New treatments for breast cancer

Now that 90% of women diagnosed with breast cancer will live at least 5 years, new treatments are aim at improving outcomes for the 10% who are not responding to current drugs and delivering treatments with less side effects.

Targeted treatments and immunotherapy
As more is discovered about the altered genes that are associated with developing cancer, treatments can be targeted at those genes or the proteins that they produce. Breast cancer was one of the early cancers to benefit from this approach. About a quarter of breast cancers have a defective gene, the HER2 gene, which makes too much of the HER2 protein causing uncontrolled growth of breast cancer cells. A drug, trastuzumab (Herceptin) blocks the signalling that tells the HER2 positive cells to grow, and prolonged the survival for patients with HER2 positive breast cancer. There are now newer drugs that can also be used against HER2 positive breast cancer and they include lapatinib, pertuzumab and trastuzumab emtasine. They can be combined with other drugs or used alone when the cancer has spread.

Similarly, other altered genes which are responsible for the growth of breast cancer are being sought. An example are proteins like CDK4 and CDK6 which are important for the growth cycle of cells and can be targeted with a drug, palbociclib. Other targets are proteins like PARP (poly ADP-ribose polymerase), responsible for repairing damage to the genetic material (DNA) in a cell and PARP inhibitors include drugs such as olaparib which is being trialled in breast cancer patients who have alterations in the BRCA1 and BRCA2 genes.

Some of the most promising new treatments involve utilising the body's immune system. Drugs are being linked with antibodies which then deliver them to key targets. A patient's immune cells (T Cells) can have their anticancer activity increased and then be reinfused into the patients to target their cancer. Vaccines can target tumour associated proteins which will lead to the death of the tumour. The ability of the body to launch an immune response to cancers may be being blocked and drugs such as pembrolizumab have been produced that target the molecules block the immune response so the body's immune system can attack the cancer.

Radiation therapy
Advances in radiation therapy in breast cancer include investigating whether reducing the extent of the breast that is irradiated and reducing the number of doses can lessen the burden of the treatment while maintaining efficacy. Accelerated partial breast irradiation (APBI) involves only irradiating an area of 1 to 2 centimetres around where the breast lump was removed and giving higher doses each treatment to complete the treatment in days rather than weeks. Techniques can involve giving radiotherapy intraoperatively, or implanting wires around the cavity to irradiate the area. When such techniques are combined with external radiotherapy this is better targeted by using 3-dimensional planning or beams such protons which irradiate less of the tissue beyond the area being irradiated. There may also be a benefit in combing radiotherapy with immunotherapies.

Surgery

One of the major thrusts of surgery is to reduce the extent of surgery required while maintaining its effectiveness. It has been known for years that in many cases, removing the lump and giving radiotherapy to the remainder of the breast can replace mastectomy. Another technique aims to reduce the need for removing the lymph nodes from under the arm to avoid troublesome swelling of the arm subsequently. Now, the first draining lymph node, the sentinel node can be sampled and if not involved or minimally involved with cancer, no further surgery need be done. Further, patients who require chemotherapy, if they are treated prior to surgery, have a higher rate of being able to conserve the breast and testing on the samples can direct what treatment would work best subsequently.

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Publication

New initiatives in the treatment of breast cancer.
Olver IN
Med J Aust. 2016 Nov 21