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Robotic surgery in pharyngolaryngeal cancer and sleep apnea syndrome: Our experience

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Abstract

Head and neck cancer is a complex pathology whose incidence has increased in recent years. The primary treatment is surgery, which involves extensive and mutilating interventions through the cervical region, leaving significant anatomofunctional sequelae.

Since 2009, the use of robotic surgery using the Da Vinci® system has been consensus for resecting oropharyngeal and supraglottic tumors through transoral surgery. Subsequently, its utility has also been observed in the surgery of patients with Sleep Apnea Syndrome (SAS).

The advantages of this technique are based on the improved and early recovery of the patients.

This article presents our experience in the management and postoperative care of this surgical technique for both oncological pathology and sleep apnea pathology.

Keywords: Transoral surgery; Robotic surgery; Postoperative recovery; Pharyngolaryngeal cancer; Sleep apnea syndrome.

1. Introduction

Minimally invasive techniques and the application of new technologies have enabled complex procedures to be performed in the head and neck region through natural orifices. Transoral Robotic Surgery (TORS) is the most modern and advanced form of Minimally Invasive Surgery.

TORS has been incorporated into the surgical speciality of Otorhinolaryngology and Head and Neck Surgery because it improves therapeutic outcomes, reduces morbidity, and thereby minimizes sequelae in the treatment of pharyngolaryngeal pathologies, especially oropharyngeal and supraglottic cancer.

TORS offers a minimally invasive approach to benign and malignant lesions by being performed through the oral cavity, improving accessibility and visual control of the intervention compared to conventional open surgery techniques.

In oncological pathologies of the pharyngolarynx, especially in advanced stages, these surgeries can lead to loss of voice, swallowing alterations, a new form of breathing through a tracheostomy, and impairment of taste and smell, resulting in significant psychological impact on patients' social and family life.

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In this regard, TORS minimizes these consequences, achieving a shorter postoperative period and reduced patient discomfort, allowing for voice recovery and improved adaptation to family and social life.

The incidence of head and neck tumors has progressively increased, ranking as the fifth most common neoplasm. Approximately half a million cases of cancer in the oral cavity, oropharynx, hypopharynx, and larynx are reported worldwide (1, 2).

This article describes our experience with this technique and presents it as a fundamental alternative for patients with benign and malignant neoplasms of the upper aerodigestive tract (oral cavity, oropharynx, hypopharynx, and larynx), as well as for those suffering from Snoring and Sleep Apnea disorders.

2. Material and methods

We prospectively studied 70 documented cases in our department from July 2019 to May 2022. Out of these 70 cases, 45 were oncology patients and 25 were patients with Sleep Apnea Syndrome (SAS).

Regarding oncology patients, there were 28 males and 17 females. The age range was between 45 and 75 years. The neoplasia was in the oropharynx in 30 cases, hypopharynx in 9 cases, and larynx (supraglottis) in 6 cases.

The T staging consisted of 28 patients with T1, 14 patients with T2, and 3 patients with T3.

3. Results

sex	age	Location	TNM	TRACH	NGS	complicacions
1	46	orof	T1	0	1	0
1	56	hipof	T1	0	0	0
1	64	orof	T1	0	0	0
1	56	orof	T2	1	1	0
1	70	orof	T2	1	1	0
1	56	orof	T2	1	1	0
1	46	orof	T1	0	1	0
1	60	orof	T3	2	1	1
1	51	larynx	T2	1	1	0
2	45	orof	T1	0	0	0
1	53	orof	T1	0	0	0
1	59	orof	T3	1	1	1
1	46	larynx	T1	0	1	0
2	61	larynx	T2	1	1	0
2	51	orof	T1	0	1	0
2	53	hipof	T1	0	0	0
2	59	orof	T1	0	1	0
1	65	hipof	T2	1	1	1
1	58	orof	T2	1	1	0
2	60	orof	T1	0	1	0
1	67	orof	T1	0	1	0
2	74	orof	T1	0	0	0
1	48	hipof	T2	1	1	0
2	69	orof	T2	1	1	0
2	73	orof	T1	0	0	0
1	68	hipof	T2	1	1	1
1	56	orof	T1	0	1	0
1	65	larynx	T2	1	1	0
2	49	orof	T1	0	0	0
1	49	orof	T1	0	0	0
1	51	hipof	T3	2	1	0
2	54	orof	T1	0	1	0
2	49	orof	T1	0	0	0
1	47	orof	T2	1	1	0
1	45	orof	T1	0	0	0
2	57	orof	T1	0	0	1
1	61	orof	T1	0	1	0
1	64	hipof	T1	0	0	0
1	75	orof	T1	0	1	0
2	45	orof	T1	0	0	0
1	66	orof	T2	1	1	0
2	69	hipof	T1	0	1	0
2	59	larynx	T2	0	1	0
2	45	hipof	T1	0	0	0
1	56	larynx	T1	0	0	0

