Title

Trans-oral robotic surgery and surgeon-performed trans-oral ultrasound for intraoperative location and excision of an isolated retropharyngeal lymph node metastasis of papillary thyroid carcinoma

Journal

American Journal of Otolaryngology - Head and Neck Medicine and Surgery, 36(5)

ISSN

0196-0709

Authors

Goepfert, RP
Liu, C
Ryan, WR

Publication Date

2015-09-01

DOI

10.1016/j.amjoto.2015.04.011

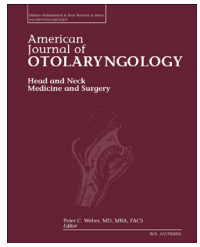
Peer reviewed

AMERICAN JOURNAL OF OTOLARYNGOLOGY–HEAD AND NECK MEDICINE AND SURGERY XX (2015) XXX–XXX

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/amjoto



Case Report

Trans-oral robotic surgery and surgeon-performed trans-oral ultrasound for intraoperative location and excision of an isolated retropharyngeal lymph node metastasis of papillary thyroid carcinoma☆

Ryan P. Goepfert, MD[a], *Chienying Liu, MD*[b], *William R. Ryan, MD, FACS*[c,*]

[a] *Department of Otolaryngology-Head and Neck Surgery, University of California, San Francisco*
[b] *Division of Endocrinology, Department of Internal Medicine, University of California, San Francisco*
[c] *Division of Head and Neck Oncologic/Endocrine Surgery, University of California, San Francisco*

ARTICLE INFO

Article history:
Received 22 January 2015

ABSTRACT

Background: Retropharyngeal metastases are uncommon but a well-known location for regional spread of well-differentiated thyroid carcinoma (WDTC). Surgeon-performed, trans-oral ultrasound (SP-TO-US) and trans-oral robot-assisted surgical (TORS) excision represent a unique combination of technology and techniques in the treatment of isolated retropharyngeal thyroid metastases.

Patient findings: A patient with a history of T3N1b papillary thyroid carcinoma (PTC) previously treated with total thyroidectomy, left central and lateral neck dissection, and radioactive iodine presented with progressive elevations in serum thyroglobulin (Tg) from baseline of 0.2 to 0.6 μg/L. She was found to have an isolated 2.6 cm left retropharyngeal nodal metastasis on MRI that was confirmed to be PTC on fine needle aspiration biopsy. She underwent SP-TO-US for identification of the node in the operating room immediately prior to TORS excision. There were no complications. Additional radioactive iodine was administered. Post-treatment iodine scans revealed resolution of avid uptake in left retropharynx and return of Tg to 0.2 μg/L.

Summary: The combination of SP-TO-US and TORS represents a novel combination of technology and technique for treatment of isolated retropharyngeal metastasis in WDTC. Trans-oral ultrasound allows for rapid localization of the lesion in relation to the adjacent neurovascular structures in the parapharynx while the robot-assisted approach affords a safe and effective dissection through the improved visualization and dexterity in a small working space. Our patient had no complications and only short-term dysphagia that resolved after temporary diet alteration. Risks and long-term morbidities associated with classical approaches to the retropharynx including trans-cervical and trans-mandibular, particularly in a previously dissected field, are avoided through this trans-oral approach.

Conclusions: Retropharyngeal metastases are a known location for regional spread of WDTC and are amenable to evaluation and biopsy using TO-US by both surgical and non-

☆ Disclosure Statement: William R. Ryan, MD is a paid consultant for Medtronic. No other competing financial interests exist.

* *Corresponding author at:* University of California, Department of Otolaryngology-Head and Neck Surgery, 2233 Post Street, 3rd Floor, San Francisco, CA, 94115. Tel.: +1 650 387 6807; fax: +1 415 885 7711.
E-mail addresses: rgoepfert@ohns.ucsf.edu (R.P. Goepfert), chienying.liu@ucsf.edu (C. Liu), William.ryan@ucsf.edu (W.R. Ryan).

http://dx.doi.org/10.1016/j.amjoto.2015.04.011

surgical providers. In cases where lateral neck dissection has already been performed or when traditional transcervical or transmandibular approaches to the retropharynx represent a comparatively extensive procedure for isolated metastases, SP-TO-US and TORS are safe and effective combination for surgical management of disease.

