A PILOT STUDY TO EVALUATE THE USE OF THE DA VINCI SURGICAL ROBOTIC SYSTEM IN TRANSORAL SURGERY FOR LESIONS OF THE ORAL CAVITY AND PHARYNX

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Abstract:

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the role of robotic surgery in the head and neck.

OBJECTIVES: The da Vinci Robotic Surgical System (Intuitive Surgical, Inc., Sunnyvale, CA) has been used in many fields with great success including: Urologic, General, Cardiothoracic, and Gynecological surgeries. The same benefits that this method offers to these specialties can be utilized in the realm of the head and neck. The aim of this study is to evaluate the potential advantages of Transoral Robotic Surgical (TORS) specifically looking at precision, dexterity, visualization and exposure of the surgical site, surgical time, recovery of speech and swallowing function, degree of pain and discomfort and incidence of bleeding.

STUDY DESIGN: Prospective Clinical Trial

METHODS: 10 patients with lesions of the oral cavity and pharynx were recruited for this study. The following timing parameters were recorded: 1. intraoperative setup time. 2. Time to obtain surgical bed exposure. 3. The duration of the surgery. 4. Days until swallowing recovery. 5. Days until speech recovery. Additionally, the following parameters were recorded: 1. Quality of surgical bed exposure. 2. Complications. 3. Pain intensity/duration. 4. Operative bleeding. 5. Postoperative Bleeding.

RESULTS:

All ten surgeries were performed between June 2007 and October 2008. The intraoperative setup time was generally less than 45 min, the major part being less than 30 min. Minimal time (less than 4 min) was required in order to obtain an excellent surgical exposure in all cases. The duration of the surgery was less than 95 min with a maximum of blood loss of 100 milliliters. There were no intraoperative or postoperative complications and speech and swallowing recovery generally did not exceed 2 days. There was minimal postoperative pain and residual bleeding. CONCLUSIONS: The Da Vinci robotic system is a safe and reliable instrument for transoral removal of lesions in the oral cavity and pharynx. Our study supports this conclusion with minimal time to speech and swallowing recovery after surgery, along with reduced postoperative pain and absence of complications in our patients.

Introduction:

The trend toward minimally invasive surgery over the last twenty years has led to the development and mastery of endoscopic and laparoscopic surgical techniques. Recently, robot-assisted surgery has evolved as an adjunct to both open and endoscopic procedures. Surgical robots are now approved by the FDA for a variety of thoracic, abdominal, and pelvic surgical procedures. The da Vinci system designed by Intuitive Surgical Corporation (Sunnyvale, CA, USA) is the first robotic device to be approved by the FDA for general surgery (1). However, the device is not approved for use in the head and neck. The role of a surgical robot in pharyngeal and microlaryngeal surgical procedures and specific situations to which it may apply have not been identified (2).

Materials/Methods:

Da Vinci Robotic System

The da Vinci Surgical Robot (Intuitive Surgical Inc., Sunnyvale, CA) was used for transoral robotic surgery (TORS) on 10 patients with lesions of the oral cavity and pharynx. This device consists of three major integrated sub-systems: 1. Endoscopic Instrument Control System, from where the surgeon remotely operates. 2. The Stereoview Endoscopic System which consists of a stereo endoscope, endoscopic camera, and various accessories including a light source and light guides which provide a three-dimensional image to the surgeon at the console. 3. Endoscopic Instruments which have the ability to convey movements similar to those of the human wrist including yaw, pitch, rotation, and insertion/withdrawal.

Data Collected Per Intraoperatively:

1. Duration of robot setup
2. Time to obtain adequate surgical bed exposure
3. Adequacy of surgical bed exposure and visualization
4. Overall duration of the surgery (in minutes)
5. Intraoperative bleeding (estimated blood loss in ml)
6. Complications (injured teeth, laceration of the mucosa, etc.)

Data Collected 3 months Postoperatively:

1. Length of hospital stay
2. Days to swallowing and speech recovery (after surgery)
3. Duration and intensity of pain on a subjective 10-grade scale
4. Bleeding
5. Cosmetic defects

Discussion:

We are currently in an era of accelerating change in operating room technology. These changes are being propelled by quantum advances in computer, information, and robotic technology. The primary objective in developing robotic devices at this stage is not to replace the technical work of the surgeons. Rather, the objective is to help surgeons perform difficult tasks more accurately, and repetitive tasks more precisely (1). Surgical robots allow for an increased freedom of movement of endoscopic instruments, including simulated flexion, extension, pronation, and supination of instruments at their distal tips. This has great implications, especially for lesions of the pharynx and larynx, where surgical incisions and dissections with mandibulotomy or pharyngotomy are required to adequately gain access to base of tongue neoplasms even in the early stages (3). They also allow for scaling of movement, translating large movements of the hands into small movements of the instruments while filtering tremor (4). The Da Vinci Robotic Surgical System (Intuitive Surgical, Inc., Sunnyvale, CA) has been used in many fields with great success including urologic, general, cardiothoracic, and gynecological surgeries. The same advantage this method offers to these specialties should be implemented in the head and neck region as well. Proposed applications for transoral robotic surgery to the field of otolaryngology include radical tonsillectomy, base-of-tongue resection, supraglottic laryngectomy and phonomicrosurgery. Our preliminary results show that the robotic system was a beneficial tool that improved access, access in a more minimally invasive way, without any noted complications. This adds strength to the argument to add this system to the armament of the Otolaryngologist.

Conclusion:

The Da Vinci Surgical Robotic System is a safe, reliable instrument for transoral resection of lesions in the oral cavity, pharynx and larynx and offers a number of compelling advantages over conventional surgery: 1. less invasive than traditional approaches 2. More precise instrument access 3. Excellent three-dimensional visualization. We believe that these benefits translate to both faster recovery times and a more efficient surgical model. Although these results are promising, larger studies are needed to assess true benefit over traditional approaches.

Data Provided:

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<th>Type of Case</th>
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<th>Duration</th>
<th>Surgical Bed Exposure</th>
<th>Length of Stay</th>
<th>EBL</th>
<th>Complications</th>
<th>Speech Recovery</th>
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References: