Breast cancer is the most common invasive cancer diagnosed in women. Of every 8 women, 1 woman is diagnosed with breast cancer in her lifetime. In 2013, more than 230,000 women were diagnosed with breast cancer in the United States alone, resulting in nearly 40,000 deaths. Breast cancer can also occur in men, although the incidence is much lower, with a total of 2,240 men diagnosed in 2013 (accounting for less than 1% of all breast cancers).

Over the past 2 decades, death resulting from breast cancer has been declining each year. This decrease in mortality is due in part to improvements in cancer treatment. These treatments have come about as a result of collaborations among physicians in various specialties. These physicians include medical oncologists (who give systemic treatments like chemotherapy and hormonal therapy), surgeons (who perform surgery such as mastectomy and lumpectomy), and radiation oncologists (who treat patients with radiation therapy). Radiation therapy, in particular, has increasingly become an important part of management of most patients with breast cancer. Radiation therapy has been demonstrated not only to prevent recurrence of cancer in the breast or chest wall area but also to improve long-term survival in women. In addition, radiation therapy allows women to undergo a less radical form of surgery in which the breast tissue is conserved, thus improving body image for breast cancer survivors without compromising survival.

As a result of this progress in treatment and improved detection of early breast cancer, in 2012, there were nearly 3 million breast cancer survivors in the United States alone, a number that will increase in the coming years. Women who survive breast cancer may face many health challenges, but the number 1 cause of death in breast cancer survivors (and, in fact, all women) remains heart disease. Unfortunately, although systemic therapies and radiation have led to increased survival in many women with breast cancer, they may also increase the risk of subsequent heart problems. In the vast majority of patients, the benefits of these treatments substantially outweigh this risk.

This Cardiology Patient Page updates the risk of heart disease in breast cancer survivors, particularly those who received radiation as part of their treatment. We highlight important steps that breast cancer survivors can take to decrease their risk of subsequent heart disease. In cardio-oncology clinics, we have adapted specific ABCDE steps that are effective in preventing heart disease in breast cancer survivors (Table).

Coronary Artery Disease

The heart is a 4-chamber muscular organ that pumps blood through the body. Just as supplying oxygenated blood to the rest of the body is important, it is equally important for the heart to receive oxygenated blood to maintain its function.

The information contained in this Circulation Cardiology Patient Page is not a substitute for medical advice, and the American Heart Association recommends consultation with your doctor or healthcare professional.

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Table. ABCDEs to Prevent Heart Disease in Breast Cancer Survivors

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...to receive a steady supply of blood to continue squeezing blood through the body. The coronary arteries are arteries that wrap around the surface of the heart and supply the heart muscle with oxygen, nutrients, and blood. Maintaining healthy coronary arteries, free of major blockages, is essential for maintaining the health of the heart muscle. Over time, blockages can occur in these arteries. This can lead to a disease called coronary artery disease (CAD), in which the heart muscle may not receive an adequate amount of blood to function well because of the blockages in the arteries. CAD is the main reason for heart attacks, which occur when the blood flow suddenly is completely obstructed to a section of the heart muscle, causing the heart muscle to stop functioning properly. CAD is the number 1 killer of men and women in the world.

CAD generally develops over time, and symptoms such as chest pain or shortness of breath may develop. There are several well-established risk factors that can increase the likelihood that a person will develop CAD. The risk factors that can be managed and treated include high blood pressure, high cholesterol, diabetes mellitus, and cigarette smoking. Other risk factors include being at an older age, being male, and having a close relative with CAD (family history). The greater the number of risk factors that a person has, the greater the risk of CAD is. For example, a 64-year woman who has high cholesterol, high blood pressure, and diabetes mellitus has a far greater risk of CAD than a 64-year-old woman who does not have any risk factors. For this reason, treating risk factors such as high cholesterol and high blood pressure will decrease the risk of CAD and prevent heart attacks.

**What Is Radiation Therapy?**

Radiation therapy is a form of treatment using high-energy beams to kill tumor cells. Radiation therapy generally follows surgery to remove the cancer to lower the chance that the cancer will come back in the breast/chest wall or axillary area. Radiation therapy has become a critical component of breast cancer therapy and has been one of the major reasons why many women do not suffer from recurrence of breast cancer.

The most common type of energy for radiation therapy comes from x-ray, but other sources of rays may be used. The x-ray beams damage the DNA (the genetic material that is responsible for cell growth) and therefore cause cancer cell death. However, normal tissue near the site of radiation may also be exposed. In the case of breast cancer (and specifically in left-sided breast cancer), the heart sits near the site of radiation and may be exposed, leading to potential damage to cells in the heart.

Breast cancer radiation, especially on the left side of the chest leading to potential exposure of the heart, has been associated with increased risk of subsequent heart disease. In particular, older radiation techniques in which large doses of radiation were given (including too much to the heart) increased the risk of CAD. This increased risk of heart disease becomes apparent several years (or even several decades) after completion of therapy. More recently, radiation oncologists have worked hard to improve radiation delivery techniques, so that the heart is mostly spared from radiation during treatment. Therefore, the cardiac risks associated with today’s radiation therapy technology are believed to be much smaller.

