電腦X射線攝影的影像品質之影響因素評估

蔡長書[a] 范瑞鳳[b] 洪茂欽[a] 陳懿芳[a,c] 黃健安[b]

摘要

本研究主要目的藉由電腦放射攝影系統(CR)探討影響x光放射診斷影像品質因素及其游離輻射安全規範，並提供作為醫療院所醫事放射師職前就業銜接培訓課程發展與醫事人力臨床能力評量參考，強化人員專業素養，增進醫療服務品質與病人健康福祉。實驗設計以頭部x光擺位及攝影為例，利用慈濟科技大學現有之x光診斷攝影機、假體和電腦放射攝影系統、輻射偵測器及游離腔等儀器設備，探討最適化的曝射因子及相關擺位技術等，並比較及探討x光醫學影像品質與劑量之評估。研究內容著重在影響x光放射診斷影像品質因素之探討，包含x光攝影之曝設因子條件評估，管電壓分別設定在45, 50, 55, 60, 65, 70 KVp ，管電流與曝射時間分別為5.6, 6.3, 8, 10, 12.5, 14.0, 16.0 mAs。另亦探討擺位技術操作與影像品質之關係，包含頭部側位像與前後軸向投射。此外，使用0.1mm -1.0mm不同厚度銅箔量測其半值層以及在60KVp, 12.5mAs x-光曝射條件下，於30-60公分之間不同距離與射源曝露劑量之關係。以瞭解輻射劑量強度大小並探討「合理抑低」的內涵與輻射安全。從實驗結果得知：在55 KVp, 8mAs 頭部前後軸向投射有較佳之影像品質及0.41μC最低之表面劑量率。在60 KVp, 5.6mAs條件下頭部側位像有較佳之影像品質及0.62μC最低之表面劑量率。銅箔片半值層實測約為0.22 mm，假體與x光射源所測得劑量強度與距離約呈平方反比。

關鍵字：曝射因子、 X光品質、合理抑低、放射擺位技術

==========

Assessments of the quality of radiographic imaging in computed radiography image

Chang-Shu Tsai[a] Jui-Feng Fan[b] Mao-Chin Hung[a] Yih-Fang Chen[a,c] Chie-Nan Huang[b]

Abstract

The aim of the study is to evaluate the quality of radiographic imaging through the steps in computed radiography (CR) image acquisition. The insights can be gained for administrators to better scheduling curriculum development of post-graduated year (PGY) training program and clinic competency assessment of radiologists, which in turn may improve the quality of medical care. The aim of the study is to examine what factors having influence on radiographic imaging quality, and the study are evaluated as follows: (i) exposure factors (45, 50, 55, 60, 65, 70 KVp and 5.6, 6.3, 8, 10, 12.5, 14.0, 16.0 mAs, respectively) (ii) radiographic positioning technique (iii) the ALARA principle (exposure to patient as low as reasonably achievable), (iv) x-ray quality (the measurement of half-value layer by using different thickness of copper foil (0.1mm -1.0mm). The optimal exposure factor of 55 KVp, 8 mAs for skull AP axial view has better image quality and the lowest surface dose rate of 0.41μC. The optimal exposure factor of 60 KVp, 5.6 mAs for skull lateral view has better image quality and the lowest surface dose rate of 0.62μC. From the results of radiographic imaging, the exposure factors of KVp and mAs may be strongly related to the quality of the image. The study shows that KVp controls the image constrast while mAs controls the optical density. We measured the relationship of dose intensity against distance by using a current-type DC ion chamber. It seemed that the dose intensity of x-ray has an inverse square relationship with distance from the source to the central line of the ion chamber. The half-value layer (HVL) of copper is about 0.221 mm. The results meet the requirements of clinical digital medical image processes. It also confirms the effectiveness of the x-ray quality supplied by hanging-type diagnostic x-ray machines.

Key Words: exposure factors , x-ray quality, ALARA , radiographic positioning technique 2