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Robotic surgery in Venezuela: the beginning

Alirio Mijares Briñez, Carmen Suárez M, Alexandra Franco, Diana Pérez, Karen Díaz, Neileth Mujica

La Trinidad Teaching Medical Center, Bolivarian Republic of Venezuela

Abstract: Objective: We are going to describe a clinical case of a patient with oropharyngeal squamous cell carcinoma, T.N.M., stage I, who had been through transoral robotic surgery. Clinical Case: The case we are describing is from a 50 years old patient, with oropharyngeal squamous cell carcinoma anatomic site. The right amygdala, was operated by the transoral robotic surgery. The patient evolved satisfactorily. The result of the biopsy was: Squamous cell carcinoma, which was completely resected. Conclusion: The implement of transoral robotic surgery over open surgery with better survival results is actually very important. The transoral robotic surgery has changed the approach for the oropharyngeal cancer, the human papilloma virus is associated to achieve an acceptable oncological results and minimize the functional sequel. The robotic transoral surgery in this patient helped for having a tridimensional vision (3D) of the surgical field and perform a resection with safe oncological margins. Probably the human papilloma virus status will improve in this the patient the prognosis.

Key words: surgery; robotic; oropharyngeal neoplasia; squamous cell carcinoma; human papilloma virus

1 Introduction

Head and neck tumors are the fifth most common type of neoplasia, accounting for 7% of all new cancer cases. Worldwide, there are nearly half a million reported cases of cancer in the oral cavity, oropharynx, hypopharynx, and larynx. In 2010, there were 170 new cases of tumors in these locations, of which 142 (83.5%) were squamous cell carcinomas. By 2020, global figures will double, resulting in nearly 500,000 deaths each year. Habits such as smoking and/or chewing tobacco, as well as human papilloma virus (HPV), are recognized as causal factors of this alarming disease [1]. Compared to HPV-negative oropharyngeal carcinoma, HPV-positive cancers are associated with a more favorable prognosis and significantly better survival outcomes, regardless of their favorable demographic characteristics [2].

Transoral robotic surgery (TORS) accesses areas of the head and neck that would otherwise be difficult to reach. Developed in the early 2000s, the Da Vinci robot has become widely accepted. Since then, TORS has replaced open pharyngeal surgery in many clinical settings. The most common application remains the resection of oropharyngeal tumors that reside predominantly in the tonsil and base of the tongue. Compared to non-surgical strategies for oropharyngeal tumors, TORS achieves equivalent oncological outcomes [3,4]. Transoral surgery with neck dissection is increasingly accepted as a primary treatment modality for early-stage oropharyngeal cancer [3,4].

The experience in Venezuela with the Da Vinci system was described by Ramírez R. in his publication, where patients who underwent surgery between June 2006 and March 2007 were collected, 57 interventions were reported, the highest number corresponding to urological surgeries, including prostatectomy with 37 cases, 10 gastroesophageal junction

surgeries, 4 cholecystectomies, 2 colectomies, 1 partial adrenalectomy, 1 right oophorosalpingectomy, and 2 cardiac surgeries [5]. However, it has not been performed in the country in the area of head and neck oncological surgery.

1.1 Da Vinci System

The Da Vinci system has retained its basic design with three components: the surgeon's console, the patient cart, and the video cart. The patient cart contains the articulated arms on which the instruments are mounted. In the original design, the arms are distributed on the four sides of a central column, on which they can move vertically. The camera arm occupies the central position on the side facing the surgical table. The other three arms support instruments and are numbered 1 to 3. Arm number 3 is located on the side opposite the patient table. In the standard Da Vinci system, the joints are more voluminous, giving it a muscular appearance, but the principle of movement about the remote center is the same as in successive models [6].

