MEDICAL INNOVATION: HERCEPTIN (PHARMACEUTICAL: SMALL MOLECULES)

Physician: Dr. Dennis Slamon of UCLA
Industry: Genentech, Hoffmann-La Roche

Situation

No effective way to target a deadlier and faster growing form of cancer

Breast cancer is the most common cancer in American women, other than skin cancers. Roughly one in eight women in the U.S. will develop invasive breast cancer at some time in their lives. In addition, a type of the disease known as "HER2-positive breast cancer," a variant of breast cancer that stands for Human Epidermal growth factor Receptor 2 (HER2). This type promotes the growth of cancer cells, and represents a particularly aggressive type of cancer that strikes one in five of breast cancer patients, or more than 200,000 women every year worldwide.

In this variant of the disease, the cancer cells make an excess of HER2 due to a gene mutation, and this can actually occur in many types of cancer. Not only are they deadlier and faster growing than other forms of the disease, HER2-positive cancers are less responsive to hormone treatment as well. Until the late 1990s, there was no effective way to target them directly.

Physician-Industry Collaboration

Persistence and will lead to a cancer breakthrough

In the mid-1980s, a cancer researcher at UCLA named Dr. Dennis Slamon began a long journey that would lead to a targeted approach to fighting this deadly form of breast cancer. Slamon worked closely with the biotechnology company Genentech, and was asked to study certain forms of HER1 cancer and its variants. In the process, he discovered the HER2 form of breast cancer and analyzed its progression in a number of women with the disease. He discovered that this type of cancer represented a particularly deadly version of the disease, and began looking for a way to treat it with antibodies.

His concept, though, was initially greeted with skepticism at Genentech, as antibody therapies had proved unsuccessful in treating other forms of cancer, and the company was reluctant to put significant resources behind another search using this approach. Slamon found a few leaders within the company who backed his idea, but had to supplement his initial funding with private donations in order to see his research through. Using remarkable persistence and unrelenting passion, he convinced several outside philanthropists of the merit of his approach, and was able to receive enough funding to eventually discover a promising compound that worked as a monoclonal antibody to counteract a mutation of the HER2 gene.

Clinical trials of the compound, Herceptin, proved successful, and the drug was finally approved by the FDA in 1998. The novel approach of targeting a specific form of the disease with a genetic compound would transform the way researchers approached treatment for cancers generally. Herceptin kills the cancer cells and decreases the risk of reoccurrence.

Innovation Benefits

A 49 percent improvement in overall survival

According to UCLA, Herceptin "was the first in a wave of new treatments that attempted to fix what was 'broken' in a cancer cell — homing in on the genetic mutations causing the cells to become malignant and targeting those alterations. Because it targets only the cancerous cells, Herceptin does not cause the harsh side effects such as hair loss and nausea that often accompany conventional therapies [like chemotherapy.]"

After three-and-a-half years in a clinical study, 87 percent of women treated with Herceptin plus chemotherapy were disease free, compared to 71 percent of women treated with chemotherapy alone. A survival analysis conducted after patients had been followed for a median of 24 months showed a 33 percent reduction in the risk of death, which is equivalent to a 49 percent improvement in overall survival.

Patient Benefits

"Herceptin saved my life…If I hadn't found that trial, I'd probably be dead."

Ladies Home Journal tells an inspiring story about the impact of Herceptin on a mother of two stricken with HER2-positive breast cancer:

Tammy Padgett was in perfect health. The trim, athletic now-44-year-old mother of two had a baseline mammogram in 2000 that found nothing amiss, so when she discovered a lump in her breast the following summer, her gynecologist assured her that she didn't need to worry. When the lump got bigger, Padgett insisted on getting another mammogram before Thanksgiving 2001. A biopsy the following week found she had a mass so large that she needed a mastectomy.

On Christmas Eve she got her pathology report and it was devastating: The tumor was estrogen and HER2 positive, the cancer was extremely aggressive, and it had invaded three of her lymph nodes. "All I could think about was that I was going to die," she recalls, "and no one would love my babies the way I do."

That January she flew to the M.D. Anderson Cancer Center, in Houston, to get a second opinion. The trip may have saved her life. At Anderson she learned about the clinical trials of Herceptin for women with earlier-stage cancers. "My oncologist thought it was my best shot," says Padgett.

Her treatment was harrowing. Chemotherapy threw her into early menopause, her hair fell out, and she was so weak she could barely brush her teeth. In May she started on Taxol infusions once a week for 12 weeks. Then in July she began the weekly infusions of Herceptin. She also received 36 rounds of radiation that fall. A year later, on her 41st birthday, she had her last Herceptin treatment.

"This December I'll celebrate my five-year anniversary," says Padgett, who still takes Arimidex every day to block production of estrogen. "Herceptin saved my life. If I hadn't found that trial, I'd probably be dead."