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Transoral robotic assisted resection of the parapharyngeal space

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ABSTRACT: *Background.* Preliminary case series have reported clinical feasibility and safety of a transoral minimally invasive technique to approach parapharyngeal space masses. With the assistance of the surgical robotic system, tumors within the parapharyngeal space can now be excised safely without neck incisions. A detailed technical description is included.

Methods. After developing compressive symptoms from a parapharyngeal space lipomatous tumor, the patient was referred by his primary otolaryngologist because of poor open surgical access to the nasopharyngeal component of the tumor.

Results. Transoral robotic assisted resection of a 54- × 46-mm parapharyngeal space mass was performed, utilizing 97 minutes of robotic surgical time. Pictorial demonstration of the robotic resection is provided.

Conclusion. Parapharyngeal space tumors have traditionally been approached via transcervical skin incisions, typically including blunt dissection from tactile feedback. The transoral robotic approach offers magnified 3D visualization of the parapharyngeal space that allows for complete and safe resection. © 2014 Wiley Periodicals, Inc. *Head Neck* **37:** 273–280, 2015

KEY WORDS: TORS, robot, da Vinci, minimally invasive, tumor, Deep neck space

INTRODUCTION

Tumors within the parapharyngeal space are most commonly benign, typically originating from the salivary gland, neuronal, or adipose tissue.[1] These tumors can demonstrate malignant potential or become symptomatic because of mass effect, which serve as the main indications for surgical excision. However, the parapharyngeal space is tucked between the mandible and pharynx, which presents challenges during surgical exposure. The most common approach to this space is via a transcervical incision,[2] which uses careful dissection superiorly along the course of the pharynx. The transcervical approach though is limited in its ability to expose the superior aspect of the space, and the upper portion of the dissection can be performed without direct visualization. Other surgical techniques, including mandibulotomy[3] and transparotid approaches,[4] are utilized less commonly because of the significant risk of morbidity. Herein, the technical aspects of a novel and minimally invasive approach utilizing the surgical robotic system to access the parapharyngeal space are described along with a representative case report.

CASE REPORT

A medical institutional review board exemption was obtained for this case report.

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Three years before presentation, a 56-year-old man was incidentally found to have a lipomatous tumor of the parapharyngeal space on radiographic evaluation of cervical spinal pain. Given the superior extent of the tumor, the patient was recommended to pursue a course of close observation and defer surgical management. Within the time period leading up to presentation, the tumor progressed in size and the patient began experiencing worsening dysphagia, chronic throat discomfort, and nighttime snoring with sleep apnea. Because of the significant rostral-caudal extent of the mass, the patient was referred to the present institution by his primary otolaryngologist. Representative images from the preoperative MRI scan are displayed in Figure 1. The MRI demonstrated a rostral-caudal diameter of 56 mm and a transverse diameter of 44 mm.

Patient positioning

The patient was induced under general anesthesia utilizing a #6.0 laser-safe endotracheal tube. Laser-safe tubes are used within the present institution for all transoral robotic surgeries to minimal the risk of cautery-related thermal damage (ie, melting of the standard polyvinyl chloride material). The endotracheal tube was then secured to the contralateral cheek skin with silk tape. Nasotracheal intubation can be recommended in similar cases through the contralateral nare; however, oral-tracheal intubation should be considered when laser-safe endotracheal tubes risk nasal trauma. The patient was then rotated 180°, with the feet positioned toward the anesthesia team. The

