Complete AV Block Following Mediastinal Radiation Therapy: Electrocardiographic and Pathologic Correlation and Review of the World Literature

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Abstract. The clinical, features, serial electrocardiograms, and autopsy findings of a patient with symptomatic complete AV block, who had received mediastinal radiation therapy 8½ years previously, are presented. The cardiac histopathology disclosed immense fibrosis of the conduction system and of the atria and ventricles. The enormous amount of fibrosis was similar in location and intensity to that observed in our previously reported patient (Cohen et al., Arch Intern Med 1981;141:676–679) who had undergone mediastinal radiation. We conclude that the severe fibrosis was primarily due to radiation, rather than secondary to atherosclerotic coronary artery disease, which also has been described as a consequence of mediastinal radiotherapy. This patient's serial electrocardiograms disclosed evidence of complete block both in the AV nodal area and infra His system, which correlated well with the histopathology. The characteristic clinical features of patients with symptomatic complete AV block post mediastinal radiation therapy are presented, along with a review of the world literature.

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Radiation therapy has been incriminated as the cause of such cardiac complications as acute pericarditis, pericardial effusion, constrictive pericarditis, cardiomyopathy due to interstitial myocardial fibrosis, valvular regurgitation, endocardial and mural fibrotic thickening, right ventricular outflow obstruction, occlusive coronary artery disease including acute myocardial infarction, internal mammary artery inflammation, electronic pacemaker dysfunction, bundle branch block, trifascicular block, second-degree AV, “advanced” AV block and complete AV block [1–75]. We have found in the literature 26 reports on a total of 39 patients who developed “high degree” or “advanced” AV block, complete AV block, or trifascicular block associated with profound fatigue, dizziness, syncope, and/or seizures following radiation therapy. We are presenting an additional case, which is the fifth autopsied case [1–4] and the second patient whose conduction system we have studied in great detail. Serial electrocardiograms in this individual were of special interest.

Case Report

In November 1969 this 45-year-old male had an inguinal node biopsy that disclosed a nodular lymphoma. After an extensive evaluation he was treated with 3900 rads to the mediastinum and gamma radiation from a 60Co source to the left inguinal area. Ten months later, the patient suffered a postero-inferior wall myocardial infarction, from which he made a satisfactory recovery. In March 1972 he experienced retrosternal chest pain on exertion, typical of angina pectoris. Coronary cineangiography revealed a 70% stenotic lesion in the left anterior descending coronary artery close to the origin of the first diagonal branch, a 90% narrowing of the proximal right coronary artery, and diffuse atherosclerotic disease of the circumflex artery and its branches.

Ventriculography demonstrated mild to moderate depression of the left ventricular function. The resting electrocardiogram was within normal limits with a normal frontal axis (Figure 1). The patient’s serum cholesterol was 180 mg percent and his blood pressure was...
120/80 mmHg. During that hospitalization he stopped cigarette smoking, a habit of his for 50 years. Saphenous vein bypass grafting was performed to the midportion of the left anterior descending coronary artery and to the distal right coronary artery. The patient had an uneventful postoperative course, except for a small superficial wound abscess.

In July 1972 repeat coronary cineangiography, performed because of recurrent angina pectoris, disclosed that the bypass grafts were patent. The right coronary artery was completely occluded at its origin, and the other coronary arteries were diffusely diseased with sluggish distal flow. No further surgery was deemed advisable. The electrocardiogram then revealed left axis deviation, an old inferior wall myocardial infarction, poor R-wave progression in the chest leads, and nonspecific repolarization abnormalities (Figure 2). During the ensuing 6 years, the patient had numerous hospital admissions for recurrent angina pectoris, congestive heart failure, incomplete intestinal obstruction due to adhesions, and an enlarged inguinal lymph node, which histologically was recurrent malignant nodular lymphoma (a well-differentiated lymphocytic type). Chlorambucil therapy was administered fol-

**Fig. 1.** The electrocardiogram of 3/11/72 showed a normal frontal axis of +30 degrees, a PR interval of 0.16 seconds, and was interpreted as within normal limits.

**Fig. 2.** The record of 7/6/72 showed sinus rhythm, a PR interval of 0.16 seconds, left axis deviation, possibly an old inferior wall myocardial infarction, and nonspecific repolarization abnormalities. Poor progression of the R wave across the chest was present.