Acute Congestive Heart Failure Due to the Arteritis of Rheumatoid Arthritis: Early Diagnosis by Endomyocardial Biopsy: A Case Report

John D. Slack, M.D., F.A.C.A.
and
Bruce Waller, M.D.

INDIANAPOLIS, INDIANA

Abstract

A 49-year-old man with rheumatoid arthritis presented with acute congestive heart failure. Acute viral myocarditis was suspected clinically as a Gallium-67 myocardial scan was positive. Percutaneous catheter-directed biopsy of the right ventricular endomyocardium, however, revealed heavy endothelial deposits of I_gM in the small blood vessels of the myocardium. Prednisone therapy resulted in normalization of both the myocardial Gallium-67 scan and left ventricular ejection fraction with resolution of the symptoms of congestive heart failure. This is the first report documenting rheumatoid arteritis antemortem by myocardial biopsy.

Introduction

Rheumatoid arthritis commonly causes pericardial effusion and valvular heart disease.[1,2] Association with congestive cardiomyopathy has been described but ante mortem diagnosis is rare.[3] We report a case of acute congestive heart failure in a patient with severe rheumatoid arthritis. Endomyocardial biopsy performed three weeks after onset of symptoms revealed an early arteritis without myocarditis which responded promptly and dramatically to steroid therapy.

Case Report

A 49-year-old white male was admitted to St. Vincent Hospital in Indianapolis, Indiana on 10-3-83 for evaluation and treatment of congestive heart failure. He was in his usual state of

From the Cardiology Section, Department of Medicine, Saint Vincent Hospital and Department of Pathology, Indiana University Medical Center, Indianapolis, Indiana

good health except for chronic deforming rheumatoid arthritis treated with aspirin until two weeks prior to admission. At that time, he suffered sudden onset of dyspnea with effort, three-pillow orthopnea, paroxysmal nocturnal dyspnea and occasional "skipped beats" preceeding sustained arrhythmia (atrial fibrillation). He denied angina pectoris, fever, rash, diaphoresis or rigor. The family history and social history were non-contributory. No exposure to cardiotoxins or recent febrile illness was reported. The review of systems was remarkable only for a five year history of mild hypertension which had not necessitated drug therapy. Physical examination revealed a blood pressure of 160/100 with a resting pulse rate of 110. Bibasilar rales were present. Cardiac examination revealed a grade II/VI murmur of mitral regurgitation and a prominent summation gallop. The electrocardiogram revealed ST-T abnormalities. An echocardiogram revealed four chamber enlargement with normal valvular structures, no evidence of pericardial effusion, and generalized hypokinesis of both the right and left ventricular chambers.

The sedimentation rate was 100 (10 × normal). The serum viscosity was slightly elevated. The RA titer was greater than 1:10, 240 and the LEFA was positive with an ANA greater than 1:320 in a diffuse pattern. The DNA antibody screening was negative. C4 complement level was normal. The IgG, IgM and IgA were elevated at 1785, 407 and 544 mg/dl respectively. Immune complex assay was high at 91% (C_1Q binding) and 818 mcg AHG eq/ml (Raji cell).

Cardiac catheterization revealed normal right heart pressures. The left ventricular pressure was 95/10. Left ventriculography revealed generalized hypokinesis and left ventricular enlargement with mild mitral regurgitation. There was a trace of aortic insufficiency on aortography. Luminal irregularities were noted on coronary arteriography. Endomyocardial biopsy was performed from the right femoral venous percutaneous approach during the catheterization with sampling from five sites in the right ventricular chamber. (Forcep #502-300; "Slack-Cambridge" sheath).

Nuclear studies revealed the left ventricular ejection fraction to be .35. Global left ventricular enlargement with generalized hypokinesis was present. A Gallium-67 scan of the heart performed 10-10-83 showed 3+ myocardial uptake at 48 hours. The patient was felt to be suffering from inflammatory myocarditis and prednisone 60 mg po daily was begun in addition to the furosemide 60 mg po daily, potassium supplementation, isosorbide dinitrate, digoxin 0.25 mg po daily, hydralazine 10 mg po q.i.d., and cimetidine 300 mg po q.i.d. begun at the time of admission. The patient's condition slowly stabilized and he was discharged on 10-20-83.

Myocardial biopsy: Light microscopy disclosed myocardium composed of striated fibers with centrally located nuclei. The interstitial space was widened by an increase in connective tissue and edema. No inflammatory infiltrates were found and small capillaries appeared normal. (Fig. 1A-1B). Electron microscopy disclosed normal myofibrillar orientation, Z-bands, mitochondria and capillaries. Within interstitial spaces were primitive cellular structures with collagen bundles condensed at irregular points, probably representing myofibroblasts. The specimens for fluorescent microscopy were transported in medium described by Michel and colleagues.[4] They were washed in buffer, imbedded, quick frozen, and four micron thick sections were cut in a cryostat at −20°C. Airdried frozen sections were rinsed in phosphate-buffered saline (PBS). Sections were incubated in a moist chamber at room temperature for 30

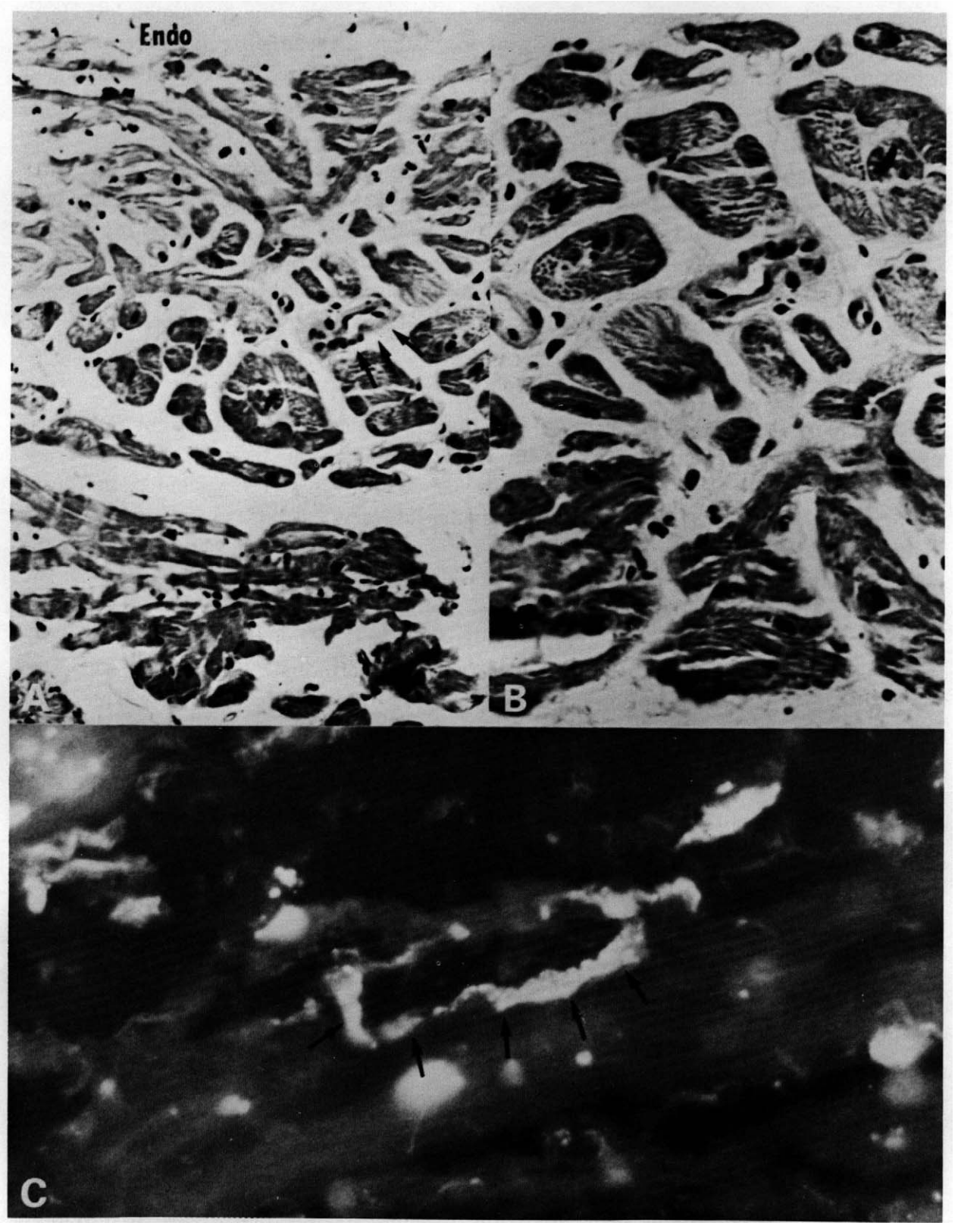

FIG. 1. (A and B) Light microscopy (Endo-endocardium). (C) Immunofluorescent stain (see text for details).

minutes with fluorescein isothiocyanate labelled anti-sera monospecific for human IgG, IgA, IgM, complement (C-3), and fibrin. Following incubation, myocardial sections were washed in PBS to remove excess conjugate, mounted in phosphate-buffered glycerol and examined with a fluorescent microscope. This revealed focal deposits of IgM on capillary walls (Fig. 1C). No deposits of IgG, IgA, C-3 or fibrin were detected.