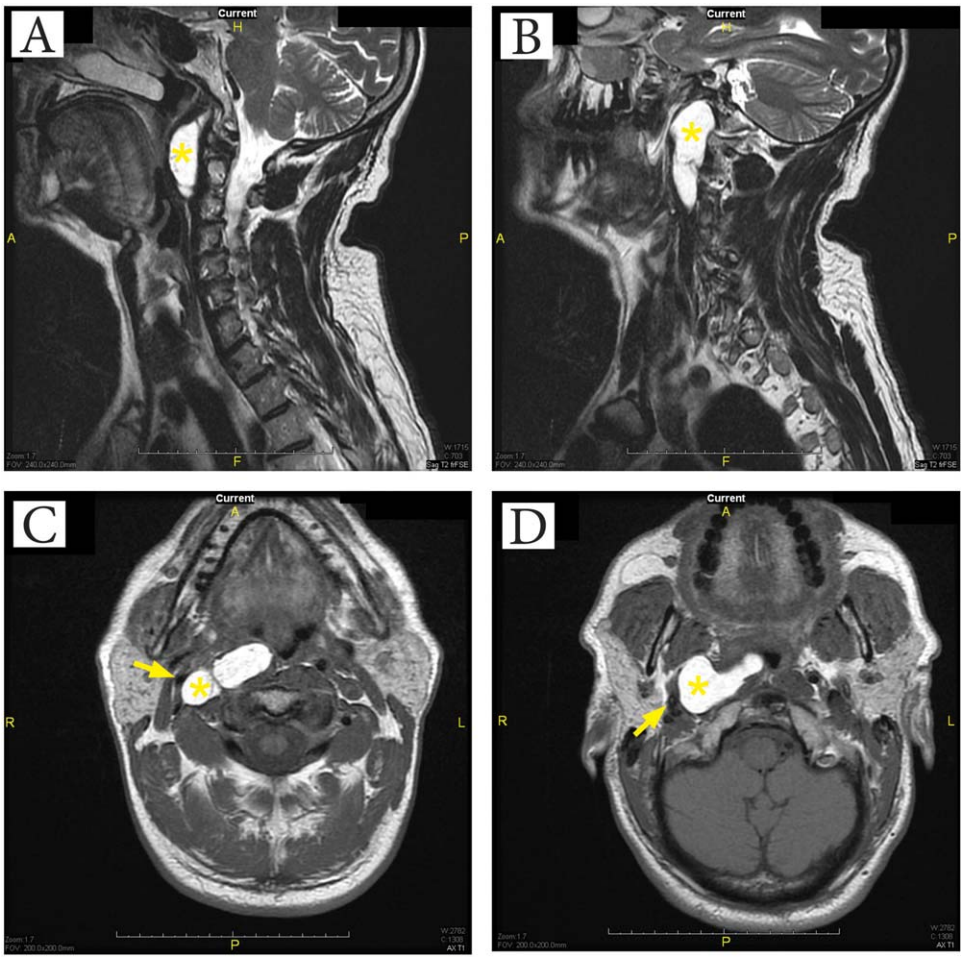

FIGURE 1. Preoperative MRI of the parapharyngeal space mass (*) is seen extending from the level of the nasopharynx to the hyoid bone in the sagittal images (A, B). The relationship between the internal carotid artery (arrow) and the mass (*) is demonstrated on the axial images (C, D).

patient's lips were held in open retraction using a standard dental cheek retractor. Rigid robotic eye-shields were placed. Upper and lower rigid tooth guards were placed. The superior guard protect against incidental dental injury while the inferior guard limits the risk of ventral tongue lacerations from mandibular incisors. A robotic adjustable pharyngoscope was configured to match the patient's anatomy, the present report utilized the LARS pharyngoscope (Fentex Medical, Neuhausen, Germany). A zero-degree endoscopy was performed to ensure adequate exposure.

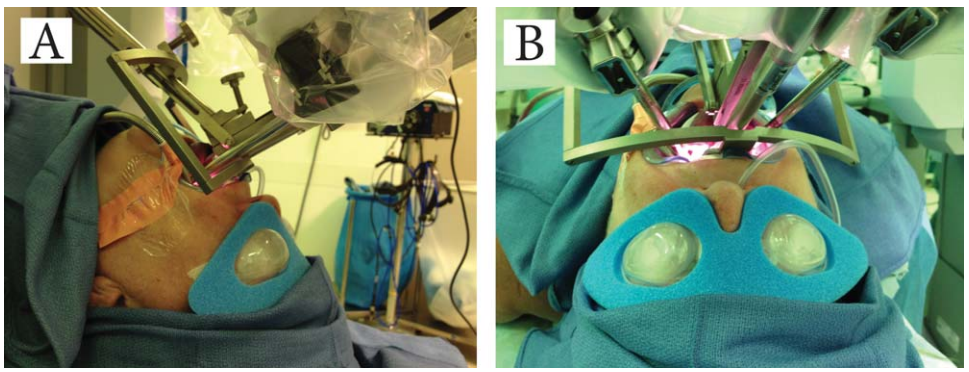

FIGURE 2. Robotic setup. The patient's mouth is held in open retraction with the LARS pharyngoscope. An oral laser-safe endotracheal tube is seen secured to the left oral commissure in the lateral view (A). The flexible nasal suction and robotic rigid eye shields are demonstrated in the frontal view (B).

