CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Discussion

CT offers high diagnostic capability and also the patient dose when compared to other diagnostic radiology practice. Patient dose received during CT examination is determined by several factors including applied voltage, kVp, tube current(mA), scan time (s), slice thickness and scan range. Among the mentioned factors, the mAs varies significantly with the patient dose. Therefore the mAs should be chosen to produce an image with an acceptable level of image quality in terms of noise. An increasing in mAs, a reduction in noise level does not provide additional diagnostic information. Therefore, the acceptable noise level should be determined among patients to maintain image quality. Image will be unacceptable noisy if the mAs is less than optimal. Alternatively, patient may receive higher radiation dose for larger mAs to produce superior image.

Our study related to pediatric data of 31 for the age range 1-12 years as the routine study prior to the application of exposure table protocol. The study showed the range of mAs between 115-250 which the patient dose, $CTDI_{vol}$ was 22.4-53.7 mGy and DLP was 281-323 mGy.cm. Image noise was determined in the range of 3.2-4.2 HU. The water phantom study showed the increasing of patient dose with the increasing of kVp and mAs. The size of phantom had no influence on $CTDI_{vol}$ as the phantom sizes were not increased seriously (9.15-15.8 cm). The exposure table of reduced mAs was assigned for the second group of 31 patients. The results showed the range of mAs of 90-160, $CTDI_{vol}$ 10.4-23.2 mGy, DLP 187- 245 mGy.cm, the image noise was 4.7-5.2 HU. The image quality among two radiologists of similar experience was fair (weighted K= 0.305), and good (weighted K= 0.611) of image quality between pre study of clinical routine protocol and post study of application of the exposure table. The reduction of $CTDI_{vol}$ from 22.4-53.7 mGy to 10.4-23.2 mGy was significantly observed and successfully met the protocol criteria.

When we compare our study to others using maximum antero-posterior diameter (MAPD) for pediatric brain CT dose reduction by selection of tube current-exposure time product (mAs), found that mAs increase linearly with MAPD which was the same direction as our study. Chan et al [10] recommended that by using the optimal mAs, the pediatric dose reduction of 40% was possible without affecting the diagnostic quality of the images.

5.2 Conclusion

Pediatric dose reduction on brain CT was studied using data from routine studies to be guidelines for experimental studies. Water head phantoms of different diameters of 9.15, 11.15, 13.15 and 15.8 cm were used to study the effect on the variation of kVp and mAs on $CTDI_{vol}$, DLP and image noise. The dose reduction was obtained as the mAs reduction from 21% at <10 kg body weight to 36% at 31-40 kg body weight. The $CTDI_{vol}$ reduced from 53.7% to 14.5 % from small child to early teenage. The increasing range of noise from 8.5 to 40.5 % did not show the significant in image quality.

5.3 Recommendation

The proposed exposure table should be set up and used as routine study in order to reduce the small child CT dose at the brain which the image quality is maintained