Prevention of heart disease is the best strategy. After breast cancer treatment and during survivorship, patients and their physicians have an opportunity to take important prevention steps to decrease the risk of a subsequent heart attack.

**How Can You Address Cardiovascular Risk Factors?**

The ABCDE schematic was initially developed at Johns Hopkins Hospital to minimize the risk of heart disease in all patients. Here, slightly modified, we believe these important ABCDE steps apply particularly to breast cancer survivors, especially those who received radiation as part of their therapy (Table).

**Awareness**

The first A in the ABCDE prevention scheme is awareness. Awareness includes the realization that breast cancer treatment can increase the risk of heart disease and the recognition of the signs and symptoms of heart disease. Symptoms of CAD may include the following:

1. Chest pain, especially during activity or stress
2. Shortness of breath
3. Extreme fatigue with exertion
4. Heart attack may vary from mild to severe and present with 1 or more of the following:
   - Sudden chest pressure, pain, or tightness at rest or with minimal movement
   - Squeezing in the chest that may radiate to the neck and jaw
   - Other signs such as nausea, heartburn, shortness of breath, or cold sweat

**Aspirin**

Aspirin taken once daily decreases the risk of heart attack or stroke in specific individuals. Women who have received significant doses of radiation therapy to their heart for breast cancer should discuss with their physicians whether they would benefit from taking a baby (low-dose) aspirin a day. This may not apply to everyone because aspirin has potential side effects.
Blood Pressure
High blood pressure or hypertension is an important risk factor for cardiovascular disease. High blood pressure is defined as blood pressure above 140/90 mm Hg. The cutoff is lower in patients with diabetes mellitus (130/80 mm Hg). It is crucial for women to monitor and treat their blood pressure if elevated.

Cholesterol
Cholesterol can build up in the wall of the arteries and form blockages or plaques, over time impeding blood flow and increasing the risk of a heart attack or stroke. Every breast cancer survivor needs to have her or his cholesterol checked every 5 years. High cholesterol needs to be treated with lifestyle intervention or medications. For breast cancer survivors who have received significant doses of radiation to the heart, there should be a low threshold for lowering the cholesterol further with medications. Exciting recent data suggest that treating cholesterol may also be effective in treating certain types of breast cancer.

Cigarette Smoking/Tobacco Cessation
Cigarette smoking is the leading cause of preventable heart disease in the world. It is a major risk factor for cardiovascular disease in breast cancer survivors, even when it comes in the form of secondhand smoke. Patients should discuss with their physicians novel ways to help themselves or loved ones stop smoking.

Diet
A heart healthy diet decreases the risk of heart problems. The Mediterranean diet, for example, was shown to reduce the incidence of heart disease in high-risk patients.

Diabetes Mellitus
Diabetes mellitus or high blood sugar is an important cause of not only coronary heart disease but also stroke and kidney disease. Every breast cancer survivor should undergo screening for diabetes mellitus by her doctor. If a breast cancer survivor is diagnosed with diabetes mellitus, it becomes important to treat not only the diabetes mellitus but also other risk factors such as high blood pressure or cholesterol.

Dose of Radiation or Chemotherapy
Some of the heart and vascular effects of chemotherapy and radiation are dose related. Fortunately, standard doses have been developed to limit heart damage and to maximize anticancer effects. Ask your oncologist about the amount of chemotherapy or radiation to your heart that you will need to receive in total.

Exercise
Lack of regular physical activity is an important risk factor for heart disease. Physical activity has many benefits, including lowering your blood pressure, weight loss, lowering your lipid levels, and reducing your risk of developing diabetes mellitus. It is recommended that every cancer survivor participate in moderate-intensity physical activity for at least 30 minutes at least 5 days per week. In addition, aerobic training should be complemented with muscle strengthening activity. There is increasing evidence that exercise may actually decrease the risk of breast cancer as well. Thus, exercise is a win-win for breast cancer survivors, although it is recommended that you start slowly and check with your doctor first, particularly if you have had a history of heart problems.

Echocardiogram
Breast cancer survivors who received certain chemotherapies, for example, trastuzumab or anthracyclines such as doxorubicin (Adriamycin), should be considered for an echocardiogram after completion of chemotherapy to look for structural changes in the heart. An echocardiogram uses ultrasound waves and carries no additional radiation risk to the patient.

In summary, the ABCDE steps outlined in here should be applied to every cancer survivor but especially to breast cancer patients who, as a result of both chemotherapy and radiation, are at risk of subsequent cardiac disease during survivorship.

Additional Resources
http://www.cardio-onc.org (This Web site lists some of the specifics of the cardiovascular care of cancer patients and cancer survivors and is a reference for both patients and physicians)


https://twitter.com/CardioOncology (Twitter updates on cardio-oncology)


Disclosures
None.
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