AbstractID: 4660 Title: Neutron scattered dose equivalent to a fetus from proton radiotherapy of the mother

Scattered neutron dose equivalent to a representative point for a fetus is evaluated in an anthropomorphic phantom of the mother undergoing proton radiotherapy. The effect on scattered neutron dose equivalent to the fetus of changing the incident proton beam energy, aperture size, beam location, and air gap between the beam delivery snout and skin was studied for both a small field snout and a large field snout. Measurements of the fetus scattered neutron dose equivalent were made by placing a neutron bubble detector 10 cm below the umbilicus of an anthropomorphic Rando® phantom enhanced by a wax bolus to simulate a second trimester pregnancy. The neutron dose equivalent in milliSieverts per proton treatment Gray increased with incident proton energy and decreased with aperture size, distance of the fetus representative point from the field edge, and increasing air gap. Neutron dose equivalent to the fetus varied from 0.025 to 0.450 mSv per proton Gray for the small field snout and from 0.097 to 0.871 mSv per proton Gray for the large field snout. There is likely to be no excess risk to the fetus of severe mental retardation for a typical proton treatment of 80 Gray to the mother since the scattered neutron dose to the fetus of 69.7 mSv is well below the estimated radiation absorbed dose threshold of 600 mGy observed for the occurrence of severe mental retardation in prenatally exposed Japanese atomic bomb survivors. However based on the linear no threshold hypothesis and this same typical treatment for the mother, the excess risk to the fetus of radiation induced cancer death in the first 10 years of life is 17.4 per 10,000 children.