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Original Investigation

Safety of Adult Ambulatory Direct Laryngoscopy Revisits and Complications

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IMPORTANCE Direct laryngoscopy, once an inpatient procedure, is now commonly performed in the outpatient setting. To ensure that safety follows the adoption of novel techniques and practice patterns, it is important to analyze the complication and revisit rates of these ambulatory surgery practices.

OBJECTIVE To determine revisit rates and complications after ambulatory adult direct laryngoscopy procedures.

DESIGN, SETTING, AND PARTICIPANTS This was a retrospective cross-sectional analysis of cases of adult patients who had undergone a direct laryngoscopic procedure extracted from multistate ambulatory surgery and hospital databases (State Ambulatory Surgery Databases for New York, Florida, Iowa, and California for 2010 and 2011). The analysis was performed on December 1, 2014. Index cases were linked to the corresponding State Emergency Department Databases and the State Inpatient Databases for visit encounters occurring within a 7-day postoperative window. All index cases were ambulatory surgery, without overnight stay or 23-hour observation.

PARTICIPANTS Adult patients who had undergone a direct laryngoscopy procedure.

EXPOSURES Direct laryngoscopy performed in an ambulatory setting. Patients who underwent flexible laryngoscopy, lesion destruction, laryngectomy, cordectomy, or a secondary nonlaryngoscopy procedure were specifically excluded.

MAIN OUTCOMES AND MEASURES Data regarding sex, age, revisit occurrence with associated complications, and mortality were analyzed.

RESULTS A total of 7743 cases of ambulatory laryngoscopy were identified (mean age, 60.4 years; 61% were male). The 7-day revisit rate was 3.0% (232 revisits). Serious airway complications occurred in 0.27% of cases (n = 21) and accounted for 9.1% of revisits. The rates of other major complications and minor complications were 0.15% (n = 12) and 0.75% (n = 58), respectively. There were no cases of anoxic brain injury. Two deaths occurred at the time of the revisit (7-day mortality rate, 0.03%; 95% CI, 0.01%-0.09%).

CONCLUSIONS AND RELEVANCE Adult ambulatory direct laryngoscopy has a favorable safety profile. Serious airway complications occur in fewer than 3 patients per 1000 cases. The risk of death following outpatient laryngoscopy is extremely low. Outpatient laryngoscopy is not universally suited for all patients, and careful preoperative selection and counseling are imperative.

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Laryngological procedures span a wide array of interventions, from brief diagnostic endoscopy to extensive laryngeal framework and reinnervation procedures. Inherent to procedural laryngology is the manipulation of the upper airway, and accordingly, such practices carry intrinsic risks of airway compromise, which can arise owing to laryngospasm, edema, and bleeding, among other causes.

Laryngology practices have changed over the past several decades as access, visualization, and manipulation of the larynx have become easier, better, and safer. Apart from the surgical realm, there is a growing body of literature describing the feasibility and safety of many office-based laryngology procedures, including diagnostics, vocal cord injection, and laser ablation.¹⁻⁹ In the operating room, direct laryngoscopy practices have benefited from the addition of endoscopic adjuncts, but the fundamental techniques have not changed drastically over the past years. Notably, the perioperative treatment of patients undergoing direct laryngology has experienced a paradigm shift away from reflexive inpatient admission in every case.

We previously evaluated the safety of several common ambulatory surgical procedures in otolaryngology and found favorable complication rates and revisit profiles.¹⁰⁻¹³ As has been described in many other realms of otolaryngology, ambulatory surgery has become the standard of care in many types of laryngology cases. There are selected cases that warrant inpatient observation, but it is not uncommon for laryngoscopy and other laryngeal procedures to be routinely managed on an outpatient basis.

To ensure that safety follows the adoption of novel techniques and practice patterns, it is important to analyze the complication and revisit rates of these ambulatory procedures. This study was aimed at reviewing the safety profile and revisit rates of ambulatory laryngoscopy using a large multistate cohort. Outcomes were critically analyzed with attention to the breadth and severity of complications.

