Kunkler (1957), using modern E.C.G. methods, recorded four instances of changes which they accepted as radiation reactions in the heart. These were observed one to two weeks after treatment, with reversion to normal within two months. Catterall (1960) reported the persistence of E.C.G. changes for nine months after radiotherapy and concluded that this argued for organic changes in the myocardium.

A contrary view was expressed by Jones and Wedgwood (1960), who studied 25 patients with carcinoma of the breast in whom a parasternal field was employed. There was evidence of pathological E.C.G. change in only 16%, and they stated that these were apparently trivial, transient, and symptomless. They noted that many of the patients had previous evidence of ischaemic heart disease. Vaeth *et al.* (1961) reported 30% with E.C.G. changes in a group of 20 patients receiving more than 3,500 r to at least 35% of the myocardium.

Histology

The paper by Jones and Wedgwood (1960) includes a comprehensive review of the literature relating to histological evidence of radiation effects on the hearts of experimental animals. Early workers showed that the heart muscle was relatively radio-resistant. Structural changes in the myocardium were found only after high radiation doses and were thought to be secondary to vascular damage. Warren (1942) recognized a fairly characteristic triad of aseptic necrosis, hyaline fibrosis, and obliterative vascular changes. Pericardial changes have also been described after juxtapericardial neoplasms have been irradiated. Asscher *et al.* (1961) have suggested that vessels showing hypertensive changes are more susceptible to damage from radiation.

Vaeth *et al.* (1961) report a single necropsy seven months after radiotherapy, where the estimated cardiac dose over 41 days was 6,000 r. There was no histological evidence of cardiac damage.

In the case reported here histological changes in the heart are evident and are thought to be attributable to radiation. They would seem to harmonize with the findings in experimental animals. That they were not restricted to the radiation field suggests that the myocardial lesions were secondary to the vascular changes. This patient was not hypertensive.

It is unfortunate that we do not know how they reflected on the cardiogram. None was recorded, because the patient had no signs of myocardial insufficiency. The state of the heart at operation indicates that the radiation effects were, however, quite severe.

It is not suggested that any change in radiotherapy technique is indicated as a result of the fatality reported here, but it is obviously important to be aware of the possibility of radiation damage to a myocardium receiving 4,000–6,000 r.

It is intended to include histology of the heart in all future necropsies, whether death occurs during radiotherapy or subsequently, and atrial biopsies will be taken during intrapericardial pneumonectomies. Should a correlation with routine electrocardiograms be forthcoming, the foreknowledge of myocardial damage should influence surgical judgment in the timing of operations and in the performance of intrapericardial dissection.

E

I am grateful to Dr. J. F. Gwynne, who was responsible for the preparation of the histological evidence presented.

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Case of Rheumatoid Lung with Cavity Formation

[WITH SPECIAL PLATE]

Lung lesions associated with rheumatoid arthritis were first described by Ellman (1947) and Ellman and Ball (1948). Most cases show non-specific fibrotic changes. In a small group the lung lesions are histologically similar to rheumatoid nodules. The case reported here had cavitating granulomatous pulmonary nodules. To our knowledge, such an association has not been reported previously.

CASE REPORT

A 43-year-old housewife was admitted to John Sealy Hospital on July 19, 1958. Pain, redness, and swelling of the proximal joints of the toes and fingers, right ankle, elbows, and shoulders were first experienced in 1952. Without treatment the symptoms abated within a few months, but recurred in February, 1958. She was treated with phenylbutazone. Three weeks before admission a routine chest x-ray examination revealed multiple pulmonary densities. She denied respiratory symptoms, but complained of joint pain, excessive sweating, anorexia, and loss of weight.

Since the age of 17 she had had "pleurisy" on several occasions. Otitis media occurred in 1951 with a few recurrences. Her mother was said to have rheumatoid arthritis.

On her admission the vital signs were normal. The left eardrum was scarred. The small toes were swollen, red, and tender bilaterally. The rest of the physical examination was normal. The blood count was normal; sedimentation rate was 40 mm./hr. Several urinalyses were negative. Total serum protein was 7.2 g./100 ml. (albumin 3.9 g., globulin 3.3 g.). Serum protein electrophoresis was normal, as were the blood urea nitrogen, blood sugar, alkaline phosphatase, and serum-uric acid. Specific organisms, including acid-fast bacilli and fungi, failed to grow on several sputum cultures. Old tuberculin skin test was positive. Skin tests and complement-fixation studies for fungi were negative. Electrocardiogram was normal. Lupus erythematosus phenomenon was negative on three occasions. Latex-fixation test for rheumatoid factor was positive. Chest film showed bilateral multiple rounded lesions. Pyelogram, barium meal, barium enema, and sigmoidoscopy were negative. Bronchoscopy showed only slight inflammation of the mucous membrane. Bronchial washings for malignant cells, acid-fast bacilli, and fungus studies were negative. An axillary lymph-node biopsy was non-diagnostic.