Figure 1 The oncology patients

Of the oncology patients, 14 required tracheostomy during surgery, with 13 being T2 patients and 1 being a T3 patient. There were 2 patients who already had a pre-existing tracheostomy, both of whom were T3 patients.

sex	age	preAHI	postAHI	difference	NGS	complicacions
1	43	28,2	3,1	25,1	0	0
2	46	31,9	5,4	26,5	0	0
1	35	88	35,5	52,5	1	1
1	49	57,6	29,3	28,3	0	0
1	47	43,3	12,9	30,4	0	0
1	47	49,7	20,2	29,5	0	0
1	53	86,8	40,4	46,4	1	0
1	42	58,9	28,9	30	1	0
1	51	60,5	16,3	44,2	1	0
1	48	38,2	13	25,2	0	0
1	44	65,8	19,1	46,7	1	0
1	48	35,2	9,7	25,5	0	0
1	44	89	39,1	49,9	1	0
1	56	91,3	42,6	48,7	1	1
1	49	46,1	20,4	25,7	0	0
2	57	41,4	17,1	24,3	0	0
1	37	29,9	3	26,9	0	0
1	43	27,7	2,1	25,6	0	0
1	41	38,3	11	27,3	0	0
1	55	34,4	7,3	27,1	0	0
1	33	57,1	21	36,1	0	0
1	50	45,1	15	30,1	0	0
1	53	27,3	2	25,3	0	0
2	58	36,5	10	26,5	0	0
1	40	34,2	5,6	28,6	0	0

Figure 2 The SAS patients

Among these, 28 patients had a nasogastric tube placed in the operating room, corresponding to T2-3 cases.

Postoperative complications included 1 nosocomial pneumonia and 4 hemorrhages (2 from the tonsils and 2 from the base of the tongue), with 2 occurring on the seventh day of the postoperative period.

The postoperative hospitalization ranged from 3 to 11 days, with patients who experienced postoperative complications requiring longer hospitalization (Fig. 1).

Regarding the SAS patients, out of the 25 cases, 3 were females and 22 were males. The age range was between 33 and 58 years. The maximum Apnea-Hypopnea Index (AHI) was 91.3, and the minimum was 25.2.

The improvement in AHI compared to preoperative polysomnography ranged from 25.1 to 52.5.

The hospitalization period ranged from 3 to 10 days, with the longer stays corresponding to patients who had postoperative complications, including 2 cases of postoperative bleeding.

Seven patients required feeding tubes, as these cases had higher AHI, and therefore, the surgery was multilevel (Fig. 2).

4. Discussion

Minimally invasive surgery aims to perform simple or complex procedures through natural orifices. In head and neck surgery, multiple approaches through the oral cavity have emerged using microscopes, endoscopes, and surgical instruments manipulated directly by the surgeon. Even laser techniques have proven useful in these procedures.

One highly useful alternative that has emerged is Transoral Robotic Surgery (TORS), which offers advantages over endoscopic techniques and traditional transoral surgical approaches. TORS is safe, less morbid, and potentially more effective for benign or malignant lesions of the head and neck (3-5).

In oral cavity and oropharyngeal tumors, the risk of internal carotid artery injury is reduced by using the robotic arm in an obtuse angle, and the 3D vision of the base of the tongue allows for control of resection margins. In mobile tongue and floor of mouth tumors, three-dimensional vision reduces damage to adjacent nerves.

