Scientific paper

Effectiveness of therapeutic (N1, N2) selective neck dissection (levels II to V) in patients with laryngeal and hypopharyngeal squamous cell carcinoma

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Abstract

Background: The use of selective neck dissection (SND) in the treatment of clinically node-positive necks remains controversial.
Methods: A total of 48 patients with laryngeal and hypopharyngeal carcinoma underwent 53 primary, therapeutic SNDs (levels II-V) and were retrospectively evaluated.
Results: Regional metastases were staged as pN1 in 8 patients, pN2a in 3, pN2b in 29, and pN2c in 8. Of the primarily treated necks 45 of 53 (85%) were irradiated postoperatively. Extracapsular spread was found in 27 neck specimens (51%). Regional recurrences in level I occurred in one patient (1.8%) and in level II-V in 5 patients (9.4%). The actuarial overall survival at 4 years was 36.5%.
Conclusions: In selected cases therapeutic SND (levels II–V) in node positive (N1,2) patients with laryngeal or hypopharyngeal carcinoma does not lead to increased risk for recurrence in level I or other levels of the neck and is therefore a safe procedure. © 2004 Excerpta Medica, Inc. All rights reserved.

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Since its description by Crile in 1906, the classic technique of radical neck dissection (RND) has remained virtually unchanged for therapeutic (N+) treatment of patients with head and neck carcinomas. During the last 2 decades, however, there has been considerable momentum toward less radical dissections preserving functionally and cosmetically important structures in the neck. This break with surgical tradition first resulted in the development of the modified radical neck dissection (MRND) removing levels I to V and preserving the accessory nerve, internal jugular vein or sternocleidomastoid muscle [1,2]. Using this technique, several investigators showed no difference in survival between patients treated with a RND or MRND [3,4].

Supported by these results, the use of MRNDs has been extended to the implementation of selective neck dissec-

tions (SND), preserving one or more lymph node levels [5]. The concept of selective removal of lymph node groups is built upon the premise that predictable patterns of metastasis from specific anatomic regions in the upper aerodigestive tract exist and that these predictions may be used to establish cervical lymphatic groups that are at highest risk for metastatic spread from primary tumors at specific anatomic sites [6]. Subsequently, SNDs have been applied widely for the elective (N0) treatment of the neck in patients with head and neck cancers. In general SNDs are considered to be as effective as MRNDs in the management of the N0 neck, although one should remain cautious [5–7].

More controversy remains whether the implementation of SNDs is oncologically justified in the therapeutical (N+) treatment of these patients. We started performing SNDs (levels II–V) in patients with laryngeal and hypopharyngeal tumors and clinically proven N+ disease in 1990. We believed that preserving level I would have a considerable impact on patient morbidity and complication risk (marginal

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branch of the facial nerve, submandibular gland, cosmesis) and yet a small impact on regional recurrence. In order to study this issue, we evaluated retrospectively the therapeutic SNDs (levels II–V) of the last 10 years in patients with laryngeal and hypopharyngeal carcinoma.

Patients and methods

The charts of all patients with SCC of the larynx and hypopharynx, who underwent a SND (levels II-V) at our institute between 1990 and 2000, were retrospectively analyzed. Only those patients (n = 48) undergoing a therapeutic SND with both clinically and pathologically proven regional metastases were included in the study. All patients underwent preoperative computed tomography as well as ultrasound-guided aspiration cytology for neck node staging. In none of the patients lymph node metastases were shown in level I preoperatively. The indication for unilateral or bilateral neck dissection was based on the site and stage of the primary tumor as well as preoperative assessment with ultrasound-guided fine needle aspiration cytology. Patients with a malignancy other than squamous cell carcinoma, a history of a prior head and neck malignancy, as well as those with previous oncological treatment in the head and neck region were excluded. Patients with small (T1, T2) primary tumors of the larynx were treated by partial laryngectomy (n = 3) or definitive radiotherapy (n = 7) of the primary tumor after surgery of the neck [8].