Methods

Cases of adult (>18 years) ambulatory direct laryngoscopy with or without biopsy were extracted from the State Ambulatory Surgery Databases (SASD) for New York, Florida, Iowa, and California for 2010 and 2011. Only isolated laryngoscopy procedures were included. The Current Procedural Terminology (CPT) codes used for data extraction are depicted in **Table 1**. The CPT codes for flexible laryngoscopy, lesion destruction, laryngectomy, and cordectomy were specifically excluded.

Index laryngoscopy cases identified in SASD were tracked into the corresponding State Emergency Department Databases (SEDD) and the State Inpatient Databases (SID) for revisit encounters within a 7-day postoperative window. The CPT codes that were included are listed in **Table 1**. A revisit included inpatient admission or emergency department visit but did not include outpatient clinic encounters. Each revisit has data of *International Classification of Diseases, Ninth Revision (ICD-9)* diagnoses that were made at the time of the encoun-

Table 1. Current Procedural Terminology (CPT) Codes Used for Ambulatory Laryngoscopy Procedures

CPT Code	Description
31525	Laryngoscopy, direct, with or without tracheoscopy; diagnostic, except newborn
31526	Laryngoscopy, direct, with or without tracheoscopy; diagnostic, with operating microscope or telescope
31535	Laryngoscopy, direct, operative, with biopsy
31545	Laryngoscopy, direct, operative, with operating microscope or telescope, with submucosal removal of nonneoplastic lesion(s) of vocal cord; reconstruction with local tissue flap(s)
31546	Laryngoscopy, direct, operative, with operating microscope or telescope, with submucosal removal of nonneoplastic lesion(s) of vocal cord; reconstruction with graft(s) (includes obtaining autograft)
31540	Laryngoscopy, direct, operative, with excision of tumor and/or stripping of vocal cords or epiglottis
31541	Laryngoscopy, direct, operative, with excision of tumor and/or stripping of vocal cords or epiglottis; with operating microscope or telescope

ter. These codes were used to determine reason for revisit and complication rates.

These databases are part of the Healthcare Cost and Utilization Project maintained by the Agency for Healthcare Research and Quality.¹⁴ This study was exempt from review by our hospital's committee on clinical investigations because the data are deidentified and are available to the public. Standard demographic information was extracted and tabulated for all cases.

The timing (postoperative day from laryngoscopy) of each revisit encounter was evaluated. If the revisit was for a laryngeal procedure, such as hemilaryngectomy, laryngectomy, or other surgery that would be expected to result from a laryngeal cancer diagnosis based on the first procedure, the revisit for that case was excluded from the analysis. Revisit complications and their diagnoses were categorized and tabulated, and the specific outcomes of death and anoxic brain injury were examined a priori.

Results

In total, 7743 cases of outpatient direct laryngoscopy were identified. Most patients were male (61%). Their mean (SD) age was 60.4 (13.4) years. The top 5 initial diagnosis codes associated with the index laryngoscopy procedure were 478.5 (other diseases of vocal cords; 1368 cases), 478.4 (polyp of vocal cord; 674 cases), 161.0 (malignant neoplasm of glottis; 539 cases), 141.0 (malignant neoplasm of base of tongue; 435 cases) and 212.1 (benign neoplasm of larynx; 420 cases).

There were 232 revisits (3.0%) within 7 days of the index procedure. The **Figure** presents the distribution of days from index procedure to revisit. The revisit rate was similar across the first 7 postoperative days. The median revisit day was postoperative day 3. There were 2 deaths that occurred at the time of the revisit. Thus, the 7-day postprocedure mortality rate for ambulatory laryngoscopy was 0.03% (95% CI, 0.01%-0.09%). Owing to data restriction requirements for confidentiality, we cannot report the procedure or factors associated with these deaths.

