sinus rhythm after 4 days. The pericardial friction rub persisted intermittently over the next 2 weeks, WBC remained elevated, and ESR rose to 67 mm per hour. Repeat chest radiographs showed a further increase in heart size and a left-sided pleural effusion. A diagnosis of acute inferior myocardial infarction, complicated by a pericarditis with an effusion was made, and treatment with prednisolone was commenced. The friction rub resolved within 2 weeks and chest radiograph showed considerable reduction in heart size. There was a small residual pleural effusion, and the left heart border had developed a bulge suggestive of a left ventricular aneurysm. Electrocardiograms showed deep Q waves and S-T segment elevation of 3 mm in the inferior leads. The patient declined the offer of further investigation and was discharged on furosemide and prednisolone.

Three months later he was readmitted following a brief episode of confusion associated with numbness over the left side of his face. There were no neurologic signs on admission, however, and chest radiograph and electrocardiogram were unchanged from the previous admission. A diagnosis of cerebral embolism from a ventricular aneurysm was made, and the patient was given anticoagulants and referred for investigation.

A first-pass radionuclide ventriculogram was carried out in the right anterior oblique projection using a computerized multicrystal gamma camera. Following an i.v. bolus of 12 mCi of Tc-99m as pertechnetate, 1000 frames of data were collected at 50-msec intervals. Left ventricular ejection fraction was 38%, calculated from the background-corrected time-activity curve over the left-ventricular region of interest. The representative
cardiac cycle showed a large aneurysmal sac attached to the inferior wall of the left ventricle. Figure 1 (top) shows end-diastolic and end-systolic images from the representative cycle. During diastole there is a greater count density in the upper chamber, which is the true ventricle (Fig. 1, top left), whereas in systole the aneurysm expands and its count density increases (Fig. 1, top right).

This impression of paradoxical motion was confirmed by superimposition of the perimeters at end-diastole (blue) and end-systole (white) in Fig. 2 (left), with the "end-systolic" perimeter lying outside the "end-diastolic" in the aneurysmal chamber.

Cardiac catheterization and left-ventricular cineangiography (Fig. 1, bottom) confirmed the presence of an aneurysmal chamber attached by a narrow neck to the inferior ventricular wall. Ejection fraction, estimated by the area-length method, was 36%. The aneurysm showed obvious paradoxical systolic expansion, confirming the radionuclide pattern of contraction.

Coronary arteriography showed the right coronary to be blocked beyond the margin. The left system was normal.

At operation there were widespread pericardial adhesions, which were dense over the large aneurysmal mass. The aneurysm arose from a circular defect, 3 cm in diameter in the inferior left ventricular wall. The aneurysmal sac extended distally as far as the apex and was adherent to the inferior left atrial wall. The pseudoaneurysmal wall was dissected to the margins of the defect, which was then closed.

The wall of the aneurysm was lined with both organized and fresh thrombus, the latter a potential source of emboli.

Postoperative recovery was uneventful. Before discharge, a repeat radionuclide study was carried out. The superimposed perimeters are shown in Fig. 2 (right). Ejection fraction had not changed; the inferior wall, consisting of the repaired cardiac rupture site and fibrous tissue, was akinetic.

DISCUSSION

Left ventricular aneurysms are usually recognized as localized noncontractile segments composed of fibrous tissue and myocardial elements. Rupture of established aneurysms of this nature is unusual (1). Four to 13% of deaths from myocardial infarction are caused by rupture of the heart (4) with massive hemopericardium, but uncommonly some ruptures are contained by pericardial adhesions (5). Initial hemorrhage is thus restricted, but a false aneurysm, with a wall composed of pericardium and organized thrombus, may develop.

The sequence of events in this patient suggest the occurrence of an acute inferior myocardial infarction, followed by prolonged postinfarction pericarditis with an effusion that responded to steroids. Subsequent rupture of the infarct into the pericardium was contained by the pericarditic adhesions. A false aneurysm developed, with clot formation inside this chamber being responsible for the embolic episode, a phenomenon previously described with false aneurysms (6).

Radionuclide techniques can successfully identify ventricular aneurysms (2,3). There is a previous report of a false aneurysm detected by gated cardiac blood-pool scanning (7). Paradoxical pulsation was not demonstrated, however, nor were correlations with contrast angiography described. There is another report of nongated radionuclide blood-pool scanning with indium-113m in this condition. It demonstrated division of the cardiac blood pool into two portions, but the diagnosis of false aneurysm was made only in retrospect (8).

In our case, first-pass radionuclide ventriculography successfully detected an aneurysmal chamber attached to the inferior left ventricular wall, with an appearance suggestive of a false aneurysm. It accurately estimated ejection fraction, demonstrated paradoxical systolic expansion of the aneurysm that was confirmed at cardiac catheterization, and showed no aneurysmal cavity postoperatively. Although other noninvasive techniques such as echocardiography have been reported as aiding the diagnosis of false aneurysms (6,9), most cases rely on angiography or surgery for the diagnosis. The reliability of this radionuclide technique in differentiating false from true aneurysms remains to be determined.

Early detection of false aneurysms is crucial, since late rupture is common and was the major cause of death in 11 out of 36 nonoperated cases (6). Successful surgical resection of these aneurysms is well documented (10).

In view of the potentially catastrophic events that complicate false aneurysms, this radionuclide technique should be valuable in the evaluation of patients with cardiomegaly following myocardial infarction, and especially in those with clinical, electrocardiographic or radiologic signs of left ventricular aneurysm.

FOOTNOTE

* Baird-Atomic, System 77, Bedford, MA.

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The Gallium "Bone Scan" In Acute Leukemia

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A 15-year-old boy with acute leukemia had a gallium-67 scan that was virtually identical to his technetium-99m pyrophosphate bone scan, except for lack of renal visualization. The quality of the radiopharmaceutical was assured by the normal appearance of gallium scan performed in another patient on the same day and with the same radionuclide batch. This extensive osseous uptake was probably due to bone-marrow replacement by leukemia cells and is a pattern that should be recognized as indicating a diffuse marrow-infiltrating disease.


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