1. Introduction

Retropharyngeal and parapharyngeal lymph nodes are uncommon but well-known locations for regional spread from of well-differentiated thyroid carcinoma (WDTC) [1–4]. Surgical excision of isolated retropharyngeal lymph node metastases from WDTC has been well described via trans-cervical, trans-mandibular, and trans-oral approaches, including endoscopic-assisted trans-oral resection [5–11]. Trans-oral robotic surgery (TORS) has been described for excision of metastatic retropharyngeal lymph nodes of oropharyngeal carcinoma and of parapharyngeal space tumors, but never for an isolated retropharyngeal metastasis from WDTC [12–16].

Trans-oral ultrasound has been used to localize retropharyngeal masses for fine needle aspiration (FNA) and prior to trans-oral resection in WDTC metastases [17,18]. Given the demonstrated convenience and accuracy of intraoperative surgeon-performed ultrasound for tumor/lymph node localization in the central and lateral neck, we also report here on the use of intraoperative surgeon performed trans-oral ultrasound (SP-TO-US) for localization of a retropharyngeal node prior to TORS resection [19].

2. Patient

A 64-year-old woman with a history of pT3(s)N1b papillary thyroid carcinoma had had detectable serum thyroglobulin (Tg) of 0.2 μg/L increase to 0.6 μg/L (with undetectable anti-Tg) in the two years since she underwent a total thyroidectomy, left central and left lateral neck dissections by a different surgeon and radioactive iodine (RAI) treatment with I-131, 128 mCi. The post-treatment iodine scan showed only thyroid bed uptake. Repeated neck ultrasound evaluation was negative for persistent or recurrent nodal metastasis. A magnetic resonance imaging scan of the head and neck was obtained to further investigate for the source of thyroglobulin positivity, and it showed an isolated 2.6 cm left retropharyngeal lymph node (Fig. 1). A positron emission tomography–computed tomography (PET–CT) of the body demonstrated the left retropharyngeal node as intensely hypermetabolic with a standardized uptake value (SUV) of 29 as well as a 10 mm left lower lung nodule that was mildly hypermetabolic, with an SUV of 1.4, and multiple additional non-specific lung nodules that measured less than 0.4 mm. She complained of mild ipsilateral, focal globus and mild dysphagia without alteration in diet. A CT-guided FNA of the retropharyngeal lymph node was positive for papillary thyroid carcinoma.

The patient underwent a TORS-assisted excision of the metastatic left retropharyngeal lymph node. After intubation and prior to the incision, we localized the enlarged lymph

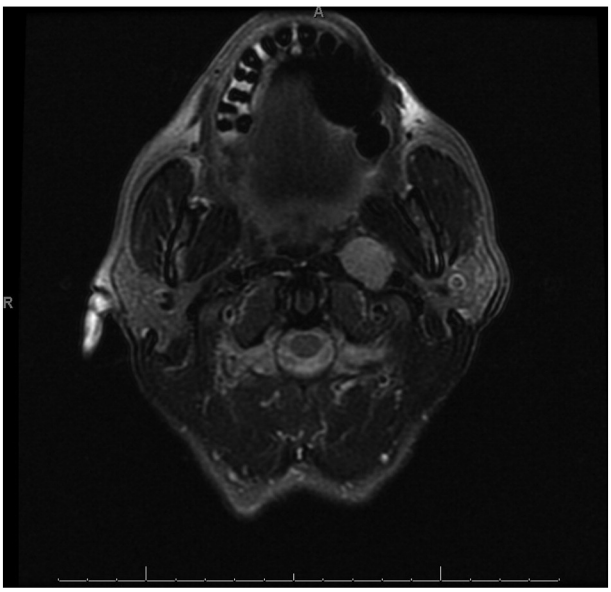


Fig. 1 – T1 MRI of the head and neck showing an abnormal 2.6 cm left retropharyngeal lymph node.