All other patients underwent a total laryngectomy, in combination with a partial or total pharyngectomy. If necessary, the pharyngeal defect was reconstructed with a pectoralis major myocutaneous flap or gastric pull up. The selective neck dissection consisted of removal of lymph node levels II to V, including the removal of the paratracheal lymph nodes (level VI). Using the posterior belly of the digastric muscle as a guide, level I was easily separated from the superior border of the neck specimen. As part of a standard procedure, the sternocleidomastoid muscle was removed in all cases, whereas removal of the internal jugular vein was indicated by extent of nodal disease. If the tumor did not involve the accessory nerve directly, every effort was made to preserve the accessory nerve.

Adjuvant radiotherapy was indicated in case of extracapsular spread, multiple pathological nodes (>1), angiolymphatic or perineural invasion, and advanced stage of the primary tumor (T4). External beam radiotherapy was delivered daily to a total dose of 70 Gy. The uninvolved neck regions were irradiated in the first 23 fractions to a dose of 46 Gy. The field of radiotherapy included the primary tumor site as well as levels IB to V bilaterally. Data were collected pertaining to tumor site, stage, pathologic N stage, histological features of nodal disease, postoperative radiotherapy, local and regional recurrence and overall survival status. The minimal follow-up was at least 2 years (range 2 to 10). The median recurrence-free interval was determined for those patients with a regional recurrence. Overall survival was calculated according to the Kaplan-Meier method.

Results

Forty-eight patients were analyzed with either a primary laryngeal carcinoma (n = 30) or a hypopharyngeal carcinoma (n = 18). Tumor characteristics are summarized in Tables 1 and 2. There were 11 females and 37 males included with an average age at the day of surgery of 60.5 years (range 46 to 80). In total, 56 neck dissections were performed in these patients. In 3 patients with bilateral metastatic lymph nodes, the lymph node metastasis was too close to level I to allow for an oncological sound procedure without including level I in the field of dissection. These 3 neck specimens were left out from the study, leaving a total of 53 primarily treated necks.

The SNDs were performed with preservation of the accessory nerve in 53% and the internal jugular vein in 23% of the cases. The majority of patients (73%) were treated with postoperative radiotherapy. There were no severe postirradiation side effects reported. Pathological staging for the operated necks was as follows: pN1 = 8, pN2a = 3, pN2b = 29, and pN2c = 8. In 51% of the neck dissection specimen extranodal spread of the lymph node metastasis was found without any positive resection margin. Resection margins at the primary tumor site were incomplete in 3 cases (6%).

Regional recurrence (Fig. 1) was a major endpoint of this study and only in 1 patient (2%) a recurrence was detected in contralateral level I, 14 months after SND and postoperative radiotherapy. In 5 patients (9%) a neck recurrence

Table 1*
T versus N stage hypopharynx

Hypopharynx (n = 18)	N1	N2a	N2b	N2c
T1			3	
T2		1	2	
T3	3		2	
T4	1		5	1

Table 2*
T versus N stage larynx

Larynx (n = 30)	N1	N2a	N2b	N2c
T1		1	1	
T2	2		4	2
T3	1		3	2
T4	1	1	9	3

* Tables 1 and 2 demonstrate the tumor characteristics of patients with a hypopharyngeal (n = 18) and a laryngeal carcinoma (n = 30) who underwent a therapeutic selective neck dissection (levels II–V). A majority of the patients suffered from multiple pathological lymph nodes.
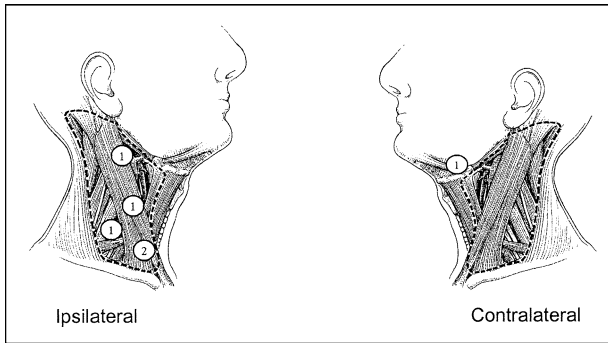
Fig. 1. Schematic overview of the site of recurrence in the 6 patients (of 48) with neck recurrences. The **dotted line** depicts the extent of the selective neck dissection. Level I = 1 of 53 (2%); level II, III, IV = 4 of 53 (8%); level V = 1 of 53 (2%).

occurred in the operated area (Fig 1). All these patients had received postoperative radiotherapy. Median (regional) recurrence free interval (Fig. 2) was 11 months (range 5 to 16). The actuarial overall survival at 4 years was 37% (Fig. 3).