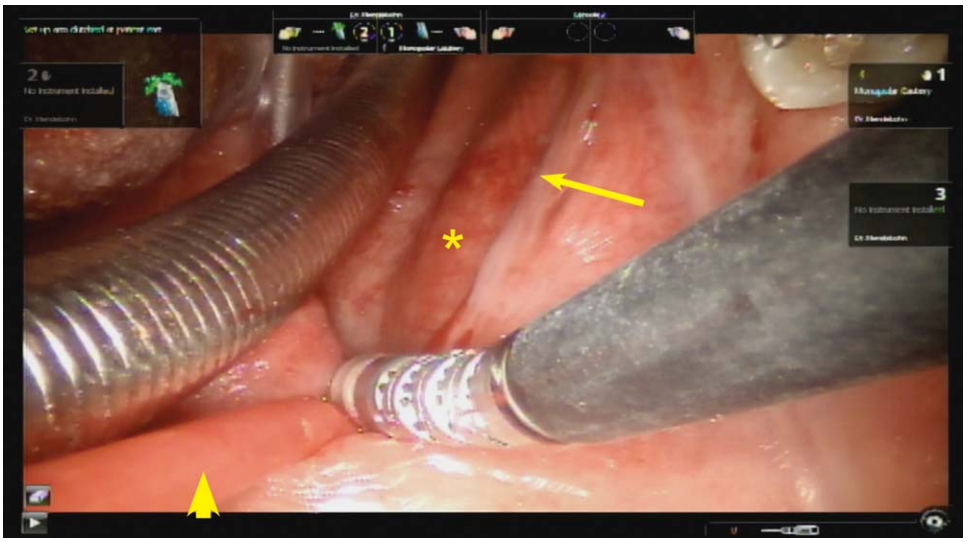

FIGURE 3. Preoperative view. A flexible Red-Robinson catheter (arrowhead) placed through the left nasal cavity is used to retract the soft palate superiorly. The parapharyngeal space mass (*) is seen protruding just posterior to the tonsillar pillar (arrow).

A flexible nasal suction catheter was placed through the contralateral nasal cavity into the pharynx, first described by Georges Lawson, MD (personal verbal communication), which functions as a smoke evacuator and limits the requirement of Yankauer suction by the assistant surgeon. The flexibility of the nasal catheter allows for frequent repositioning of the suction to achieve optimal smoke evacuation. At times, the catheter may be placed within the endoscopic view, just lateral to the point of dissection to maximize its utility. The robotic setup is demonstrated in Figure 2.

A soft Red-Robinson catheter was placed through the ipsilateral nasal cavity and retracted through the oral cavity, which retracts the soft palate superiorly (similar to soft palate retraction during a standard adenoidectomy). The surgical robotic system was then docked parallel to the operating room bed. The present report utilized the Si da Vinci Surgical Robotic System (Intuitive Surgical, Sunnyvale, CA). The surgery began with the 5 mm endowrist instruments: spatula Bovie in the dominant arm and Maryland dissecting forceps in the nondominant arm. The 0-degree 8.5 mm intuitive endoscope was positioned in the camera arm.

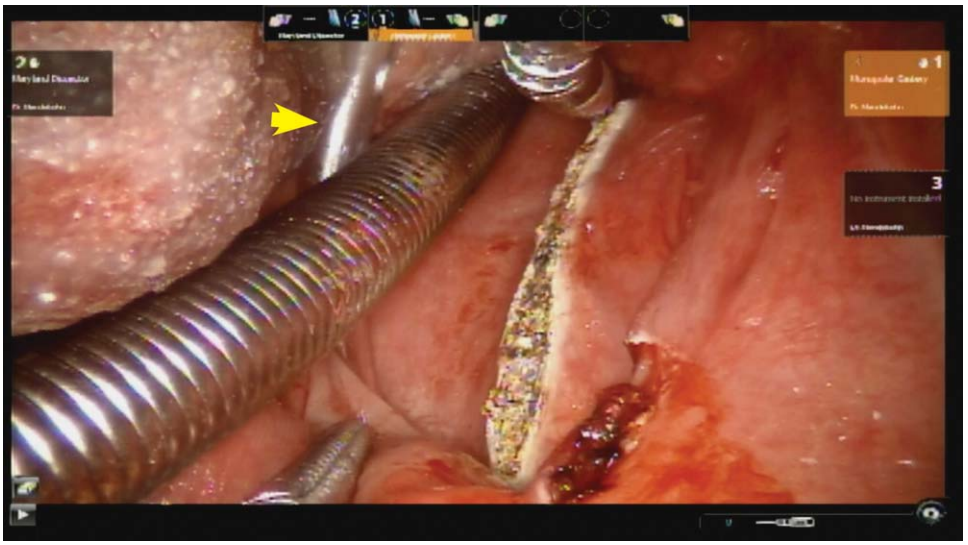

FIGURE 4. Mucosal incision. The 5-mm spatula Bovie is used to make the mucosal incision in a vertical orientation at the medial aspect of the mass. The flexible suction nasal catheter (arrowhead) for smoke evacuation can be seen toward the left. The mucosal incision line is placed, in this case, in a medial position. The position of the incision is a point of discussion. Both laterally positioned incision lines (lateral to palatoglossal fold)[5–7] and medially positioned incisions[8] have been described. The medial incision line was chosen in this case in particular because of the nasopharyngeal extent of the mass and to reduce injury to the lateral pharyngeal musculature, specifically, the palatoglossus muscle. As experience is gathered regarding both medial and lateral approaches, the involved risks of synechia, prolonged dysphagia, or unpredictable scarring, all of which were avoided in this case, may be better quantified. The author recommends the medial approach when nasopharyngeal involvement is encountered, whereas the lateral approach should be taken when the level of the soft palate is the superior extent of the lesion.

