Clinical Significance of Positive Delphian Node in Supracricoid Laryngectomy with Cricohyoidoepiglottopexy

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Objective: A positive Delphian node is known to predict a poor prognosis in laryngeal cancer. To elucidate the clinical significance of positive Delphian node metastasis in supracricoid laryngectomized patients, we conducted a thorough clinical review.

Methods: We reviewed clinical data from 65 patients who underwent supracricoid laryngectomy with cricohyoidoepiglottopexy; in these patients, the Delphian node was examined by frozen section as a routine process. Incidence, positivity rates and clinical impact of the positive Delphian node were analyzed.

Results: The presence of the Delphian node was detected in 27 of 65 (41.5%) patients; among these 27 patients, 3 (3/65 = 4.6%) were positive for metastasis. Case 1 (pT3N2b) died of lung metastases 32 months after supracricoid laryngectomy with cricohyoidoepiglottopexy. Case 2 (pT4N2c) underwent conversion to total laryngectomy during supracricoid laryngectomy with cricohyoidoepiglottopexy because of unexpected submucosal lymphatic infiltration; this patient is currently alive with disease 23 months after surgery. Case 3 (T3N1) is currently alive without disease 48 months after surgery.

Conclusions: The positive Delphian node is exclusively encountered in advanced laryngeal cancers and suggests an ominous outcome. Sufficient dissection of the paratracheal and lateral neck nodes is recommended. Delphian node evaluation is advised for all supracricoid laryngectomy surgeries.

Key words: laryngeal cancer – Delphian node – supracricoid laryngectomy

INTRODUCTION

The Delphian (DL) node, also called the prelaryngeal or cricothyroid node, is a lymph node located on the fascia above the cricothyroid membrane. The DL node receives afferent lymphatic drainage from the larynx (supraglottis and subglottis via the anterior commissure) and the thyroid gland (upper and anterior portions of both lobes and isthmus). The DL node has two main efferent lymphatic drainage routes: one flows toward the pretracheal (sub-DL), mediastinal, supraclavicular nodes and the other to the paratracheal and lower jugular (Level IV) nodes (Fig. 1). The expression ‘Delphian’ was first used by R. Randall, at the time a medical student at Harvard, because a metastasis to the DL node may predict the prognostic outcome of laryngeal and thyroid cancers, in the same way the prophecy of Apollo at temple of Delphi foretold the future in ancient Greece (1,2).

Supracricoid laryngectomy with cricohyoidoepiglottopexy (SCL-CHEP) is a reliable laryngeal preservation procedure for T2 and well-selected T3 and T4 laryngeal cancers (3,4). In SCL-CHEP, the entire thyroid cartilage is resected along with the tumor-bearing glottis; the remaining cricoid cartilage with one or two arytenoids is approximated to the hyoid bone thus forming a neo-glottis. The DL node is easily explored during SCL-CHEP as manipulation of the cricothyroid region is required during the early stage of the procedure. Regardless of the reported clinical significance of the DL node in laryngeal cancers (5–9), there have been
limited publications studying the DL node in SCL-CHEP (10,11).

Among all SCL-CHEP carried out at our institute, we have prospectively examined the DL node by frozen section as a routine process. To elucidate the clinical significance of positive DL node metastasis in SCL-CHEP patients, we conducted a thorough clinical review.

PATIENTS AND METHODS

We reviewed clinical data from 65 patients who underwent SCL-CHEP between 1997 and 2010. There were 63 males and 2 females with a mean age of 62 years old (age range from 32 to 76 years). Incidence, positivity rates and clinical impact of the positive DL node were analyzed. Intraoperative and post-operative management of patients with a positive DL node are discussed. Histopathologic sections from the patients with positive DL node metastasis were reviewed, and selected sections were immunostained for p53 using the monoclonal mouse antihuman antibody (Do-7, Dako, Glostrup, Denmark). We also conducted a thorough review of the literature related to laryngeal cancers and DL node metastasis.

