Purpose: According to the national regulations the absorbed dose to the breast tissue must be calculated and protocolled. Correct and individual calculation would allow right assessment of the additional risk and the comparison of the different mammography units. The current procedure for calculating the average glandular dose (AGD) relays on the right multiplication of three different tabulated conversion factors and implies measurement of the HVL.
Method and Materials: To calculate the conversion factor, which relays the incident air kerma to the absorbed dose in the sensitiver glandular tissue, we used the Monte Carlo simulations software EGSnrc. In it no electrons were transported and the photons were followed down to 1 keV. The photons cross section data was taken from XCOM. The breast was simulated as a D-shaped mathematical model. It consists of 5 mm outer region made of 100% adiposal tissue. The inner region was made of five different mixtures of adiposal and glandular tissue. Six different breast thicknesses from 2 cm to 6 cm were investigated. Five different anode/filter combinations (Mo/Mo, Mo/Rh, Rh/Rh, W/Rh and W/Ag) and for each three different energies were used.
Results: Conversion factors were calculated for each anode/filter combination, x-ray tube potential, breast thickness and breast composition. Through the means of regression analysis for each anode/filter combination a general function was proposed. It has as an input the potential, breast thickness and glandularity and returns one conversion factor, which is to be multiplied with the incident air kerma to calculate the AGD. The error due to this method is less than 1%.
Conclusions: An individual calculation of the AGD is possible. For each patient we consider only one conversion factor and not a combination of three. We do not need tabulated values. This method represents an easy and straightforward way of calculating the AGD.