The patient was afebrile during her stay in hospital. She was discharged on August 6, 1958. Chest x-ray examination on October 10 (Special Plate, Fig. 1) revealed cavity formation

in both upper lobes. She was readmitted to the hospital. A diagnostic thoracotomy was done on October 24. Much of the middle lobe was resected. This (Special Plate, Fig. 2) revealed an area of necrosis just beneath the pleura surrounded by dense fibrous tissue, with large numbers of lymphocytes, palisading macrophages, and occasional giant cells of foreign-body type. There was no vasculitis. Specific stains for acid-fast bacilli and fungi were negative. The patient was discharged on November 8 on chloroquine and prednisone.

Four months later the nodules and the cavities had become barely discernible. In December, 1959, the chest x-ray picture showed only residual scarring without nodularity in either lung field. The arthritis has been well controlled with antimalarials and aspirin. Subsequent chest radiographs revealed no changes.

COMMENT

More than 50 cases of rheumatoid arthritis associated with lung lesions have been described, excluding those with pneumoconiosis (Caplan, 1953). In a small number of cases the diagnosis was made by lung biopsy (Rubin, 1955; Ellman, 1956; Flatley, 1959; Horler and Thompson, 1959; Ognibene, 1960; Robertson and Brinkman, 1961). More often the diagnosis has been only clinical (Ellman and Ball, 1948; Hart, 1948; Schlesinger, 1949; Ellman and Weber, 1949; Leys and Swift, 1949; Bloom and Rubin, 1950; Middleton, 1951; Stolte, 1952; Harris, 1954; Rubin, 1955; Spence, 1955; Ellman, 1956; Horler and Thompson, 1959). Necropsies were performed in about 20 cases. Histological changes of non-specific pulmonary fibrosis were described in the cases reported by Yardumian and Kleinerman (1949), Bevans *et al.* (1954), Ellman and Ball (1948), Christie (1954), Ellman (1956), Price and Skelton (1956), Brinkman and Chaikof (1959), Gardner *et al.* (1957), Edge and Rickards (1957), Smith and Rothermich (1957), Dixon and Ball (1957), Horler and Thompson (1959), and Ognibene (1960).

In about 12 patients (Bennett *et al.*, 1940; Raven *et al.*, 1948; Gruenewald, 1948; Ellman *et al.*, 1954; Christie, 1954; Bevans *et al.*, 1954; Skogrand, 1956; Gresham and Kellaway, 1958; Flatley, 1959; Horler and Thompson, 1959; Robertson and Brinkman, 1961) the lungs showed granulomas resembling subcutaneous rheumatoid nodules.

The clinical and radiological features of the "rheumatoid lung" are not diagnostic. Metastatic malignancy and infectious granulomas were suspected and excluded in this patient. Polyarteritis nodosa (Sandler *et al.*, 1950), and particularly granulomatosis of Wegener (Churg and Straus, 1951; Walton, 1958), may produce similar radiological appearances. Absence of angiitis in the present case militates against these possibilities.

Review of the literature has not revealed previous descriptions of cavity formation in the "rheumatoid lung," if "Caplan's syndrome" is excluded. Several of the patients with pneumoconiosis accompanied by rheumatoid arthritis (Caplan, 1953, 1959) had multiple densities in the lungs with or without cavitation; however, our patient did not have pneumoconiosis, as attested by a negative history and tissue examination (Gough *et al.*, 1955).

Histological findings in the present case were not typical of a rheumatoid nodule. Without other aetiological factors it may be justified to relate the lung lesions to the co-existing rheumatoid arthritis.

Resolution of pulmonary infiltration, with or without treatment, has been observed clinically in the "rheumatoid lung." In histologically proved cases improvement has not yet been reported. In the present patient the lungs showed almost complete resolution over a period of three years. Whether this is spontaneous or due to therapy is not known.

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A new edition of that useful handbook *All About Your Wedding* has been published by the National Marriage Guidance Council (pp. 54; 2s. 6d.). It sets out advice on the customary lines and succeeds in being informative without frightening the reader into thinking that convention is all. A new booklet from the same Council, *The First Five Years of Marriage* (pp. 54; 2s. 6d.), should be of help to many newly married couples. Simple advice is given on such subjects as having the first baby, feeding him and rearing him, dealing with in-laws, and family holidays. Again the authors do not force their advice on the reader but give him some good ideas to think about.