CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Discussion

The quality control program for x-ray equipment and computed radiography system are an important role in compliance to the national regulations and standards in Thailand. Furthermore, the results from the program are analyzed for the continued clinical service. Those show the radiation output, beam quality and image quality which were used in this studies. The PMMA phantom of various thicknesses had been used to get the exposure table protocol for kVp at AEC mode which vary according to patient chest thickness. The results on dose and image quality were used to set up such the protocol. One hundred and sixty patients had been applied for the proposed protocol which all patient data, exposure table, DAP dose ($cGy.cm^2$), calculated entrance skin dose (mGy), S-Value and image quality scoring on chest radiography were recorded in table 3. From manufacturer's guideline, the S-Value should be greater than 200 for the optimal image quality. The DAP dose was used to observe the result on dose when phantom thickness, kVp and mAs changed, as it was direct readout. The ESD increased as the patient chest thickness, kVp and BMI increased. The image quality scores decrease from the maximum of 8 of chest thickness 15-18 cm. to 5.5 of chest thickness of 19-22 cm. The total score was 8. The score at 27-30 cm chest thickness was 6.6. The body mass index (BMI) was also another indicator which increased resulting the image quality scores decreased as in Figure 6. Furthermore, the influenced factor for image quality was according to the patient pathology which reduced the image quality as well. The patient image quality score varied from 5.5 to 8 according to the above mentioned factors. The maximum reduction in image quality is only 75 percent showing the good quality of high kVp technique.

For the patient dose, the average ESD was 0.068 mGy (0.045-0.12) when high kVp technique under the exposure table protocol was applied. This ESD was within the dose reference level (DRL) for all standards as in Table 8. As Thai patients were smaller in size compared to the western, so the DRL for Thai should be set up for the lower range.

5.2 Conclusion

This study has shown the protocol for chest radiography using high kVp technique on Computed Radiography in correlation to phantom and patient studies.

Image quality was evaluated on computer monitor for 160 images of chest PA when high kVp technique was used as shown in table7. Patient chest thickness and BMI are major factors affecting the image quality as shown in Figure 5 and 6.The average entrance skin dose (ESD) from the high kVp technique (table 5) was lower than dose reference level (DRL) from all references. This was the result from using of optimal kVp and radiographic techniques recommended by the Commission of the European Communities (CEC) [17].

Table 9. Comparison of the ESD values for chest radiography (PA) to international established reference dose values (mGy)

CEC Standard patient (1995)	NRPB median values	IAEA Basic Safety Standards (1996)	Our study (mGy)
0.3	0.3	0.4	0.068

In conclusion, the application of high kVp technique for 160 cases of chest radiography in CR system shows the optimal image quality of average scores of 6.93 from 8 as the CEC recommendation. The scores are high at small chest thickness and low at large chest thickness. The ESD shows the range of 0.045 to 0.120 mGy for chest radiography from small to large chest thickness respectively.

The exposure table protocol should be posted and implemented regularly to obtain the dose reduction and optimal image quality in chest radiography at Emergency Unit of King Chulalongkorn Memorial Hospital, Thai Red Cross Society.