RESULTS

The presence of the DL node was detected in 27 of 65 (41.5%) patients; among these 27 patients, 3 (3/65 = 4.6%) were positive for metastasis. Staging details of 65 patients are tabulated in Table 1; there were 3, 26, 24 and 12 patients in Stage I, II, III and IV, respectively. Three patients with a positive DL node were staged as T3N2bM0 (Stage IV), T4N2cM0 (Stage IV) and T3N1M0 (Stage III). DL nodes were not palpable preoperatively in any of these three patients. Details of the patients are presented subsequently.

Case 1 was a 59-year-old man with T3N2bM0 glottic cancer. A transglottic tumor invaded the left hemilarynx with fixed vocal fold (Fig. 2). The patient underwent SCL-CHEP and left lateral neck (Level II–IV) and paratracheal node dissections. Pathologic examination revealed a well-differentiated squamous cell carcinoma invaded the left hemilarynx including the paraglottic space. Neck node pathology showed 1/1 and 2/11 metastases to DL and Level II nodes, respectively. No metastasis was found in the paratracheal node. Subsequent to the surgery, the patient

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**Table 1. Staging details of 65 SCL-CHEP patients**

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SCL-CHEP, supracricoid laryngectomy with cricohyoideopiglottopexy.

*Stages of the three patients showing positive DL node.

Figure 1. A schematic drawing of the afferent and efferent lymphatic drainage routes of the Delphian (DL) node. The DL node receives afferent lymphatic drainage from the larynx and thyroid gland. The DL node has two main efferent lymphatic drainage routes: one flows toward the paratracheal (sub-Delphian), mediastinal and supraclavicular nodes and the other to the paratracheal and lower jugular (Level IV) nodes.

Figure 2. Contrast computed tomography image and supracricoid laryngectomy specimen of Case 1. (a) Ring enhancement of the positive DL node (arrow) could be identified above the cricothyroid membrane. (b) Surgical specimen showed a massive endophytic tumor invading the left hemilarynx.
Case 2 was a 56-year-old man with T4N2cM0 glottic cancer. An endophytic tumor invaded the anterior commissure and subglottis with bilateral mobile vocal folds. Larynx-targeted computed tomographic scan indicated thyroid cartilage penetration at the anterior larynx. DL node examination demonstrated one metastasis (Fig. 3). The patient underwent conversion to total laryngectomy during SCL-CHEP procedure because of unexpected submucosal lymphatic infiltration. Bilateral selective neck (Level II–IV) and paratracheal node dissections were also conducted. Histologically, a moderately differentiated squamous cell carcinoma invaded the entire endolarynx with multiple submucosal lymphatic permeations. Neck node pathology showed 1/1 metastasis to DL node; 8/14, 2/6, 3/9 and 1/2 metastases to right level II, III, IV and V nodes, respectively. No metastasis was found in the paratracheal node. Subsequent to the surgery, the patient received radiotherapy (60 Gy) to the local region and adjuvant chemotherapy. The patient developed local recurrence at the pharynx and is currently alive with disease 23 months after surgery.

Case 3 was a 65-year-old man with T3N1M0 glottic cancer. An ulcerative tumor invaded the left glottis and extended toward the subglottis and anterior commissure. DL node examination demonstrated one metastasis (Fig. 4). The patient underwent SCL-CHEP, left lateral neck (Level II–IV) and thorough paratracheal node dissections. Histologically, a well-differentiated squamous cell carcinoma invaded the left hemilarynx and invaded the inner layer of thyroid cartilage. Neck node pathology showed 1/1 metastasis to the DL node and no metastasis to the other neck areas including the paratracheal node. The patient did not receive adjuvant treatment and is currently alive without disease 48 months after surgery.

In three cases, p53 showed negative expression in both primary tumors and metastasized DL nodes.

A summary of medical literature related to laryngeal cancer and DL node metastasis comprised eight papers published over 18 years (Table 2). The presence of the DL node ranged from 7 to 87%; the rates of metastasis were between 0.9 and 8.7%; and the mortality rates ranged from 50 to 100%.

