

影像導航強度調控放射治療(Imagine Guided Radiation Therapy ; IGRT)在癌症治療的應用

The applications of Image Guided Radiation Therapy (IGRT) on cancer treatment

隨著科技日新月異，癌症治療已有大幅演進，尤其在放射線腫瘤治療方面。受惠於科技的進步及電腦強大的運算能力，放射線治療的儀器設備由最原始的鈷-六十治療機(Cobalt-60)，舊式的傳統直線加速器到本院 2006 年引進的最新式影像導航強度調控放射治療系統，此新的醫療技術確實為癌症病友帶來更優質且有效率的治療成果。

Along with the advancement of technology, the treatment of cancer has been improved greatly. The equipments of radiotherapy have evolved from original Cobalt-60, linear accelerator to the latest model- IGRT. This new technique has indeed performed better and more efficient treatments.

相較於傳統的直線加速器 (linear accelerator)，新式的影像導航強度調控放射治療系統(IGRT)，結合影像導航系統及強度調控放射治療(Intensity Modulated Radiation Therapy ; IMRT)二項醫療科技於一身。

Compared with conventional linear accelerator, new IGRT combines Image Guided Radiation Therapy and Intensity Modulated Radiation Therapy (IMRT).

(一) 影像導航系統(IGRT) 藉由加速器上新增的 X 光(On-Board Imager ; OBI)及電腦斷層掃描器(Cone Beam CT)配合同步的電子數位化影像擷取系統，可在病人接受放射線治療前，先確認病人的治療姿勢及腫瘤位置在正確的治療區域後，再投予精確的照射劑量，以確保投予的照射劑量能精準的涵蓋在欲照射的腫瘤範圍內。過去在舊式的傳統直線加速器上執行這項工作，需要使用較費時的沖洗式 X 光片，因而無法同步獲得病人在治療床上的立即影像，以便在第一時間修正病人的位置及鎖定腫瘤治療的精確範圍。

另外在放射線治療的過程中，對於腫瘤的形狀大小及其與相鄰組織的相對位置，放射腫瘤專科醫師亦可經由 Cone Beam CT 即時線上掃描系統，再確認原設計的腫瘤治療範圍是否須因應放射線照射後腫瘤的縮小變形，重新微調治療的範圍，以減少相鄰正常組織遭受非必要放射線照射所可能引發的副作用。

(A) IGRT : using the On-Board Imager (OBI) and Cone Beam CT, together with simultaneous electronic digital image interception system, doctors can make sure the position of the patient and the location of the tumor in order to give precise dosage which ensures the amount is able to cover the exact tumor area before giving the radiotherapy. In the past, the application of linear accelerator required lengthier time to develop the X ray film, therefore, instant images were not available for attending staff to rectify the position of patients and decide the precise area of treating tumors.

Besides, (radiation oncology doctors)放射腫瘤專科醫師 can use Cone Beam CT to scan instantly the size and shape of tumors and their surrounding tissues' corresponsive position. Then, they can decide if the calculated treatment area should be readjusted due to radiotherapy, in order to diminish possible side effects of surrounding normal tissues caused by irradiation.

(二) 強度調控放射治療(IMRT)則是藉由高能運算的電腦計算系統，準確的驅控直線加速器內調控放射線劑量分布的多葉準直儀，可使放射線治療的劑量分布，隨著腫瘤的形狀變化精確的投射到欲治療的腫瘤區域，比傳統的治療技術更能提升放射線治療的功效，徹底撲滅腫瘤細胞以降低癌症復發的可能性。

利用上述的醫療技術可有效而精準的將放射線治療劑量投射到腫瘤組織內，同時減少周邊正常組織接受到非必要放射線劑量的機會，達到最佳的治療效果並降低放射線治療可能引起的副作用。

(B) IMRT : using high performance computing to accurately drive MLC delivery in linear accelerator. MLC enables the dosage to be projected accurately to the tumor area which needs to be treated. This function enhances better treatment in radiotherapy and thoroughly destroy tumor cells to decrease the possibility of relapse of cancer.

By using the above mentioned medical techniques, The distribution of radiotherapy dose can be efficient and precise, meanwhile reducing the possibility of effecting surrounding normal tissue to achieve best result and lower the possible side effects caused by radiotherapy.

本院自 2006 年引進此最先進的放射線治療系統，一年來治療的病人數已達 300 人次，治療的癌症種類包含頭頸部腫瘤、胸腔部腫瘤、消化道腫瘤、泌尿道腫瘤、婦癌及小兒腫瘤等，幾乎可運用至身體各部位。

另外對已接受過放射線治療的復發性癌症，過去因受限於傳統治療技術，對二次照射可能引起嚴重的副作用而無法再接受放射線治療的病人，亦受惠於此新的醫療技術，已有許多復發病友接受第二次放射線治療，並獲得極佳的療效。

Our hospital has introduced the latest cancer radiation therapy system since 2006, more than 300 patients have been treated so far. The cancers we have covered includes head and neck tumors, thoracic tumors, gastrointestinal tract tumors, urinary tract tumors, gynecological tumors and pediatric tumors. It could be utilize in all body parts. In addition, the relapse of cancer on patients who have undergone radiotherapy can benefit from this treatment. It does not have the side effects like the traditional treatment therapy if patients undergo radiotherapy for the 2nd time. Therefore, many relapse patients have received their second radiotherapy and the results were excellent.

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