

Robotic surgery (da Vinci Xi system) in head and neck cancer – own experience

Authors' Contribution:

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
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ABSTRACT:

Introduction: Patients before 50 years of age with HPV-positive oropharyngeal cancer are characterized by significantly better survival than HPV-negative patients. The consequences of oncological treatment directly affect physiological function of the organs of the upper respiratory tract and, in consequence, the quality of life of these individuals. Therefore, the choice of therapy is of great importance. Minimally invasive surgery offers radical oncological treatment, while preserving the quality of life. The principal surgical methods are transoral access using TLM, electrosurgery and TORS. Radiochemotherapy as primary treatment is equally effective in the first and second stages of clinical advancement of cancer. However, occurrence of late complications such as swallowing, breathing, taste and smell disorders led to a recent re-emergence of minimally invasive surgery, particularly transoral robotic surgery, which has been widely used in head and neck surgery in the United States of America, Asia and Western European countries for more than 20 years. After many years, Poland joined the community of countries where the head and neck interventions are performed using the da Vinci Surgical System.

Objective: The purpose of the work is to present our own experience with the TORS at the Department of the Head and Neck Surgery and Laryngological Oncology of the Poznan University of Medical Sciences and to analyze the latest literature reports on the use of TORS in the treatment of oropharyngeal squamous cell carcinoma.

KEYWORDS:

da Vinci Surgical System, oropharyngeal cancer, robotic surgery

ABBREVIATIONS

FDA – United States Food and Drug Administration

HPV – Human Papillomavirus

TLM – Laser Microsurgery

TORS – Transoral Robotic Surgery

INTRODUCTION

The oropharynx encompasses palatine tonsils, base of tongue, soft palate and the posterior and lateral walls of the oropharynx. The most common malignant tumor in this anatomical area is squamous cell carcinoma. Its development is closely related to cigarette smoking, alcohol consumption and infection of oncogenic HPV types. The latter constitutes the main cause of a gradual increase in the incidence of squamous cell carcinoma of the oropharynx, particularly in young adults (below 45 years) [1]. Notably, epidemiological data from the USA show an increase in the proportion of patients with HPV-dependent carcinoma from 16.3% to 71.7% over 10 years [2].

Several methods such as surgery, radiotherapy and chemotherapy are usually used in oncological treatment of oropharyngeal cancer. Both classical radical surgical procedure with adjuvant radiotherapy as well as primary radiochemotherapy provide good therapeutic effects with comparable 5-year patient survival rates

[3]. Unfortunately, in both cases late complications pose a significant problem, reducing the quality of life of patients. Patients before 50 years of age, both women and men, with HPV-positive oropharyngeal carcinoma have significantly better prognosis than HPV-negative patients (82.4% for 3-year overall survival vs. 57.1% acc. to Ang et al. [4]). The sequelae of oncological treatment directly affect physiological function of the upper respiratory tract organs and patients' quality of life. For this reason, the right choice of therapy is of such a great importance.

Minimally invasive surgery offers radical oncological treatment while preserving the quality of life. The main method of surgical treatment is the transoral access using TLM, electrosurgery and TORS. Radiochemotherapy as a primary treatment method in the first and second stages of clinical advancement of cancer is equally effective, although late complications such as dysphagia, dyspnea, disorders of taste and olfaction led to growing significance of minimally invasive surgery in the recent years. Transoral robotic surgery, which has been widely used in head and neck surgery in the United States of America, Asia and Western Europe for more than 20 years, is particularly popular. After many years, Poland joined the ranks of countries where head and neck surgical interventions are performed using the da Vinci Surgical System.

The aim of this publication is to present our own experience with TORS at the Department of Head and Neck Surgery and Laryngo-

Tab. I. Patients characteristics (Pos. – positive, Neg. – negative, RChT – radiochemotherapy, RT – radiotherapy).

