Section 4 – HYPOPHARYNX AND CERVICAL ESOPHAGUS

Chapter 52 – Esophagoscopy

Ryan J. Soose,
Ricardo L. Carrau

HISTORICAL BACKGROUND

The first reported attempt to examine the esophagus is attributed to Bozzini, who in 1809 attempted to examine the upper esophagus by placing a mirror in the throat.[1] Recognizing the need for an instrument that could keep the esophageal lumen widely open, other surgeons used different hollow tubes. Most devices used mirrors to compensate for the angulation necessary to pass the instrument through the mouth into the esophagus. The first straight esophagoscope was a urethroscope, used in 1868 by Kussmaul, who also described the correct head position to pass the endoscope after learning it from observing a sword swallower.[2] Nevertheless, it was not until the early 1900s that Chevalier Jackson invented an instrument similar to what is known today as a rigid esophagoscope. Even more importantly, Jackson standardized the technique and safe use of the instrument by emphasizing training in the laboratory before the operator was permitted to use the technique on human subjects.[3]

During the late 1930s, bronchoesophagologists adopted the use of fiberoptic illumination systems, which made the instruments more effective.[4] Flexible endoscopes were introduced during the 1960s and, along with further advances in fiberoptic systems, microinstrumentation, and lasers, expanded the role of esophagoscopy in the diagnosis and treatment of diseases of the esophagus. The transnasal esophagoscope, which does not require intravenous sedation, was designed in the 1990s. This instrument allows a quick office examination that is generally well tolerated and has diagnostic accuracy comparable to that of conventional esophagogastroduodenoscopy.[5,6]

ANATOMY

The endoscopist should be familiar with the “superficial” anatomy of the esophagus. The cervical esophagus is curved to the left, whereas the thoracic esophagus is convex toward the right, where it comes in contact with the aorta and left main stem bronchus.[7,8] In adults, the esophagus starts at the level of the cricopharyngeus (upper esophageal sphincter), ends at the cardia (lower esophageal sphincter), and measures approximately 22 cm in length. The endoscopist, therefore, usually advances the instrument 38 cm from the incisors before the cardia is reached. As the instrument is advanced, several constricting points are encountered: the cricopharyngeal sphincter (16 cm from the incisors), the left main stem bronchus (27 cm from the incisors), and the gastroesophageal junction (38 cm from the incisors). The cricopharyngeal sphincter is the narrowest point and is the area at highest risk for injury or perforation (Fig. 52-1).