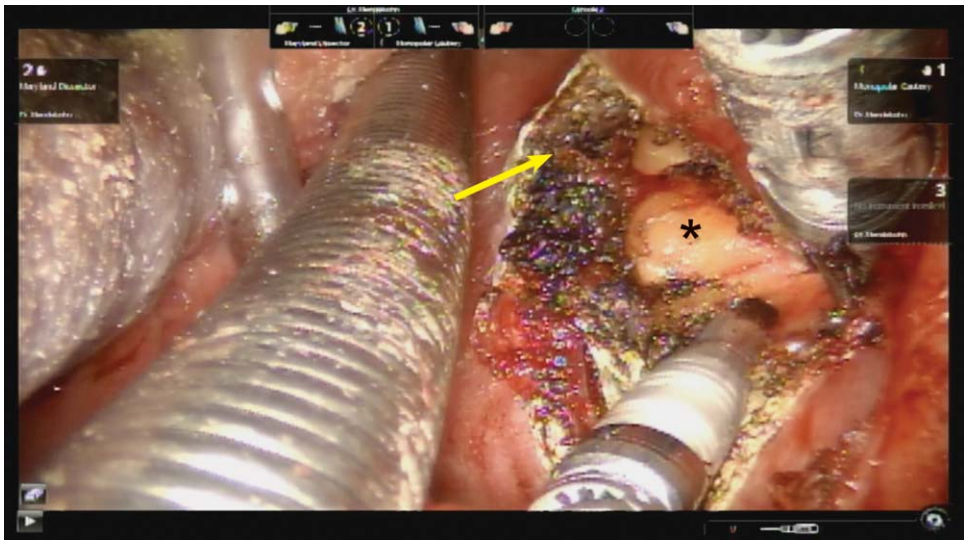

FIGURE 5. Entering the parapharyngeal space. The mucosal incision is carried through the superior and middle constrictor muscle groups (arrow). Immediately deep to the constrictor muscles and the buccopharyngeal fascial layer, the mass (*) is identified filling the parapharyngeal space.

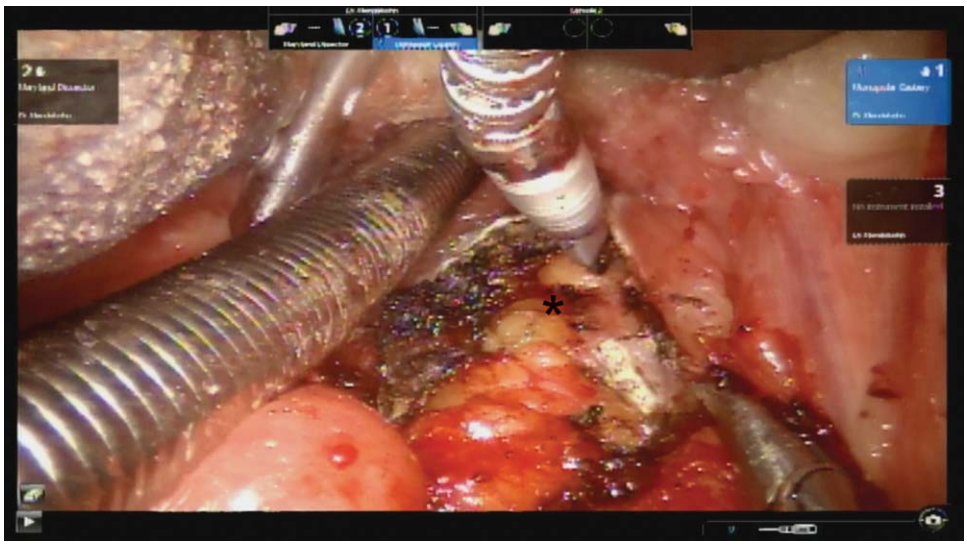

FIGURE 6. Opening the parapharyngeal space. The Bovie is used to extend the depth of dissection from the caudal to rostral position of the mass (*).

