Introduction to Head and Neck Cancer 28

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28.1 Epidemiology

Worldwide, an estimated 6,44,000 new cases of head and neck squamous cell cancers (HNSCC) are diagnosed per year [1]. More than 90 % of these cancers are of squamous histology, which are frequently related to tobacco and alcohol use. Growing evidence over the past two decades suggests that human papillomavirus (HPV) 16 infection is implicated in the etiology of a subset of oropharyngeal squamous cell cancers in individuals who have little or no history of alcohol or tobacco use [2, 3].

28.2 Management According to Stage

Early stage tumors (TNM stages I and II) are managed with single modality therapy, surgery alone or radiation alone. In addition to surgery, radiotherapy is one of the pillars for treatment in HNSCC. Radiotherapy is applied as a single modality or as component of multimodality treatment. The choice of therapy largely depends on the stage of the disease: at early stages either surgery or radiotherapy can be sufficient, but in more advanced stages a combination of therapies yields better treatment results. Radiotherapy is also an essential component of organ preservation strategies. Imaging plays an important role in radiotherapy treatment planning. Optimal application of radiotherapy in head and neck cancers is often challenged by several tumor-related factors: total tumor burden, delineation of tumor borders, potential damage to healthy tissues around the tumor, tumor heterogeneity such as hypoxia and cell proliferation [4]. Advances in radiation therapy such as three-dimensional conformal radiation (3D-CRT) , intensity-modulated radiation therapy (IMRT), image-guided radiotherapy (IGRT), stereotactic body radiation (SBRT) and proton therapy aim to selectively deliver radiation to tumor tissues and spare the surrounding healthy tissues. Precise three-dimensional delineation of target volumes is the hallmark of high accuracy radiotherapy. Contrast-enhanced computed tomography (CECT) is the current standard for delineating tumors of the head and neck for radiotherapy. Modern imaging techniques may increase the therapeutic ratio and are currently being utilized.

28.3 Locally Advanced Disease

Patients with HNSCC often present locally advanced disease associated with significant local or regional spread of disease. Locally advanced HNSCC requires a multidisciplinary approach and is often curable with combined modality treatment including surgery, radiotherapy (RT), and chemotherapy. Treatment

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selection for patients with locally advanced disease usually relies on organ-sparing/preserving approaches, taking into consideration the potential side effects, quality of life and patients' performance status and preferences. Historically, surgery followed by radiotherapy was the cornerstone in the management of locally advanced OSCC. However, these approaches often produced suboptimal control of locoregional disease and significant long-term functional impairment.

Concurrent chemoradiotherapy has been established as the optimal combination of chemotherapy and radiotherapy in locally advanced disease by randomized trials and metaanalyses [5–7]. Assessment of tumor response routinely includes clinical examination and radiographic imaging. These methods and criteria for tumor response assessment, however, after chemoradiotherapy have several limitations. Established Response Criteria guidelines, such as RECIST, use tumor measurements obtained by computed tomography (CT) or magnetic resonance imaging (MRI). CT or MRI assessments are based on anatomy and reflect changes in tumor volume. RECIST criteria were mainly developed for the evaluation of response in metastatic solid tumors treated with palliative systemic therapies. Complete response (CR) is defined as complete disappearance of all lesions, including lymph nodes. Subcentimeter lymph nodes can be a residual finding after shrinkage of pathologic lymph nodes after chemoradiotherapy. In this setting, defining CR using RECIST can be challenging [8].

28.4 Imaging

Positron emission tomography (PET) provides measurement of metabolic activity within a target lesion. A variety of PET tracers have been developed to assess metabolic differences between normal and cancer cells and tumor hypoxia. Therefore, they may be useful in selecting tumors for hypoxia modifiers or dose escalation. FDG PET can be useful in detecting recurrence even when disease is undetectable by conventional radiologic imaging. Combined functional and anatomical imaging offers advantages in response assessment.

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