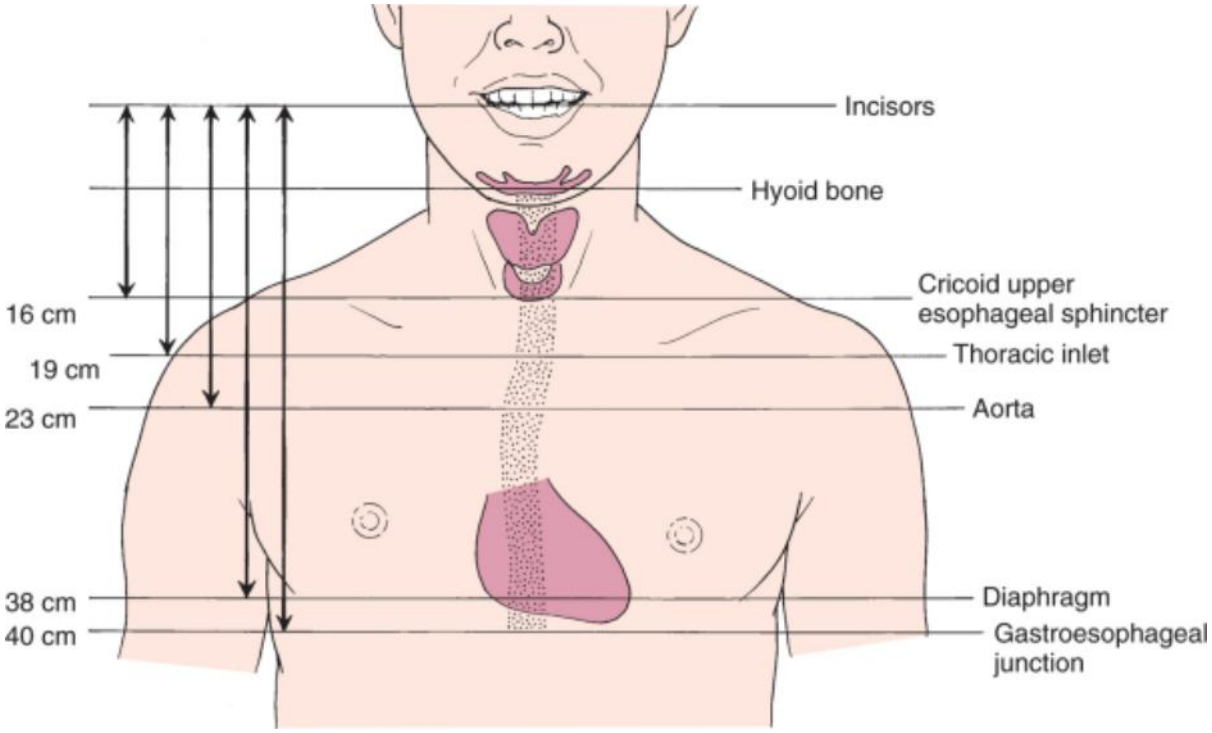

Figure 52-1 Surgical landmarks during esophagoscopy.
(Redrawn from Lee KJ: Essential Otolaryngology: Head and Neck Surgery, 8th ed. New York, McGraw-Hill, 2003.)

INDICATIONS

Rigid or flexible esophagoscopy is most commonly used as a diagnostic tool for the evaluation of suspected tumors, trauma, strictures, or benign inflammatory conditions (e.g., gastroesophageal reflux).

Esophagoscopy may also be used as a surgical approach for dilatation of webs or strictures under direct visualization with or without placement of endoluminal stents, as well as for biopsy, removal of foreign bodies, myotomy of the cricopharyngeal muscle for Zenker's diverticulum (i.e., Dohlman's procedure or endoscopic stapling), tracheoesophageal puncture, and palliative laser excision of obstructing tumors.

PATIENT EVALUATION

Recommendations for esophagoscopy are usually based on a thorough history and physical examination with emphasis on the affected area (e.g., upper aerodigestive tract and chest). Fundamental factors in formulating a differential diagnosis include the age of the patient; the onset, duration, and progression of the dysphagia or pain; and associated symptoms such as postnasal drip, hoarseness, neck masses, cough, hemoptysis, reflux, and heartburn. Risk factors such as alcohol or tobacco use should be noted. A past history regarding neck surgery (e.g., cervical spine fusion), chest or abdominal surgery (e.g., mediastinal surgery or surgery to correct gastroesophageal reflux), or the presence of diverticula is important for surgical planning.

The physical examination should include evaluation of factors that influence passage of the instrument, such as the status of the dentition and the range of motion of the neck and mandible. Flexible pharyngolaryngoscopy is recommended as part of the office examination for all patients with swallowing problemsrelated to the pharynx or cervical esophagus (Fig. 52-2). Besides providing direct visualization of the anatomy, the flexible laryngoscope allows dynamic evaluation of the pharyngeal phase of swallowing.

