

# Mediastinal Radiation Therapy and Occlusion of the Ostium of the Left Main Coronary Artery

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*Radiation therapy for the treatment of mediastinal tumors may cause ischemic heart disease, a rare complication just recently recognized. Case Report: Fifty-one-year-old female with rapidly progressive angina with angiographic presentation of occlusion of the ostium of the left main coronary artery. The patient had undergone radiotherapy 2 years earlier to treat mediastinal Hodgkin's lymphoma, with a focus near the right ventricle. Surgical resection pre-radiation, and chemotherapy were the modes of treatment. Coronary stenosis induction in these patients may or may not be dependent on focal atherosclerosis and is mediated, mainly, by intimal thickening due to tissue fibrosis, without any alteration of the medial layer and with a preferred location in the proximal portions (ostial) of the main arteries. Recognizing this condition (thoracic radiotherapy) as an isolated and independent factor for coronary disease must be considered to develop prevention and detection measures and early treatment.*

Coronary artery disease is highly prevalent with well-known clinical repercussion and is, usually, due to atherosclerotic arterial lesion. Unusual situations, such as the presence of focal and ostial lesions in the coronary trunk, should be a forewarning to the physician of unusual implications in the genesis of the process, especially when it occurs in patients with few if any cardiovascular risk factors. Mediastinal radiotherapy is an example of a treatment that induces potential alterations in the microscopical structure of the vascular coronary endothelium<sup>1</sup> and may lead to obstructive coronary artery lesions<sup>2</sup>, and myocardial ischemic lesions, which may occur years after the use of ionizing radiation.

## Case Report

A 51-year-old female dentist reported the presence of retrosternal pain radiating to the lower jaw and right interscapular area for 30 days. The pain was initially due to habitual activity and became progressively worse. In the last 5 days of evaluation, after mild physical effort, she experienced intense pain radiating to the right superior limb and a feeling of imminent death. She denied concomitant or cardiovascular symptoms. Dyslipidemia treated with atorvastatin, and climacterium treated with hormonal replacement had been isolated risk factors for 6 years. No evidences existed of hypertension, diabetes, smoking, or familial history.

Two years previously, she had been diagnosed with mediastinal Hodgkin's lymphoma with right ventricular compression. She underwent surgical resection and chemotherapy (Adriamycin + vinblastine) for 6 months, in addition to 40 radiotherapy sessions.

A physical examination demonstrated a blood pressure of 125/80 mmHg, a heart rate of 72 bpm, symmetric pulses, normal lungs, and sinus rhythm with the presence of the 4th heart sound, and without murmurs.

The chest X-ray when lymphoma was diagnosed demonstrated mediastinal enlargement (fig. 1). The electrocardiogram and echocardiogram on that occasion were normal, apart from echocardiographic signs of tumoral mass in the right ventricle anterior wall. A current electrocardiogram (fig. 2) evidenced sinus rhythm, 72 cycles/min, mild ST segment depression with a negative T wave in DI, AVL, V3 to V6, and the echocardiogram revealed mild anteroseptal hypokinesia.

With this clinical picture, the patient inadvertently underwent treadmill testing. In the second minute of effort of the Bruce protocol, the patient experienced intense precordial pain and nonsustained ventricular tachycardia with ST segment depression of up to 3.3mm in MC5, V5, and V6, which remained up to the 12th minute of recovery (fig. 3).

Coronary angiography demonstrated occlusion of the ostium of the left main coronary artery. The other arteries were not atherosclerotic (fig. 4). On the same day, the patient underwent surgical revascularization, using vein grafts. No

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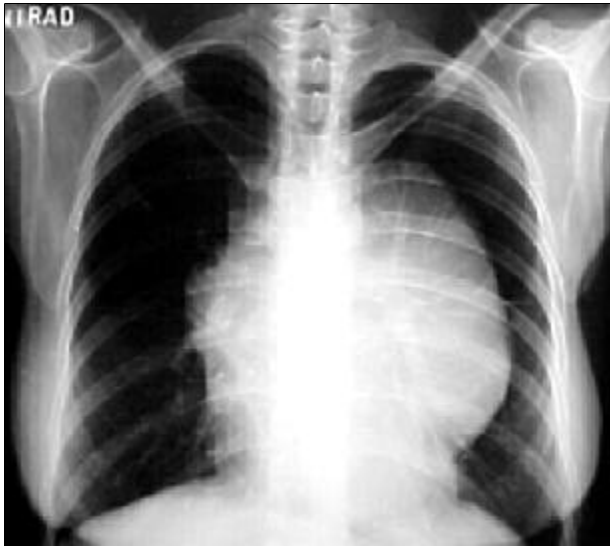


Fig. 1 - Chest X-ray demonstrating mediastinal enlargement.



Fig. 2 - 12-Lead electrocardiogram demonstrating T wave inversion in antero-lateral wall.