Table 2 presents the rates of the most common revisit complications. Serious airway complications occurred in 0.27% of cases overall (1.9% of revisits [n = 21]). Stridor, dyspnea, respiratory failure, and larynx stenosis or airway edema comprised the most common serious airway complications (14 patients [0.18% of all cases]). There were no cases of anoxic brain injury. Other major complications occurred in 0.15% of all cases (12) and accounted for 5.2% of primary revisit diagnoses: syncope and collapse, pneumonia, septicemia, and wheezing or painful respiration (combined incidence, 12 cases).

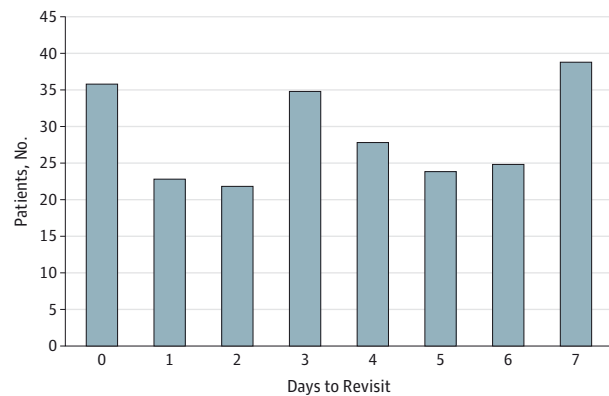
The overall rate of minor complications was 0.75% (58 cases), which included urinary complications (20 [0.26% of all index cases]); acute pain (11 [0.14%]); esophageal-, dysphagia-, and chest-related diagnoses (16 [0.20%]); and vomiting, dehydration, and/or nutritional deficiency (≤10 [0.05%]).

Discussion

Our results reflect the continuing evolution of surgical innovation in laryngology over the past several decades. To illustrate, a 1987 study¹⁵ of more than 10 000 intubations from the 1970s and 1980s found the risk of postoperative airway compromise to be significantly greater among patients who underwent diagnostic laryngoscopy and panendoscopy than among patients who had general anesthesia for other reasons. In 1994, Hendrix et al¹⁶ presented 169 inpatient direct laryngoscopy or panendoscopy cases and found a 19.5% rate of major complications and a 21% incidence of minor complications. They classified major complications as any that necessitated inpatient admission, which included fever (temperature >100°F; 18 cases), chest pain or electrocardiographic changes (5), dysphagia (5), bleeding (3), urinary retention (3), suicidal ideation (2), bilateral pneumothorax (1), and laryngospasm or other acute respiratory difficulty (6). An attempt was made at finding statistically significant associations between complications and clinical parameters, but none were identified. As a result, Hendrix et al¹⁶ concluded that all patients undergoing direct laryngoscopy should be monitored in an inpatient setting for 24 hours.

However, toward the turn of the century laryngology practices shifted with emerging evidence of improved outcomes and safety profiles. Armstrong et al¹⁷ studied 692 outpatient endoscopies (including 589 direct laryngoscopies) and found a less than a 1% risk of airway emergencies in carefully selected patients. Their study¹⁷ reported 10 unplanned admissions and 7 major complications. Cancer and laryngeal biopsies significantly increased the risk of complications, but Armstrong et al¹⁷ cautioned that the surgeon was the best judge of the need for inpatient admission. Common reasons for planned admission included large laryngeal tumors, vocal fold motion dysfunction, and laryngeal stenosis requiring stent placement.¹⁷ Despite the relatively rapid evolution of ambulatory laryngeal surgery with advanced techniques, relatively few studies have examined the ongoing safety profile of these procedures.

Figure. Days to Revisit After Adult Ambulatory Direct Laryngoscopy



The revisit rate was similar across the first 7 postoperative days. The median revisit day was postoperative day 3.