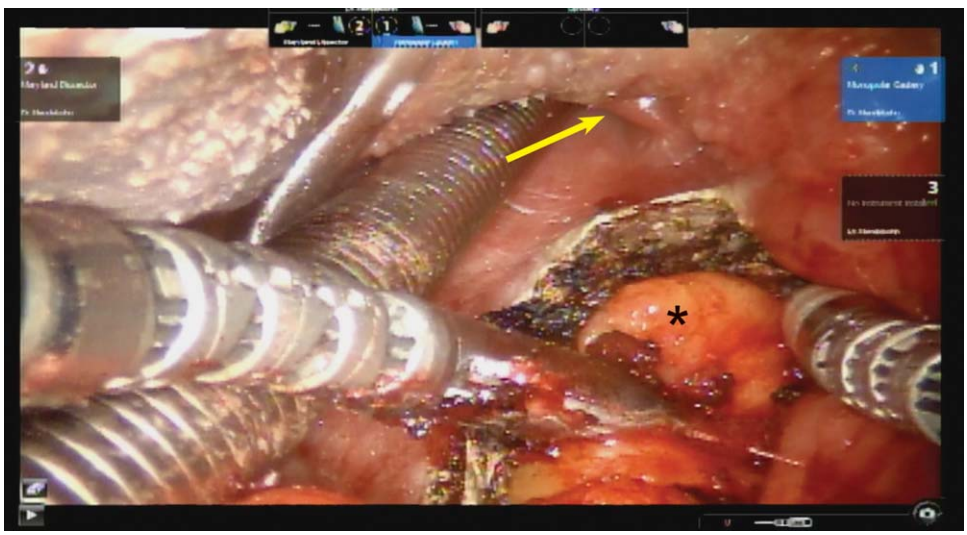

FIGURE 7. Caudal dissection. On the right, the Maryland dissecting forceps gently grasps the mass (*) to tease it superomedially. The Bovie on the left is used as a blunt instrument in a hand-over-hand technique to dissect the mass free. The inferior position is noted at the level of the epiglottis (arrow). Note: Cautery was utilized sparingly at this point in the dissection where the internal carotid artery was in closest approximation to the mass.

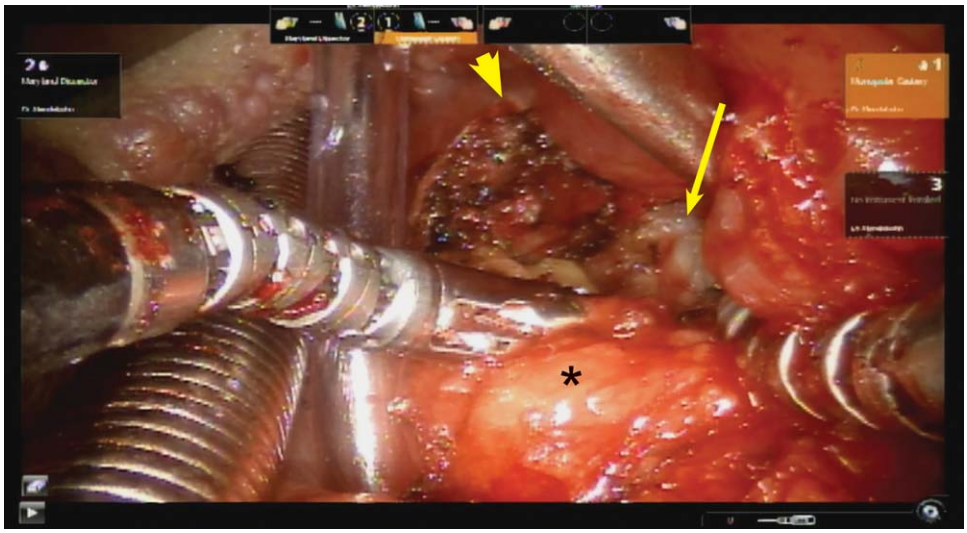

FIGURE 8. Inferolateral extent of dissection. The mass (*) is dissected from its caudal position. The inferior apex of the pharyngeal incision is marked (arrowhead) and is seen just adjacent to the base of tongue. The lateral pharyngeal tissue is retracted by the Yankauer suction to display the white/gray appearance of the tensor- veli palatini-styloid fascia (arrow), separating the prestyloid and poststyloid compartments of the parapharyngeal space.

