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Perioperative Considerations in Transoral Robotic Surgery (TORS): Experience of CHU UCL Namur

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Abstract

Transoral Robotic Surgery (TORS) is an emerging technique for the treatment of head and neck tumors. The aim of this paper is to describe our experience of perioperative considerations. Indeed, TORS is feasible, safe, and both oncologically and functionally effective. However, this technology has certain perioperative implications. We present the experience of anesthesiologists and surgeons over the past ten years with the Da Vinci Surgical System, and strongly recommend assigning a specific medical and paramedical team to shorten the learning curve and manage this innovative surgical technique with confidence and expertise.

Keywords: Anesthesiology; Transoral robotic surgery; TORS; Da Vinci Surgical System; Head and Neck Cancer

Introduction

Over recent decades, minimally invasive surgical procedures have become a major objective in many fields of surgery. In this regard, Transoral Laser Microsurgery (TLM) is now one of the most widely accepted approaches for early laryngeal and pharyngeal cancers, instead of open partial procedures, when surgery is indicated [1,2]. However, TLM has some disadvantages, including operator distance from the surgical field, limited exposure of the laryngoscopes and reduced depth perception with binocular vision [3]. Transoral Robotic Surgery (TORS) has emerged as a novel surgical technique for the resection of head and neck squamous cell carcinoma [4-8]. TORS was first described in the literature in 2006 by Gregory Weinstein's team at the University of Pennsylvania, who performed the procedure on animals, cadavers, and then in clinical [9]. TORS allows a one-bloc transoral resection of the primary tumor with the availability of tissue for margin analysis and pathological staging. It may be performed with less blood loss and fewer complications than standard open techniques, offering reductions in operative time, intensive care stays, and length of hospitalization [10,11]. Many authors suggest that the minimally invasive transoral approach offers significant benefits toward improving patient recuperation and the avoidance of substantial postoperative morbidity [10,12-16]. TORS require a high-definition 3D endoscope and two instrument arms on each side carried by the three arms of the patient cart. Therefore, the Da Vinci docking step requires a large space, occupied by the patient cart that reduces the access for anesthesiologists, nurses and assisting surgeons. The purpose of this report is to review the literature and describe our management of perioperative considerations.

Preoperative Care

Exposure is a key parameter for the success of TORS procedure. During the general anesthesia for direct laryngoscopy, we tried to position the appropriate retractor to verify if the patient is eligible for TORS. In our practice, direct laryngoscopy with biopsies is performed systematically for every patient with a suspected tumor, to assess the extension and have a histological confirmation of the malignant nature of the lesion. Moreover, mouth opening assessment and complete dental checkup is realized in order to prevent unsuccessful exposition or injuries during the main procedure. General preoperative workup with general examination by an anesthesiologist, adequate head and neck imagery (CT, MRI or PET-CT) and fibroscopic examination was also performed in each patient.

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Perioperative Care: Anesthesiologists Considerations

The anesthesiology management during TORS requires specific considerations since access to the upper aerodigestive tract is dramatically reduced and any mobilization of the table contra-indicated during the robotic surgical procedure. Classical Monitoring is used: ECG, noninvasive blood pressure and pulse oximeter, monitoring of neuromuscular blockade, peripheral vein perfusion and invasive blood pressure measurement if required. In our center, muscle relaxation is performed at induction and during the procedure to prevent any movement of the patient. Corticosteroid bolus is also given since the beginning of the surgical procedure in order to anticipate postoperative edema. The patient is placed in supine position. The induction is individualized for each patient with the presence of a specific material for difficult intubation (vigil endoscopy, intubation *via* video-optical systems, using various probes guides, LMA) since many of patients addressed for TORS may present a difficult airway management. Airways are secured with an armed tube. An essential component of this procedure is the ability of the surgeon to have an unobstructed view of the operating field, this is why we used the smallest laser-safe endotracheal tube possible for ventilation (inner diameter: 6 mm; Hi/Lo, Mallinckrodt Medical, Athlone, Ireland). To allow appropriate positioning of the mouth gag and cheek retractor, the tube was not fixed with adhesives but carefully handled by the surgeon. We use an armed endotracheal tube for two major reasons: to avoid compression or twist of the tube by the robot instruments given the lack of tactile sensitivity of the surgeon and possible use of the laser. Safety goggles (EMS Medical Ltd, Gloucester, UK) and lip retractor (Hager & Werken, Duisburg, Germany) are used to protect the patient (Figure 1). About the dental guard, we use a flexible thermoplastic sheet to obtain a protection molding with respect of the patient's anatomy (Aquaplast, 1.6 mm, Advys, Belgium, Figure 2). Indeed, when we're putting it onto hot water, it became flexible, we have just to mold it onto the patient's maxillary and wait 1 min to 3 min to become hard again. Since its use, no dental injuries were observed. Intubation may be nasotracheal especially since the use of Da Vinci Xi with larger arms, in order to create more space in the operative field (Figure 2). It is mandatory to set the operating room to avoid disconnection of IV lines, monitor devices, robotic equipment and anesthesia lines. The anesthesia machine and anesthesiologist are at the patient's foot (Figure 3).

