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Original article

Lymph-node metastasis following total laryngectomy and total pharyngolaryngectomy for laryngeal and hypopharyngeal squamous cell carcinoma: Frequency, distribution and risk factors

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ABSTRACT

Objectives: To evaluate the prevalence and distribution of lymph-node metastasis after total laryngectomy or total pharyngolaryngectomy.
Material and methods: Retrospective single-center series of 136 successive patients undergoing total laryngectomy or total pharyngolaryngectomy with neck dissection for squamous cell carcinoma of the larynx or hypopharynx.
Results: The primary site was laryngeal in 110 cases and hypopharyngeal in 26. In 63 patients, surgery was first-line treatment; 73 were operated on for recurrence. The lymph-node metastasis rate, confirmed on histology, was 44.8% regardless of primary site. Hypopharyngeal location was a risk factor for lymph-node metastasis (73.1%, $P=0.002$) as was the supraglottic subsite (64.3%, $P=0.039$). Levels IIa and III were invaded in 28.7% and 25.7% of cases, respectively. Level VIb lymph-node involvement was 23.8% in patients who underwent level VIb neck dissection. Lymph-node recurrence rate was 10.3% in levels II to IV and 13.2% in VIb.
Conclusions: Whatever the tumor site, levels IIa and III were most frequently invaded. The high rate of histological involvement of level VIb and of recurrence argues for systematic elective bilateral neck dissection of these territories in some primary sites.

1. Introduction

Onset of cervical lymph-node metastasis in patients with head and neck squamous cell carcinoma is an important factor of poor prognosis, with high risk of recurrence and up to 50% reduction in survival [1,2]. Radical neck dissection was first described by Crile in 1906 and came into routine use with Martin in 1951, enabling systematic histologic lymph-node analysis to study lymphatic drainage territories according to tumor site [3]. Subsequently, Suarez in 1963, then Bocca in 1980, developed the concept of functional neck dissection, removing all lymph-node groups while preserving neck structures so as to limit intra- and postoperative morbidity [4]. Lymph-node areas are currently divided into 6 levels according to the American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS) classification, also known as the Robbins classification [5,6], which defines head and neck lymphatic drainage territories; selective neck dissection of specific levels according to tumor site has thus, became the gold-standard for surgical treatment [7].

Two types of neck dissection are to be distinguished: "elective" dissection concerns patients free of lymph-node metastasis on initial extension assessment (cN0 neck), while "therapeutic" neck dissection applies to cases of clinically and radiologically confirmed lymph-node metastasis.

The main objective of the present study was to assess the frequency and distribution of lymph-node metastases and to identify risk factors, in a population of patients with laryngeal or hypopharyngeal squamous cell carcinoma treated by total laryngectomy or total pharyngolaryngectomy associated to neck dissection.

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2. Material and methods

A single-center retrospective study covered an 8-year period, from January 2008 to September 2015 in the ENT and head and neck surgery department of the head and neck oncology reference center.

The department's database identified 178 patients treated by total laryngectomy or total pharyngolaryngectomy for malignant laryngeal or hypopharyngeal tumor.

One hundred and thirty six patients with uni- or bilateral neck dissection associated to primary resection were included.

Exclusion criteria comprised: incomplete data, histology other than squamous cell carcinoma, and history of non-pharyngolaryngeal head and neck cancer.

The UICC-AJCC TNM staging system (6th edition) was used. Initial work-up systematically comprised endoscopy under general anesthesia and cervicothoracic contrast-enhanced CT. Cervical ultrasound or PET-scan were performed as needed, but not systematically. All files were discussed in multidisciplinary team meeting.

All neck dissections involved levels IIa, IIb, III and IV, with extension to level VIb (pretracheal, left and right paratracheal and anterosuperior mediastinal groups) according to tumor site and lymph-node metastasis on preoperative imaging. Group VIa (prelaryngeal) was removed in a monobloc systematically along with the primary tumor. Lymph-node specimens were grouped on the operative table on the Robbins classification before transfer for pathologic examination.

Potential risk factors for lymph-node metastasis comprised: T stage, hypopharyngeal or laryngeal tumor location, subsite, primary versus salvage surgery, and first-line surgery versus radio- and/or chemotherapy in case of salvage surgery. Pearson's Chi^2 or Fisher exact tests were used for statistical comparisons, on the specialized IBM SPSS Statistics 20.0 software package (IBM Inc., New York, USA).

Table 1
Distribution of types of neck dissection according to tumor site and type of surgery.

