Unusual Cardiac, Pulmonary and Meningeal Involvement
In Rheumatoid Arthritis*

Report of a Case

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CARDIAC AND PULMONARY MANIFESTATIONS in rheumatoid arthritis are relatively common, yet definitive rheumatoid nodule formation in such sites are rare. Recently Lebowitz1 studied 62 rheumatoid cases. Of these, 34 had cardiac lesions, but in only two cases did he find granulomas in the heart. Talbott and Calkins4 studied 37 rheumatoid cases and Brannan et al.5 also studied a series of 76 cases with rheumatoid arthritis and found granuloma in the lung. Only a few cases have been reported with rheumatoid granulomas in the lung and the heart in the same subject.4

Recently, a patient with a well-documented case of rheumatoid arthritis who had received extensive steroid therapy was encountered with extensive involvement of the heart, lung and the cerebral meninges at necropsy.

CASE REPORT

On her last admission to the Bronx Municipal Hospital Center the patient was taken to the emergency room, where she was found to have blood pressure of 90/50 and bradycardia. She died within an hour.

Past History: The patient had suffered from rheumatoid arthritis since 1942, when she was 38, and had been in another hospital for many months. There were bilateral subcutaneous nodules on both forearms, with diffuse osseous de-mineralization and destruction of the articular cortices of phalangeal joints.

The patient was started on penicillin and prednisone (Meticorten) 15 mg. four times a day. This was decreased and then increased again. On the 70th hospital day, the patient gradually started to respond to the therapy. Thereafter, the dose of prednisone was slowly decreased and the patient was discharged on 12½ mg. per day and 20 grains of salicylate per day.

Laboratory data: During all her stays in the hospital, repeated lupus erythematosus cell prepara-
tions, tuberculin tests and blood cultures were negative. Blood studies: cephalin flocculation was positive with the range of 1+ to 4+, thymol turbidity test was 3.1 to 8.3, cholesterol was 197 mg. per cent and esters 65 to 72 per cent. Alkaline phosphatase and phosphorus were within normal limits. Sheep cell agglutinations were positive 1:56 (normal 1-7) and 1:112, with one month interval (normal 1:14). Latex fixation test was 1:5120. The serologic tests of spinal fluid were negative. Uronalysis was within normal limits and there were no other significant laboratory findings.

The radiographic examinations revealed transient linear and nodular densities in both lower lung fields. One density in the left lower lobe was noted to increase in size to approximately 2½ cm. with subsequent lucencies within this density apparently representing breakdown and cavitation. In the last seven years, she was admitted to Bronx Municipal Hospital Center a total of ten times with arthritic complaints, repeated episodes of pneumonia, gastric ulcer, fascia lata graft for scleromalacia of the right eye and intracapsular cataract extraction.

Postmortem Examination: The body was that of an emaciated white woman with severe arthritic deformities of both hands and feet.

Figure 1: The left ventricular wall, through the mitral valve, including thickened greyish gelatinous cut surface of the mitral valve (arrow). The greyish lesion extends to involve the leaflet of the mitral valve, the ring, the papillary muscle and the ventricular wall. The coronary artery is thickened and appeared translucent (arrow-head).

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The heart weighed 250 gm. The tricuspid valve showed some thickening with edema; the valvular ring and the surrounding area had a patchy greyish appearance. The surface was somewhat rough with greyish opaque foci, but no vegetation. The cut surface of the mitral valve through the left ventricular wall showed the valve leaflet to be thickened, opaque and fibrotic. This appearance extended from the valvular ring into the septum (Fig. 1). The transected coronary arteries revealed thickening and the wall appeared translucent; the lumen was narrowed (arrowhead, Fig. 1). The aortic valve was somewhat thickened with ridges. The cut surface of the aortic valve revealed a thickened leaflet with granulation tissue in the adventitial region of the sinus of Valsalva. The myocardium was rather pale. Multiple focal greyish-white nodules were present in the interventricular septum and in the left ventricular wall near the base, measuring from 0.3 to 0.5 cm. (short wide arrows, Fig. 1 and 2).

**Lungs:** The lungs weighed 800 gm, together. The pleural surface was covered with fibrous adhesions. A mass measuring 7.0 x 7.0 cm. was seen posteriorly in the right lower lobe (Fig. 3, arrows) and two firm masses, each measuring 5.0 x 4.0 cm. were palpated in the left lower lobe.
lobe. On sectioning, the masses were seen to be composed of a greyish-white, caseous-like material with a central cavitation (Fig 3). There were also multiple small, more solid nodules measuring 0.5 to 1.0 cm. in diameter which were greyish-white and sharply delineated from the surrounding lung parenchyma by a translucent zone. The regional lymph nodes were swollen with no nodular areas or zones of necrosis or calcification.

**Brain:** The leptomeninges showed a thick, milky exudate over the superior frontal region on the left just rostral to the central sulcus (arrows Fig. 4) extending for a zone of 4 sq. cm. The coronal sections revealed an old cystic zone of malacia in the inferior parietal lobe measuring 1.5 cm.; otherwise the brain was quite normal in the gross.

