Da Vinci robot-assisted excision of a vallecular cyst: A case report

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Abstract
The da Vinci Surgical System is a new and exciting entrant into the field of robotic technology. This system is undergoing considerable research and is being practically applied in general surgery, cardiothoracic surgery, urology, and gynecology. We have previously described our experience with the da Vinci system in the laboratory setting, and we have reviewed its potential applications in otolaryngology. Here we present a case report of the first da Vinci–assisted excision of a vallecular cyst in a human. Although we initially encountered some difficulties in the setup, we were able to perform the procedure with moderate ease and without complication. The potential of the da Vinci system in otolaryngology is promising. Further research is needed to explore all of its possible uses in our field.

Introduction
The da Vinci Surgical System (Intuitive Surgical; Sunnyvale, Calif.) is a new and exciting technology that is being studied and applied in general surgery, cardiothoracic surgery, urology, and gynecology.1-3 The da Vinci system features three primary components: a surgical cart, a vision cart, and a surgeon’s console (figure 1). The surgical cart is equipped with a robotic manipulator and three mounted arms; one arm holds a camera and the other two hold 8-mm instruments. The operation is viewed from the vision cart. The surgeon’s console is equipped with an integrated three-dimensional stereoscopic viewer. Visualization is made possible by two three-chip cameras that are mounted within one integrated 12-mm endoscope that has two separate optical channels. The surgeon sits at the control console and views the images obtained by the endoscopic cameras; from there, the surgeon controls the instrument arms and the cameras by maneuvering the “master” robotic manipulators. This “master-slave” setup allows the surgeon to perform surgical manipulations that are more precise than those that can be achieved during conventional endoscopic surgery.

We have previously described our experience with the da Vinci system in the laboratory setting, and we have reviewed its potential applications and use in otolaryngology.4 In this article, we present a case report detailing the first da Vinci–assisted excision of a vallecular cyst in a human.

Case report
A 46-year-old woman presented to our otolaryngology clinic with a 3- to 4-month history of progressive dysphagia and a sensation of fullness in her throat on swallowing. She denied any history of odynophagia, hoarseness, stridor, or shortness of breath other than mild dyspnea on exertion. Examination by flexible nasopharyngoscopy revealed the presence of a large vallecular cyst. After appropriate counseling, she consented to undergo excision of the lesion under direct laryngoscopy guided by the da Vinci system.

The patient was placed in the supine position on the operating table, and general endotracheal anesthesia was induced. The operating table was then rotated 90°, and the surgical cart was maneuvered into place with its base on the patient’s right side (figure 2). The endoscopic arm was affixed to a suspension stand while a round-tip cautery instrument was set up in the system in the laboratory did facilitate this process somewhat.

Direct laryngoscopy was performed with a slotted laryngoscope, and the vallecular cyst was visualized. No other lesions were identified. The laryngoscope was affixed to a suspension stand while a round-tip cautery instrument was
placed in the right arm of the surgical cart and brought into place (figure 3). An olive-tip suction was used manually by the assisting surgeon in order to provide tissue retraction and suctioning of smoke and cyst debris. The other instrument arm was not used because the space in which to work intraorally was limited. The vallecular cyst was marsupialized with the round-tip cautery under three-dimensional stereoscopic vision (figure 4). Inspissated mucoid debris was suctioned from the cyst and biopsies of the cyst wall were sent for analysis. Adequate hemostasis was achieved with 0.05% oxymetazoline-soaked pledgets. The patient was then removed from suspension and extubated without complication. She recovered in the postanesthesia care unit and was discharged home later that day.

Discussion

Efforts to devise less invasive and less morbid surgical procedures and a need to re-create the true open surgical experience paved the way for the development and application of robotic and computer-assisted systems in surgery. Methods such as the da Vinci system have been shown to facilitate and improve the performance of endoscopic surgery in numerous fields. They provide surgeons with the ability to use open surgical movements and techniques while maintaining the benefits of access through keyhole incisions.

The da Vinci unit is equipped with unique articulating EndoWrist instruments that provide a total of seven degrees of freedom, thus allowing surgeons to make open surgi-
Although movements in a confined operative field. Additional benefits include (1) three-dimensional viewing of the operative field with superb depth perception attributable to the coaxial alignment of the eyes, hands, and tool-tip image, (2) motion scaling, and (3) tremor filtering. All of these features increase surgical precision.1,4

Despite the many developments that have significantly advanced endoscopic surgery, otolaryngologic endoscopy remains encumbered by anatomic constraints and by the limited degree of instrumentational freedom. These drawbacks have hindered our ability to fully exploit endoscopic surgical techniques in otolaryngology. The introduction of surgical robotics may help overcome many of these limitations. Our previous experience with the da Vinci system in porcine and cadaveric models demonstrated its feasibility for use in the airway.4

Even so, we discovered that the system has several shortcomings of its own, namely the large size of the instrumentation and the difficulty of the setup process for airway surgery. The total operating time in this case was 1 hour and 49 minutes. However, the first 1 hour and 15 minutes was spent on the setup process; the actual surgical procedure itself took approximately 30 minutes. We also encountered difficulty in using all three arms of the surgical unit; because intraoral working space is so limited, we were able to use only two of the three arms—one to hold the stereoscope and the other to cauterize the cyst. As a consequence, an assisting surgeon was needed to provide suction and countertraction of tissues. Yet despite these limitations, we were able to successfully marsupialize the vallecular cyst under enhanced stereoscopic vision.

The budding technology of surgical robotics offers the promise of exciting new applications in otolaryngology. Further research is needed to explore its numerous potential applications in our field and to provide data for comparative assessments between this technology and standard techniques.

References