At two months follow-up, the patient was clinically well. A repeat radionuclide left ventricular ejection fraction was .65 with normalization of the left ventricular chamber size and wall motion. A repeat Gallium-67 scan of the heart on January 11, 1984 showed no myocardial uptake of gallium at 48 hours. Prednisone was gradually tapered over the next four months to 10 mg daily without recurrent cardiac symptoms. The patient was killed in a tragic automobile collision while riding his motorcycle on May 24, 1984. An autopsy was not performed.

Discussion

Rheumatoid arthritis is a collagen-vascular disease characterized clinically by inflammatory joint symptoms. It occasionally can involve other collagenous tissue, especially periarticular tissue, blood vessels, serosal membranes and heart valves. Cardiac manifestations usually recognized are pericardial effusion and valvular disorders.[1,2] Congestive cardiomyopathy secondary to myocarditis and/or arteritis often remains clinically occult, perhaps because the symptoms mimic atherosclerotic heart disease which is so much more prevalent in this age group.[5,6]

Nevertheless, subacute or healing myocadial arteritis may be found in approximately 20% of autopsies performed on patients dying with rheumatoid arthritis.[3,7,8] It has been suggested that most cases remain subclinical due to the sedentary lifestyle forced on these patients by their crippling arthritis.[9] The vasculitis associated with rheumatoid arthritis may involve the epicardial vessels leading to stenosis, thrombosis, occlusion and myocardial infarction.[5,6,10] More commonly, however, the small intramyocardial vessels are involved, remaining subclinical if only focal or subacute.[3,7] An acute panarteritis, as demonstrated in our patient, results in acute congestive cardiomyopathy presenting as congestive heart failure and/or arrhythmia.[3,11] The vascular lesions found at autopsy include round cell infiltrate, edema, fibrosis, and intimal proliferation.[3,5,11] Severe necrotizing changes as seen in periarteritis nodosa (vascular nodules and aneurysms) are not seen, and acute fibrinoid necrosis is less commonly encountered than in other collagen vascular diseases.[12] Similar arteritis is often found in other areas of smooth muscle and skeletal muscle in patients with myocardial arteritis.[3,6,7,10,12] It has been suggested that the myocardial vasculitis associated with rheumatoid arthritis may be mediated by intravascular immune complex formation.[12] Entrapment of these complexes along the basement membrane of vessel walls may cause activation of complement pathways.[13] Chemotactic factors then promote accumulation of polymorphonuclear leukocytes which release lysosomal enzymes and damage vessel walls.[14,15] The degree of seropositively has been related to the likelihood and severity of arteritis.[16,17]

Our patient had deforming rheumatoid arthritis with marked seropositivity. He developed sudden onset of acute, otherwise unexplained, congestive heart failure. Early myocardial biopsy documented IgM deposits on the small arteries of the heart without evidence of active

myocarditis.[18] It is presumed that the endothelial deposits precede small cell inflammatory infiltrates which characterize arteritis on light microscopy and cause impaired tissue perfusion with resultant myocardial dysfunction.[12,13] There was marked improvement in the patient's clinical symptoms and cardiac function following the institution of anti-inflammatory medication (prednisone). Unfortunately, follow-up myocardial biopsy was refused by the patient as his clinical condition had improved so dramatically. The gallium scan, however, converted from 3+ positive to negative in three months as the patient improved clinically and as the left ventricular ejection fraction rose from .35 to .65.[19]

Conclusion

It is possible, but unlikely, that this patient had concomitant viral myocarditis which cleared with steroid therapy. There was no myocardial inflammatory infiltrate or fibrosis on the myocardial biopsy.[20] Recognition of symptoms and signs of left ventricular dysfunction in patients with rheumatoid arthritis should prompt testing for active inflammatory arteritis and/or myocarditis as dramatic improvement may result from immunosuppressive therapy.[15,21,22] This case is the first ante mortem demonstration of in vivo IgM myocardial arteriolar wall deposition in the early stages of clinically significant congestive cardiomyopathy associated with rheumatoid arthritis.

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John D. Slack, M.D., F.A.C.A.
St. Vincent Hospital Professional Bldg.
8402 Harcourt Rd., Ste. 413
Indianapolis, IN 46260

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