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**BREAST INTENSITY MODULATED RADIATION THERAPY IS SAFER:
Sunnybrook-led study reports radiation dose delivery to the body, from five
different radiation techniques during breast cancer treatment.**

Toronto (February 1, 2011) – In the first high-precision dosimetry study to compare five new radiotherapy techniques for breast cancer, Sunnybrook researchers find breast IMRT (intensity modulated radiation therapy) and virtual wedge significantly safer than an older technique of the metallic, physical wedge, for whole breast radiotherapy, as published in *Radiation Oncology*. For partial breast radiotherapy, low energy source brachytherapy seed implants and 3D-CRT (conformal radiotherapy) appear safer than temporary ¹⁹²Ir (Iridium) HDR (high-dose rate) brachytherapy.

Traditional radiotherapy use triangular-shaped blocks made from metallic material. The blocks serve to even out the radiation dose inside the breast during treatment. The blocks scatter the radiation, which is often absorbed in other parts of the body. Since 2000, in Ontario, the physical wedge technique has been replaced by the virtual wedge technique and eventually breast IMRT. IMRT and virtual wedge techniques use computer-simulated fields and a motion of the radiation beam jaws, to better target therapy to the affected breast.

Since 2003, in the United States and Canada, selected patients have been offered treatment to part of the affected breast using the popular technique of HDR brachytherapy. The technique involves the temporary placement for a few minutes, twice a day and for five consecutive days, of a very intense and miniature source of ¹⁹²Iridium inside a tube or balloon catheter implanted inside the surgical cavity. An alternate technique pioneered at Sunnybrook Health Sciences Centre involves the permanent insertion of low energy radioactive seeds under light sedation in a one-hour procedure.

“More patients are living longer, and with any therapy used, the goal is for us to reduce risk of complications from treatment itself to better ensure continued quality of life,” says Dr. Jean-Philippe Pignol, lead investigator and radiation oncologist with the Breast Cancer Care team at Sunnybrook’s Odette Cancer Centre. Recent data published by the SEER Program (Surveillance, Epidemiology and End Results) shows 60 per cent of breast cancers are diagnosed at an early stage, with patients having a 98 per cent chance of being alive at five years after diagnosis.

To evaluate the amount of unwanted radiation deposited elsewhere in the body, the study researchers used a very sophisticated simulation technique called Monte Carlo. A CT (computed tomography) scan of a random patient was used to recreate a virtual patient to test the various breast radiotherapy techniques. The amount of radiation delivered to several internal organs at risk of developing secondary cancer or radiation complication was calculated. Organs included the breasts, lungs, the heart, chest walls, spleen and other body volumes.

“There are so many breast radiation techniques available and it is our hope is that the data from this study will drive important dialogue about the risks of using techniques such as wedge or ¹⁹²Iridium brachytherapy when considering breast radiotherapy techniques for patients,” says Dr. Pignol, Professor in the department of Radiation Oncology at the University of Toronto.

Study findings include: for external beam radiotherapy the wedge compensation technique yielded the largest doses to internal organs like the spleen or the heart, respectively 2,300 mSv and 2.7 Gy. Smaller scatter dose are induced using breast IMRT, respectively 810 mSv and 1.1 Gy, or 3D-CRT partial breast irradiation, respectively 130 mSv and 0.7 Gy. Dose to the lung is also smaller for IMRT and 3D-CRT compared to the wedge technique. For multicatheter HDR brachytherapy a large dose of 3.6 Gy is delivered to the heart. The spleen receives 1,171 mSv and the lung receives 2,471 mSv. These values are 44 per cent higher in case of the balloon catheter method. In contrast, the researchers find the breast seeds implant are associated with low dose to most internal organs.

To compare and contrast the data, the researchers provide a literature review of all studies on the safety of the five techniques examined, and use criteria from the domain of radiology where an unwanted radiation dose of 20 mSv from a basic CT scan is considered high.

The researchers conclude that breast IMRT, seed implant brachytherapy and 3D conformal radiotherapy are safer techniques, while the relative safety of traditional physical wedges and ¹⁹²Ir HDR brachytherapy is questionable.

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Media Contact:
Natalie Chung-Sayers
416.480.4040