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Original Article

Is the extent of paratracheal nodal irradiation in laryngeal cancer with subglottic extension related to outcome?

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Abstract

During a 20-year period, we treated 26 patients with radiation after total laryngectomy because of laryngeal cancer with subglottic extension (LCSE). The paratracheal lymph nodes superior (and inferior in two cases) to the suprasternal notch were irradiated in addition to the primary tumour bed. With a follow-up period ranging from 5 to 185 months, the occurrence of neoplastic disease in the upper mediastinum was not observed in a single case. The rates of recurrent tumour in the neck and distant metastasis were both 8%. The 6-year survival rate was 67%. The observed results lead us to the conclusion that even with non-irradiation of the superior mediastinal paratracheal lymph nodes, postoperative radiotherapy can achieve reasonable long-term disease-free survival in patients with LCSE.

Keywords

Laryngeal cancer; radiotherapy; lymph node metastasis

INTRODUCTION

A management conundrum may exist for patients who have laryngeal cancer with subglottic extension (LCSE) because the extent to which paratracheal lymph nodes (PLNs) require treatment has not yet been ascertained. Should postoperative irradiation of the PLNs above the clavicles also include those situated in the superior mediastinum of the chest?

A radiotherapeutic experience was reviewed to evaluate postoperative management and outcome in these particular patients.

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MATERIALS AND METHODS

Patient records were examined to obtain the information presented. Between 1983 and 2002, 26 individuals received radiotherapy after total laryngectomy with or without neck dissection (including a patient who submitted to cytoreductive surgery of the tumour). The diagnosis of LCSE was based upon reviewed pathology and operative reports.

Total laryngectomy was performed because of vocal cord fixation and/or tumour involvement of the subglottis. In addition, ipsilateral thyroid lobectomy was effected in six subjects. Among the 15 patients subjected to neck dissection, the extent of dissection was unilateral (7 patients) or bilateral (8 patients).

Adjuvant postoperative radiotherapy was applied when histopathological examination of resected tissues revealed the presence of tumour in the surgical margins, metastatic disease in two or more cervical lymph nodes, extranodal spread, or neoplastic invasion of the laryngeal cartilage(s) and/or the subglottic laryngeal compartment. External beam megavoltage irradiation was administered using Cobalt-60 or a 6 MV linear accelerator. The overall mean absorbed dose to the tumour bed/upper neck was 59 Gy ± standard deviation 4.9 Gy (range 50–65 Gy), and to the lower neck 50 Gy ± 2.6 Gy (range 50–60 Gy). The PLNs in the superior mediastinum were irradiated in two patients to a total dose of 50 Gy; daily fractional dose was 1.8–2 Gy. The mean interval between surgery and postoperative radiotherapy was 43 days ± 22.6 days (range 10–110 days). The mean duration of irradiation was 50 days ± 12 days (range 37–102 days).

Treatment failures were histologically confirmed except in one instance. In that case, neoplastic progression towards systemic disease was deemed present when computed tomography demonstrated metastatic tumour in the elbow region.

RESULTS

The mean age at diagnosis of the 23 men and 3 women was 60 years (range 41–79 years). Coexisting illness (e.g., diabetes mellitus, hypertension, coronary artery disease) was present in 10 patients (39% ± 95% confidence interval 20%). The mean extent of LCSE was 20 mm ± 11 mm (range 5–50 mm).

The Kaplan–Meier survival rate at 6 years was 67% ± 18%. At last follow-up (Table 1), 15 patients were alive and free of disease; 6 have died without cancer; 2 persons have died from relapse in the neck or distant metastasis; 1 patient is alive with recurrence in the neck and systemic disease; and 2 have died with undetermined neoplastic disease status.

Among the 24 evaluable patients, there were no instances of tumour relapse in the upper mediastinum. The rates of recurrence in the neck and relapse at a distant site were both 8% ± 12%. The rate of failure in the neck was 7% ± 14% when the extent of subglottic involvement by laryngeal cancer was between 15 and 19 mm and 10% ± 20% when it was 20 mm or more ($p > 0.8$). The site of recurrent tumour in the neck was peristomal or in the posterior cervical node area (level 5); distant disease was in the elbow or lung. The interval between the diagnosis of laryngeal cancer and treatment failures ranged from 4 to 20 months. Three patients received radiotherapy for palliation of recurrent or progressive tumours. Survival after the appearance of disease relapse or progression did not exceed 10 months (excluding the patient with tumour relapse in both the neck and a distant site who is alive at nine months from the time of failure diagnosis).