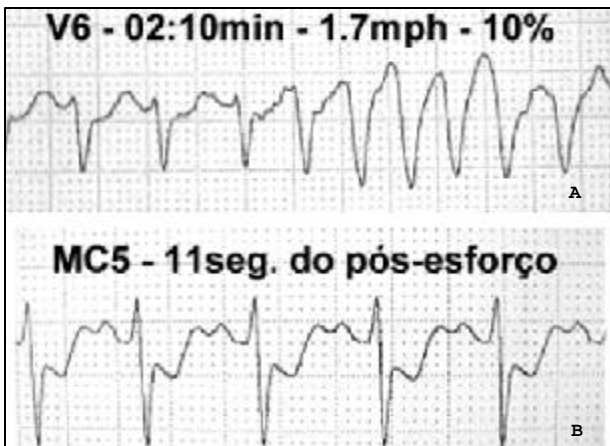


Fig. 3 - Electrocardiogram recorded during effort demonstrating ventricular tachycardia (A) and ST segment depression (B).

clinical intercurrents occurred during the procedure, and the current evolvement does not represent morbid events.

## Discussion

Left main coronary ostial obstruction is a rare finding, corresponding to 0.13 to 2.7% of the angiographic studies<sup>1</sup>, usually associated with coexisting disease in multiple vessels. In the literature, ostial lesion in the left main coronary artery in the absence of other lesions, may be attributed to

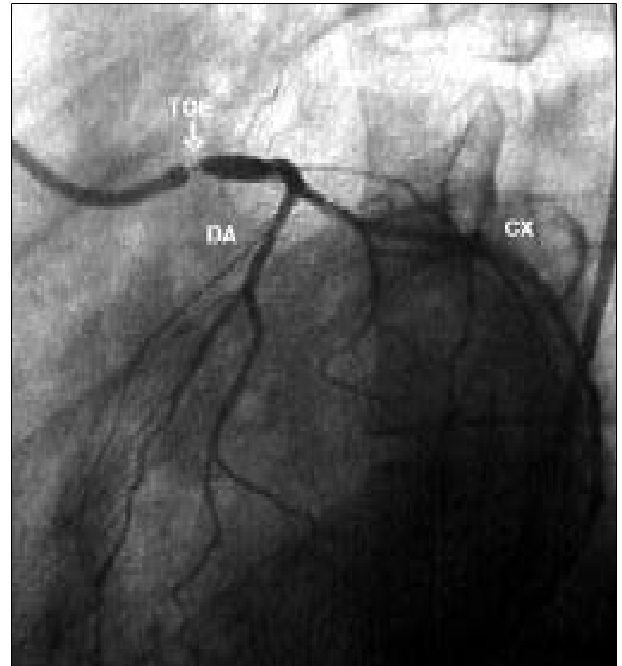


Fig. 4 - Cine-coronary angiography; DA: anterior descending artery; CX: circumflex artery; OAE demonstrating severe occlusion of the ostium of the left main coronary artery.

several causes, such as being congenital, secondary to arteritis (Takayasu, lues), fibromuscular dysplasia, iatrogenic (after aortic valve exchange), idiopathic, and secondary to focal intimal fibrosis by radiotherapy directed at the mediastinum.

The main cardiac complications of patients undergoing radiotherapy are pericarditis and myocarditis. Valvular<sup>2</sup>, pulmonary infundibular<sup>3</sup>, and coronary involvement are rare. In this last case, characteristically, patients who develop symptoms, on average, 5 years after exposure are relatively young patients with few if any risk factors for atherosclerotic disease<sup>4</sup>. The great majority (85%) present with mediastinal Hodgkin's lymphoma, and the initial symptoms are angina, heart failure, infarction, and even sudden death. The presence of hypercholesterolemia, concomitant use of chemotherapy agents (especially doxorubicin), and the level of radiation<sup>5</sup> increase the risk of developing coronary disease.

In a review of the literature on coronary disease secondary to radiotherapy, an incidence of around 18%<sup>5</sup> is estimated, 16% being represented by isolated ostial lesions<sup>6</sup>. In these cases, the characteristic histopathologic aspect is a localized thickening of the intimal chamber, without evidence of damage in the mean layer or lipid deposits suggestive of atherosclerotic deposits<sup>1,7</sup>. Another presentation also mentioned in the literature is the pre-existent accelerated atherosclerotic disease associated with focal intimal thickening<sup>7</sup>. Another particularity in these patients is the great incidence of concomitant damage in the mammary arteries, thus making its use during surgical revascularization forbidden and associated with bad results<sup>8</sup>.

Therapeutic and diagnostic procedures, using ionizing radiation on the chest, especially in the treatment of me-

diastinal tumors or even breast cancer, must be recognized as an independent risk factor for the appearance of coronary disease.

In these circumstances, arterial involvement is frequently severe, involving proximal segments and leading to severe consequences.

"Brachytherapy, a' clearly different form of radiation therapy may be responsible for stenosis of the borders of the treated segments for intra stent restenosis.

It was used a first choice approach since the recent use of drug-eluting stents<sup>9</sup>. Restenosis of the borders of irradiated segments is responsible for up to 40% of postbrachytherapy reestenosis<sup>10</sup>.

In these circumstances, the warning about the damaging action of this form of treatment advises taking prophylactic measures and performing periodical testing in the patients undergoing diagnostic or therapeutic radiation, or both, of the chest.

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