The surgeon's console, although with some changes, maintains a similar external appearance between the standard model and the Da Vinci S. However, the patient cart, although with a similar basic design, has a lighter appearance in the Da Vinci S, with more streamlined joints. Among other differences, it can accommodate 5 mm instruments. There is also a 3-arm model, the Da Vinci Si. The S model also introduces high-definition imaging. The Si model maintains the same format as the patient cart, but changes the surgeon's console, adding software improvements and additional features such as the dual console, training consoles, and single-port surgery [6] .

Finally, the Da Vinci Xi retains the external appearance of the surgeon's console, but changes the design of the patient cart, so that the arms no longer articulate around a central column. Instead, the column supports a horizontal telescopic arm at the end of which the four arms are suspended on a rotation axis. In addition to physically facilitating placement on the surgical field, it has powerful equipment assembly assistance systems that auto-configure for the chosen procedure. The design of the forceps has also changed, and the camera, which is much lighter, can be housed in any of the arms [6] .

Robotic surgery is indicated for the resection of primary tumors of the tonsillar cell or base of the tongue that can be classified within the AJCC TNM staging system as T1 or T2. The purpose of this article is to demonstrate that transoral robotic surgery allows procedures to be performed that would otherwise require an open approach, with the advantage of high-definition three-dimensional proximity vision and the dexterity and precision provided by robotic instrumentation. Similarly, in certain situations, the possibility of a robotic approach may involve a change in the management plan from non-surgical to surgical treatment, without altering the final oncological outcome.

2 Clinical case

A 50-year-old female patient with no history of smoking presented with a lesion on her right tonsil. Physical examination revealed a minor lesion measuring less than 2 cm on the right tonsil, which was exophytic, increased in consistency, and extended to the soft palate (Figure 1). No lymph nodes were palpable in the neck. A biopsy was taken, which reported squamous cell carcinoma of the oropharynx, anatomical subsite tonsillar fossa, classified as cT1N0M0.

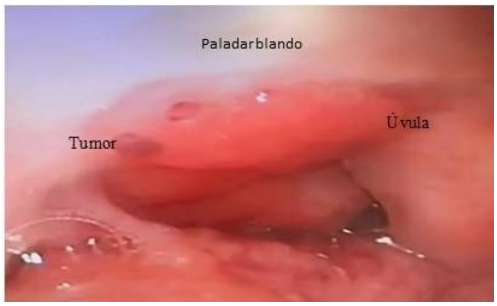


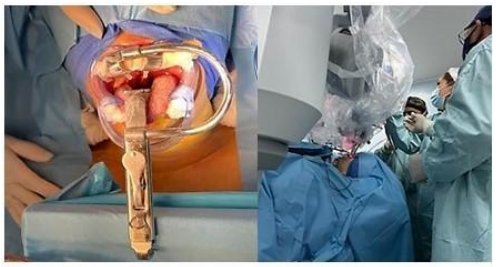
Figure 1. Lesion in the right tonsil - soft palate

2.1 Surgical procedure

It is essential to have a clear plan for the configuration of the operating room. Preparation for surgery begins with the positioning of the surgical cart, console, patient table, and robot. The cart was placed on the right side, the surgeon was positioned at the console, and the robot was placed on the left side of the patient. Space must be left to maneuver the surgical cart, support staff, and instrument carts were located on one side of the patient. The anesthesia machine and the anesthesiologist were at the foot of the patient (Figures 2,3,4).

Figures 2,3,4. Location of the surgical cart, console, and anesthesia machine.

Anesthetic induction should not involve disconnecting/reconnecting intravenous lines, monitoring devices, or the anesthesia circuit, thus avoiding interference with the robotic equipment. With the patient in the supine position, the airway was secured by standard endotracheal intubation and the tube was properly secured. Eye protection was used. A Crowe-Davis retractor was placed in the patient's mouth to achieve surgical exposure, and the three sterile robotic arms were placed in surgical position, with the camera in the midline and the 5 mm instrument trocars on the right and left sides in the articulated arms, which were then controlled by the surgeon from a console in another part of the room (Figures 5,6).



