Purpose: A commercial 6D carbon fiber radiotherapy treatment couch (Imaging Couch Top, BrainLAB) has recently been reported to attenuate photon beams and increase skin dose. To prevent skin toxicity and ensure the target dose, it is important to correct the attenuation properties of the treatment couch with the treatment planning system (TPS). In this study, we evaluated the accuracy of dose attenuation correction by a virtual couch technique integrated into the TPS.

Methods: A virtual couch was modeled in the TPS (Eclipse v10.0, Varian). The CT value of the virtual couch was assigned with the CT value of the kilovoltage-CT images of the treatment couch. A phantom consisting of several plastic water slabs was created. We selected an evaluation point within the phantom on the couch structure at a 9 cm depth from the couch surface, which was placed at the isocenter. The doses at this point were calculated and measured at several gantry angles, from 120 degree to 240 degree at 10 degree steps, and each field size was 10 cm x 10 cm. The prescribed dose was 100 monitor units for 6/10 MV photon beams and 6 MV-SRS mode (Trilogy Tx, Varian). Dose measurements were performed with an ion chamber.

Results: The largest difference between measured and calculated doses was 3.3% for a gantry angle of 120 degree and 6 MV-SRS mode. The average dose difference was within 1.6% for all gantry angles and photon beams. In the case without attenuation correction, the largest difference was 8.2% and the average difference was 5.2%.

Conclusions: Use of the virtual couch technique in TPS accomplished sufficient accuracy for dose attenuation correction of the 6D carbon fiber treatment couch, and it is an effective method for clinical use.