Table 1. *Patient characteristics*

Case	Age (yrs)	Length of SGE* (mm)	Adverse pathological features**	Outcome***	Follow-up (mos)
1	48	20	absent	ANED	47
2	51	15	present	DNED	8
3	62	20	present	ANED	61
4	61	15	present	DWNR	6
5	78	30	present	AWNR–DM	27
6	53	20	absent	DDSU	16
7	63	15	present	ANED	6
8	57	20	absent	DNED	185
9	79	14	present	DNED	20
10	79	7	absent	ANED	43
11	71	13	present	DNED	79
12	64	25	present	ANED	45
13	61	6	absent	ANED	70
14	55	20	present	DDSU	15
15	60	35	present	ANED	48
16	76	15	present	ANED	53
17	57	15	absent	ANED	71
18	41	5	absent	ANED	119
19	72	20	absent	DWDM	22
20	47	50	present	ANED	102
21	43	13	present	ANED	5
22	63	18	present	ANED	123
23	60	20	absent	DNED	8
24	47	22	present	DNED	22
25	72	17	present	ANED	50
26	49	5	absent	ANED	57

*Subglottic extension by laryngeal cancer.
**Tumour positive resection margins, metastatic disease in 2 or more cervical lymph nodes, extranodal spread.
***ANED = Alive without cancer; DNED = Died without cancer; DWNR = Died with nodal relapse; AWNR–DM = Alive with nodal relapse and distant metastasis; DDSU = Died, disease status unknown; DWDM = Died with distant metastasis.

DISCUSSION

LCSE accounted for 10% of cases in one study of 82 patients.[1] LCSE is defined as glottic cancer

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extending 10 mm anteriorly and 5 mm posteriorly below the free edge of the vocal cords. The rationale behind this definition may lie in the fact that glottic cancer situated posteriorly at the vocal process of the arytenoids needs only a few millimeters of downward extension to reach the cricoid cartilage. With this posteriorly located lesion, there is a reduced possibility of adequately resecting tumour by partial laryngectomy.[2]

The glottic and subglottic compartments of the larynx develop from the tracheobronchial anlage.[3] The three lymphatic pedicles draining the subglottic area consist of the anterior chain (which terminates in the lower deep cervical or prelaryngeal Delphian node which in turn drains into the pretracheal and supraclavicular nodes) and the two posterolateral pedicles (which drain into the paratracheal and superior mediastinal nodes).[3] Welsh[4] showed, in his radioactive tracer study of the lymphatic drainage of the subglottic space, that only 0.2% of the tracer terminated in a superior mediastinal lymph node, and over 99% ended in the PLNs of the neck.

Muntz and Sessions[5] reported a correlation between the extent of subglottic involvement by tumour and recurrence rate; cases with 15–19 mm neoplastic extension to the subglottis had a recurrence rate of 29%, and, with 20 mm subglottic involvement, there was a 42% recurrence rate. In our experience, the lack of correlation between the magnitude of subglottic extension by carcinoma of the larynx and relapse in the neck may be attributed to the small number of studied patients.

Reported incidents of metastasis and treatment failure in the upper mediastinum appear to be inconsistent. In Harrison's experience,[6] the incidence of metastatic disease in the superior mediastinal nodes was 60%. In another report of 62 patients with subglottic cancer spread, only one individual developed mediastinal recurrence.[7] In contrast, viewpoints concerning the extent of irradiation of the PLNs are not at variance.[8–11] Moreover, the failure pattern after definitive surgery or radiotherapy for LCSE has been mostly local or stomal.[5,7,8,12,13]

The answer to our initial question is this: even given the constraints of the small patient sample and the inherent limitations of a retrospective analysis, we believe the observed findings indicate that judicious omission of irradiation of the superior mediastinal PLNs in subglottic carcinoma patients (as other investigators[14] have done) may not be detrimental. In addition, we maintain that under special circumstances (e.g., when the lower neck has clinically involved or histologically detected nodal metastases) the PLNs below the suprasternal notch deserve attention for irradiation particularly when imaging studies strongly suggest their presence of metastasis. Recent reports[15,16] of patients with advanced laryngeal cancer (including those with level 4 N_3 disease) evaluated the results of paratracheal lymph node dissection in the superior mediastinum; metastatic disease in the PLNs was demonstrated in 20–27% of cases, and some long-term survivors were observed despite the presence of extended tumour.

Recommendations are important to clinicians contemplating management of a disease that has the potential to recur as a life threatening illness for which salvage therapy may not be successful. As additional data confirming the preceding considerations are obtained, it is likely that we will be able to select the most appropriate candidates for treatment of the PLNs below the clavicles in the future. Further study is required to determine whether such therapy will have a significant impact on tumour control and overall survival.

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