In laryngeal tumors, manipulation of the perichondrium of the thyroid cartilage allows patients to have better postoperative swallowing and phonation. Additionally, in the parapharyngeal space, three-dimensional vision allows for control of the carotid artery and the pterygomandibular boundary, avoiding nerve injuries.

Compared to traditional transoral laser microsurgery (TLM) for T1 and T2 oropharyngeal tumors, TORS allows wide resections with surgical safety margins (6, 7).

TORS offers significant advantages, such as rapid oral tolerance in operated patients, with an average of 5-7 days according to the reviewed literature, and improved phonatory recovery. The fast recovery in swallowing is due to the preservation of the constrictor muscles and of the parapharyngeal nerve plexus, reducing dysphagia and bronchoaspirations.

The routine postoperative recommendations for airway management in malignant tumors is the use of tracheostomy, with early decannulation on average at 5.5 days according to the literature, while tracheostomy is avoided whenever possible in benign tumors. In our patients, we have avoided routine tracheostomy whenever possible.

Bleeding has a low incidence, only 5.4% according to the reviewed literature.

In late 2009, the Federal Drug Administration (FDA) approved the use of TORS with the Da Vinci® system for T1 and T2 malignant tumors of the oral cavity, pharynx, and larynx, as well as for benign lesions in the same locations (8).

However, in recent years, indications have expanded to include T3 and T4 tumors with variable N (9).

Furthermore, robot-assisted biopsies of the pharynx in patients with tumors of unknown primary origin can be much more effective than blind random biopsies (10-12).

With complete tumor resection using transoral robotic surgery, the indications for postoperative adjuvant radiotherapy targeting the tumor bed have been reduced.

Postoperative rehabilitation aims to achieve early reintegration of the patient into their normal activities. Therefore, a multidisciplinary team is required, including respiratory therapy, physical therapy, speech therapy, and management of swallowing disorders.

On the other hand, for patients with disproportionate pharyngeal anatomy and Obstructive Sleep Apnea-hypopnea syndrome (OSAHS), robotic surgery is of great utility. Lingual tonsillectomy associated with uvulopalatopharyngoplasty using TORS can be indicated to achieve volumetric reduction (13, 14).

Immediate postoperative care of the patient is important with two objectives: maintaining the airway and initiating feeding. The orotracheal tube is kept in place for 24 to 48 hours to protect the airway from edema or bleeding in the intensive care unit, and nutrition is provided through a flexible feeding tube until the orotracheal tube is removed. Afterward, a soft diet is continued.

The average hospitalization time is 3-7 days, which reduces the hospital stay from 7-10 days compared to conventional surgery.

In cases requiring prolonged ventilatory support, a temporary tracheostomy is left in place for as long as necessary, and for those with prolonged swallowing difficulty, a nasogastric tube should be used for as long as needed (15-17).

5. Conclusions

TORS is a minimally invasive surgery that reduces postoperative pain and minimizes the aesthetic and functional impact on patients by avoiding sequelae caused by resection of structural parts of the pharyngolaryngeal anatomy.

TORS is initially indicated for benign tumors, T1 and T2 carcinomas, and select T3 and T4 tumors. Additionally, it is useful for reducing redundant pharyngeal and tonsillar tissue as well as the base of the tongue in patients with sleep apnea syndrome (SAS).

The advantage of TORS lies in the magnified 3D vision, allowing for multiplanar resection in 360 degrees. To achieve adequate exposure of the operative field, the use of the FK-WO retractor or the LARS20 retractor is recommended.

Furthermore, TORS accelerates postoperative functional recovery, reduces hospitalization time, and minimizes the risk of complications.

Our work demonstrates the reduction of complications and postoperative sequelae, resulting in improved oncological and functional outcomes. Thus, we can demonstrate an improvement in the quality of life for head and neck cancer patients, by accurately assessing their situations, capacities, state, integration, and self-assessment.

Therefore, we recommend TORS for accessing complex areas of the head and neck, such as the pharynx and larynx, in order to address functional and neoplastic pathologies in these areas.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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