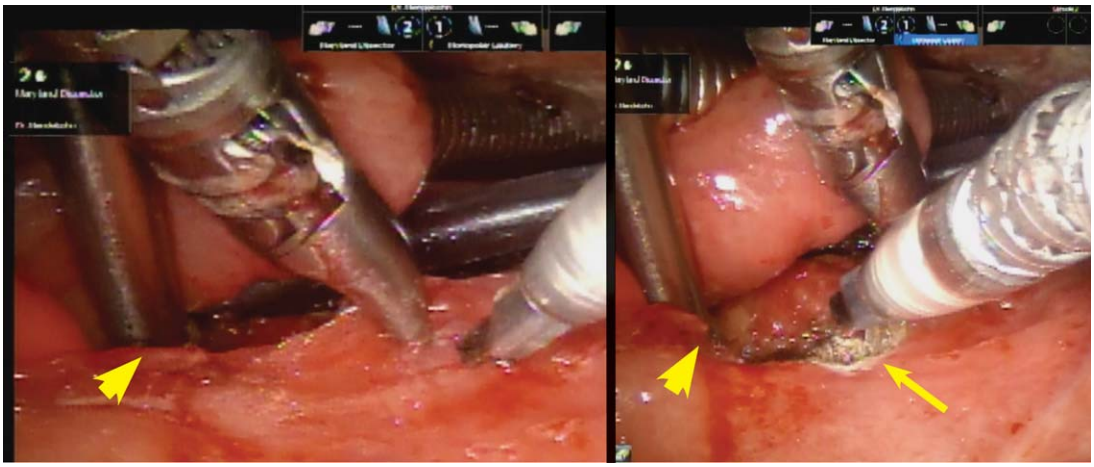

FIGURE 9. Lateral soft palate split. Because of the superior extent of the mass into the nasopharynx, the rostral position of the mass could not be visualized, even with soft palate retraction. Before (left) and after (right) images demonstrate the 7-mm incision in the soft palate. The Bovie is used to make the incision just medial to the base of the uvula (arrowhead). The final extent of the incision is noted (arrow).

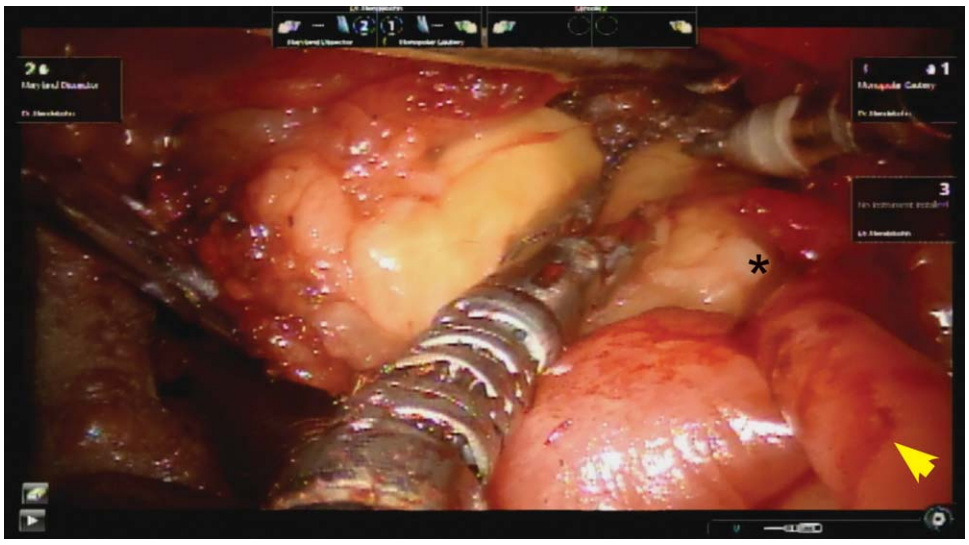

FIGURE 10. Superolateral dissection. The mass continues to be dissected bluntly, here at its rostral extent (*). The visualization in this case was only possible following soft palate split and Red Robinson catheter retraction (arrowhead).

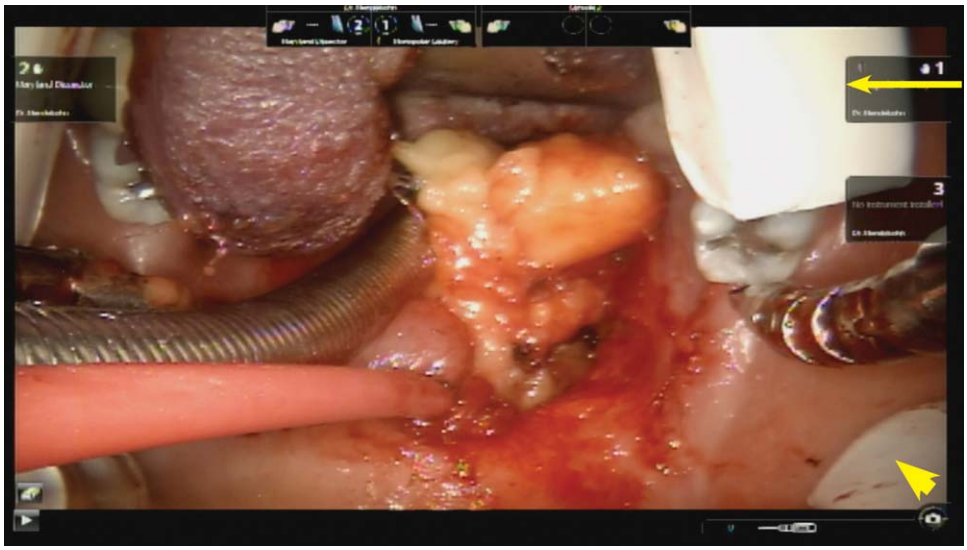

FIGURE 11. Peroral delivery. Once the mass is dissected free, the robotic endoscope is retracted and the mass delivered. The maxillary (arrowhead) and mandibular (arrow) tooth guards are seen here.

