Advance in Radiotherapy for Nasopharyngeal Carcinoma

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Dr Kwong graduated from the Faculty of Medicine in the University of Hong Kong in 1988 and entered into Radiotherapy and Oncology training in 1989 right after internship. She obtained the fellowship of the Royal College of Radiologists in 1993 and then the fellowships of the Hong Kong College of Radiologists (Clinical Oncology) and Hong Kong Academy of Medicine in 1996. She joined the University of Hong Kong as academic staff in 1995.

Her major research interests include head and neck cancers, paediatric cancers, esophageal cancers and radiation complications. She is interested and involved in both clinical trials and basic research. At present, she has more than 100 publications and conference presentations. The results of this talk on intensity modulated radiotherapy for nasopharyngeal carcinoma are published in *Cancer, International Journal of Radiation Oncology, Biology, Physics* and *Head & Neck.*

Nasopharyngeal carcinoma (NPC) is endemic in Southern China and in South-East Asia. In Hong Kong, NPC is the most common head and neck cancer. The tumor is deep-seated in the centre of the head and is difficult to access surgically. Fortunately, it is a radiosensitive tumor and radiotherapy (RT) remains the backbone of primary treatment for all stages of NPC without distant metastases. The chance of cure after conventional RT ranges from more than 80% in early stage disease to less than 40% in late stage disease. The nasopharynx (NP) is surrounded by an array of sensitive normal tissues like the brainstem, spinal cord, temporal lobes, optic and auditory pathways and parotid glands. Conventional RT employs large field radiation coming from both sides of the head to irradiate the NP. The dose differential between tumor and normal tissues is low. The high dose radiation which is required to eradicate the disease can result in irreversible radiation damage to normal tissues. For patients with early disease, since the chance of cure after RT is good, radiation complications and quality of life of survivors will be a concern. The goal of improving treatment in this group will be to reduce complications while maintaining or improving the disease control rate. On the other hand, for locally advanced tumor, since the tumor is extending close to neural tissues, the RT dose and coverage often has to be compromised in order to avoid unacceptable complications, and this contributes to the poor disease control. The aim of treatment for locally advanced disease will be to improve local control by escalating radiation dose in tumor but without exceeding tolerance of neural tissues. For both purposes, more refined RT that is able to concentrate radiation dose in the target is needed.

Intensity modulated radiotherapy (IMRT) is an advanced form of conformal RT, conforming high dose to tumor while conforming low dose to normal tissues. Besides employing multiple beams conforming to the shape of the target, IMRT also allows for fine modulation of radiation intensity within each radiation beam. Thus, in effect, there are thousands of beamlets, each with calculated intensity to deposit a defined dose at each specific point. A good therapeutic ratio can be achieved by giving a high dose to the tumor to achieve high local control probability while keeping down normal tissue complications by limiting radiation dose to normal tissues.

IMRT was installed in Queen Mary Hospital in 1998 when the technique was still new and there were very limited data on treatment of NPC with IMRT. The technique was developed from dosimetric studies, to using IMRT as a boost on top of conventional RT, to implementation of full course IMRT in 2000. Since 2000, more than 100 cases of NPC were treated with IMRT. Prospective studies on the efficacy of IMRT in disease control and reduction of RT complications were performed. For early disease, IMRT achieved good disease control with preservation of salivary function and quality of life of survivors. For locally advanced disease, dose escalation with IMRT was used in combination with chemotherapy. Preliminary results showed obvious improvement in disease control compared with historical results with no major complications. The early results of IMRT are very promising. Continued studies to monitor for late complications and long term disease control with this new technique are continuing.