NO.	LOCATION OF PRIMARY TUMOR	SURGICAL PROCEDURE	POSTOPERATIVE - TNM				STAGING (UICC 2018)	GRADING	P16 (IHC)	HPV (ISH)	HOSPITALIZATION (DAYS)	ADJUVANT TREATMENT
			T	N	M							
1	palatine tonsil	partial pharyngectomy, ipsilateral neck dissection	1	2b	0	II	3	Pos.	Neg.	5	RChT	
2	palatine tonsil	partial pharyngectomy	2	0	0	I	3	Pos.	Neg.	7	RChT	
3	palatine tonsil	partial pharyngectomy	1	1	0	I	2	Pos.	Neg.	8	RChT	
4	palatine tonsil	partial pharyngectomy	1	0	0	I	2	Neg.	Neg.	4	Follow-up	
5	epiglottis	epiglottectomy, tracheotomy	1	0	0	I	2	Neg.	Neg.	9	Follow-up	
6	palatine tonsil, base of tongue	partial pharyngectomy	1	2a	0	I	2	Pos.	Neg.	5	RChT	
7	palatine tonsil	partial pharyngectomy, ipsilateral neck dissection, tracheotomy, external carotid artery ligation	2	0	0	II	2	Neg.	Neg.	8	RT	
8	base of tongue	partial pharyngectomy, tracheotomy, external carotid artery ligation	2	0	0	I	2	Pos.	Neg.	7	Follow-up	
9	base of tongue	partial pharyngectomy, ipsilateral neck dissection, tracheotomy, external carotid artery ligation	2	0	0	I	2	Pos.	Neg.	8	RChT	
10	epiglottis	epiglottectomy, ipsilateral neck dissection, tracheotomy	1	0	0	I	1	Neg.	Neg.	11	Follow-up	
11	palatine tonsil	partial pharyngectomy, ipsilateral neck dissection, tracheotomy, external carotid artery ligation	1	0	0	I	2	Neg.	Neg.	6	RT	
12	base of tongue	partial pharyngectomy, ipsilateral neck dissection, tracheotomy, external carotid artery ligation	1	0	0	I	1	Neg.	Neg.	6	Follow-up	
13	epiglottis	epiglottectomy, ipsilateral neck dissection	2	1	0	III	2	Neg.	Neg.	6	RChT	
14	soft palate	partial pharyngectomy	2	0	0	II	2	Neg.	Neg.	5	Follow-up	

logical Oncology of Poznan University of Medical Sciences and to perform an analysis of the latest literature on the use of TORS in the treatment of oropharyngeal squamous cell carcinoma.

TORS (TRANSORAL ROBOTIC SURGERY)

The first application of robotic surgery dates back to 1985 [5]. Twenty years later, in 2005, McLeod and Melder performed marsupialization of a cyst of the epiglottic vallecula using the da Vinci Surgical System [6]. It was the first time ever this technique was applied in surgery of the head and neck. In 2007, a report by Weinstein et al. was published in the English literature describing the results of using TORS in the resection of palatine tonsils [7]. The FDA has accepted the use of TORS in surgery of oropharyngeal cancers as early as in 2009. Since then, indications for TORS in the treatment of squamous cell carcinoma of the head and neck have quickly widened and currently include not only the oropharynx but also the hypopharynx, supraglottis and paralaryngeal spaces. Moreover, aside from transoral surgery, da Vinci System is also used in the surgery of cervical lymph nodes and the thyroid gland. The principal goal of TORS and other minimally invasive surgical

methods is to gain broad view of the surgical field, while minimizing the need for surgical intervention, which significantly reduce patients' quality of life, such as tracheotomy, pharyngectomy or free-lobe reconstruction.

In view of rapid development of minimally invasive surgery of the head and neck cancers, Rich et al. described eight factors (the eight Ts), which thorough analysis before TLM or TORS qualification allows to estimate the quality of endoscopic field access [8]. In case of TORS, additional exclusion criteria are present, e.g. pathological obesity, micrognathism, microstomy or anatomical abnormalities of face, which may hinder the view [9, 10]. High safety and effectiveness of robotic surgery in the treatment of head and neck cancers has been repeatedly emphasized in the world literature. Unfortunately, at the moment the results of long-term observational studies are not available. Moreover, there is a small number of reliable randomized studies comparing the effectiveness of TORS to treatment with radiochemotherapy or open surgery.

