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HEAD AND NECK CANCER SYMPOSIUM

POSTOPERATIVE AND PRIMARY RADIOTHERAPY FOR SALIVARY GLAND CARCINOMAS: INDICATIONS, TECHNIQUES, AND RESULTS

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INTRODUCTION

In the past, salivary gland carcinomas were considered to be radioresistant. However, at present, postoperative radiotherapy plays an important role in the treatment of salivary gland cancer. The indications for postoperative radiotherapy depend on the prognostic factors for locoregional failure. We report on the prognostic factors for locoregional failure, including indications for, and delivery of, postoperative and primary radiotherapy.

Convincing evidence has been shown in published reports that postoperative radiotherapy, administered in the case of negative prognostic factors, might increase locoregional control (1–3) or might prevent sacrifice of the facial nerve. In general, postoperative radiotherapy does not influence overall survival (1). Primary radiotherapy for medically or technically inoperable patients could result in long-term cure (4, 5). Because radiotherapy plays an important role in locoregional treatment, only locoregional prognostic factors and indications are discussed.

PROGNOSTIC FACTORS

Local

Local invasion of the skin for a parotid and submandibular carcinoma is present in 10% and 3% of cases, respectively (1). Of the patients, 10–12% may complain of pain, caused by tumor invasion in the masseter, temporal or pterygoid muscles, or, rarely, the base of the skull. Tumor invasion in the facial nerve is observed in one of four parotid carcinomas and results in partial or complete facial paralysis. The primary tumor size correlates with the histologic subtype; acinic cell, mucoepidermoid, and adenoid cystic cancer, in general, are smaller than carcinoma ex pleomorphic adenoma, squamous cell carcinoma, and undifferentiated carcinoma. In the study of the Dutch Head and Neck Oncology Cooperative Group, the most significant independent prognostic factors for local control were treatment modality, T stage, and tumor site (favoring oral cavity tumors). Bone invasion and, marginally, the resection margin status were independent prognostic factors derived from the resection specimen. Postoperative radiotherapy significantly improved local control for patients with perineural invasion on univariate, but not multivariate, analysis. The relative risk of local recurrence was 9.7 for surgery alone compared with surgery combined with postoperative radiotherapy (1). In Fig. 1, local control of an extended data set ($n = 666$) from the Dutch Head and Neck Oncology Cooperative Group with long-term follow-up (>10 years) after surgery alone compared with postoperative radiotherapy for close and incomplete resection is shown. The distribution of favorable prognostic factors was in favor of the surgery-alone group. The histologic type was not an independent prognostic factor in several studies (1, 6). Probably, more ''aggressive'' histologic types such as carcinoma ex pleomorphic adenoma, squamous cell, undifferentiated carcinoma, and salivary duct carcinoma are strongly associated with negative prognostic factors such as advanced T stage, incomplete resection, and bone and perineural invasion. On multivariate analysis, these factors predominated over the factor of histologic type.

On the basis of these and other results from published studies, postoperative local radiotherapy is recommended for T3-T4 tumors, close or incomplete resection, bone involvement, perineural invasion, and recurrent cancer.

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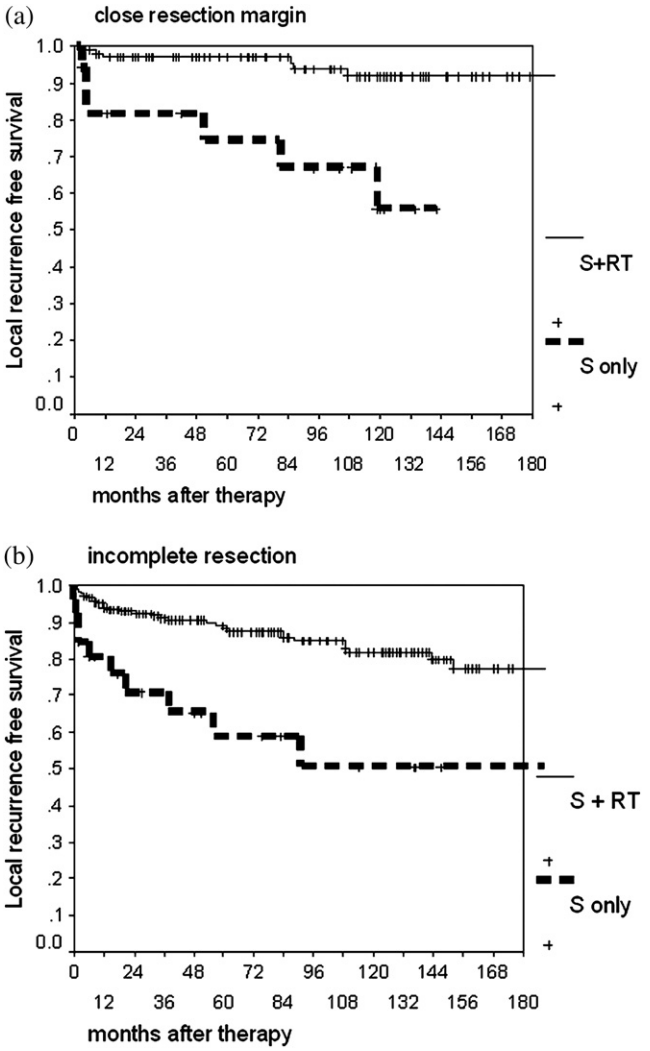