Figures 5,6. Placement of retractor and trocars.

Resection of the tumor was performed with surgical margins. (Figures 7, 8,9).

Figures 7, 8, 9. Surgical findings.

The specimen was sent to pathology for frozen section analysis, and margins were reported free of lesion. The surgery

was completed with a right supraomohyoid neck dissection. The patient was discharged from the center in satisfactory condition. The definitive biopsy reported non-keratinizing squamous cell carcinoma measuring 1.2 cm in its longest diameter, with lesion-free resection margins, no vascular or lymphatic invasion observed, 8 dissected lymph nodes, negative, p16 positive on immunohistochemistry, resulting a pT1N0M0, stage I. The patient progressed satisfactorily (Figures 11,12).

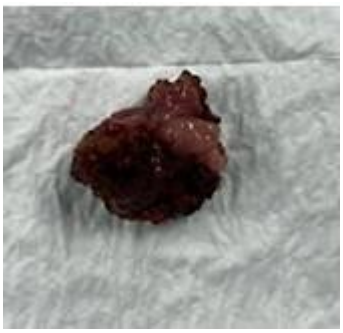
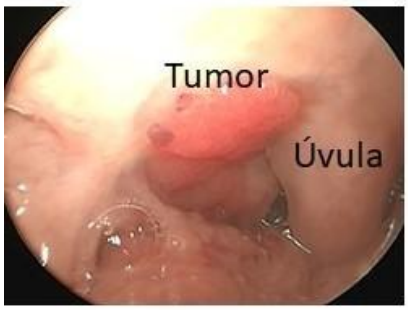


Figure 10. Findings from surgical intervention.



Figures 11,12. Surgical findings.

3 Discussion

Transoral robotic surgery has shifted the focus toward therapy de-escalation for HPV-related oropharyngeal carcinoma in order to achieve acceptable oncological outcomes and minimize functional sequelae. The advent of minimally invasive transoral techniques in robot-assisted surgery expanded the role of surgery for oropharyngeal cancers that had traditionally been treated with chemoradiation or open surgical approaches with comparatively higher morbidity. TORS was approved by the Food and Drug Administration (FDA) for T1/T2 tumors in 2009. Retrospective comparisons of functional outcomes, including swallowing, speech, and long-term dependence on nasogastric tubes, also appear to be favorable. It is very important to obtain good exposure when performing this type of surgery, because the instruments attached to the articulated robotic arms must be moved in a small space. For this reason, prior to surgery, the patient must be assessed to rule out limitations in mouth opening or alterations such as retrognathia and aberrant dentition. The main general contraindications for the use of TORS are: reduced mouth opening and partial visualization of the tumor [2].

The patient presented was evaluated with a diagnosis of oropharyngeal squamous cell carcinoma, anatomical subsite right tonsil, clinical stage I, who on physical examination had good mouth opening and was indicated for TORS. TORS is defined as a surgical procedure performed through the oral cavity using a minimum of three robotic arms and allowing for bimanual tissue manipulation. It was first developed by Yver C et al., who evaluated the feasibility of this technique using the Da Vinci Robotic System [2].

Among the advantages of using TORS is the possibility of multiplanar resection at any angle in a very complex anatomical area, accompanied by magnified 3D vision, with excellent tolerance and minimal pain for the patient [2]. TORS

in this patient allowed for a 3D view of the surgical field and performance of resection with safe oncological margins.

Holcomb et al. evaluated local control in patients with close negative margins compared to those with wider margins. Although there is no data conclusively demonstrating a relationship between defect volume and quality of life, it is logical to assume that a personalized approach with narrower margins, if oncologically safe, could reduce morbidity and improve postoperative function. In addition, there could be a significant functional and financial benefit for patients if radiation could be safely avoided in selected patients with "close" margins [3].