Comments

Cancer of the head and neck tends to metastasize in a predictable fashion in relation to the primary tumor site. In a histopathological study by Shah et al [9], which involved 1,081 previously untreated patients who underwent 1,119 elective and therapeutic classical RNDs for squamous cell carcinoma of the aerodigestive tract, lymph node levels I, II and III were found to be at greatest risk for nodal metastases from oral cavity tumors, while levels II, III, and IV seemed to be at risk for metastases from cancers of the oropharynx, larynx and hypopharynx. With respect to the larynx and hypopharynx it has been shown that even in case of clinical N+ disease the majority of metastatic nodes were present at

Fig. 2. Crude cumulative incidence curves depicting the time relapse between the end of treatment and local recurrence (LR), regional recurrence (RR), distant metastases (DM), and death of other cause (DOOC).
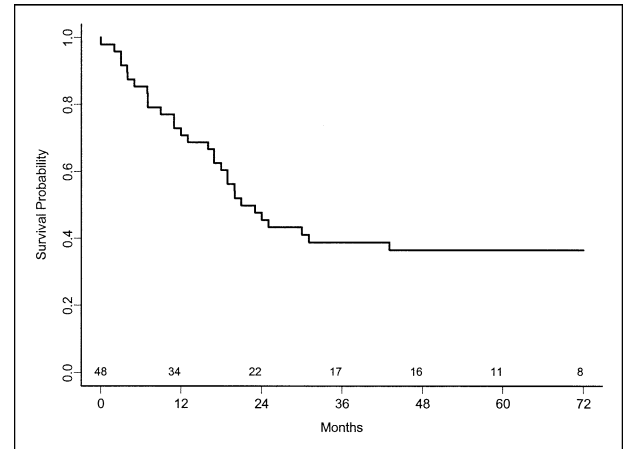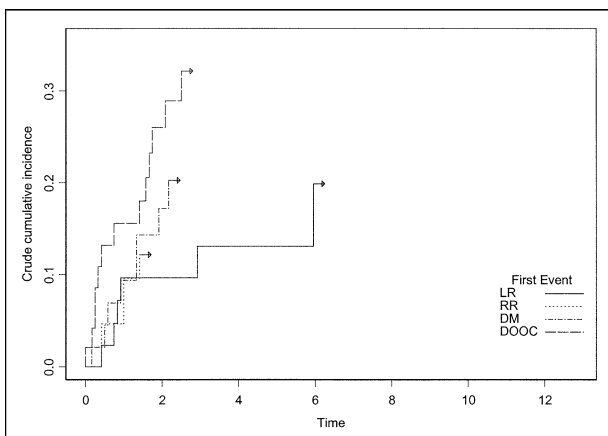

Fig. 3. Overall survival of the combined group (n = 48).

levels II, III, and IV, level I being involved in 8% and 10% and level V in 5% and 11% of the specimens, respectively [9]. Apparently, the mucosa of the larynx and hypopharynx drains predominantly into lymph nodes along the internal jugular vein, and rarely or in a late stage into lymph nodes in level I or level V.

Based on the results of such studies, the use of SNDs for the elective treatment of the N0 neck has become popular, with the intention to diminish the morbidity of the traditional RNDs. In SNDs only the lymph node groups considered at risk of (micro)metastases are removed. Several authors have recently shown that lateral (jugular) SND (levels II, III, IV) is a safe procedure for elective neck treatment in patients with squamous cell carcinomas of the larynx and hypopharynx. Spiro et al [10] examined the use of elective lateral SND in a group of 56 patients with cancer of the larynx and hypopharynx and found a regional failure rate of 7% within the field of dissection and 11% in or at the anterior limit of level V. About one third of these patients received postoperative radiotherapy on the basis of the characteristics of the primary lesion. Pitman [11] and later Byers [12] found that patients with primary cancers of the larynx and hypopharynx and cN0 disease treated by lateral SNDs (postoperative radiotherapy in selected cases) had similar regional recurrence rates compared with patients treated with RND or RMND.

