

## Heart Failure in a Breast Cancer Survivor

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A 64-year-old woman named J.G. was diagnosed with a right side, node-negative, HER2-positive, hormone-negative (stage I) breast cancer about eight years ago. Following lumpectomy and sentinel node biopsy, she was referred to a medical oncologist at a National Cancer Institute–designated comprehensive cancer center for consultation on the need for adjuvant chemotherapy. The oncologist recommended four cycles of doxorubicin plus cyclophosphamide. Final trials for trastuzumab in the adjuvant setting had not been completed at the time of the consultation. And, because of the small size of the primary tumor (0.8 cm), the oncologist did not recommend trastuzumab, citing evolving concerns about cardiotoxicity related to long-term use of the drug. J.G. had a positive family history of cardiac events: Both of her parents died from sudden myocardial infarctions in their 60s and her older brother had congestive heart failure (CHF). J.G. had a personal history of hypertension (for which she declined antihypertensive treatment), was obese (body mass index of 38.4), and was sedentary. She agreed with the treatment plan as discussed with her oncologist. A prechemotherapy cardiac assessment of an electrocardiogram and multigated acquisition (MUGA) scan showed no cardiac problems. The MUGA scan's result for left ventricular ejection fraction (LVEF) was 61% (normal is 50% or greater). J.G. proceeded with treatment, which she tolerated well. Following chemotherapy, she underwent six weeks of external beam radiation to her right breast with a boost to the tumor site.

After completing adjuvant therapy, J.G. was seen regularly during a five-year period by her surgeon and medical oncologist. Two months ago, however, J.G. noted a sudden increase in fatigue. She had a persistent dry cough and was gaining weight without an increase in

food intake. She dismissed the cough and fatigue as symptoms of a viral infection. Within weeks, however, she had rapidly increasing orthopnea. And, in the space of two weeks, she had progressed from sleeping on two pillows to having to sit upright in a chair day and night.

J.G.'s assumption was that her breast cancer had recurred in her lungs. She had an annual follow-up appointment already scheduled with her oncologist within a week and, as a teacher, she wanted to wait for the assumed "bad news" until after the close of the school year. Two days before that appointment, however, her feet suddenly began to swell and she experienced mild nausea, difficulty fitting into her clothing and shoes, and a dull ache in her abdomen. When she presented in the oncology clinic, she had 3+ pitting edema in her bilateral lower extremities, her blood pressure was 110/62, pulse was 122, and respiration was 30. Evidence was noted of significant jugular vein distension, pulmonary rales, and an S3 gallop heart sound.

The oncologist ordered a chest x-ray, echocardiogram, complete blood count, chemistry panel, B-type natriuretic peptide (BNP)—a marker of heart failure—and liver enzymes. The chest x-ray showed cardiomegaly (enlargement of the heart); the complete blood count, chemistry panel, and liver enzymes all were within normal limits. The BNP was markedly elevated at 1,542 pg/ml (normal is less than 100 pg/ml). The echocardiogram result of 10% LVEF confirmed the most likely differential diagnosis: cardiomyopathy and acute presentation of CHF. Diagnostic criteria for CHF are shown in Figure 1. J.G.'s LVEF had declined by 51% over her prechemotherapy baseline. In addition, a BNP value greater than 900 pg/ml is indicative of severe heart failure (Hunt et al., 2009).

J.G. was advised to go to the medical center's emergency department, where she was aggressively diuresed and admitted to a telemetry unit. During her inpatient stay, J.G. was seen by a heart failure team, including a board-certified cardiologist specializing in heart failure and a cardiology nurse practitioner. Additional workup during her stay

### Major Criteria

- Acute pulmonary edema
- Hepatojugular reflux
- Increased central venous pressure (more than 16 cm H<sub>2</sub>O at right atrium)
- Neck vein distention
- Paroxysmal nocturnal dyspnea
- Radiographic cardiomegaly (increasing heart size on chest radiography)
- Rales
- S3 gallop
- Weight loss of more than 4.5 kg in five days in response to treatment

### Minor Criteria

- Bilateral ankle edema
- Decrease in vital capacity by one-third from maximum recorded
- Dyspnea on ordinary exertion
- Hepatomegaly
- Nocturnal cough
- Pleural effusion
- Tachycardia (heart rate more than 120 beats per minute)

*Note.* Minor criteria are acceptable only if they cannot be attributed to another medical condition (e.g., pulmonary hypertension, chronic lung disease, cirrhosis, ascites, nephrotic syndrome). The Framingham Heart Study criteria are 100% sensitive and 78% specific for identifying individuals with definite congestive heart failure (CHF). Diagnosis of CHF requires the simultaneous presence of at least two major criteria or one major criterion in conjunction with two minor criteria.

### Figure 1. Framingham Criteria for Congestive Heart Failure

*Note.* Based on information from McKee et al., 1971.