



Transcervical Dissection of Metastatic Suprahyoid Retropharyngeal Lymph Nodes from Papillary Thyroid Carcinoma through Three Anatomical Barriers

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Abstract

Background: Papillary Thyroid Carcinomas (PTCs) rarely metastasize to the Suprahyoid Retropharyngeal Lymph Nodes (SRPLNs). Studies on SRPLN metastasis from PTCs and description of dissection of SRPLNs via the transcervical approach are rare in the literature.

Methods: We retrospectively reviewed 6 patients (three men, three women) diagnosed as PTCs with SRPLN metastasis who underwent dissection of SRPLNs between 2001 and 2017. Median age at dissection was 38 years (range 12-58). A transcervical approach was applied for exposure and dissection of SRPLNs in all patients. Dissection of SRPLNs was performed simultaneously with the initial surgery for PTC in five patients, while the remaining one patient underwent dissection as secondary surgery.

Results: All patients were successfully treated by transcervical resection of the metastatic SRPLNs from PTCs. No patient needed mandibulotomy or presented severe complications. Median duration of follow-up after dissection of SRPLNs was 83 months (range, 15-213). No recurrence of SRPLN metastasis was identified during follow-up, and none of the patients died of the disease.

Conclusion: SRPLN metastasis from PTCs presents most likely in patients with advanced lesions. Surgery might be the best treatment for cure. Surgical removal of metastatic SRPLN through transcervical approach was safe and effective. The surgical route through three main anatomical barriers to the retropharyngeal space and the landmarks to identify SRPLN should be well known for the surgeons.

Introduction

The retropharyngeal space is a potential space that lies between the buccopharyngeal fascia anteriorly and ala fascia posteriorly [1,2]. Papillary Thyroid Carcinomas (PTCs) commonly metastasize to lymph nodes in the central compartment and lateral regions of the neck, which occurs in approximately 60% of all cases [3]. Nevertheless, Suprahyoid Retropharyngeal Lymph Node (SRPLN) metastasis from PTCs has been considered an unusual event [4]. Generally, two lymphatic pathways were identified as the route of SRPLN metastasis. One was through the posterosuperior lymphatic trunk from upper pole of the thyroid glands and the other was from the jugular lymphatic chain [5]. To the best of our knowledge, studies on SRPLN metastasis from PTCs are rare in the literature. The largest study so far only reported a series of 12 PTC cases with SRPLN metastasis [6]. Since the treatment using Radioactive Iodine (RAI) is not optimal for metastatic lymph nodes in PTC patients, surgery is the main choice in this rare clinical scenario [7]. Surgical removal of the SRPLNs is possible but difficult mainly because of the narrow space and adjacent important structures including the internal carotid artery and cranial nerves [8]. Two approaches were reported in the literature including transoral and transcervical approaches. The transoral approach was well established [9,10]. Dissection of the SRPLNs via transoral approach is direct and close to the target. However, the localization and removal of the SRPLNs are not simple. Intraoperative ultrasound is normally necessary to identify the lymph nodes and sometimes robot-assisted surgery is needed to remove the lymph nodes because of the narrow surgical field [9,11]. All of these factors limit the application of the transoral approach. Transcervical approach is familiar to head and neck surgeons. In addition, most of the time SRPLN dissection is done simultaneously after completion

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Table 1: The clinical features of the patients.

Case	Age/Sex	Chief complaint	Thyroid lesion	Local extension	Lateral neck LN	SRPLN (cm)	Distant metastasis	Thyroidectomy	Neck dissection	Postoperative treatment
1	48/F	Neck mass	Unilateral	Trachea	Upper neck	2.3 × 3.0	No	Total	Level II-IV+VI	External RT
		Hoarseness	diffused							
2	42/F	Neck mass	Bilateral	No	Multiple	2.8 × 2.5	Lung	Total	Level II-IV+VI	I ¹³¹
3	34/M	Neck mass	Unilateral	No	Upper neck	2.5 × 1.6	No	Total	Level II-IV+VI	No
			2 cm × 1.8 cm							
4	58/M	Neck mass	Unilateral	Trachea	Upper neck	1.6 × 1.4	No	Total	Level II-IV+VI	External RT
		Hoarseness	4.5 cm × 4 cm	Strap muscle						
5	12/M	Neck mass	Bilateral	Trachea	Multiple	2.0 × 1.8	No	Total	Bilateral	No
									Level II-IV+VI	
6	33/F	Neck mass	Bilateral	No	Multiple	1.3 × 1.0	No	Total	Level II-IV+VI	I ¹³¹

