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Transoral robotic partial glossectomy and supraglottoplasty for obstructive sleep apnea

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The standard treatment for patients with obstructive sleep apnea syndrome is positive airway pressure (PAP) therapy (continuous PAP, bilevel PAP, or auto titrating PAP). Alternative therapies for patients who cannot tolerate PAP therapy include the use of oral appliances or upper airway surgery. The base of tongue plays an important role in this obstruction, and addressing the tongue base surgically can be a challenge for head and neck surgeons. Transoral robotic surgery using the da Vinci Surgical System provides a safe and effective way to approach and manage the base of tongue and supraglottis. Transoral robotic surgery offers clear advantages over alternative endoscopic and open procedures. These advantages include wide-field high-definition 3-dimensional visualization; precise instrumentation; and when compared with open procedures, less operative time, quicker recovery, no external scars, and comparable tissue resection.

Introduction

The base of tongue has been proven to play a significant role in upper airway obstruction in many patients with obstructive sleep apnea (OSA) and is a main reason for failure of palatal procedures performed in isolation. Standard procedures to address the tongue base include maxillary advancement, genioglossal advancement, hyoid suspension, tongue suspension or base of tongue resection performed endoscopically as in a partial midline glossectomy or a tongue base reduction with hyoid epiglottoplasty, and an open procedure described by Chabolle et al.[1] Weinstein and O'Malley pioneered transoral robotic surgery (TORS) using the da Vinci robotic system (Intuitive Surgical; Sunnyvale, CA) for minimally invasive transoral resection of oropharyngeal cancers,[2,3] and in 2009, the Food and Drug Administration (FDA) approved TORS for benign and malignant lesions of the tongue base. This technique was extended to transoral resection of the base of tongue and supraglottoplasty in patients with OSA by Vincini et al,[4] and in 2014, the FDA approved the TORS procedure for resection of benign lesions on the base of the tongue after its safety and feasibility were demonstrated in patients with OSA.[5]

Preoperative selection

This study enrolled all patients who are diagnosed with OSA by polysomnography and in whom the standard treatment for OSA—positive airway pressure (PAP) therapy (continuous PAP [CPAP], bilevel PAP, or auto titrating PAP)—has failed. To be a candidate for transoral robotic

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partial glossectomy, patients should have retrolingual collapse from a prominent base of the tongue or prominent lingual tonsillar tissue or both, as evident on fiberoptic endoscopic examination with Mueller maneuver in the office, or with drug-induced sleep endoscopy. Drug-induced sleep endoscopy can also help identify patients whose obstruction is secondary to epiglottic collapse. Patients who have not tried CPAP or are compliant and well controlled with CPAP should not be considered for surgical intervention. Other contraindications to TORS of the base of the tongue would include patients with small oral cavities, trismus, or limited ability to open the mouth (interincisor distance <2.5 cm). Consideration must also be taken in patients with cervical problems and limited ability to extend the head and neck. Patients with any degree of dysphagia (unless the dysphagia is secondary to lingual tonsillar hypertrophy), swallowing complaints, psychiatric illnesses, or who have an American Society of Anesthesiologists (ASA) score >3 should also not be considered for a robotic partial glossectomy.

Anatomical considerations

One must be familiar with the anatomy of the tongue base, which, when viewed transorally, is quite different from the usual lateral approach most head and neck surgeons are used to. The neurovascular structures are lateral and deep within the tongue musculature; therefore, dissection in the midline involving the intrinsic tongue muscles is safe. The main trunk of the lingual artery, a branch of the external carotid artery, lies on the lateral surface of the genioglossus muscle and is covered by the hyoglossus muscle. The artery runs along the greater cornu of the hyoid bone and then passes below the hyoglossus muscle, where it gives off the dorsal lingual arteries for the tongue base and the deep lingual branches to the body of the tongue. The hypoglossal nerve and vein are more lateral and lie on the external surface of the hyoglossus muscle. The glossopharyngeal nerve runs along the lateral surface of the stylopharyngeus muscle, and at the level of the tongue base, it splits into branches for the tongue base and the tonsillar region, making identification of this nerve much more difficult when viewed transorally.[6]

Operative technique

All procedures are performed under general anesthesia. Patients undergo either orotracheal or nasotracheal intubation. Tracheostomy, often performed in European countries, is usually not required or performed in the United States. Intravenous steroids and a broad-spectrum antibiotic are given. The patient is placed in a "sniffing" position, and the bed is rotated away from the anesthesiologist by 90°-180°. Protective eye goggles and mandibular and maxillary dentition guards are placed. A 0 silk suture is placed in the midline of the tongue to aid in retraction out of the oral cavity (Figure 1). There are several oral retractors that may be used. A commonly used oral retractor is the Feyh-Kastenbauer retractor (Gyrus) (Figures 2 and 3), although the author's preference is a Crowe Davis mouth gag (Karl Storz) with Davis Meyer blades (Figure 4). The Davis Myer blades are flat (no indentation for the endotracheal tube) and have a suction port at the distal tip. The blades come in half sizes, which is helpful. Best exposure is often obtained with a short but wide tongue blade. A retractor holder that attaches to the bed frame is most helpful. The da Vinci robot is docked along the right side of the bed and the arms are loaded with 2 Endowrists measuring 5 mm, a Maryland dissector (Figure 5) is used for grasping and retracting tissue (a Schertel may also be used for retraction; however, I find this to be bulkier and less helpful), and a monopolar cautery is performed with a spatula tip (Figure 6). The center arm is loaded with an 8.5-mm, 30°, high-definition, 3-dimensional (3-D) camera (a 12-mm camera may also be used). The camera provides a very clear and detailed high-definition 3-D image and offers the option of digital zoom. The robotic

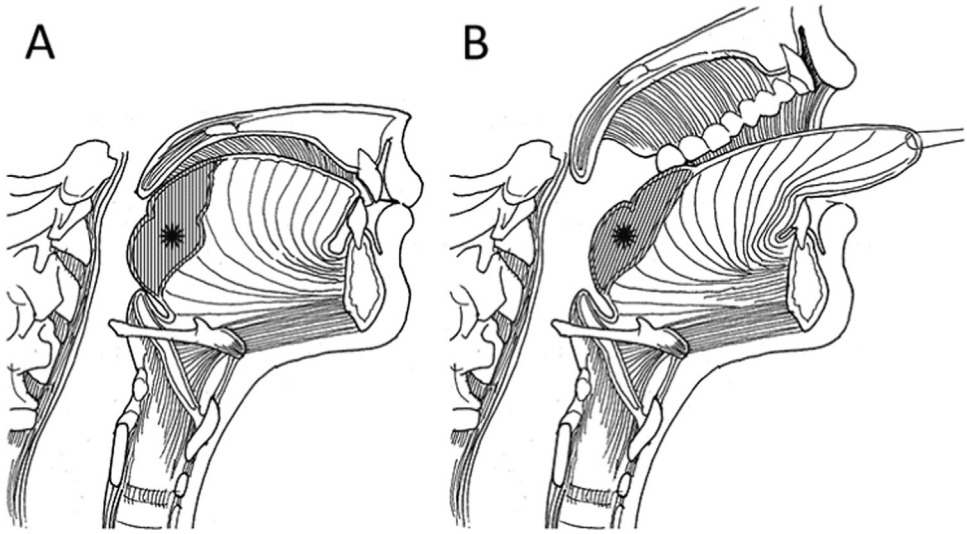

Figure 1 A 0 silk suture is placed in the midline of the tongue to aid in retraction out of the oral cavity. The asterisks show the area of tongue base that should be resected.