Although robotic surgery can be used to treat head and neck cancers at various locations, the majority of data relates to the oropharynx. Initially, only patients in early stages of tumor advance-

ment were qualified for robotic surgery. Currently, the da Vinci System is also used for minimally invasive surgery in patients with T3 and T4a tumors [10], which is a natural consequence of the objective of organ protection and maintenance of high quality of life in treated patients. Moreover, latest literature data report that the effectiveness of TORS in the treatment of oropharyngeal squamous cell carcinoma is comparable with the results of treatment using open surgical techniques or radiochemotherapy [11]. Therefore, 5-year survival free of locoregional recurrence is estimated at 92% and overall survival is 86% [12]. Furthermore, Almeida et al., in multicentre study that included 410 patients with T1 and T2 oropharyngeal cancer treated surgically with robotic techniques, demonstrated 3-year disease-free survival of 92.5%, which is comparable to radiotherapy [13]. Despite the growing popularity of robotic surgery in the treatment of oropharyngeal squamous cell carcinoma we cannot diminish its limitations. Transoral robotic surgery is primarily meant for stage I and II cancers. Despite extensive surgical experience and the preservation of oncological clearness, patients often require adjuvant radiotherapy. The latest literature reports speak of the so-called short adjuvant radiotherapy – 30 Gy [14]. Like any other surgical method, TORS also is not free of early and late complications, bleeding being the most common [15]. Depending on their intensity and the location they require different interventions, from the vessel ligation to embolization and tracheotomy.

TORS – OWN EXPERIENCES

The first two head and neck cancer robotic operations were carried out at the Department of Head and Neck Surgery and Laryngological Oncology of Poznan University of Medical Sciences on 27.03.2019. The da Vinci Xi System was used. In total, 14 patients were referred for treatment with TORS from March to August 2019.

In any case, the qualification for robotic surgery was preceded by a thorough interview and physical examination as well as an in-depth analysis of the medical records. In order to rule out the spread of cancer, 18F-FDG-PET/CT was also recommended. Patients were informed about the innovative nature of this method in Poland, the risk of complications and other therapeutic options.

MATERIAL AND METHODS

The TORS technique was applied in 5 women and 9 men. The youngest patient was 43 and the oldest 78 years old. The median age of patients was 53.7 years. The primary tumor involved palatine tonsil (n = 5), epiglottis (n = 3), palatine tonsils and base of the tongue (n = 2), tongue base (n = 3) and soft palate (n = 1) (Tab. I.) presents a summary of surgical procedures performed. Squamous cell carcinoma was diagnosed in each case. Routine immunohistochemical tests confirmed the p16+ status in 6 patients (43%). In-

terestingly, the result of HPV PCR was negative in each of those cases. According to the TNM classification (UICC 8 edition), the majority of subjects had stage I cancer (n = 9), 4 had stage II and one had stage III (Tab. I.). Elective neck dissection was performed in 7 cases due to the high risk of regional disease. The decision to perform tracheotomy was made in 7 patients. In any case, the intervention was elective and was largely dictated by patients' comorbidities and, therefore, high risk of pulmonary complications. External cervical artery was ligated above the origin of superior thyroid artery in 5 patients before robotic surgery (Tab. I.).

THE EFFECTIVENESS OF TORS AT THE DEPARTMENT OF HEAD AND NECK SURGERY AND LARYNGOLOGICAL ONCOLOGY

Counting from the date of surgery, the average duration of hospitalization amounted to 6.78 days. The longest follow up involved patients who had undergone simultaneous neck dissection and/or tracheotomy. None of the patients suffered from surgical site infection in the postoperative period. Standard perioperative antibiotic therapy was administered according to the recommendations at the Greater Poland Cancer Centre.

After obtaining the final result of the histopathological examination, in line with a decision of the interdisciplinary team, 6 patients were left in follow-up, 2 patients were referred for adjuvant radiotherapy due to narrow surgical margin. The remaining 6 patients were subject to adjuvant radiochemotherapy. Additional qualifying factors included high histological grading of malignancy (G) and histologically confirmed metastases to regional lymph nodes.

CONCLUSIONS

Minimally invasive surgical techniques, primarily robotic surgery, have contributed to changes in the therapeutic management of head and neck cancers, especially of the oropharynx. In view of increased incidence of HPV-dependent oropharyngeal cancer, which most often affects young adults, striving to maintain the best possible quality of life of patients TORS has become an important element in planning of oncological treatment. Multidisciplinary approach, in which TORS plays an important role, will be the future of oncological treatment of head and neck cancers. Development of robotic surgery can be compared to a tsunami. There are centers in the world, especially in the South Korea, whose experience in robotic surgery is spectacular: from primary surgery to salvage surgery in basic locations such as the oropharynx and supraglottis, as well as the neck, thyroid gland, base of the skull and nasopharynx. For 40 years there has been no breakthrough in the treatment of head and neck tumors. Today, the hope for our patients lies in robotic surgery and immunotherapy. Further development of these methods is necessary.

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