**DISCUSSION**

DL node metastasis is known to indicate a poor prognosis in laryngeal cancer. Apart from its clinical significance, there have been limited reports studying the DL node in laryngeal cancers (1,2,5–14). Because of its anatomical location, the DL node is resected with the specimen and is not otherwise examined during total laryngectomy, which is one of the most frequently conducted surgeries for laryngeal cancer. Thaler et al. examined whole-organ sections from total laryngectomized specimen and reported that 8.7% of the DL node was positively involved. They also stressed that because of the nature of cricoid cartilage preservation in SCL, the pathophysiology of the DL node is particularly important for surgeons performing partial laryngectomy (7). After introducing SCL-CHEP at our institute in 1997, we have prospectively examined the DL node by frozen section as a routine process. The presence of the DL node was detected in 27 of 65 (41.5%) patients; other pathological samples were taken from the thyroid or connective tissues. Three patients (3/65 = 4.6%) were identified as positive for DL node metastasis and were staged as III or IV. Our results with SCL-CHEP patients corresponded well with the previous reports analyzing patients with partial or supracricoid laryngectomies (1,5,6,8–11). Although DL node metastasis is generally identified in advanced stage cancers, T1b or occult glottic cancer may also metastasize to the DL node (9,13). In these early-stage patients, the anterior commissure and anterior subglottis are two key subsites for DL node metastasis since the central anterior lymphatic drainage
flows directly into the DL node (Fig. 1). All three patients with positive DL node metastasis in our series showed cancer invasion to these two key subsites. During all SCL-CHEP procedures regardless of the tumor size and stage, we therefore recommend DL node examination by frozen section.

Management of the regional neck nodes is another important subject when a positive DL node is encountered. Based on the observation of a higher incidence of stomal recurrence in DL-positive patients, paratracheal node dissection has been encouraged (7). Olsen et al. reported that although the DL node drains to the bilateral neck, with unilateral glottic cancers and a clinically negative neck, the subsequent metastasis occurred only in the ipsilateral neck and rarely metastasizes to the contralateral side. Whereas supraglottic cancers have a marked predisposition to bilateral neck metastasis and therefore bilateral neck dissections are advised (1). When DL node metastasis is encountered, a thorough paratracheal node dissection is advised; in the SCL-CHEP procedure, thorough dissection is feasible by elevating the larynx (before the SCL procedure) upward and carefully dissecting lymph nodes (asterisk), separating them from the recurrent laryngeal nerve (arrow) (Fig. 5). The unilateral thyroid gland might be removed along with paratracheal nodes. We consider that even with negative nodal pathology, such as that in the current three patients, it is appropriate to perform paratracheal node dissection.

Our policy for neck dissection is as follows. In all SCL surgeries, the DL node should be routinely examined using frozen section. When the positive DL node is encountered, a thorough paratracheal node dissection is advised; in the SCL-CHEP procedure, thorough dissection is feasible by elevating the larynx (before the SCL procedure) upward and carefully dissecting lymph nodes (asterisk), separating them from the recurrent laryngeal nerve (arrow) (Fig. 5). The unilateral thyroid gland might be removed along with paratracheal nodes. We consider that even with negative nodal pathology, such as that in the current three patients, it is appropriate to perform paratracheal node dissection.

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(ii) The positive DL node was associated with high mortality rates ranging from 50 to 100% in the literature; of our three patients with the positive DL node, only one is currently alive without disease.

(iii) In all SCL-CHEP procedures regardless of the tumor size and stage, we recommend DL node examination by frozen section.

(iv) When positive DL node metastasis is encountered, thorough paratracheal node dissection is advocated. Ipsilateral neck dissection is recommended for glottic cancer confined to the unilateral glottis and bilateral neck dissections are advised for glottic and supraglottic cancer with extensive preepiglottic space or anterior commissure invasion.

(v) At the moment, there is still not sufficient evidence supporting adjuvant treatments, but treatment options should be discussed with patients demonstrating DL node metastasis.

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Conflict of interest statement

None declared.

References