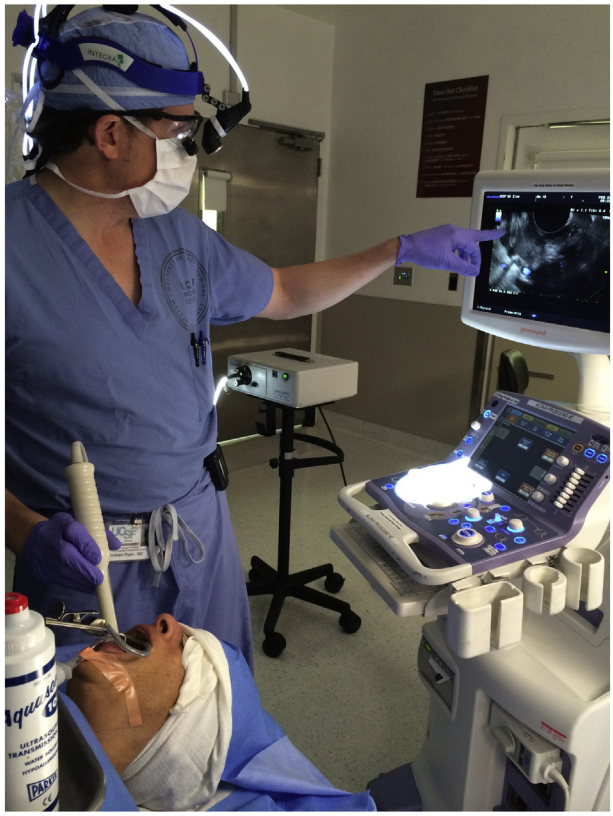


Fig. 2 – Retropharyngeal lymph node localization with a surgeon who performed ultrasound using an endocavitary transducer.

Please cite this article as: Goepfert RP, et al, Trans-oral robotic surgery and surgeon-performed trans-oral ultrasound for intraoperative location..., Am J Otolaryngol–Head and Neck Med and Surg (2015), http://dx.doi.org/10.1016/j.amjoto.2015.04.011

node with intraoperative SP-TO-US using an endocavitary transducer (Fig. 2). The ultrasound visualized the node in its location lateral to the superior constrictor muscle and medial to the internal carotid artery and jugular vein and aided in placement of the mucosal incision and planning of the subsequent dissection (Fig. 3). With the da Vinci® robot monopolar cautery, a vertical incision was made in the mucosal and superior constrictor muscle overlying by the node. The lymph node was visualized, dissected free from the surrounding tissue, and excised by the combination of da Vinci® robot arm and bedside-assistant instruments. The internal carotid artery was visualized and avoided. The sympathetic chain and glossopharyngeal nerve were not seen. There was minimal bleeding. A two-layer closure of the constrictor muscle and mucosa was made with simple-interrupted braided absorbable suture. Docking and console working times were 10 and 20 min, respectively. Suture closure of the incision line took 5 min.

There were no complications such as postoperative bleeding, hematoma, Horner's syndrome, vocal paralysis, palate elevation paralysis, or lingual/hypoglossal nerve dysfunction. The patient stayed one night in the hospital. She was started on a liquid diet and advanced to a soft diet by discharge with no aspiration but some mild oropharyngeal pain and the need to concentrate for coordination of swallow. In the first month of follow up, her swallowing improved to near normal. She did experience a 10-lb weight loss attributed to prior mild pain (resolved by 1 month) and swallowing discoordination. At 2 months, her swallowing was normal with no further globus and no first-bite syndrome. At 2 months post-lymph node excision, she underwent a second course of RAI treatment with I-131, 125 mCi. The post-treatment iodine scan again showed thyroid bed uptake that was decreased compared to the prior scan, and no uptake in the left retropharyngeal region or in the lungs. At 4 months, her Tg was 0.2 μg/L. Her lung nodules, suspicious for metastatic disease, are currently being monitored with an increase at 6 months from 10 mm to 12 mm.

