AbstractID: 13282 Title: Effect of CT Scan Parameters on Adult and Pediatric CT Dose when using Automatic Tube Current Modulation

Purpose: To develop pediatric CT protocols by characterizing effects of CT parameters on adult and pediatric CT dose using automatic tube-current modulation (ATCM).

Method and Materials: Adult and 10-year-old (10yo) ATOM (CIRS) phantoms were scanned on a 16-channel CT system (Emotion16, Siemens) using ATCM (CareDose4D) to characterize the relationships between CT scan parameters and patient dose. The scan parameters investigated include scan-kVp, reference-mAs, scout-kVp, patient-size selection (adult/pediatric), and rotation-time. Effective-mAs delivered by ATCM was extracted from the DICOM header of each CT image.

Results: Effective-mAs delivered by ATCM varied with patient-size selection, relative to reference-mAs, it decreased for adult but increased for pediatric. Using ATCM the average effective-mAs for 80, 100, 130 scan-kVp changed by 81%&124%, 61%&110%, 55%&103% relative to reference-mAs for the adult&10yo phantoms. However, when the 10yo was selected as adult, the average effective-mAs decreased to 34%, 29%, and 26% of reference-mAs. When selected as adult, dose decreased for all anatomical regions but when selected as pediatric, dose increase was observed for abdomen and pelvis (120-155%). ATCM effective-mAs per slice scaled linearly (1±0.06) with input reference-mAs. However, the minimum mA limited the modulation of effective-mAs at low reference-mAs. For both phantoms, 80 kVp scouts reduced the effective-mAs by 5-7% on average (up to 20% for thorax) compared to 130 kVp scouts. For identical reference-mAs, ATCM increased effective-mAs for lower scan-kVp; however, patient dose also decreased for lower scan-kVp. For the adult&10yo phantoms, average dose at 80 and 110 scan-kVp was 42%&39% and 72%&72% of that at 130 scan-kVp, respectively.

Conclusion: Patient dose with ATCM decreased for adult and increased for pediatric patients. The scout-kVp affects ATCM schema with lower effective-mAs for lower scout-kVp. ATCM effective-mAs is linear with input reference-mAs. Net patient dose is reduced despite increased effective-mAs at lower scan-kVp using ATCM.