



Precision radiotherapy in nasopharyngeal carcinoma

Radiotherapy plays a pivotal role in the treatment of nasopharyngeal carcinoma (NPC) and is the only realistic curative local treatment, usually combined with chemotherapy. Due to the very close proximity of adjacent critical organs at risk, the highest precision radiotherapy is mandated to eradicate cancer while minimizing treatment-induced toxicities. In this focused issue on “precision radiotherapy in NPC,” seven specific areas were addressed.

The current standard of care in precision radiotherapy for NPC is intensity-modulated radiotherapy (IMRT). Optimization of IMRT plans can be a time-consuming process. With conventional planning algorithms, a standard IMRT plan for NPC takes hours to complete even by a highly experienced planner. Multiple trial-and-error and parameter tuning are traditionally needed during the plan optimization process. A more efficient plan optimization strategy is needed. Knowledge-based treatment planning relies on a data library built upon prior treatments and a planner-independent optimization algorithm. It has potential to streamline the process and speed up planning procedures. Many vendors are now offering such features, with promising preliminary applications, as summarized by Fung *et al.* Furthermore, the rapidly evolving field of artificial intelligence (AI) has begun to revolutionize the whole workflow in radiotherapy planning completely. In the article by Sun *et al.*, automation from target delineation and treatment optimization to outcome prediction by AI are discussed. Consequently, a fully automated system in the future is expected to greatly facilitate the application of adaptive radiotherapy (ART) on a daily basis.

As for the treatment delivery, Li *et al.* discuss the evolving roles of ART in NPC. This is an appealing strategy given the inevitable anatomical changes in tumor and organs-at-risk during the 6–7 weeks course of radiotherapy. However, the optimal workflow and when/how to trigger ART need to be carefully assessed, given its very labor-intensive property.

Another area demanding precision radiotherapy is re-irradiation for locally recurrent NPC. Safe delivery of tumorocidal dose to recurrent tumor while protecting critical organs remains a major challenge. Stereotactic radiotherapy and proton therapy have an evolving role in selected cases, but high quality data are needed, preferably tested in clinical trials. The article by Huang *et al.* summarizes the role of stereotactic radiotherapy in salvaging small local tumor recurrence. In the article by Lee *et al.*, the fundamental concept and beam properties of photon/heavy-ion particles are described; they also review the pros and cons of this rapidly evolving treatment method in locally recurrent NPC based on the clinical outcomes reported in the literature.

Multimodality therapy is still the primary treatment approach for most patients with loco-regional advanced NPC, and there has been a major leap forward in the fields of both systemic and personalized treatments. Zhu *et al.* discuss the present landscape in optimizing systemic therapy with precision radiotherapy, while Lin *et al.* explore the various biology-driven personalized approach, including hypoxia-, radioresistance-, and biomarker-driven stratifications.

Precision radiotherapy in NPC is a fast evolving field. The collection of articles in this special issue is a snapshot of current understanding and future direction of this topic. We hope the readers find these articles both useful and stimulating.

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