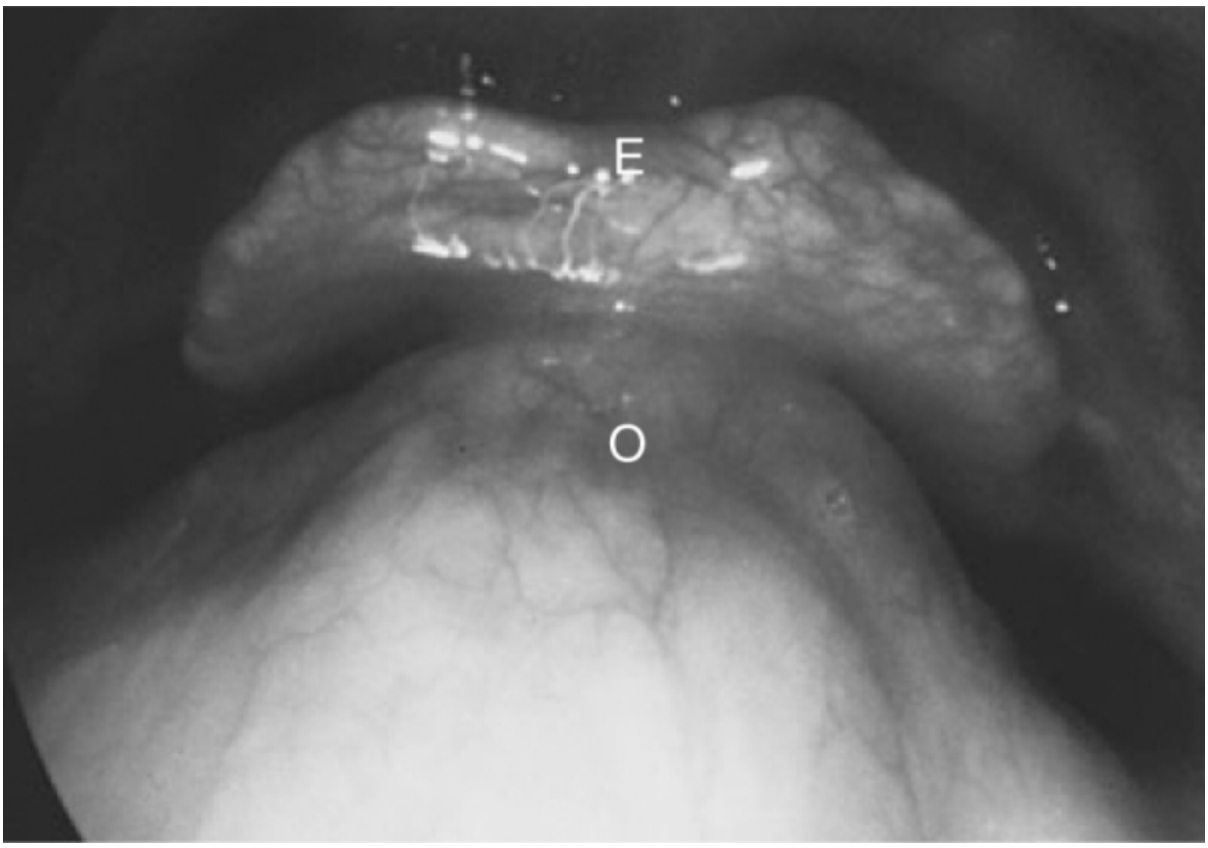

Figure 52-2 A cervical osteophyte (O) displacing the epiglottis anteriorly (E).

In addition to the clinical examination and flexible pharyngolaryngoscopy, a preoperative contrast-enhanced esophagogram is helpful in patients whose symptoms suggest esophageal dismotility, a stricture, or a pulsion diverticulum. Contrast-enhanced esophagography complements esophagoscopy for the diagnosis of these conditions and other anatomic abnormalities (Fig. 52-3). A contrast-enhanced esophagogram is also recommended for patients with high-risk factors for cancer (i.e., alcohol and tobacco use) and those whose symptoms suggest neoplasia. A chest radiograph should likewise be part of the diagnostic evaluation of patients in this category.

