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Prevention of post-radiation complications – oncologist's perspective

Radiotherapy is very effective in treatment of head and neck cancers, whether as adjuvant treatment after surgery or as primary definitive treatment for organ preservation. As high dose radiation is required for disease control, late radiation-related complications are not uncommon among survivors. Radiation complications are often enhanced by use of concurrent chemotherapy also. Common complications includes xerostomia, hearing loss, soft tissue fibrosis and in severe cases, soft tissue necrosis or osteonecrosis.

The essence of prevention of radiation complications lies in careful radiotherapy planning to limit dose to normal tissue especially those that are not directly involved by tumor. This involves consideration of radiobiological difference between tumor and normal tissues as well as physical distribution of radiation. Normal tissues can recover better from radiation damage and are more sensitive to fractional dose while tumor cells are more sensitive to total dose of radiation. Hyperfractionation has previously been studied to allow dose escalation without increasing radiation toxicity.

With advance in radiotherapy technique, we have moved from large field irradiation to 3-dimensional conformal radiotherapy to intensity modulated radiotherapy (IMRT). With IMRT, it is possible to have simultaneous integrated boost. Higher fractional and total dose can be delivered to tumor than normal tissues, thus, exploiting both the physical and biological effects of differential dose on protecting normal tissues. Much of the late complications are significantly reduced with advanced precision radiotherapy and quality of life among survivors are improved. Newer radiation technique like stereotactic radiotherapy, proton therapy can give high dose radiation precisely to small volume of tumor, thus can be more useful for radiotherapy of skull base lesions or for re-irradiation of unresectable recurrent disease.

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放疗后并发症的预防—肿瘤科医生视角

放疗在头颈癌治疗中非常有效，无论是作为手术后的辅助治疗，还是作为保留器官功能的根治性治疗。由于疾病控制需要较高的放疗剂量，远期放射性损伤在治愈者中并不少见。 放疗并发症通常也会因采用同期化疗而加重。 常见的并发症包括口干、听力受损、软组织纤维化，严重者还包括软组织坏死或骨坏死。

预防放疗并发症的核心在于谨慎设计放射治疗计划，特别是降低未被肿瘤直接侵犯的正常组织放疗剂量。这涉及到肿瘤组织和正常组织之间的放射生物学差异以及放疗剂量的物理分布。正常组织可以从辐射损伤中恢复，并且对分割剂量更为敏感，而肿瘤细胞对辐射的总剂量更敏感。研究已证实超分割放射治疗可提升总剂量而不增加放射性损伤。

随着放疗技术的发展，我们已经从大野照射发展到三维适形放疗，再到适形调强放疗（IMRT）。调强放疗可实现同步推量。可以提高肿瘤区域的分割剂量和总剂量，而正常组织区域剂量不增加。从而利用物理剂量学和放射生物学差异达到保护正常组织的目标。通过先进的精确放疗，许多远期放射性损伤明显减少，治愈者的生活质量也得到改善。更新的放疗技术，如立体定向放射治疗、质子治疗，可以对小体积肿瘤实施更精确的高剂量照射，尤其适用于颅底病变或不可手术的复发性疾病的再程放疗。