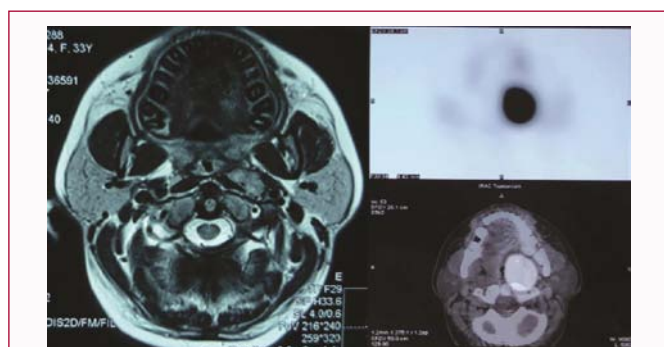


Figure 1: Left: A horizontal section of MRI image showed the metastatic SRPLN from a papillary thyroid carcinoma; Right: A PET/CT scan showed high metabolic metastatic SRPLN on the same case.

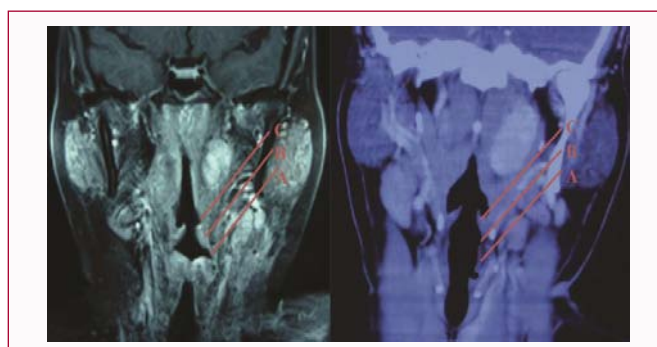


Figure 2: A coronal section of MRI image showed the three anatomical barriers accessing to the retropharyngeal space transcervically. The submandibular gland was just located before the A line. The posterior belly of the digastric muscle was located between the A and B lines. The blood vessels were shown between the B and C lines. The suprahyoid retropharyngeal space could be entered through the C line.

of the neck dissection. It is quite convenient to extend the surgery, especially for the PTC patients with multiple cervical lymph node metastases. Because of the complicated anatomy of the suprahyoid retropharyngeal space, there is still rare description of the dissection of SRPLNs via the transcervical approach in the literature. In this study, we reported a simple and applicable method to locate and expose the suprahyoid retropharyngeal space *via* the transcervical approach. The surgical route through three main anatomical barriers and the landmarks to identify SRPLN were described and discussed in detail.

Patients and Methods

Patients

The protocol for this retrospective study was approved by the Institutional Review Board of the SUN Yat-sen University Cancer Center, Guangzhou, China. The clinicopathological data of all PTC patients who received treatments in this cancer center between 2001 and 2017 were reviewed retrospectively. Six patients were diagnosed as PTCs with SRPLN metastasis according to imaging and pathology (Table 1). There were three male and three female patients. Median age of the patients at the time of surgery was 38 years (range 12-58). All patients complained about neck mass and two patients presented with sound hoarseness. Three patients had bilateral and the other three patients had unilateral thyroid mass. Evident local extension was seen in three patients including tracheal and strap muscle invasion. All patients had lateral neck lymphadenopathy at presentation. Among them, three patients presented with multiple and the other three with localized upper cervical metastasis. One patient had lung metastasis on the initial diagnosis. CT or MRI imaging showed that one patient

had cystic and the others solid SRPLNs. All patients underwent surgical treatment for the metastatic SRPLNs. Dissection of SRPLNs was performed simultaneously with the initial surgery for PTC in five patients, while the remaining one patient underwent dissection as secondary surgery. Pathological examination confirmed SRPLN metastasis from PTCs in all these cases.

Surgical dissection of the SRPLNs

The patient was intubated under general anesthesia and put in supine position. The neck was slightly extended and the head rotated a little bit to expose submandibular region. The incision was extended from the incision of lateral neck dissection previously, generally along the middle line of the Sternocleidomastoid (SCM) muscle upward to the tip of the mastoid process. The flap was developed on the subplatysmal plane. The anterior edge of the SCM muscle was incised and retracted backward. Then the exposure of the retropharyngeal space was started. The surgical route to the retropharyngeal space through three anatomical barriers and the landmarks to identify SRPLN were described as the following.