Table 2. Diagnoses Prompting Revisit Following Adult Ambulatory Laryngoscopy Procedures

Diagnosis/Complication	No.	% (95% CI)	
		Among Revisits	Among All Cases
Serious airway complications	21	9.1 (6.0-13.4)	0.27 (0.18-0.41)
Stridor, dyspnea, respiratory failure, larynx stenosis, or airway edema	14	6.0	0.18
Hemorrhage complicating a procedure, foreign body in pharynx, fracture of cervical vertebra, aspiration of food or vomitus, among others	<10	3.1	0.09
Other major complications ^a	12	5.2 (3.0-8.8)	0.15 (0.09-0.27)
Minor complications	58	25 (19.9-31.0)	0.75 (0.58-0.97)
Urinary tract infection, obstruction, or other complication	20	8.6	0.26
Acute pharyngitis, postoperative pain, headache	11	4.7	0.14
Esophageal reflux, stenosis, dysphagia, chest pain or palpitations	16	6.8	0.20
Other minor complications	11	4.6	0.13

^a Including syncope, pneumonia, septicemia, wheezing, among others.

Outpatient laryngoscopy practices were further supported by another single institution study¹⁸ that found routine admission for patients undergoing upper airway endoscopy to be unwarranted. Eleven of 317 endoscopy cases (3.0%) had major complications requiring admission. Several risk factors for complications were reported: preexisting cardiac conditions, high American Society of Anesthesiologists rating, airway class rating, type of anesthesia, and number of endoscopic procedures performed. Selective admission based on clinical judgment was found to be superior to routine admission in all patients. More recent data from over than 180 000 pharynx and larynx procedures from the National Survey of Ambulatory Surgery reported an acceptably low rate of complications without any cases of cardiac arrest, apnea, airway obstruction, shock, or hypoxia.¹⁹ However, that survey was only able to capture complications occurring at the time of the index procedure and did not evaluate revisits and complications in the 7-day window.

The current study demonstrates the safety of adult ambulatory direct laryngoscopy across several states. Revisits were uncommon (3.0% within 7 days). Two deaths occurred, although the circumstances related to these mortalities cannot be discussed for confidentiality reasons. Serious airway complications were seen in 0.27% of cases, which is greatly decreased from rates reported only a few decades ago. These data support the current consensus among otolaryngologists that ambulatory laryngoscopy can be performed with a highly acceptable safety profile.

The favorable safety profile seen in this study is likely a result of multiple factors, not least of which being sound judgment in selecting patients well-suited for ambulatory laryngoscopy. Not all patients can be safely treated in the ambulatory surgery setting, and presurgical risk stratification is paramount. Inpatient laryngoscopy is favored for patients who are at high risk for bleeding, airway obstruction,

and cardiopulmonary complication and those who are unable to readily return if worrisome symptoms develop. There are no established criteria to predict patients at highest risk for such complications, so each patient should be individually assessed carefully.

Ambulatory surgery and revisit data capture diagnoses that prompt return for medical care to ambulatory, emergency, and inpatient settings. This study is unable to capture information on minor complications that may be bothersome to patients but fall shy of the threshold needed to prompt revisit. Such complications would be likely to include minor pain, mucosal, dental, and nerve injuries. Minor mucosal injuries are not uncommon with suspension laryngoscopy procedures, but rates of dental and nerve injuries have been shown to be very low.^{20,21}

Additional study limitations are related to the accuracy and level of detail contained in the SASD, SID, and SEDD data sets. Unfortunately, there are insufficient clinical and surgical details to permit analysis of factors that may affect risk of complication or revisit. Large institutional data would be better suited to answer such questions because they would contain information about comorbidities, anatomic, surgical, and pathologic considerations.

Conclusions

This study serves as an evidence-based evaluation of modern outpatient laryngoscopy practices. Ambulatory laryngoscopy carries an acceptable safety profile with regard to revisits and complications within the first 7 postoperative days. Serious airway complications occur in fewer than 3 per 1000 cases. The risk of death following outpatient laryngoscopy is extremely low. Nonetheless, careful preoperative selection, patient counseling, and emergency preparedness remain critical when considering the suitability of outpatient airway procedures.

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Study concept and design: Orosco, Bhattacharyya.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Orosco.
Critical revision of the manuscript for important intellectual content: All authors.
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Correction: Table 2 and related text in the Results section were corrected online September 3, 2015.

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