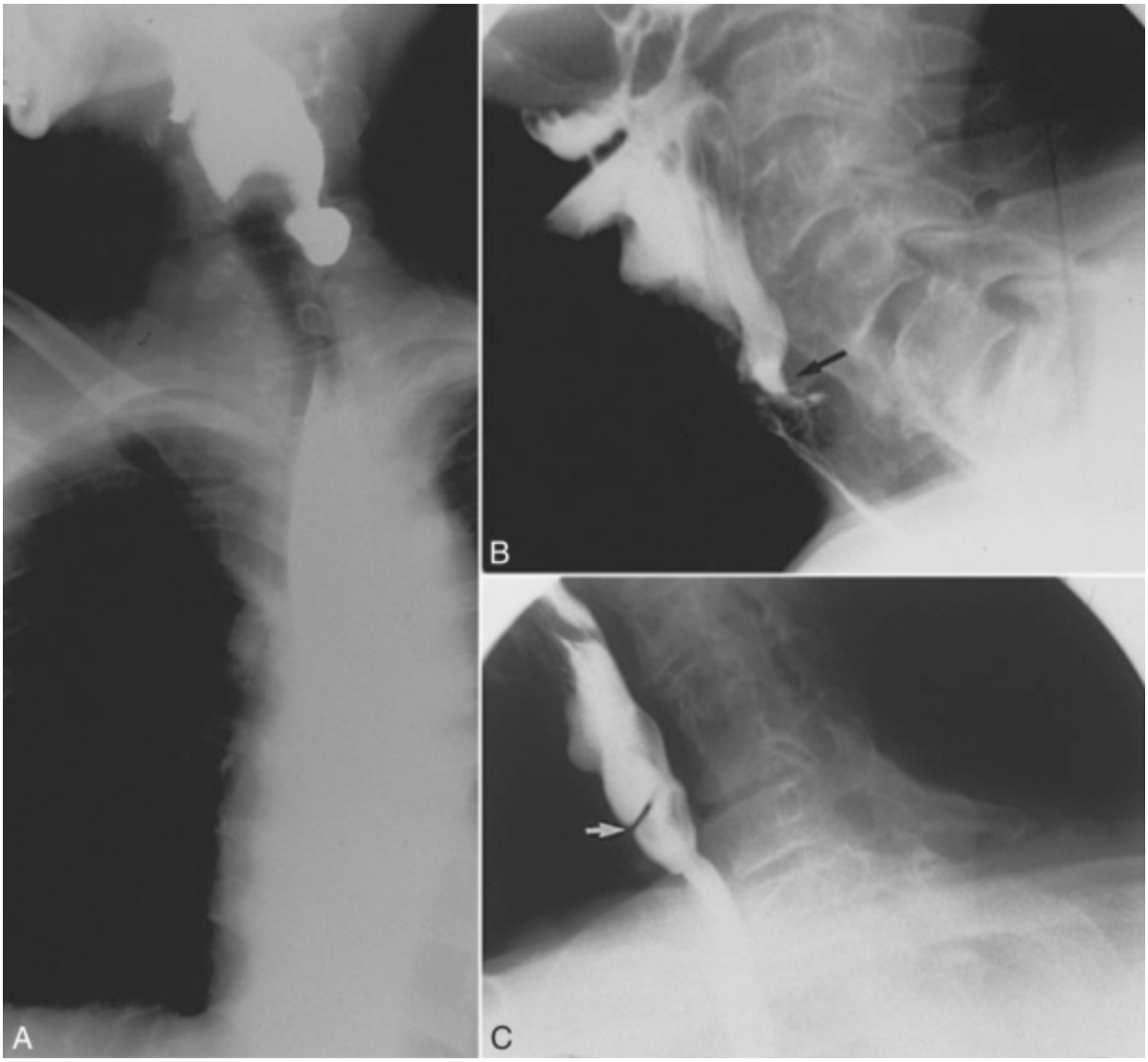

Figure 52-3 **A**, Barium esophagogram demonstrating a Zenker diverticulum. **B**, Barium esophagogram of a patient with dysphagia and a large anterior cervical osteophyte *(arrow)*. **C**, Barium esophagogram demonstrating an esophageal web *(arrow)*.