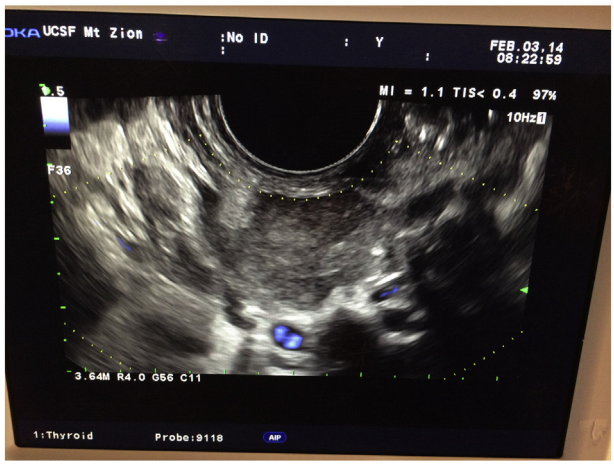


Fig. 3 – The abnormally enlarged left retropharyngeal lymph node is found lateral to the superior constrictor and medial to the internal carotid artery and internal jugular vein.

3. Discussion

The use of SP-TO-US and TORS for resection of WDTC retropharyngeal lymph nodes metastases is a useful application of high-resolution ultrasound and robotic surgical technologies. Compared to conventional trans-oral resection, TORS affords the surgeon a magnified visualization in addition to finely articulated instrument movements within a small working space. If desired, an angled view can also be obtained through a beveled endoscopic camera. These all can be very helpful in identifying and preserving adjacent neurovascular structures of the retropharyngeal and parapharyngeal spaces while maximizing and the adequacy of resection [12,13,20,21]. The ease of use of the articulating robot instrument arms coupled with the 3-dimensional optics of the camera gives the surgical robot advantages over the use of an endoscope (that has a 2 dimensional view) and long transoral non-articulating instruments. This use of a rigid endoscope has been reported as being effective for transoral retropharyngeal excision [11]. We think that the 3-D view and articulating arms of the robot likely bring superior visualization and maneuvering ability possibly making the operation safer, more efficient, and more effective in clearing all disease.

The trans-oral approach itself avoids the potential morbidity of trans-cervical and trans-mandibular approaches with their potential injuries to the major vascular structures, lower cranial nerves, and sympathetic chain. It also avoids the risk of a pharyngocutaneous salivary fistula and the potential osseous and dental morbidity of mandubulotomy. These are especially important when a transcervical approach would have to be performed thorough the fibrosis and inflammation of a previously operated (or irradiated field) as would have been present for the patient described herein. Moreover, our operative time for the patient in this report likely equals or would have been less than a trans-cervical approach for an isolated retropharyngeal lymph node, particularly in the scenario of a previously operated neck. We estimate the trans-cervical approach would take approximately 45–60 min in a case where no bleeding or misadventure occurs, in relation to the 35 min taken for the trans-oral, robot-assisted approach.

The trans-oral approach does require violation of the superior constrictor musculature and possible disruption of upper vagal nerve motor contributions to the constrictor and palatal musculature and sensory contributions to the oropharynx, all of which are important to swallowing function. Our patient did suffer to some degree with oropharyngeal pain and dysphagia for roughly 3 weeks after surgery. This type of recovery is similar to that described in the setting of adult tonsillectomy [22]. Other authors have discussed need for speech language rehabilitation in select cases after trans-oral retropharyngeal and parapharyngeal approaches. However, relatively few studies provide details of the specifics of their post-operative swallowing dysfunction apart from gastrostomy tube dependence. Those studies that provide results using validated swallowing indices are reports concerning the treatment of oropharyngeal carcinoma with and without adjuvant therapy [23–26]. As such, it is difficult to draw a correlation between these series and extrapolate to our single patient's post-operative swallowing function.

Please cite this article as: Goepfert RP, et al, Trans-oral robotic surgery and surgeon-performed trans-oral ultrasound for intraoperative location..., Am J Otolaryngol–Head and Neck Med and Surg (2015), http://dx.doi.org/10.1016/j.amjoto.2015.04.011

TO-US is an efficient, cost-effective method for evaluating the retropharyngeal space that has been described for distal extracranial carotid pathology [17,18,27]. Its usefulness in FNA and operative localization has been described for WDTC with a high degree of success [18]. Our experience with the advantages of intraoperative SP-US for both primary and re-operative cases lends itself to a case incorporating TORS as well [19]. SP-US has become an extended component of the physical examination in head and neck patients particularly those with thyroid pathology. Pre-operative or intraoperative lateral or central neck SP-US provides real-time information about the presence of pathology and on anatomic relationships of pathology in relation to vital structures potentially allowing for a more targeted, safe, and less morbid surgery. More specifically, TO-US allows the differential application of pressure to the lesion retropharyngeal mass to determine its mobility with relation to the carotid artery, and TO-US-guided injection of dye into the lesion(s) of interest can also be performed for enhanced localization [10,18,19].

