Utilizing Trans-Oral Robotic Surgery (TORS) in head and neck malignancy – is it practical in oropharyngeal squamous cell carcinoma (OPSCC)?

A case report

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ABSTRACT

Introduction: Oropharyngeal squamous cell carcinoma (OPSCC) is often managed by multimodal methods, including open surgical resection and reconstruction in advanced cases. Trans-oral Robotic Surgery (TORS) was introduced to minimize and avoid complications caused by the open surgery method and chemo-radiation therapy in treating oropharyngeal squamous cell carcinoma (OPSCC). In Malaysia, TORS is still a new, rare, and limited surgical technique practiced in our healthcare system. Case Presentation: We present a case of the base of tongue lesion which presented with chronic globus sensation for four months associated with chronic dysphagia and cough. Endoscopy examination revealed a lobulated mass situated at the left side base of the tongue. Contrast Enhanced Computed Tomography (CECT) of the neck revealed an enhancing lesion at the same site. There were multiple subcentimeter cervical lymph nodes bilaterally from level II to level V. The patient underwent a TORS procedure using the da Vinci Surgery System for incisional biopsy. By using TORS, we were able to obtain a good tumor sample including the margins for the biopsy. Histopathology examination (HPE) of the sample reported moderate to poorly differentiated squamous cell carcinoma. Based on the HPE and CECT results, the patient was diagnosed with oropharyngeal squamous cell carcinoma (OPSCC) with a clinical stage of T3N2cMx. Conclusion: Management strategies for patients with OPSCC continue to evolve to minimize the morbidities and complications of treatments. Minimally invasive surgical techniques such as TORS offer impressive functional and oncologic outcomes particularly for patients (therapeutic function) compared to the traditional method of treatments.

Keywords: robotic surgery, TORS, head and neck cancer.


INTRODUCTION

Worldwide, head and neck squamous cell carcinoma (HNSCC) is the 6th common malignancy with an estimation of around 500,000 new cases diagnosed annually.1,2 Historically, OPSCC was attributed to exposure to tobacco and alcohol.3 In recent decades, oropharyngeal squamous cell carcinoma (OPSCC) as part of HNSCC is seen to be rising in numbers, especially in younger groups of populations.4,5 More than 50% of cases of newly diagnosed OPSCC are related to positive HPV infection mainly affecting the younger age group without a history of smoking or consuming alcohol.1,6 The increased incidence of OPSCC is contributed by the epidemic increase in the incidence of Human Papillomavirus (HPV) infection.1,3,5 From 1995 to 2012, HPV-positive OPSCC incidences have escalated regardless of gender, race, and nations.5 Historically, the treatment of early-stage OPSCC was multimodal, involving transoral surgery, trans-oral laser surgery, or chemo-radiation (CRT).7 In the advanced stage OPSCC was treated with open surgical resection, and reconstruction and followed with or without adjuvant radiotherapy (RT).8 These open approaches to the oropharynx required mandibulotomy or pharyngotomy with a trans mandibular or trans pharyngeal approach.9 Although surgery is effective in locoregional control, it is known to be associated with multiple complications which subsequently lead to morbidity.1,2,6 The complications occur from 10% up to 60%.2,8

Open surgical techniques such as mandibulotomy and mandibulectomy have been seen to be associated with speech and swallowing impairment, malocclusion, temporomandibular joint pain, and cosmetic deformities.1,9 Other methods such as pharyngotomy, transoral oropharynx ectomy, or transcervical trans pharyngeal require tissue flap reconstruction and tracheostomy for airway management.7 In 1991, Veterans Affairs Laryngeal Cancer Study Group proposed a more conservative organ preservation method in the treatment of OPSCC, by introducing chemoradiation therapy (CRT).1,6-8 In 2002, a meta-analysis study showed that there were similar outcomes in survival and functional aspects, as well as disease
control rates between open surgery followed by RT and CRT.\(^1\),\(^2\),\(^6\) Moreover, CRT surpassed the open surgery technique by eliminating surgical complications and comorbidities.\(^1\),\(^2\),\(^10\) These outcomes have helped the primary nonsurgical approach become more widely used for OPSCC patients.\(^3\),\(^4\)

Unfortunately, CRT also gives rise to certain complications on its own, mainly due to the acute and chronic toxicity effects.\(^1\),\(^3\),\(^6\),\(^8\) Osteoradionecrosis, renal failure, neutropenic sepsis, pharyngeal and esophageal scarring/stenosis, xerostomia, muscle fibrosis leading to impaired speech and swallowing function, and development of a second primary malignancy are the side effects caused by CRT.\(^2\),\(^9\) Among these complications, dysphagia is the most common complication arising from CRT.\(^1\),\(^3\),\(^7\),\(^10\) Several reports showed 9% to 30% of patients who received CRT, had to depend on gastrostomy as an alternative feeding route.\(^3\),\(^10\)