First anatomical barrier: The submandibular gland formed the first anatomical barrier to retropharyngeal space (Figure 2). The submandibular branch of the facial nerve was carefully identified and preserved firstly. Then the submandibular gland was removed. The facial artery was ligated. The lingual nerve was exposed and preserved. The lower pole of the parotid gland was dissected upward a little bit to expose the post-mandibular fossa.

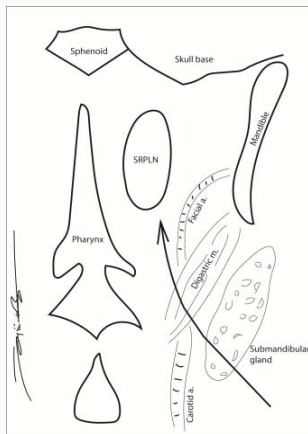


Figure 3: The hand sketch showed the three anatomical layers before accessing to the suprahyoid retropharyngeal space. The root of the facial artery branching from the external carotid artery formed the landmark to identify the SRPLN.

Second anatomical barrier: The second anatomical barrier was the posterior belly of digastric muscle (Figure 2). After the removal of the submandibular gland, the posterior belly of digastric muscle was cut and reflected to expose the underlined major vessels.

Third anatomical barrier: The third anatomical barrier was the blood vessels branching from the external carotid artery and internal jugular vein (Figure 2). The common facial vein was identified and firstly ligated. The sublingual nerve was identified to preserve. The external carotid artery and its branch especially the facial artery was identified.

Identification and dissection of the SRPLNs: The root of the facial artery formed the landmark to identify SRPLN (Figure 2 and 3). The dissection of retropharyngeal space started just behind the root of facial artery. The buccopharyngeal fascia was firstly opened to access the retropharyngeal space. Then the SRPLN could be identified by careful palpation. The metastatic SRPLN was cautiously dissected upward and downward just along the internal carotid artery (Figure 4). Slight retraction of this artery was sometimes needed for protection. Generally the internal carotid artery might be palpated and should not be exposed during the surgery.

Postoperative evaluation

All the patients were followed up to record local recurrence and survival status. Blood test was done to monitor Thyroglobulin level (Tg). Postoperative CT/MRI was done to evaluate the surgical result. Surgical complications and postoperative oral function were investigated.

Results

All patients were successfully treated by transcervical resection of the metastatic SRPLNs from PTCs (Figure 5). No patient needed mandibulotomy or showed severe complications. No postoperative nerve damage was observed. All patients had normal postoperative swallowing. Median duration of follow-up after dissection of SRPLNs was 83 months (range, 15-213 months). No recurrence of SRPLN metastasis was identified during follow-up, and none of the patients died of the disease.

Case Report

A 33-year-old woman (Case #6) complained about neck mass

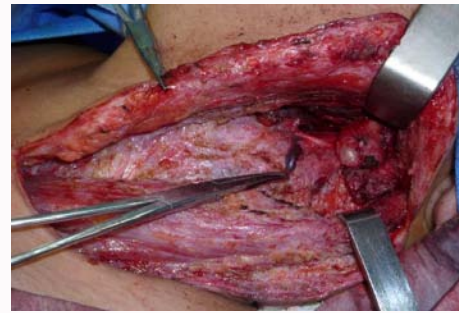


Figure 4: The surgical image showed the removal of the metastatic SRPLN via the transcervical approach.

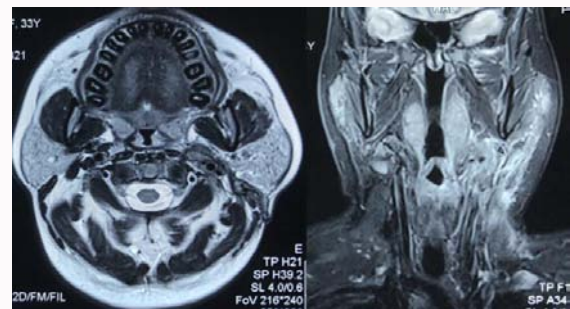


Figure 5: The postoperative MRI image showed the metastatic SRPLN was successfully removed for the same case.