Perioperative Care: Surgeons Considerations

TORS is performed with the Da Vinci Surgical Robotic System (Intuitive Surgical, Sunnyvale, CA). The surgical robotic cart was positioned 30° from the surgical bed on the left side of the patient. It is equipped with a robotic manipulator and four mounted arms. However, we only used three of the robotic arms: One arm held a 0° or 30° endoscope, and the other two held Maryland dissector and Bovie cautery instruments. Instead of the Bovie arm, a subset of tumors is resected utilizing a robotic adapter for CO2 laser fiber (Fiberlase, Lumenis, Santa Clara, CA). Since the first studies initiated by O'Malley et al. [17] on canine and cadaveric models and therefore in patients, different retractors have been used. The choice of retractor and the surgical field exposition are mandatory to achieve primary tumor resection with negative margins and perfect hemostasis in order to avoid post-operative complications. In our institution, intraoral retraction is obtained in all cases using the Laryngeal Advanced Retractor System (LARS) pharyngoscope (Fentex Medical, Neuhausen, Germany; Figure 4). All surgeries are performed by the same surgeon team (G.L., S.V., G.D. and S.H.). These surgeons, as well as the dedicated nurse to robotic surgery in our institution, received a specific training (both theoretical and practical) related to the Da Vinci Surgical System. A dedicated robotic nurse is helpful and time-keeping. Indeed, she coordinates all the different teams, the planning and the availability of the specific material. During the surgery, she's

Figure 1: Double cheek retractor (Hager & Werken, Duisburg, Germany) and eye shields (EMS Medical Ltd, Gloucester, UK).

Figure 2: Double cheek retractor, Dental guard molded into the patient with Thermoplastic device (Aquaplast, Advys, Belgium) and Naso-tracheal intubation.

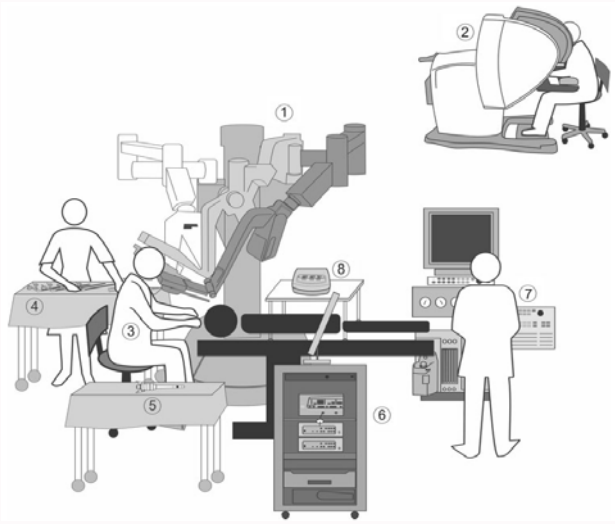

Figure 3: Surgical setting: 1. Da Vinci robot 2. 1st surgeon at the console 3. 2nd surgeon at the patient's head 4. Nurse and the instruments table 5. 2nd table for Da Vinci robot devices 6. Rack for imaging equipment 7. Anesthetist 8. Monopolar/Bipolar cautery [18].

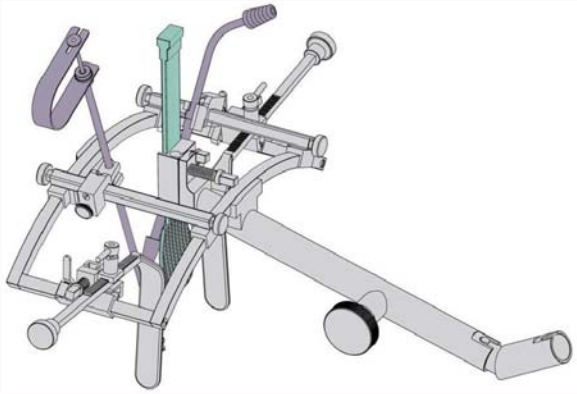

Figure 4: Retractor by Remacle and Lawson, LARS (Fentex Medical, Neuhausen, Germany).

also at the patient's head and provides appropriate surgical support (rinse, aspirate and avoid arm conflict). A well-trained robotic nurse allows us to reduce the surgical time.

Postoperative Care

Extubation are performed the same day or the day after the surgery. Tracheostomy is avoided in almost of cases. All patients with laryngeal or pharyngeal resections are monitored for 24 h in the intensive care unit. Perioperative antibiotics are continued for 24 h and perioperative corticosteroids are continued for 48 h. Patients in whom swallowing difficulties were anticipated had a small nasogastric feeding tube inserted during the surgery. All the patients had intensive swallowing therapy starting on the following day of the surgery under our speech therapist supervision. Patients are kept in the hospital until safe swallow is demonstrated with both solid and liquid diets. Postoperative swallow function is assessed starting on postoperative day 1 with Fiberoptic Endoscopic Evaluation of Swallowing (FEES). Patients without aspiration on FEES are then referred for Modified Barium Swallow Study (MBSS). The demonstration of safe swallow on both modalities allows for advancement of oral diet to solids with thickened liquids followed by thin liquids.

Conclusion

TORS belong to current and future surgical landscape of head and neck surgery. It is feasible, safe, oncologically and functionally efficacious. It facilitates the exposure of surgical sites like the supraglottis, the base of tongue and the pyriform sinuses. It is a valuable technique that requires very well-trained team and specific perioperative considerations. Based on our experience, we strongly recommend a specific training (both theoretical and practical) related to the system for surgeons, nurses and anesthesiologists.

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