The views of the retropharyngeal and parapharyngeal spaces are difficult to fully define via ultrasound performed in the external trans-cervical fashion because of the shadowing effect of the mandible. This limitation is overcome with use of an endocavitary transducer. For an awake patient, topical anesthetic is typically required to overcome gagging. General anesthesia affords a high quality trans-oral ultrasound examination in real time just prior to the operation making the surgeon a suitable if not ideal practitioner for the ultrasonic assessment. In this case report, SP-TO-US provided precise localization of the node in relation to the adjacent vascular structures thereby improving incision placement and dissection planning immediately prior to surgery to potentially help reduce morbidity. In our case report, the retropharyngeal node was initially found on MRI though the patient subsequently underwent PET–CT as well as CT-guided biopsy. Trans-oral ultrasound guided FNA in the diagnosis of retropharyngeal metastasis has been well described by others and we hope to further pursue this application in conjunction with our radiology and pathology colleagues [10,18].

TORS and SP-TO-US both have costs and limitations. Both technologies bring the need for capital investment and maintenance costs, the availability of the machines for use, extra training for their skilled use, and medial-to-lateral anatomic knowledge which differs somewhat from the classical lateral-to-medial surgical relationships of neck anatomy. TORS also brings the challenges of a loss in tactile feedback, the need for a different type of communication between the console surgeon and the bedside assistant surgeon, and a non-dissector-based surgical technique. There is arguably more risk to the carotid arteries although the surgeon authors believe that in selected patients with preoperative knowledge of the location of the carotid arteries, the robotic-assisted approach actually brings less risk of bleeding. These costs and limitations should be carefully considered when faced with the decision of using these new technologies for the care of a particular patient.

4. Conclusion

Isolated retropharyngeal lymph node thyroid carcinoma metastases may be evaluated by TO-US, particularly when surgeon-performed, and may be safely and successfully excised with a TORS approach with minimal short or long-term morbidity. This approach may be especially useful in the setting of a previously operated or irradiated patient or when traditional approaches represent a comparatively extensive procedure for isolated retropharyngeal disease.

REFERENCES

[1] McCormack KR, Sheline GE. Retropharyngeal spread of carcinoma of the thyroid. Cancer 1970;26:1366–9.

[2] Robbins KT, Woodson GE. Thyroid carcinoma presenting as a parapharyngeal mass. Head Neck Surg 1985;7:434–6.

[3] DiLeo MD, Baker KB, Deschler DG, et al. Metastatic papillary thyroid carcinoma presenting as a retropharyngeal mass. Am J Otolaryngol 1998;19:404–6.

[4] Aygenc E, Kaymakci M, Karaca C, et al. Papillary thyroid carcinoma metastasis to the parapharyngeal space. Eur Arch Otorhinolaryngol 2002;259:322–4.

[5] Otsuki N, Nishikawa T, Iwae S, et al. Retropharyngeal node metastasis from papillary thyroid carcinoma. Head Neck 2007;29:508–11.

[6] Shellenberger T, Fornage B, Ginsberg L, et al. Transoral resection of thyroid cancer metastasis to lateral retropharyngeal nodes. Head Neck 2007;29:258–66.

[7] Le TD, Cohen JI. Transoral approach to removal of the retropharyngeal lymph nodes in well-differentiated thyroid cancer. Laryngoscope 2007;117:1155–8.

[8] Laccourreye L, Breheret R, Rohmer V, et al. Transoral resection of thyroid cancer metastasis to retropharyngeal lymph node. Ann Otolaryngol Chir Cervicofac 2008;125:309–12.

[9] Ma QD, Grimm K, Paz BI, et al. Transoral surgical approach for retropharyngeal node involvement in I-131-negative 18-fluoro-2-deoxyglucose positron emission tomography-positive recurrent thyroid cancer. Skull Base 2009;19:431–6.

[10] Andrews GA, Kwon M, Clayman G, et al. Technical refinement of ultrasound-guided transoral resection of parapharyngeal/retropharyngeal thyroid carcinoma metastases. Head Neck 2011;33:166–70.

