Transoral robotic selective neck dissection for papillary thyroid carcinoma: Dissection of Levels III and IV

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Abstract
We present the operative procedure of transoral robotic selective neck dissection for papillary thyroid carcinoma. A 28-year-old woman, diagnosed with papillary thyroid carcinoma and lymph node metastasis at right level IV, underwent total thyroidectomy, central neck dissection, and selective neck dissection involving levels III and IV via the transoral robotic approach. A 1.5-2-cm central incision was made near the base of the lower lip frenulum, and two lateral incisions were made close to the oral commissure. An additional right axillary port was made to place a third robotic instrument for countertraction. The operation was completed successfully without conversion to the conventional transcervical approach. The working space and surgical view were enough to perform selective neck dissection of levels III and IV. There were no major postoperative complications. Transoral robotic selective neck dissection of levels III and IV is feasible and safe in selected patients.

KEYWORDS
remote-access thyroidectomy, robotic thyroidectomy, selective neck dissection, thyroid cancer, transoral thyroidectomy

1 | INTRODUCTION

Recently, transoral robotic or endoscopic thyroidectomies have gained popularity and interest and been adopted by many surgeons worldwide. The surgical morbidity for creating the working space is less invasive by the aforementioned approach than that by other remote-access approaches. The postoperative cosmetic outcomes of the transoral approach may be potentially superior to those of other remote-access approaches because it leaves no cutaneous scar, except for a small axillary incision if indicated. Furthermore, the transoral approach has the advantage of being fit for use in performing bilateral total thyroidectomy and central neck dissection.

Transoral thyroidectomy is feasible and safe in properly selected patients. However, unusual complications such as mental nerve injury, CO₂ embolism, surgical site infection, skin burns, and trauma have been documented in the literature. Our previous studies have shown that the surgical outcomes of transoral thyroidectomy are comparable to those of the conventional transcervical approach.

After becoming familiar with the procedure, we expanded the transoral robotic approach to selective neck dissection (SND) for papillary thyroid carcinoma (PTC) with clinically positive lymph nodes at the lateral compartment.

Here, we describe the novel surgical procedure of transoral robotic SND for PTC (Video S1). The patient was a 28-year-old woman diagnosed with incidentally found subcentimeter PTCs of both lobes. A small suspicious lymph node at right level IV was noted on ultrasonography. Fine needle aspiration cytology confirmed metastatic papillary carcinoma at the suspicious right
level IV lymph node. Hence, she underwent total thyroidectomy, bilateral central neck dissection, and SND of right levels III and IV via the transoral robotic approach. Written informed consent was obtained from the patient for publication.

2 | OPERATIVE TECHNIQUE

The patient is placed in a supine position, and the neck is extended with the help of a shoulder pillow. General anesthesia is induced with orotracheal intubation using a nerve monitoring tube. The oral cavity is disinfected with povidone solution, and skin preparation and draping are performed in the usual manner.

A 1.5-2-cm central incision is made near the base of the lower lip frenulum, and two lateral incisions are made close to the oral commissure to avoid injuring the mental nerve. After creating the central mucosal incision, dissection is performed using monopolar electrocautery and clamps to the chin over the periosteum of the mandible and extended to the submental area. Blunt dissection of the submental area is performed with a Hegar dilator in the midline and on both sides of the midline in a fan-like shape. A 12-mm trocar for an endoscope is inserted, and carbon dioxide is insufflated at 5-6 mmHg pressure. The lateral mucosal incisions are made, and 5 mL epinephrine diluted in saline (1:400 000) is injected over the periosteum of the mandible with a Veress needle syringe for hydrodissection. Two trocars are inserted through the lateral oral vestibular incisions on either side of the endoscope. When inserting the two lateral trocars, care is taken not to perforate facial skin because the skin and soft tissue are very thin.

After inserting the three trocars, a 30° endoscope is inserted centrally. Then, laparoscopic dissectors and a hook bovie are inserted through the lateral trocars. The exact plane of the subplatysmal layer is identified in the submental area, and the skin flap is elevated through the plane of the subplatysmal layer using laparoscopic dissectors and a hook bovie. After the elevation of the skin flap, a da Vinci Si surgical system (Intuitive Surgical, Inc., Sunnyvale, California) is placed and docked on the left lateral side of the patient. A dual-channel 30° endoscope is placed face-down in the center of the oral port, and two robotic instruments, either monopolar scissors or Maryland forceps, are placed on either side of the endoscope. After docking the da Vinci robot, the elevation of the skin flap is continued inferiorly to the level of the sternal notch and clavicle and laterally to the lateral border of the sternocleidomastoid (SCM) muscle (Figure 1). Upon creating sufficient working space, a 1-cm incision is made in the right axillary fossa and a long robotic cannula is inserted. A third robotic instrument, such as Cardinal forceps, is inserted through the right axillary port.

