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EVALUATION OF ABDOMINAL COMPUTED RADIOGRAPHY (CR) EXPOSURE PARAMETERS AT SELECTED HOSPITALS IN KLANG VALLEY OF MALAYSIA

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ABSTRACT

Computed Radiography (CR) system has the ability to reduce patient radiation dose compared to the conventional screen film system. However, if it is not properly handled, it may result in higher radiation dose to the patient. The objectives of this study are to compare the kVp usage and the exposure indicators recommended by the manufacturer for abdominal CR in selected hospitals with the optimum quality image produced using standard abdominal phantom. In medical imaging laboratory, abdominal phantom images are produced using several X-ray exposure parameters setting. All images are studied for noise level, contrast, resolution and the Entrance Skin Dose (ESD). The best image with high quality and lowest ESD was identified and the mean exposure parameters involved become the references value. In clinical practice, exposure parameters used for abdominal radiography were collected and analysed in three hospitals. The mean for kVp, mAs, exposure indicator and ESD were compared between hospitals and laboratory results. The use of exposure indicators were analysed and compared with the machine Manufacturer Recommended Range (MRR). The result showed that, the mean for exposure parameters to produce the best standard abdominal image quality using phantom was 75 kVp and 46.5 mAs with ESD 5.71 mGy. In clinical practices showed that variation of exposure parameters used in clinical practice was between 60 to 80 kVp and 16 to 50 mAs. The median kVp for centre A, B and C is 75, 70 and 73 with 32, 31 and 24 mAs respectively meanwhile the median ESD for centre A, B and C is 3.77, 2.71 and 2.65 mGy. More than 60% of the exposure indicators for those centres were beyond the manufacturer recommended range (MRR) value. Each hospital practices the same standard of exposure parameters but most of them used lower setting compared to the reference value. Most of radiographers used exposure parameters beyond the MRR. The different ESD in clinical practice with the reference value is due to multiple X-ray machine used which each of them has dedicated output factors.

Keywords - computed radiography, exposure parameters, exposure index, entrance surface dose, abdominal radiography

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CHAPTER ONE

INTRODUCTION

1.1   RESEARCH BACKGROUND

General radiography is a production of images of the bones and soft tissues to detect fracture, tissue damage or pathological changes using ionising radiation known as X-ray. This examination is also recognized as plain radiography and it contributes to the highest number of the total radiological examinations in most medical centres worldwide. In Malaysia from the year 1996 to 2000, the total medical imaging examinations in government hospital were measured and it has been discovered that plain radiography contributed 90.6 % from the whole examinations [1]. The high number of examinations has a correlation with the long term risks of cancer from ionising radiation, therefore more attention has been focused to bring the received dose to a minimum level [2]. To record an image, General radiography uses conventional film screen combination, computer technology known as Computed Radiography or Direct Digital Radiography.

Computed Radiography (CR) system has been introduced by Fuji in the early 1980s [3-5]. Since then, CR usage in medical imaging gradually replaces the conventional film/screen combination. In Malaysia, this technology has been adopted and it is growing rapidly. The first hospital using CR is a government hospital in August 1998 followed by a teaching hospital in 2003. Today several government and private hospitals have this facility due to technology changes in medical imaging worldwide. Hence, this has been chosen as the research area to explore the exposure trend.

Upon adoption of this new technology, it is advisable that the technology undergoes valuation and critique so that strategies are devised to optimize its use. Until at our knowledge, in Malaysia, two published papers related to CR were identified. One paper describes the usage of CR in visualization of the uric acid for renal calculi and another paper comparing the CR and screen film method for Chest Radiography in terms of image quality and the radiation dose.