Since then, multiple approaches have been proposed with the main aim to reduce the risk of complications either from open surgery technique or CRT. Trials of reducing radiotherapy intensity, and substituting chemotherapy drugs are examples.\(^1\),\(^2\) Trans-oral robotic surgery (TORS), the most recent cutting-edge therapeutic approach, offers outstanding oncologic and functional outcomes while avoiding the morbidities related to open surgery techniques. Patients undergoing TORS had reasonably high health-related quality of life (QOL) scores, with an overall survival rate at 2 years above 80% and a local failure rate of less than 3%. TORS also provides better access to the surgical field enabling surgeons to retrieve good samples for biopsy, tumor resection, and bleeding control. In Malaysia, despite being the latest and rare surgical technique practice in the treatment of OPSCC, the limitation of TORS service in the country has implicated a new paradigm shift in our Otorhinolaryngology services. Thus we present a case of a patient who underwent TORS for a lesion at the base of the tongue.

**CASE PRESENTATION**

This is a case of a 69-year-old gentleman who complained of throat discomfort which was described as a foreign body sensation for four months, in 2021. It was associated with dysphagia, particularly in solid food. The patient also had a chronic cough with clear sputum for three months in the same year. Symptoms were suggestive of laryngopharyngeal reflux (LPR). No earlier or other treatments were sought by the patient.

The patient did not have odynophagia, trismus, hoarseness, aspiration, or drooling of saliva. There was also no history of foreign body ingestion, no ear symptoms such as otalgia, otorrhea, reduced hearing, and no rhinitis symptoms too. The patient has underlying diabetes mellitus, hypertension, and dyslipidemia which were all well-controlled. This patient was a chronic smoker for 40 years. He did not consume alcohol and there was no history of malignancy among his family members.

On physical examination, there was an indurated tissue at the left side of the tongue base. There was no trismus to suggest any involvement of the medial pterygoid muscle and the tongue is also mobile. Both tonsils were normal in structure with grade 1 hypertrophy. There was no other mass in the oral cavity. There was no scar on the neck and no cervical lymph node was palpable during the neck examination. Other examinations of the ear and nose were normal and unremarkable. For exclusion of diagnosis, further investigations were done to rule out the possibility of pulmonary tuberculosis (TB) infection and the results were negative.

We proceeded with an endoscopy examination. Using the 70-degree rigid endoscope, we inspected the oropharynx
and laryngeal area. There was a lobulated mass, situated at the left side base of the tongue with a size of 3 cm without any extension (Figure 1). Other subsites such as vallecular, pyriform fossa, and vocal folds appeared normal. Both vocal folds were mobile symmetrically with an intact airway. The subglottic region was normal and no pooling of saliva was demonstrable.

A contrast-enhanced computed tomography (CECT) of the neck was performed to guide us in further investigation. CECT neck revealed an enhancing mass at the left base of the tongue with the size of 2.7 x 2.0 x 2.1 cm (Figure 2). The lesion partially obliterated the left vallecular and abutted the epiglottis without extension to the mylohyoid and palatine tonsils. The rest of the tongue was normal. No mandibular involvement was seen in the scan. There were multiple subcentimeter cervical lymph nodes bilaterally at level II to level V with the largest of 0.8 cm in size. Nasopharynx and hypopharynx appeared normal.

In September 2021, an incisional biopsy was performed. Instead of using traditional surgical methods, we subjected the patient to undergo an advanced technique. It was by conducting a minimally invasive surgical technique using the da Vinci Surgical system which is a trans-oral robotic surgery (TORS) method (Figures 3-5). With this procedure, an en-bloc tumor sample was able to be taken including the margins for histopathology examination (HPE). The tumor was 6 cm in size (Figure 6).

The HPE was reported as moderate to poorly differentiated squamous cell carcinoma (SCC) with all the margins close to the tumor (less than 5mm). With the diagnosis of oropharyngeal squamous cell carcinoma (OPSCC) clinical staging of T3N2cMx, we planned for magnetic resonance imaging (MRI) to look for any other soft tissue involvement and disease extension, before deciding the definitive treatment for this patient. Postoperatively, the patient was well without any complications and had short admission to the hospital.