on the left side for 2 years. There were no palpable thyroid nodules on physical examination. However, ultrasound and Computed Tomography (CT) scan showed two small thyroid nodules (5 mm in diameter) bilaterally and two enlarged cervical lymph nodes (20 mm × 20 mm) on the left Level III highly suspected to be thyroid cancer with cervical metastasis. After confirmation of PTC metastasis on Level III by frozen section, a total thyroidectomy with ipsilateral modified neck dissection (Level II-VI) was performed. The postoperative pathology reported bilateral papillary thyroid cancer with multiple cervical lymph node metastasis (Level II-VI) (pT1N1bM0, Stage I). The patient received postoperative radioactive iodine therapy. Three months later on follow-up, a mass (15 mm × 15 mm) on the left retropharyngeal space was detected by CT and PET/CT scan, which was highly suspected to be a metastatic lymph node (Figure 1). No symptoms were reported by the patient. Another surgery was planned. The mass was then resected via the transcervical approach without a mandibulotomy and tracheotomy. There were no surgical complications after the procedure. The mass was confirmed as lymph node metastasis of PTC by postoperative pathology. The patient received another dose of radioactive iodine therapy.

Discussion

SRPLN metastasis has the clinical significance in head and neck cancers, especially nasopharyngeal carcinoma [12,13]. However, SRPLN metastasis from PTC is relatively uncommon compared to the high incidence rate of lymph node metastasis to the central compartment and lateral regions of the neck. In two recent large series, only 0.43% [14] and 0.83% of the PTC patients presented SRPLN metastasis respectively, whereas the incidence rate of lymph node metastasis to the central compartment and lateral neck was as high as 61%. SRPLN metastasis from PTC may be found at initial diagnosis or appear as recurrent or persistent diseases during

follow-up after first treatment. Because of the low incidence rate and occultness of SRPLN metastasis from PTC, it seemed to be ignored and underestimated all the time [4]. According to a systematic review, only a total of 90 cases with SRPLN metastasis from thyroid cancers had been reported in the literature so far. Although SRPLN metastasis from patients with PTCs is rare, its presentation is most likely seen in the patients with advanced PTCs [15]. In our series, all cases had multiple or advanced PTC lesions. Local extension of the primary lesion was seen in three patients. One patient even presented with lung metastasis. CT or MRI scan was the most effective diagnostic method for SRPLN metastasis. For patients with advanced PTCs, especially multiple neck or distant metastasis, a detailed imaging test should be done to exclude SRPLN metastasis. Differential diagnosis of SRPLN metastasis includes squamous cell carcinoma of the head and neck, lymphoma, benign or inflammatory SRPLNs, pharyngeal infection, or tuberculosis [16]. Treatment for SRPLN metastasis from PTCs may involve surgery, RAI, external beam radiation therapy, systemic therapy, or simply “watch and wait” [17]. Considering the relatively indolent nature and good prognosis of most PTCs, surgical resection might be the best choice for cure among all the treatment modalities. All the patients in the current study had good prognosis after surgery. Intraoperative localization and dissection of the metastatic SRPLNs is the key in the surgical treatment, especially for the small SRPLNs [18]. The surgical route and anatomical landmark were the most important two factors when considering transcervical resection of SRPLNs. In this paper we described three anatomical barriers before accessing to retropharyngeal space *via* transcervical approach. The submandibular gland and posterior belly of digastric muscle should be removed to open the surgical route to retropharyngeal space. The anatomical landmark to localize and identify retropharyngeal space was the root of facial artery diverted from the external artery. During the operation, the third layer of blood vessels was easy to identify. Dissection of the retropharyngeal space should be started downward just at and behind the root of the facial artery. Here the buccopharyngeal fascia was dissected and the suprahyoid retropharyngeal space might be accessed. Any lymph nodes could be identified by palpation here. Because these lymph nodes located just next to the internal carotid artery, careful dissections should be carried to avoid hurting the internal carotid artery posteriorly. Complete control of the intraoperative bleeding using bipolar diathermy and careful dissection were the necessity in this surgery.

Conclusion

PTCs rarely metastasize to the SRPLNs, and SRPLN metastasis from PTC presents most likely in patients with advanced lesions. Surgery might be the best treatment for cure. Surgical removal of metastatic SRPLN through transcervical approach was safe and effective. The surgical route through three main anatomical barriers to the retropharyngeal space and the landmarks to identify SRPLN should be well known for the surgeons.

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