International Journal of Surgery 42 (2017) 123–127

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original Research

Risk factors and the preoperative assessment of right para-oesophageal lymph node metastasis in right lobe papillary thyroid carcinoma: A case series

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HIGHLIGHTS

- Large tumours (>1 cm) in right lobe were associated with RPELN metastasis in PTC patients.
- Central and lateral compartment lymph node metastasis were associated with RPELN metastasis.
- PTC patients with a high enhanced CT value (>132) could predict RPELN metastasis.

ARTICLE INFO

Article history:
Received 16 November 2016
Received in revised form
16 April 2017
Accepted 30 April 2017
Available online 1 May 2017

Keywords:
Right para-oesophageal lymph node (RPELN)
Papillary thyroid carcinoma (PTC)
Lymph node metastasis

ABSTRACT

Background: Right para-oesophageal lymph nodes (RPELN) are included among the right central compartment lymph nodes (rCLN) and located behind right recurrent laryngeal nerve (rRLN). However, due to the likelihood of increasing postoperative complications, and the extremely difficulties of RPELN dissection, the decision to perform RPELN dissection remains controversial. The aim of this study was to explore the risk factors of RPELN metastasis and evaluate RPELN metastasis by preoperative examination.
Methods: We reviewed the medical records of 163 consecutive papillary thyroid carcinoma (PTC) patients (125 females and 38 males) who underwent right lobe plus isthmic resection (91 patients) or total thyroidectomy (72 patients) with right or bilateral central compartment lymph node dissection. The RPELN dissections were performed in all patients and were individually dissected and recorded intra-operatively. All patients underwent thyroid ultrasound and enhanced neck computed tomography (CT) routinely during preoperative examination.
Results: RPELN metastasis was detected in 20 patients (12.3%), among whom 6 (3.7%) had RPELN metastasis without rCLN metastasis. Total rCLN metastasis and lateral compartment lymph node metastasis were confirmed in 57 (35.0%) and 24 (14.7%) patients, respectively. The tumour diameter, number of metastatic rCLN and lateral compartment lymph nodes, RPELN visible on CT, and enhanced CT value of RPELN were confirmed significantly associated with RPELN metastasis by univariate analysis ($P < 0.05$). The area under the ROC curve of CT values was 0.77 (95% CI, 0.59–0.95; $P = 0.003$). The CT value of 132.0 was used as the cut-off point, and the specificity and sensitivity were 84.1% and 71.4%, respectively.
Conclusions: PTC patients with a large tumour (>1 cm) in the right lobe or suspected rCLN metastasis were recommended to undergo prophylactic RPELN dissection, particularly in those with a high enhanced CT value (>132) of RPELN or those with the copresence of lateral compartment lymph node metastasis.

1. Introduction

Papillary thyroid carcinoma (PTC) accounts for more than 90% of all thyroid malignancies. And the incidence of PTC grows fastest among the malignant tumours in recent years [1,2]. PTC is a relatively indolent disease and often has a good prognosis [2–6] due to

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http://dx.doi.org/10.1016/j.ijsu.2017.04.063
1743-9191/

its slow progression, with a 10-year survival rate of more than 90% [7]. In contrast to its slow course of disease, lymph node metastasis often occurs earlier: 20%–90% patients presented with lymph node metastasis at the diagnosis of PTC, particularly in the central compartment, which may result in regional recurrence and a reduction in the postoperative survival rate [2,3,8–18]. However, due to the likelihood of increasing incidence of postoperative complications, including recurrent laryngeal injury and hypoparathyroidism, prophylactic central neck dissection remains controversial [19,20].

According to a consensus statement [21], the central compartment is further divided into the prelaryngeal (Delphian), pretracheal, and bilateral paratracheal lymph nodes. Due to the anatomical difference, the recurrent laryngeal nerve of right side is more superficial than the left. So there are a few fat and lymphatic tissues present posterior to the rRLN. Thus, the right paratracheal lymph node is further classified into two sub regions by rRLN. The nodes located near the posterior side of the right nerve, upper to the oesophagus and prevertebral fascia are called the right upper para-oesophageal lymph nodes or right para-oesophageal lymph nodes (RPELN) [22].

RPELN are in the range of the right central compartment lymph nodes (rCLN). However, due to the difficulties of dissection, the possibility of increasing the morbidity of postoperative complications [23] and the low prevalence of RPELN metastasis, some physicians continue to selectively omit RPELN when performing central lymph node dissection (CLND). The prevalence of RPELN metastasis was reported to range from 2.6% to 26.7% [22,24–31]. The inclusion criteria varied among these studies, some studies included patients with both left and right lobe thyroid lesions [24–27], while others included the right lobe only [28,30], which leading to a large difference in the rate of metastasis. All of the studies assessed the risk factors of RPELN metastasis. However, the investigation of preoperative assessment especially neck computed tomography (CT) of RPELN, was rarely performed. Due to the lack of uniform risk factors and the relatively low sensitivity of preoperative thyroid ultrasonography, the diagnostic value of CT in identity RPELN metastasis is urgent to be clear. The present study was aim to investigate the diagnostic value of CT in preoperative assessments and explore the prevalence and the risk factors of RPELN metastasis.