More recently, Hosal [13] and Leon [14] also reported favorable results using lateral SND in the N0 neck. Leon et al [13] performed 145 SND in 79 patients with laryngeal carcinoma (postoperative radiotherapy in 62%) and found no regional relapse in any of the cases. In their study, SND consisted of the removal of levels II and III with intraoperative histological analysis of a sample of subdigastric nodes. When intraoperative analysis of this sample was positive (15%), dissection of levels IV and V was completed. All these investigators concluded lateral SND to be a satisfactory staging procedure for clinical N0 disease in patients with squamous cell carcinoma of the larynx and hypopharynx, and a definite operation if all nodes are pathologically

negative. If a node is tumor positive at histopathology, postoperative radiotherapy is advised in most cases.

Even though up to one third of the electively performed SND prove to be pN+ [9,12], the use of SND for the clinically N+ neck is much more controversial. Although from sentinel node studies it is known that lymphatic drainage is altered in N1 and N2 necks, we found that the chance of recurrences in level I remains very low in the N+ neck. Several investigators have reported on their results of therapeutic SND in N1 and N2B larynx and hypopharynx carcinoma, all receiving postoperative radiotherapy, with regional recurrence rates ranging from 0% to 33% [10,11,15,16]. Such a diverse range of recurrence percentages is comparable to that of MRND in the same type of tumor patients.

In our study we also focused on the levels of the regional recurrences with special attention for the nonoperated level I, a detail that is not specified in most articles dealing with this topic. The very low recurrence rate (2%) in this level indicates that the risk for recurrence is within acceptable limits and justifies the exclusion of level I in therapeutic selective neck dissection in patients with laryngeal and hypopharyngeal carcinoma. It should, however, be notified that the positive results of our analysis may be biased by the addition of radiotherapy in patients with poor prognostic signs and the exclusion of 3 patients in whom level I was dissected to achieve macroscopically tumor free margins. These 3 patients remained free of regional recurrence, although 2 of them died as a result of distant metastases.

Our SND protocol encompassed dissection of levels II, III, IV, V, and often VI. The indication for inclusion of level V was not only based on the risk of failure in this level [10], but also on anatomical arguments such as the skin incision which often overlies level V and the uncertainty about the exact posterior border of the surgical dissection. Weighing the risk of surgery induced morbidity against the risk for regional tumor recurrence, one could argue to restrict the selective neck dissection even further to levels II, III, and IV. Several clinical studies have confirmed that metastatic spread from the jugular chain towards level V is infrequent in N+ disease [9–11,15–17]. However, in none of these studies the lymph nodes were thoroughly examined using multiple or serial sectioning or immunostaining, and none of these studies reports on the exact number of lymph nodes examined. The true incidence might thus be 10% to 20% higher than reported.

Selective dissection of levels II to V (and often VI) is an adequate procedure for patients with lymph node metastases from laryngeal or hypopharyngeal carcinoma if tumor free resection margins are obtained. In the future this approach might even be extended to preservation of level V in patients in whom preoperative assessment has shown no evidence of metastases in both levels I and V. One should however be aware of the fact that any preoperative assessment technique will miss some 30% to 75% of the small occult metastases [18,19]. Not electively dissecting these

levels in tumor positive necks is thus an absolute indication for radiotherapy of the whole neck.

Supported by the literature and based on our experience and the results of this investigation we believe that, in an effort to decrease patient morbidity, there is an indication for SND (levels II–V) in the N1 and N2 neck in patients with laryngeal and hypopharyngeal cancer. Preoperative staging of level I using palpation and imaging and postoperative radiotherapy are both imperative. In case of N3 disease, and in those cases where a lymph node metastasis is extending to level I a (M)RND should remain the standard.

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