

Anesthetic Considerations for Transoral Robotic Surgery

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- TORS • Transoral robotic surgery • Head and neck cancer
- Tonsil cancer • Larynx cancer • Da Vinci surgical system

During the past decade, robotic surgery has been progressively incorporated into the mainstream of cardio-thoracic and abdomino-pelvic surgery. With the recent US Food and Drug Administration (FDA) approval of transoral robotic surgery (TORS) for the treatment of all benign tumors and select malignant tumors of the head and neck, robotic surgery has established its place in otolaryngologic surgery. Given the multi-specialty applications and widespread use of robotic surgery, there exists a need for anesthesiologists to familiarize themselves with robotic surgery. This article focuses on TORS and the goal of which is to provide the anesthesiologist with a foundation for caring for the TORS patient in the perioperative period.

TRANSORAL ROBOTIC SURGERY

TORS is a minimally invasive surgical technique, first developed by Weinstein and O'Malley.¹⁻⁷ Through their early investigations of feasibility using the daVinci Surgical Robot (Intuitive Surgical, Sunnyvale, CA, USA), they found that TORS was most effective if performed through mouth gags rather than traditional laryngoscopes. Further studies of patient safety ultimately led to the first application of TORS in human patients. Currently, TORS is performed by otolaryngologists throughout the United States and the number continues to grow as more and more surgeons become trained in TORS techniques.

TORS with the daVinci Surgical Robot addresses several key challenges inherent to otolaryngologic surgery. Like sternotomies in cardiac surgery and laparotomies in

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urologic surgery, otolaryngologic surgery often mandates surgical exposures that are far greater than the surgical field that the tissues are manipulated within. TORS allows the otolaryngologist true 3-dimensional endoscopic vision of the surgical field with accurate depth perception through the use of multiple endoscopes, cameras, and dual eye pieces. TORS supplants the limited visualization of the 2-dimensional endoscope and line-of-sight microscope. The limitations of traditional laparoscopic and endoscopic instrument manipulation are also improved on in TORS. The robotic system allows multiple degrees of motion (flexion, extension, supination, pronation) and through robotic scaling transforms large movements of the surgeon's hands into small movements of the robotic instruments. The tremor of the human hand is also filtered through the use of a robotic system resulting in smooth bimanual dexterity within the surgical field.⁸ When compared with standard open surgical approaches, TORS offers significant potential benefits to patients. TORS use may avoid a disfiguring mandibulotomy, tracheostomy, and minimize or possibly eliminate the need for chemoradiation therapy. Additionally, decreased blood loss, risk of wound infection, and postoperative pain allows for a shorter recovery time with a quicker return to preoperative speech, swallowing, and quality of life.^{6,7}

PREOPERATIVE ASSESSMENT

The FDA has approved the daVinci surgical system for all benign lesions of the oral cavity, larynx, and pharynx and all T1 and T2 malignancies and has excluded all pediatric disease and lesions that invade the mandible. Dental procedures are also excluded. At the authors' institution, before performing TORS, the patient routinely undergoes panendoscopy (direct laryngoscopy, bronchoscopy, esophagoscopy). During the panendoscopy, TORS feasibility is assessed with regard to surgical exposure. Additionally, the lesion is biopsied for pathologic diagnosis to ensure that the patient meets appropriate surgical indications for TORS. An added benefit of this process is the opportunity for the anesthesiologist to meet the patient in the context of a minimally invasive, brief procedure before undertaking subsequent more invasive procedures. This improves the efficiency of use of time booked with the daVinci robot.

OPERATING ROOM SETUP

The operating surgeon is located at the surgeon's console approximately 10 feet away from the patient (**Fig. 1**). The surgical assistant is located at the patient's head and assists with suction and retraction. The anesthesiologist and anesthesia machine are located at the patient's feet. The nurse and instrument carts are located on the side of the patient opposite the surgeon to minimize obstruction and maximize communication between surgeon, assistant, and anesthesiologist. The daVinci Surgical Robot consists of a master surgeon's console, a surgical cart, and a robotic patient-side cart. The robotic patient-side cart has 3 robotic arms—2 laterally placed arms, which hold instruments, and a centrally placed arm for the endoscopic camera (**Fig. 2**). The 2 instrument arms hold interchangeable instruments with miniaturized versions of standard surgical instruments, such as electrocautery and forceps (**Fig. 3**).

At the beginning of a TORS case, the patient is placed in the supine position and the airway is secured using standard endotracheal intubation. This may be accomplished before or subsequent to rotation of the patient 180 degrees away from the anesthesiologist. Although induction in the rotated position requires planning and assistance, it may significantly reduce induction time, as the patient-side cart can be set up before induction. The patient is then draped in the standard fashion for transoral otolaryngologic surgery. During all TORS cases the patient's eyes are protected using plastic

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