Breast cancer and heart disease may have common roots

December 20 2011

Women who are at risk for breast cancer may also be at greater risk for heart disease, new research has found.

The majority of women with hereditary breast and ovarian cancer have a mutated form of the BRCA1 or BRCA2 genes, which normally suppress the growth of breast and ovarian tumours.

Dr. Subodh Verma, a cardiac surgeon at St. Michael's Hospital, said his research team was surprised to discover the genes also regulate heart function.

Following a heart attack, mice with the mutated BRCA1 gene had a three-to-five times higher rate of death. This was largely due to the development of profound heart failure, possibly because their heart attacks were twice as severe as those in mice who did not have the mutated gene.

A similar two-fold increase in heart failure was observed when mice with a mutated BRCA1 or BRAC2 gene were treated with doxorubicin, one of the most common chemotherapy drugs for patients with breast cancer. In addition to studies in mice, the authors also verified this observation in human tissues.

The researchers believe that the mutated BRCA1/2 prevents DNA repair in muscle cells that is essential to recovery after a heart attack.

Their findings were published in the journals *Nature Communications* and Journal of Biological Chemistry.

"Our findings suggest that individuals who are at risk of breast cancer may also be at a previously unrecognized risk of heart disease," Dr. Verma said. "More importantly, we now understand that breast cancer and heart disease -- the two leading causes of death for Canadian women – have a common biological basis, a common soil."

Dr. Verma emphasized that these findings may have important implications for patients. Knowing that the BRCA1/2 gene is essential to DNA repair may lead to future treatments for anyone with heart disease, a leading cause of death worldwide. Women who carry this mutated gene now know they may also be at a higher risk for developing heart disease in addition to the risk of developing cancer.

Dr. Christine Brezden-Masley, an oncologist at St. Michael's and a co-author of the paper, said that while physicians knew doxorubicin was associated with heart failure, the new research shows women with the mutated BRCA1/2 gene are particularly sensitive to its toxicity.

"What this means is that when a patient has the mutated gene, I now have to think about how much doxorubicin I'm going to give them or whether we should consider an alternate therapy," Dr. Brezden-Masley said.

Provided by St. Michael's Hospital