

AbstractID: 13249 Title: CT Dose Reduction with Tube Current Modulation: A Case Study of Fetal Doses to Pregnant Patients Using Monte Carlo Computational Phantoms

Purpose: To demonstrate CT fetal dose reduction with the use of tube current modulation (TCM) on pregnant patients using retrospective data. **Method and Materials:** Monte Carlo (MC) simulation techniques are used to model CT scanners, the TCM schemes, and the pregnant patients. Two MDCT scanners, GE LightSpeed Pro 16 and GE LightSpeed™ 16, were modeled in MCNPX source code. The TCM data were selected from archived clinical records for pregnant patients who underwent CT procedures recently at Massachusetts General Hospital (MGH) in Boston. Three pregnant patient phantoms with different gestations were utilized. **Results:** According to the calculation results, it is found that the fetal dose from TCM is always smaller than the fetal dose from non-TCM. TCM schema can reduce fetal dose from 14% to 25%. Also, fetal dose gets increased when fetus becomes larger. It is also found that results of ImPACT calculations are always larger than MC calculations performed in this research. The difference between the two sets of data can reach around 40%-50%. **Conclusion:** This work demonstrates that Monte Carlo method can be used to assess the organ doses and fetal doses of pregnant patients undergoing TCM CT examinations by modeling the CT scanner and TCM schema as well as patient phantoms. The comparison between TCM organ doses and non-TCM organ doses indicates that the modulated current can effectively help reduce organ dose from CT scans from 14% to 25% according to the specific TCM schema.