Tumor site	Number of patients	Number of functional neck dissections	Number of radical neck dissections
Larynx	110	101	9
Glottic	37	33	4
Supraglottic	14	13	1
Subglottic	4	4	0
Transglottic	55	51	4
Hypopharynx	26	19	7
Total	136	110	16
Type of surgery			
Primary	63	57	6
Salvage	73	63	10

3. Results

3.1. Patient characteristics

The study population comprised 127 males (93.4%) and 9 females (6.6%). Mean age at surgery was 63.3 years (range, 26–83 years). Mean follow-up was 26 months (range, 1–88 months). Ninety three percent of patients were smokers, and 54% had associated alcohol consumption. The primary site was laryngeal in 110 cases (81%) and hypopharyngeal in 26 (19%). Laryngeal subsite was glottic (with possible sub- or supra-glottic extension) in 37 cases (27.2%), subglottic in 4 (2.9%), supraglottic in 14 (10.3%) and transglottic in 55 (40.4%); hypopharyngeal subsite was piriform sinus in 24 cases (17.7%), retrocricoid in 1 (0.7%) and posterior hypopharyngeal wall in 1 (0.7%). Preoperative cTNM staging found 69 cT4a tumors (50.8%), 50 cT3 (36.7%) and 17 T2 (12.5%). All T2N0 tumors underwent salvage surgery (rT2N0) and were inaccessible to conservative surgery. 63 procedures (46.3%) were primary and 73 (53.7%) for recurrence. 20 patients underwent laryngectomy for recurrence after failure of primary cordectomy or partial laryngectomy, 17 after exclusive radiotherapy, 16 after first-line radio-chemotherapy, and 20 after failure of induction chemotherapy (followed by radiotherapy or radio-chemotherapy or not).

3.2. Frequency and distribution of lymph-node metastases on histology

Two hundred and eighteen neck dissections were performed: 54 ipsi- and 82 bi-lateral; 4617 lymph-nodes were analyzed: 21 per specimen, on average. Table 1 shows types of neck dissection.

In the overall population ($n = 136$), 61 patients (44.8%) showed lymph-node metastasis confirmed on histology (pN+). Frequency and distribution varied according to tumor site and subsite and also to primary versus salvage surgery (Table 2).

Involvement mainly concerned levels IIa, III and IV (28.7%, 25.7% and 8.8% respectively), while level VIb showed involvement in 5 cases (5/21, 23.8%), IIb in 4 (2.9%) and VIa in 3 (2.2%). 31 patients had extracapsular spread (RC+), mainly in levels IIa and III (38.5% and 42.9% of patients with lymph-node involvement, respectively). The occult lymph-node metastasis rate (cN0 and pN+) was 18.7% ($n = 17$). Fig. 1 shows lymph-node metastasis distribution in the overall population.

3.2.1. Larynx (n = 110)

In total, 32.2% of patients ($n = 42$) developed histologically confirmed lymph-node metastasis. Twenty-three patients with metastasis showed extracapsular spread ($n = 36$ nodes). The occult lymph-node metastasis rate was 14.1% ($n = 11$). Patients were pN+ in 40.5% of cases of glottic tumor ($n = 37$), 25% of subglottic tumor ($n = 4$), 64.3% of supraglottic tumor ($n = 14$), and 30.1% of transglottic tumor ($n = 55$). Fig. 2 shows the distribution of lymph-node metastasis from laryngeal tumor subsites.

Table 2
Frequency and distribution of lymph-node metastasis per level according to primary site.

Level	Primary tumor site *n* (%)						
	Larynx					Hypopharynx	Total ($n = 136$)
	Glottic	Supraglottic	Subglottic	Transglottic	Total		
Ib	0	0	0	0	0	1 (3.8%)	1 (0.7%)
IIa	10 (27%)	7 (50%)	0	8 (15.5%)	25 (22.7%)	14 (53.8%)	39 (28.7%)
IIb	1 (2.7%)	0	0	1 (1.8%)	2 (1.8%)	2 (7.7%)	4 (2.9%)
III	8 (21.6%)	5 (35.7%)	0	9 (16.4%)	22 (20%)	13 (50%)	35 (25.7%)
IV	3 (8.1%)	3 (21.4%)	0	1 (1.8%)	7 (6.4%)	5 (19.2%)	12 (8.8%)
VIa	0	0	1 (25%)	2 (3.6%)	3 (2.7%)	0	3 (2.2%)
VIb	0	1 (7.1%)	0	2 (3.6%)	3 (2.7%)	2 (7.7%)	5 (3.7%)

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