They included patients who underwent modality-alone TORS for HPV-positive tumors at three academic medical centers from 2010 to 2019. Results were compared between patients with narrow surgical margins (<1 mm or requiring resection) and clear margins, including 99 patients (median follow-up 21 months, range 6-121). Final margins were close in 22 (22.2%) patients, clear in 75 (75.8%), and positive in 2 (2.0%). Eight patients (8.1%) recurred, including two local recurrences (2.0%). Four patients died during the study period (4.0%). Local control (P=0.470), disease-free survival (P=0.513), and overall survival (P=0.064) did not differ between patients with narrow and clear margins. Patients with narrow surgical margins after TORS for HPV-positive lesions, without concurrent indications for adjuvant therapy, may be considered for observation only [3]. The patient who underwent surgery presented negative margins for neoplastic lesions, which will improve her disease-free survival.

Chillakuru et al. evaluated differences in survival among patients with oropharyngeal carcinoma treated with TORS vs. non-robotic surgery. It was a retrospective study of patients with HPV-positive and HPV-negative oropharyngeal carcinoma who underwent TORS or non-robotic surgery with neck dissection from 2010 to 2016. 3,167 (58.1%) patients underwent non-robotic surgery and 2,288 (41.9%) underwent TORS. Patients with TORS demonstrated better overall survival than patients with non-robotic surgery (HPV+ patients: P=0.02; HPV- patients: P<0.01). Subsite analysis showed that TORS correlated with better survival in primary tongue base cancers for HPV+ (P=0.01) and HPV- (P=0.01). TORS was associated with better overall survival for HPV+ oropharyngeal carcinoma. and HPV-, as well as with higher overall survival for primary tongue base tumors [7]. HPV status will likely improve the prognosis in this patient.

Implementing TORS over open surgery has become important, as it is associated with better survival outcomes compared to non-robotic surgery on a larger scale. TORS has shifted the focus toward reducing therapy for HPV-related oropharyngeal carcinoma to achieve acceptable oncological outcomes and minimize functional sequelae. TORS in this patient allowed for a three-dimensional (3D) view of the surgical field and resection with safe oncological margins. The HPV status will likely improve the prognosis in this patient.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Cadena E, Guerra R, Pérez-Mitchell C. Cirugía Robótica Transoral (TORS), en el manejo de lesiones neoplásicas de cabeza y cuello. Rev Colombiana Cancerol. 2014;18(3):128-136.

[2] Yver C, Shimunov D, Weinstein G, Rajasekaran K, Cannady S, Lukens J, et al. Oncologic and survival outcomes for resectable locally-advanced HPV-related oropharyngeal cancer treated with transoral robotic surgery. Oral Oncology. 2021;118:105307.

[3] Holcomb A, Herberg M, Strohl M, Ochoa E, Feng A, Abt N, et al. Impact of surgical margins on local control in patients undergoing single-modality transoral robotic surgery for HPV-related oropharyngeal squamous cell carcinoma. Head Neck. 2021;43(8):2434-2444.

[4] Stokes M, Ramadan J, Lawson G, Ferris R, Holsinger F, Turner M. Bleeding complications after Transoral

Robotic Surgery: A Meta Analysis and systematic review. Laryngoscope. 2021; 131(1):95-105.

[5] Ramírez-Lares R. Cirugía mínima invasiva. Cirugía robótica: Reporte de 57 casos, primera experiencia en Caracas, Venezuela. Rev Venez Cir. 2007;60(1):16-20.

[6] Granel J, Gutiérrez R. Libro de Introducción a la Cirugía Robótica en Cabeza y Cuello. Madrid (España): Editorial Amplifon; 2015.

[7] Chillakuru Y, Benito D, Strum D, Mehta V, Saini P, Shim T, et al. Transoral robotic surgery versus non robotic resection of oropharyngeal squamous cell carcinoma. Head Neck. 2021;43(7):2259-2273.