[11] Buttà L, Lombardi D, Marconi A, et al. Transoral excision of a retropharyngeal lymph node under rigid endoscopic control. Ann Otol Rhinol Laryngol 2010;119:211–4.

[12] Byeon HK, Duvvuri U, Kim WS, et al. Transoral robotic retropharyngeal lymph node dissection with or without lateral oropharyngectomy. J Craniofac Surg 2013;24:1156–61.

[13] Moore EJ, Ebrahimi A, Price DL, et al. Retropharyngeal lymph node dissection in oropharyngeal cancer treated with transoral robotic surgery. Laryngoscope 2013;123:1676–81.

[14] O'Malley Jr BW, Quon H, Leonhardt FD, et al. Transoral robotic surgery for parapharyngeal space tumors. ORL J Otorhinolaryngol Relat Spec 2010;72:332–6.

[15] Park YM, De Virgilio A, Kim WS, et al. Parapharyngeal space surgery via a transoral approach using a robotic surgical system: transoral robotic surgery. J Laparoendosc Adv Surg Tech A 2013;23:231–6.

[16] Chan JY, Tsang RK, Eisele DW, et al. Transoral robotic surgery of the parapharyngeal space: a case series and systematic review. Head Neck 2015;37:293–8.

[17] Miyashita T, Tateno A, Ablimit I, et al. Ultrasonographic demonstration of retropharyngeal lymph nodes: preliminary report. Ultrasound Med Biol 2003;29:633–6.

[18] Fornage BD, Edeiken BS, Clayman GL. Use of transoral sonography with an endocavitary transducer in diagnosis, fine-needle aspiration biopsy, and intraoperative localization of retropharyngeal masses. AJR Am J Roentgenol 2014;202:W481–6.

Please cite this article as: Goepfert RP, et al, Trans-oral robotic surgery and surgeon-performed trans-oral ultrasound for intraoperative location..., Am J Otolaryngol–Head and Neck Med and Surg (2015), http://dx.doi.org/10.1016/j.amjoto.2015.04.011

[19] Ryan WR, Orloff LA. Intraoperative tumor localization with surgeon-performed ultrasound-guided needle dye injection. Laryngoscope 2011;121:1651–5.
[20] Weinstein GS, O'Malley Jr BW, Snyder W, et al. Transoral robotic surgery: radical tonsillectomy. Arch Otolaryngol Head Neck Surg 2007;133:1220–6.
[21] Genden EM, Desai S, Sung CK. Transoral robotic surgery for the management of head and neck cancer: a preliminary experience. Head Neck 2009;31:283–9.
[22] Vaiman M, Krakovski D, Gavriel H. Swallowing before and after tonsillectomy as evaluated by surface electromyography. Otolaryngol Head Neck Surg 2007;137:138–45.
[23] Sinclair CF, McColloch NL, Carroll WR, et al. Patient-perceived and objective functional outcomes following transoral robotic surgery for early oropharyngeal carcinoma. Arch Otolaryngol Head Neck Surg 2011;37:1112–6.
[24] Dziegielewski PT, Teknos TN, Durmus K, et al. Transoral robotic surgery for oropharyngeal cancer: long-term quality of life and functional outcomes. JAMA Otolaryngol Head Neck Surg 2013;139:1099–108.
[25] Park YM, Kim WS, Byeon HK, et al. Clinical outcomes of transoral robotic surgery for head and neck tumors. Ann Otol Rhinol Laryngol 2013;122:73–84.
[26] Hutcheson KA, Holsinger FC, Kupferman ME, et al. Functional outcomes after TORS for oropharyngeal cancer: a systematic review. Eur Arch Otorhinolaryngol 2015;272:463–71.
[27] Yasaka M, Kimura K, Otsubo R, et al. Transoral carotid ultrasonography. Stroke 1998;29:1383–8.

Please cite this article as: Goepfert RP, et al, Trans-oral robotic surgery and surgeon-performed trans-oral ultrasound for intraoperative location..., Am J Otolaryngol–Head and Neck Med and Surg (2015), http://dx.doi.org/10.1016/j.amjoto.2015.04.011