Surgical technique

The surgical steps for the robotic-assisted resection of the parapharyngeal space tumor are displayed within Figures 3–15. Total operating room time was 2 hours 52 minutes, with 97 minutes of robotic utilization.

Postoperative course

The patient was extubated without event and was admitted for observation. Oral diet was initiated on postoperative day 1. The surgical drain was removed transnasally 24 hours postoperatively. The oral intake improved on postoperative day 2 and then the patient was discharged home after a 48-hour admission. No intraoperative, perioperative, or postoperative complications were encountered. The patient maintained good outpatient oral intake, but reported mild dysphagia symptoms up to 3 weeks postoperatively. On 12-month follow-up, the patient was asymptomatic without evidence of residual parapharyngeal space mass.

CONCLUSIONS

To date, there have been a few case series[5–7] describing an initial clinical experience with transoral robotic surgical excision of parapharyngeal space tumors. These

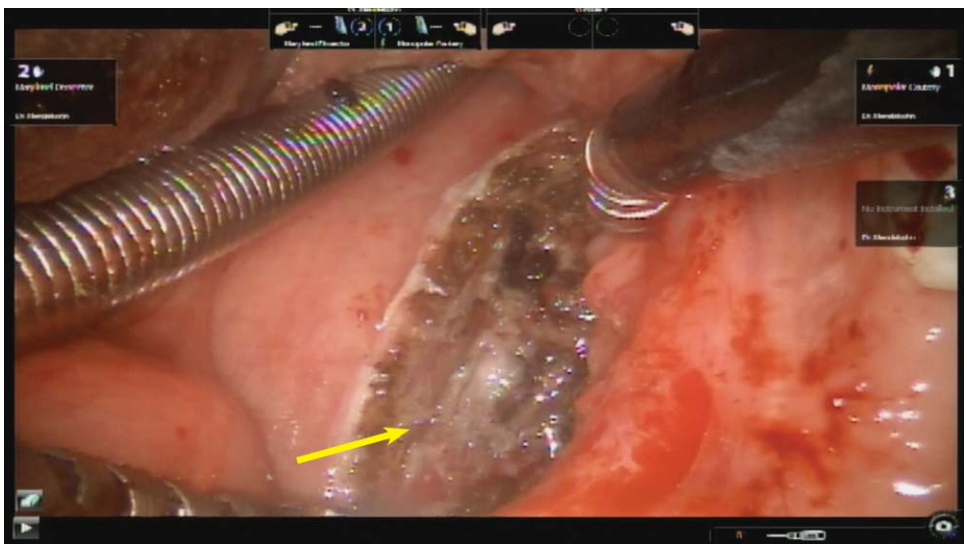

FIGURE 12. Wound inspection. The surgical bed is assessed for any tumor remnants. Small vessels (arrow) are coagulated at this time to minimize the risk of postoperative bleeding.

