# 動態準直儀葉片於虛擬楔形濾板之研究 The Study of Virtual Wedge by Using Dynamic Multi-Leaf Collimator

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摘要

放射線治療劑量的均勻影響癌症患者的腫瘤控制率和正常組織副作用發生率，所以治療計劃的擬定是以高劑量區均勻分布於治療靶區且周圍正常組織的劑量愈低爲努力的目標。但由於人體各部位組織及輪廓的差異性往往造成劑量的不均勻分布。在傳統的治療方式是藉由實體的楔形濾板以補償劑量的不均勻。然而實體的楔形濾板有楔形角度、照野大小的限制並僅有一維的補償效果。本論文研究的目的即在發展出一個二維的動態楔形濾板，且角度與照野史較傳統濾板寬廣，以利放射治療需要，使患者可以接受到史均勻的劑量。 藉由計算的楔形劑量圖譜轉換成治療計劃機的通量圖譜產生葉片移動的執行檔，本論文利用動態準直儀的葉片移動形成－非實體的動態楔形濾板，並以假體驗證其劑量曲線與絕對劑量的準確性。結果証實在 X 軸向 45i、15i38iY 軸向 20i、30i的動態楔形濾板劑量曲線的最大誤差分別是 1.8%、1.7%、-1.8%、-2.6%、-2.3%。同時具 X 軸向 45iY 軸向 15i的二維動態楔形濾板，其二維的等劑量曲線誤差也小於 2%及 2 mm。絕對劑量驗證在各角度的動態楔形濾板給予劑量誤差也都不大於 3%。 動態楔形濾板可以配合現行的 CadPlan 電腦治療計劃機進行劑量曲線模擬，爲患者提供一更好且準確放射治療計劃。

**Abstract**

Dose uniformity is directly related to tumor control probability (TCP) and normal tissue complication probability (NTCP). An ideal situation is one in which a uniform high dose is focused on the tumor target region and normal tissue surrounding the target volume receives minimal radiation. Dose distribution and uniformity must take into account the irregular contours and density changes within the body, especially the head, neck, and breast. A physical wedge has been used to compensate for irregular contours during traditional treatment, but a physical wedge is limited by its fixed angle and size. In addition,

it cannot compensate for two dimensions simultaneously. We have developed a two-dimensional dynamic wedge to overcome these limitations. A wedge-shaped dose map was calculated for this study. The dose map was transferred to a fluence map in a CadPlan treatment planning program to generate a multileaf motion file. We created 6 dynamic wedges and verified them by phantom measurements. The maximum differences in the beam profiles between the calculated values and the measured values were 1.8%, 1.7%, and -1.8% when measured for wedges at 45 degrees, 15 degrees, and 38 degrees in the X direction, and -2.6% and -2.3% when measured for wedges at 20 and 30 degrees in the Y direction. The differences between the isodose curves for the two-dimensional dynamic wedges were less than 2% and 2mm. Absolute doses also showed good agreement between calculated and measured values in this study such that all differences were less than 3%. The two-dimensional dynamic wedge developed in this study may be valuable for simulating isodose curves and can be used for CadPlan treatment planning which is currently used in many hospitals.