# 電腦斷層掃描顯影劑對於放射治療劑量之影響與修正

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## 摘要

本實驗利用 Gammex 467 假體內各種模擬人體材質，建立密度與 CT 值的校正直線。同時利用 KI 溶液來模擬顯影劑，以瞭解一般顯影劑對於電腦斷層掃描後的高 CT 值以及劑量擾動的現象。實驗發現，在模擬人體一般軟組織（密度 0.95~1.82 $g/cm^3$)的各種密度的介質中，CT 值與物理密度或相對電子密度都呈現了一般所熟知的直線關係，但是密度較低的模擬材質(肺)卻不適用這樣的直線關係。若病人含有顯影劑主要成分之一的碘元素，則 CT 非常高(本實驗的 KI 之 CT number 可高至 2614)，明顯落在一般軟組織的校正回歸直線之外。根據蒙地卡羅劑量模擬結果，在含有模擬顯影劑的材質 KI 溶液的前後軟組織，與一般不含顯影劑單純是水的介質來比，出現了劑量擾動現象，且正比於 KI 濃度。在本實驗中大溶解度的 KI 溶液中，在介面的前端將高出 22%，介面的後端將低了 15%。

**關鍵字：密度、CT 值、劑量擾動、顯影劑、KI**

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# Impact of the CT contrast agent on dosimetry and calibration of radiotherapy

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Abstract

The calibration curves of density versus CT values have been established through the Gammex 647 phantom which simulates soft tissues in this study. In order to understand the high CT value of contrast agent and the dose perturbation phenomena, various KI solutions were used to simulate the contrast agent. The well-known linear relationship was found between the physical density (or relative electron density) and CT values, however, the CT values of lung materials were not fit to such linear relationship. The CT values of KI were extremely high (The maximum CT number of KI solution =2614 in this study) and away from the linear regions. According to the Monte Carlo simulations, the dose perturbations were found in front of and after the regions of contrast-simulated KI solutions, such phenomena were found to be proportional to the concentration of KI solutions. Using the KI solution with maximum solubility, KI solution would result in 22% higher dose at the media in front of the KI solution, and would give 15% lower dose at the media after the KI solution, compared to soft tissues (water) without contrast agent.

**Key words: Density, CT values, Dose perturbation, Contrast agent, KI.**