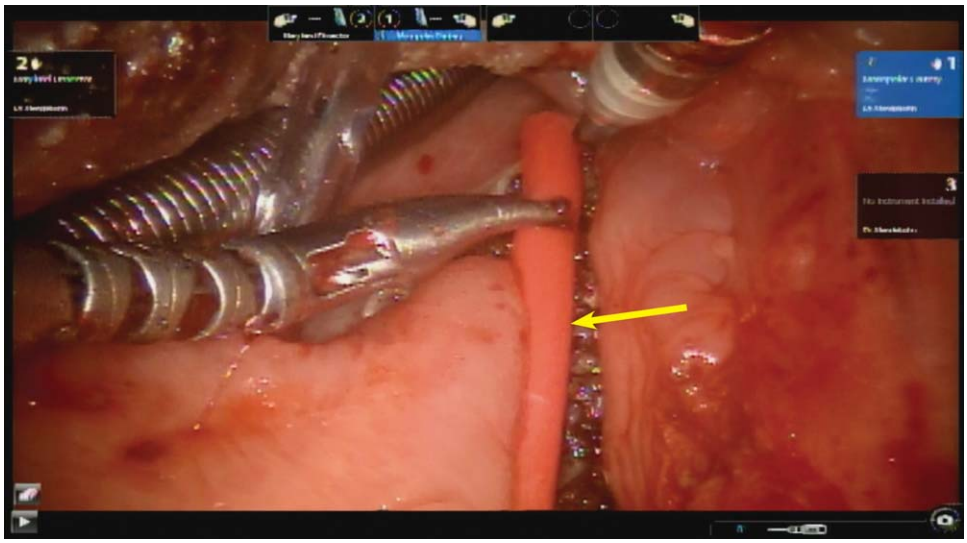

FIGURE 13. Draining the surgical cavity. The decision to drain the wound cavity is made by the operative surgeon based on the risk of seroma formation, and has previously been reported in an alternative placement method.[5] The previously positioned Red Robinson catheter (arrow) is now positioned through the ipsilateral nasal cavity and positioned into the surgical bed with the tip just beyond the caudal extent of the incision to allow for gravity-dependent drainage into the hypopharynx and lateral to the glottis. The proximal edge of the drain is then sutured to the membranous nasal septum for transnasal drain removal.

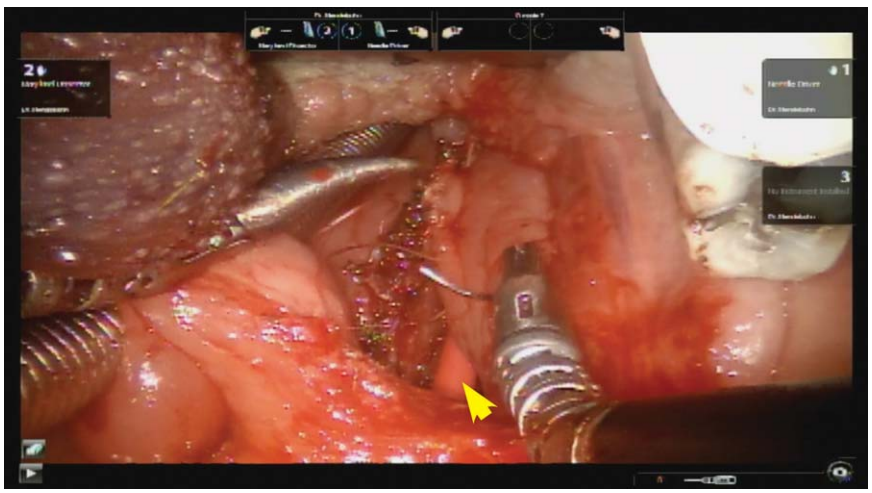

FIGURE 14. Closure. The mucosal edges are approximated over the drain (arrowhead) using 3-0 braided absorbable sutures placed in a horizontal mattress technique. The robotic instruments are utilized to improve visualization of the inferior-most aspect of the wound as well as excellent visualization of the mucosal and muscular layers.

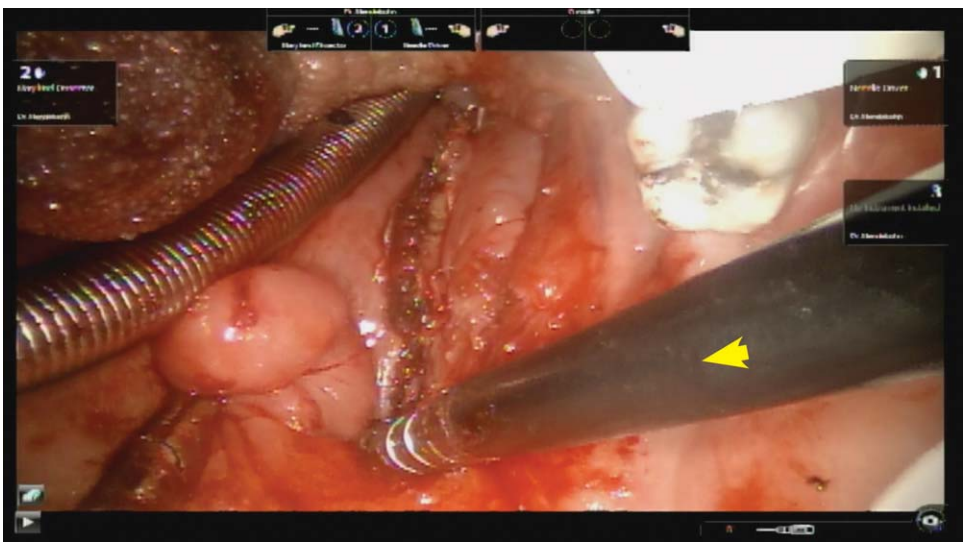

FIGURE 15. Postoperative view. The wound is closed to prevent salivary contamination of the deep neck spaces. The robotic instrument (arrowhead) is positioned within the soft palate split, which is then approximated in layers using 3-0 braided absorbable sutures.

reports have demonstrated feasibility and safety of this approach. This report describes the operative technique involved with the transoral dissection of the parapharyngeal space. Future publications involving clinical outcomes are needed to demonstrate the surgical efficacy of this minimally invasive approach.

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