DISCUSSION

TORS was first introduced by Dr. Hockstein back in 2005 with the case report of a supraglottic laryngectomy performed in a canine model.1 TORS then underwent further development by Dr. O’Malley and Dr. Weinstein at the University of Pennsylvania.2,3,6,8 Being a minimally invasive surgery method (MIS), TORS provides the advantage of an operation performed through the oral cavity but with low incidences of complications and morbidity.1-3 The United States Food and Drug Administration (FDA) approved TORS for the treatment of head and neck malignancies in December 2009.1,2

Since its development, TORS reduces complications and morbidity by minimizing the risk of severe or life-threatening postoperative bleeding, shorter operative time, and better obtaining a negative margin.1,8 Those are achievable with technical advantages in TORS.1,3,8,11,18,24 First, the movement of the surgeon’s hands is steadied by the movements of the robotic arms equipped with a tremor filter. With the use of this function, parapharyngeal dissections in dangerous locations, like over the internal carotid artery, can be performed with more accuracy. Secondly, visualization was enhanced by the 3D high-definition image. Third, angled scopes enhance visualization and assist the surgeon in navigating the operating room. Fourth, the surgical maneuvers are made more flexible by the articulated robotic arms. Fifth, research has revealed that the learning curve for robotic surgery is more favorable than that of conventional open surgery.8 Moreover, TORS provides great access to the oropharyngeal sub-sites, including the base of the tongue, palatine tonsils, soft palate, and oropharyngeal wall1,3,8,11 making it potentially beneficial for both diagnostic and biopsy purposes in addition to ablative objectives.4

TORS has been used to treat a variety of cancers in a variety of places in the head and neck region, including the larynx, oropharynx, and para pharynx.4 In addition to multiple advantages seen in surgical technique, TORS has also been reported to shorten the length of hospitalization which further reduces hospital expenses.11 Furthermore patients who underwent TORS as primary treatment in OPSCC were also less likely to rely on gastrostomy and tracheostomy tubes.4

As for the survival outcomes, a study by Lörincz et al. reported 88% 2-year disease-free and 80% recurrence-free survival in 50 patients who underwent TORS.13 Moore et al. reported a 3-year overall survival rate of 91% in a case series of 314 TORS patients.14 This high survival rate might be attributed to the ability to achieve negative margins in 98% of their cases.48 Achieving negative margins intraoperatively is an important prognostic factor in transoral surgery for OPSCC.3,4,11 Haughey et al. found that the risk of death increases 2.5-fold to 3.0-fold in patients with positive margins compared to patients with negative margins.3 With TORS, it is easier to achieve 5 mm clear surgical margins in the area of interest, especially in the oropharynx, without requiring mandible split or floor-of-mouth release.3,4 TORS followed by adjuvant CRT, has shown to be beneficial in the disease control of OPSCC.3,7 to minimize or avoid adjuvant treatment in OPSCC that is HPV positive, it is mostly utilized to treat early T class (T1-T2) OPSCC.3,4 With low gastrostomy tube reliance at 6 and 12 months and improved dysphagia scores at 1 year, the functional results for T1-2 OPSCC are favorable.4,6

However, these advantages seem impossible to achieve in patients with HPV-negative OPSCC. They present with large volume, aggressive tumors and it is difficult to maintain functionality with such surgical defects and requires adjuvant therapy.6,10 Early-stage (T1/T2) HPV-negative OPSCC may be treated with TORS, which may assist patients by lowering the postoperative radiation dose and possibly avoiding chemotherapy.6,10 In Malaysia, due to high cost, lack of expertise, and services, TORS practice is still a limitation in our health care.

Both tumor and patient variables are taken into consideration while choosing patients for TORS. TORS is not advised for malignancies that have invaded the bone, encased the carotid artery, or become fixed to the paravertebral musculature.5,9 It is crucial for patients who are candidates for TORS to have adequate exposure, including oral compliance, neck flexibility, mandibular arch width, the presence of mandibular tori, and tongue size.48 TORS provides improved three-
dimensional visualization for manipulation of the oropharynx, allowing the surgeon to gain better access to examine for any hidden lesions that might be missed out and to take a biopsy with sufficient margins. Moreover, better hemostatic security also could be achieved. We believe TORS will be widely applied for the primary treatment of OPSCC as it is proven to be an advantage not only to the surgeon but most important to the patient's well-being and quality of life.

CONCLUSION

TORS is the latest and most advanced method in treating early-stage OPSCC. TORS provides multiple advantages to the surgeon and patients. This subsequently offers better survival and functional outcomes and thus improves the quality of life among OPSCC patients. It can be utilized from obtaining samples through incisional biopsy until the resection of the tumor intraorally. Being a minimally invasive method, TORS is superior compared to the traditional open surgical method or CRT procedure. In our case, we were able to obtain a good biopsy sample, the patient had a short-time surgical procedure, a short duration of hospitalization, and successful tumor resection without any complications.

CONFLICT OF INTEREST

The authors report no conflicts of interest in this work.

AUTHOR CONTRIBUTIONS

All authors contributed to the case report, participated in the drafting, and editing and all authors read and approved the final manuscript.

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ETHICAL STATEMENT / CONSENT

The patient has been informed regarding the purpose and intention of this case report. Assurance was given to the patient that all personal data will be confidential and no liability or claim should be made to the patient. The patient agreed and consented to this case publication.

REFERENCES