14 EMBRACING THE TWENTY-FIRST CENTURY: Changing Definitions and the Future of Cancer

Cancer affects all of us, whether you're a daughter, mother, sister, friend, coworker, doctor, or patient.

—**Jennifer Aniston**, actress

A Wake-Up Call

On the evening of August 27, 2013, approximately 32,000 American women went to sleep thinking they had been diagnosed with breast cancer. When they woke up the next morning, their cancer was gone. Was it some kind of miracle or act of God? Neither one, in fact, because as the sun rose the next day, a group of medical experts concluded that the disease these women had could no longer be called "cancer" at all.

These experts were talking about DCIS of the breast, a condition that will *never* become invasive cancer in 70 to 80 percent of women with this diagnosis (Chapter 2). In the past, about 98 percent of women with this "stage 0 cancer" would undergo invasive treatments for this disease, such as lumpectomy, radiation therapy, or mastectomy—at great cost as well as emotional and physical distress. In the future, most of these women will probably be treated with what is called "watchful waiting."

The prominent breast surgeon Dr. Laura Esserman of the Diller Family Cancer Center at the University of California at San Francisco (UCSF) has recommended changing the name of DCIS to IDLE (indolent lesions of epithelial origin). This change not only describes the condition more accurately but also eliminates the specter of cancer from the diagnosis.

In Chapter 6, we explained how decades of medical dogma about ovarian cancer now must be reimagined and revised because this silent killer of women actually arises in the fallopian tubes and is now called pelvic serous carcinoma (PSC).

In the future, so-called ovarian cancer may be prevented by simply removing a woman's fallopian tubes after her childbearing years, or earlier, if she's genetically at risk.

This situation has been nicely summarized by the Chief Medical Officer of the American Cancer Society, Dr. Otis Brawley, who has said, "We need a twenty-first-century definition of cancer instead of a nineteenth-century definition, which is what we've been using."

After decades of research, scientists now understand that cancer is not one singular disease but hundreds of different diseases, all of which result from "misprints" (mutations) in our DNA. These diseases affect everyone differently. In fact, not all of the conditions we traditionally refer to as cancer will inexorably progress to metastases and death. For an increasing number of cancers, they will be viewed as simply

another chronic illness, like type 2 diabetes or high blood pressure. Treatments will be designed to manage the cancer instead of always trying to destroy it with harsh methods that have serious side effects. Treatment will be based on precision diagnosis and personalized treatment for each unique patient.

Reimagining Diagnosis and Treatment

In the not-too-distant future, a blood test to detect many types of cancer may just be another part of your annual physical, like checking your blood sugar and cholesterol. Researchers have recently discovered that once cancer forms, even if it's too small to see on an Xray or CT scan, some cancer cells break down and leak their tumor DNA into the bloodstream.

There is abundant research currently studying whether liquid biopsies (blood tests) to detect this "circulating tumor DNA" (ctDNA) can be used for early detection of cancer, monitoring treatment responses, and early detection of recurrences or resistance to treatments.

Technologically, it's getting easier and cheaper all the time to check large collections of genes for smoking gun mutations that indicate cancer, even for the very tiny amounts of ctDNA that tumors leak into the bloodstream.

What could this mean for patients?

In Chapter 6, we reported that mutations in a gene called TP53 seem to be early events in the development of ovarian (pelvic serous) cancer. What if future research shows that we can detect abnormal copies of TP53 DNA leaked into the blood by these early cancers? Would such a test be run every year on high-risk women like BRCA1 and BRAC2 carriers who could use this information to help them decide when or if to undergo prophylactic surgery? Could such a test even be used in all women, with the goal of catching early cancers