The midline fascia between the strap muscles is divided, and the sternohyoid and sternothyroid muscles are dissected to expose the thyroid gland. Finally, total thyroidectomy and bilateral central neck dissection is performed.6,7

After completion of the total thyroidectomy and central neck dissection, lateral SND is begun. The fascia
between the strap muscles and the SCM muscle is dissected to expose the internal jugular vein medially in levels III and IV using harmonic curved shears (Figure 2). An external hanging suture is applied to retract the SCM muscle for better exposure. The omohyoid muscle is cut, and the lymph nodes and fibrofatty tissues are dissected in levels III and IV. (Figure 3).

The cervical plexus nerves are preserved if possible. The transverse cervical artery is preserved (Figure 4), and the phrenic nerve, which passes under the deep cervical fascia, is carefully preserved (Figure 5). Care is taken to avoid injury to the right lymphatic duct in the lower part of level IV. After completing SND including in levels III and IV (Figure 6), the resected specimen is extracted in a plastic bag via the axillary port. The drain is placed through the axillary incision. The oral vestibular mucosal incisions and the axillary incision are closed.
3 | RESULTS

The operation was completed successfully without conversion to the conventional transcervical approach. The working space and surgical view were sufficient to perform total thyroidectomy and SND for levels III and IV. The total operative time was 295 minutes, and the operating time for selective neck dissection was 55 minutes. The numbers of harvested lymph nodes were 12 and 29 in the central and lateral compartments, respectively. The numbers of metastatic lymph nodes were 6 and 1 in the central and lateral compartments, respectively. There were no major postoperative complications such as recurrent laryngeal nerve palsy, hypoparathyroidism, hematoma, seroma, mental nerve injury, surgical site infection, CO₂ embolism, and chyle leakage.

4 | DISCUSSION

In order to avoid a long transverse incision in the lower neck area or a hockey stick incision needed for SND in PTC, we perform remote-access approaches such as the gasless trans-axillary or postauricular facelift approaches for SND. Additionally, we introduced the novel transoral robotic approach for SND after familiarizing ourselves with the transoral approach for thyroidectomy and central neck dissection. As shown in this case, the transoral robotic approach is feasible for SND of levels III and IV. The dissection of level V is also possible if indicated. However, the dissection of level II lymph nodes is difficult owing to the inadequate axis of surgical view and the instruments. The transoral approach is performed in the midline region in a superior-to-inferior direction. Therefore, it is difficult to reach the level II area using this approach.

Sometimes intraoperative conversion to a conventional approach might be necessary during transoral robotic SND. The criteria for conversion to conventional transcervical approach include uncontrollable intraoperative bleeding or inability to eradicate the metastatic lymph nodes. It is challenging to remove all metastatic lymph nodes if it is located in a hard-to-reach area (eg, high-level II or level I area) or there is an invasion of the surrounding structures.

The optimal extent of therapeutic lateral neck dissection for PTC remains a subject of debate. The dissection of level I is usually not recommended in PTC because of the rarity of metastatic nodes at level I. Metastasis of PTC into the lateral compartment occurs generally in levels II through V, while levels III or IV nodes are consistently the most frequently involved. Therefore, some authors recommended comprehensive neck dissection including levels II to V for complete clearance of lateral neck metastasis. However, the question of whether or not to routinely dissect levels V and II arises, considering the relatively lower metastatic rates and potential morbidities associated with injury to the spinal accessory nerve. Super-selective neck dissection of levels III and IV or single-level SND is also suggested for PTC patients with small single-level metastatic lymph nodes in levels III or IV because the surgical morbidity is minimal without compromising the oncologic outcomes and the metastatic rates of levels II or V are relatively low.

To the best of our knowledge, this is the first video demonstration of transoral robotic SND for PTC. The ideal indications of transoral robotic selective neck dissection are differentiated thyroid carcinoma with single-level small lymph node metastases in levels III or IV without invasion of the surrounding structures.

5 | CONCLUSION

Transoral robotic SND of levels III and IV is technically feasible and safe in highly selected patients. Further studies with larger sample sizes and long-term follow-ups are necessary to determine the surgical outcomes and oncologic safety of this procedure.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

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