2. Materials and methods

2.1. Patients

A retrospective study was performed using 163 consecutive PTC patients who underwent initial surgery from February 2015 to February 2016 at the Department of Thyroid Surgery, The First Hospital of China Medical University, Shenyang 110001, People's Republic of China. The study included patients who met the following criteria: at initial thyroid surgery, PTC in the right lobe or both lobes (patients with left lobe PTC only were excluded). The preoperative examination included thyroid and neck lymph node ultrasound, thyroid function tests, and enhanced neck computed tomography in all patients. All participants signed an informed consent form. The same group of surgeons performed all procedures. The study was approved by our institutional review board, and our work has been reported in line with the PREFERRED REPORTING OF CASE SERIES IN SURGERY (PROCESS) criteria [32].

All patients were confirmed to have PTC by intraoperative frozen section biopsy and postoperative pathological analysis and underwent right lobe and isthmus thyroidectomy or total thyroidectomy with ipsilateral or bilateral central compartment, including right upper para-oesophageal lymph node dissection routinely performed. Additionally, lateral neck dissection was performed during surgery for N1b patients.

The central compartment dissection specimen was divided into the following 3 or 4 parts: (1) prelaryngeal (Delphian) lymph nodes; (2) pretracheal and right paratracheal lymph nodes (rCLN, anterior to the rRLN only); (3) RPELN; (4) left paratracheal lymph nodes (in bilateral dissection). The pretracheal and right paratracheal lymph nodes were assessed together, while RPELN were not included and were analysed separately, and the lateral compartment lymph nodes were also analysed as an entirety. All lymph nodes were classified during the operation by the surgeon. The presence or absence of lymph node metastasis was defined by senior pathologists in a standardized procedure according to postoperative pathological reports.

We analysed the risk factors for RPELN metastasis including the following items: age at diagnosis, gender, Hashimoto's thyroiditis, tumour location, tumour multifocality, tumour diameter, extrathyroidal extension, the number of metastatic rCLN, lateral compartment lymph nodes, preoperational ultrasound, and each parameters (including maximal and minimal axial diameter, and maximal enhanced CT value) of enhanced neck CT. Hashimoto's thyroiditis was categorized by postoperative pathology. For multifocal tumour patients, we selected the largest tumour's location and size, and the PTC location was defined as the upper-third, middle-third, or lower-third, according to the tumour centre of thyroid gland. We corroborated the tumour diameter by the ultrasonic-displayed maximal axial diameter. All patients underwent enhanced neck CT examination preoperatively. We defined the compartment below the oesophagus or common carotid artery level and above the prevertebral fascia on CT screen display as RPELN area, and defined “CT visibility” as the detection of lymph nodes in this compartment. The largest section of the largest node was selected to record the maximal axial diameter (max-AD), minimal axial diameter (min-AD) and maximal enhanced CT value; the area of the largest lymph node section was approximately equal to the max-AD multiplied by the min-AD.

The prevalence of transient or permanent RLN injury was defined by operative records of voice change and postoperative electronic laryngoscope examination. The permanent hypoparathyroidism was determined by blood calcium levels <2 mmol/L at 6 months after surgery.

2.2. Statistical analysis

Statistical analysis was performed using the Statistical Package for Social Sciences version 19.0 for Windows (SPSS Inc, Chicago, IL, USA). The risk factors of RPELN metastasis were examined by univariate analysis. Statistical significance was defined as $P < 0.05$. The specificities and sensitivities of max-AD, min-AD, area, and enhanced CT value of the largest lymph node were determined by ROC curves. The optimal cut-off point was calculated by using Youden's index.

3. Results

The numbers of metastatic or resected RPELN were both significantly less than that of rCLN or lateral compartment lymph nodes. The numbers of metastatic RPELN, rCLN, and lateral compartment lymph nodes were 0.31 ± 0.75, 0.97 ± 1.83, and 3.75 ± 2.09, respectively (Table 1). The incidence of complete right central compartment metastasis, including both rCLN and RPELN compartment, was 38.7% (63/163). Among these patients, 35.0% (57/163) had rCLN metastasis, 12.3% (20/163) had RPELN metastasis, and 8.6% (12/163) was metastatic in both rCLN and RPELN. Of the 20 patients with metastatic lesions in the RPELN, 6 (3.7%) had