Nuclear medicine scan could identify who might benefit from aromatase inhibitor treatment

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A new, noninvasive nuclear medicine test can be used to determine whether aromatase inhibitor treatment will be effective for specific cancer patients, according to a recent study reported in *The Journal of Nuclear Medicine*. The research shows that a PET scan with the ligand C-11-vorozole reliably detects aromatase in all body organs - demonstrating the value of its future use to pre-determine the effectiveness of the treatment for breast, ovarian, endometrial and lung cancer patients, potentially reducing unnecessary treatment costs and adverse effects.

Aromatase inhibitors are drugs that work by blocking the aromatase enzyme, which turns the androgen hormone into cancer-stimulating estrogen. They are widely used in the adjuvant treatment of breast cancer and other endocrine conditions. However, no quantitative, noninvasive studies had been done of the distribution and regulation of aromatase in living humans.

Anat Biegon, PhD, corresponding author of the study, explains, "This is the first study conducted in living human subjects that surveys the whole body, comparing healthy young and old men and women."

For the study, 13 men and 20 women were injected intravenously with C-11-vorozole (111-296 MBq/subject), with PET data acquired over a 90-minute period. Each subject had four scans, two per day separated by

two to six weeks. Brain and torso or pelvic scans were included. Young women were scanned at two discrete phases of the menstrual cycle (midcycle and late luteal). Men and postmenopausal women were also scanned after pretreatment with a clinical dose of the aromatase inhibitor letrozole. Time-activity curves were obtained, and standardized uptake values (SUV) were calculated for major organs, including brain, heart, lungs, liver, kidneys, spleen, muscle, bone, and male and female reproductive organs. Organ and whole-body radiation exposures were calculated using OLINDA software.

The study shows for the first time that the body organ with the largest stable capacity for estrogen biosynthesis is the male brain, closely followed by the female brain. Aromatase availability is slightly but consistently higher in all organs in men relative to women, with the exception of the ovary. In addition, aromatase availability in the ovary is tightly linked to the ovulatory phase of the menstrual cycle in young women, with increased levels evident in one ovary/cycle around the time of ovulation. Also of interest is the finding that aging and cigarette smoke reduce aromatase availability in the brains of healthy men and women.

Dr. Biegon points out the significance of the study: "Research using in vitro methods indicates aromatase over expression is not limited to breast cancer and is evident in a considerable proportion of ovarian, endometrial, and lung tumors. This study provides methodological, baseline and dosimetry information supporting the use of PET and C-11 vorozole in the non-invasive identification of individuals with disparate disorders who may benefit from treatment with aromatase inhibitors." She notes, "It also offers the ability to distinguish breast cancer patients who are not likely to benefit from this treatment, reducing unnecessary treatment costs and adverse effects. Finally, aromatase imaging can be used in monitoring efficacy of treatment with aromatase inhibitors and aid in the development of new drugs in this class."

Another key finding relates to the differences between men and women. Dr. Biegon states, "Radiotracer uptake and the resultant radiation exposure can be sex-dependent and strongly modulated by hormonal status. Nuclear medicine procedures need to be adjusted for these factors when applied in women."

More information: Authors of the article "Aromatase Imaging with [N-Methyl-11C] Vorozole PET in Healthy Men and Women" include Anat Biegon, David L. Alexoff, Sung Won Kim, Jean Logan, Deborah Pareto, David Schlyer, Gene-Jack Wang, and Joanna S. Fowler.

Provided by Society of Nuclear Medicine