The other gross findings were gastric ulcer, cholelithiasis, myomata of the uterus and atrophy of adrenals.

**Microscopic Findings:** The nodules or patchy greyish areas showed a similar histologic picture throughout the heart and lung. The granulomas were sharply demarcated from the normal tissue and the zone between the necrosis and the nor-

![Image of brain showing leptomeninges](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21432/)

**Figure 4:** Brain: The leptomeninges show focal milky thickening in the region of the left superior frontal and central gyrus.

![Image of typical nodule in myocardium](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21432/)

**Figure 5:** A typical nodule in the myocardium, showing necrosis in the center; this is surrounded by a reactive zone with giant cells with a more external zone of fibrosis and round cells. (H and E, X 100).
normal tissue consisted of fibrous tissue with lymphocytes, plasma cells, eosinophils, mononuclear leukocytes and fibroblasts; the latter appeared as elongated cells with pale nuclei and had a palisaded arrangement. There were many giant cells present (Fig. 5). The necrotic areas were composed of debris and altered collagen fibers. The branches of the pulmonary arteries were thickened with an inflammatory reaction. This arteritis and occasional thrombosis was most prominent in the lung. These granulomas were demonstrable in the valvular ring, in the mitral valve proper (Fig. 6) and in the chordae tendineae, as well as in the myocardium and in the meninges. The thickened translucent coronary arteries showed typical rheumatoid nodules in their walls. The granulomas in the leptomeninges were similar to those of the heart and lungs, but were more cellular and contained more neutrophilic leukocytes. The synovial membranes were thickened and fibrous and showed cell reaction with surface fibrinoid material.

Oil-red-O showed lipid material in the necrotic area and in some of the giant cells. The alkaline phosphatase reaction was negative in the reacting cells which surrounded the necrosis; though the capillaries located at a distance showed positive reaction product. The DPNH-diaphorase (Nitro BT-reductase) reaction showed a very weak or negative precipitate in the reacting cells which surrounded the necrosis, except for the formazan in the lipid. The myocardium showed the usual positive formazan distribution. Elastica van Gieson, trichrome and PTAH (phosphotungstic acid hematoxylin) procedures showed no unusual features.

**Discussion**

Ellman et al., Gresham and Kellaway, and Bevans et al. reported extensive involvement in cases of rheumatoid arthritis, including the heart valve and the lung in the same patient. Bevans et al. and Cruickshank observed rheumatoid granulomas in calcified aortic valves, as well as in valves with changes resembling rheumatic mitral stenosis. Bywaters et al. studied 91 patients with rheumatic fever nodules and rheumatoid arthritis nodules and concluded that in the younger group (under 16 years old) the rheumatoid nodule closely resembled the nodules in patients with rheumatic fever; this was not true in the adult (over 17 years old).

The manifestations of the rheumatoid arthritis have been reported in the valve, valve ring and in the myocardium. In the present case, the cardiac involvement was extensive; the gross appearance was impressive (Fig. 1 and 2). How the long-standing steroid therapy affected the histologic pattern in this case is obscure.

Pulmonary involvement has been reported. Ellman described one case with involvement of the dura; the cerebral dura was not available for examination in this case. The leptomeninges showed a patchy area of thick, milky exudate over the superior frontal region on the left. Histologically, this region revealed a lesion with inflammatory reaction and rheumatoid granulomas. The association of vasculitis and

*Figures 6: Mitral valve: Two of granulomata near tip of leaflet show fibrinoid, changed fibers in the center which are surrounded by giant cells, fibroblasts, etc., and fibrous tissue (H and E, X 20).*
rheumatoid arthritis has been noted by several, but has been stressed by Kulka. The vascular lesions in this case were found in relation to the large rheumatoid nodules in the heart and lungs and strongly suggested a role for the vasculitis in the development of necrosis.

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Cardiac Pain Syndrome of Cervicothoracic Radiculitis

In patients affected with cervicothoracic radiculitis, the nature of the cardiac pain syndrome depends upon the clinical form of radiculitis. Cervicothoracic radiculitis without the involvement of ganglia of the sympathetic trunk causes pain in the cardiac region, but does not provoke, as a rule, angina pectoris and does not lead to functional changes of the heart. In this form of radiculitis in patients with atherosclerotic cardiostenosis, there may occur a combination of coronary and extracardiac pain. Cervicothoracic radiculitis complicated by irritation of sympathetic ganglia, apart from radiculitis pain, causes sympathalgia and angina pec-
toris.

For the treatment of cardiac pain syndrome in patients with cervicothoracic radiculitis, physio-
therapeutic methods may be successful; for the treatment of cardiac pain syndrome in cervicotho-
racic radiculitis complicated by irritation of ganglia of the sympathetic of the heart, it is expedient at first to use ganglionic blocking agents and later physio-
therapeutic methods.