Fig. 1. Local control for surgery alone (S) vs. surgery plus postoperative radiotherapy (RT). Data from Dutch Head and Neck Oncology Cooperative Group. (a) Close (1–5-mm) margin ($p = 0.0002$); and (b) incomplete (<1-mm) resection margin ($p = 0.0001$).

Regional

Risk of positive neck nodes. Overall, the percentage of positive neck nodes (including the results of neck dissection) for parotid, submandibular, and minor salivary gland cancers amounts to approximately 25%, 41%, and 10%, respectively. Positive neck nodes are frequently seen in the case of facial nerve paralysis. The risk of occult neck disease and, consequently, the indication to treat the neck electively can be based on histologic type, T stage, and tumor location (4). The greatest risk is seen for squamous cell carcinoma, undifferentiated cancer, and salivary duct cancer (4, 7). An intermediate risk is seen for mucoepidermoid cancer and a low risk for acinic cell cancer, adenoid cystic carcinoma, and carcinoma ex pleomorphic adenoma (4). The risk is 15%, 26%, and 33% for Stage T1, T2, and T3-T4 tumors, respectively (4). An example of a scale to estimate the risk of positive neck nodes, as determined by tumor location, T stage, and histologic type, is shown in Table 1 (4). Elective treatment

Table 1. Risk estimation for positive neck nodes

Total score (T stage plus histologic type)	Parotid gland (%)	Submandibular gland	Oral cavity	Other locations
2	4	0	4	0
3	12	33	13	29
4	25	57	19	56
5	33	60	—	—
6	38	50	—	—

Scale: T1 = 1; T2 = 2; T3-T4 = 3; acinic or adenoid cystic carcinoma or carcinoma ex pleomorphic adenoma = 1; mucoepidermoid = 2; squamous cell or undifferentiated = 3.

From Terhaard *et al.* (4).

of Level Ib-III for parotid tumors is indicated for a score of ≥4. Except for Stage T1 acinic or adenoid cystic cancer, elective treatment of Level I-III is indicated for all submandibular tumors. In the case of a minor salivary gland cancer, elective neck treatment is indicated for localization of the primary tumor in the tongue, floor of the mouth, and pharynx or larynx (3).

Regional control. The most frequently involved levels are, in a descending order, Level II, III, Ib, IV, and V for parotid gland cancer and Level II, I, III, IV, and V for a submandibular location (4). Independent prognostic factors for regional control are N stage, facial nerve dysfunction, incomplete resection of the node, and treatment, even in the pN1 case. The relative risk of regional recurrence was 2.3 for surgery alone compared with surgery plus postoperative radiotherapy (1). Consequently, postoperative radiotherapy is indicated for patients with positive nodes in the neck dissection specimen.

POSTOPERATIVE RADIOTHERAPY

Radiation techniques

A delay between surgery and postoperative radiotherapy in general plays an important role in locoregional control after postoperative radiotherapy for head-and-neck cancer. This is, however, for a delay up to 12 weeks, not the case for salivary gland cancer (4). Postoperative radiotherapy, in general, is delivered by external beam photon therapy.

Sparing of critical normal tissues such as the spinal cord, healthy salivary glands, mastoid, and cochlea, can be best obtained using three-dimensional conformal radiotherapy or intensity-modulated radiotherapy (IMRT). The delineation of the clinical target volume of the primary tumor depends on the disease extent and the pathologic findings after surgery. In the case of perineural invasion of a major nerve, the cranial nerve pathways up to the base of the skull must be included in the target volume. A bolus over the scar region is indicated in the case of skin invasion and/or for very superficial localized tumors of the parotid or submandibular gland.

The clinical target volume of the parotid gland should include the parapharyngeal space and the fossa infratemporalis. The homolateral neck node Levels I–V should be included in