An esophagogram may also help identify radiolucent foreign bodies not visualized on plain films. Barium is usually recommended as a contrast material except when injury to the esophagus with possible leakage is suspected. In these circumstances we prefer a water-soluble contrast agent because it will not induce the foreign body reaction associated with extravasation of barium into soft tissue. Conversely, water-soluble agents, especially meglumine diatrizoate (Gastrografin), can induce a severe inflammatory reaction when aspirated into the lower respiratory tract; consequently, water-soluble agents are contraindicated when aspiration or tracheoesophageal fistula is suspected.

Preoperative preparation requires minimal effort. The patient is given H_2-blockers or a proton pump inhibitor to increase gastric pH (decrease the acidity) and diminish the possibility of gastroesophageal reflux and may be given an anticholinergic agent to curtail oropharyngeal secretions. Patients with cardiac valve disease are treated with systemic prophylactic antibiotics to protect them against bacterial endocarditis.

SURGICAL TECHNIQUE

Flexible Versus Rigid Esophagoscopy

Whether to use a flexible or rigid esophagoscope depends mainly on the surgeon's preference, the purpose of the esophagoscopy, and the general condition of the patient. As a general rule, a rigid esophagoscope is more useful in evaluating the cervical esophagus because this area has multiple folds that can hide pathology and may not be easy to insufflate to allow inspection with a flexible instrument; therefore, flexible esophagoscopy, transoral or transnasal, can miss tumors at the distal pharyngeal, postcricoid, and cricopharyngeal areas. Rigid esophagoscopy is better for evaluation of these areas.[9] In addition, a rigid scope allows the use of larger suction cannulas and surgical instruments, thereby facilitating manipulation and removal of large foreign bodies under direct

visualization.

Flexible esophagoscopy improves visualization of the gastroesophageal junction and allows instrumentation in patients with severe limitation of range of motion of the neck (e.g., cervical spine fusion, rheumatoid arthritis) or other anatomic problems (e.g., osteophytes).[4] Transoral flexible esophagoscopy is performed with the patient under topical anesthesia and sedation, whereas transnasal esophagoscopy (TNE) is performed with topical anesthesia only. TNE is more suitable as an “office” procedure because it does not require an observation area.[10,11] Flexible esophagoscopy, transoral or transnasal, is preferred for patients who cannot tolerate general anesthesia. Because TNE avoids general anesthesia or conscious sedation, it may improve patient safety, enhance practice efficiency, and reduce overall health care costs.[12]

Anesthesia

The choice of anesthesia is influenced by the patient's general condition, psychological profile, potential for aspiration, and need for instrumentation. For example, diagnostic rigid esophagoscopy to rule out a second primary tumor can be performed under either apnea or monitored anesthesia care (MAC) with a superior laryngeal nerve block (“direct laryngoscopy”). Conversely, general anesthesia with endotracheal intubation is needed for retrieval of a foreign body from the thoracic esophagus, which may require complex instrumentation and protection of the airway from aspiration. Severe trismus or limitation of range of extension of the neck (e.g., in patients with cervical spine fusion) restricts passage of a rigid esophagoscope. Communication with the anesthesiologist is fundamental to prevent complications.

Instrumentation

Rigid esophagoscopes are available in a variety of lengths, diameters, and shapes to suit different purposes. The design of surgical instruments and suction tips has also followed this principle, and a special instrument (e.g., to retrieve a foreign body) can even be fabricated to one's own specifications within a reasonable time (Fig. 52-4). Likewise, transnasal esophagoscopes are available in a variety of lengths and diameters, and they may offer channels for insufflation, suction, and instrumentation. Their degrees of flexibility and therefore the ability to retroflex and examine the cardia also vary.

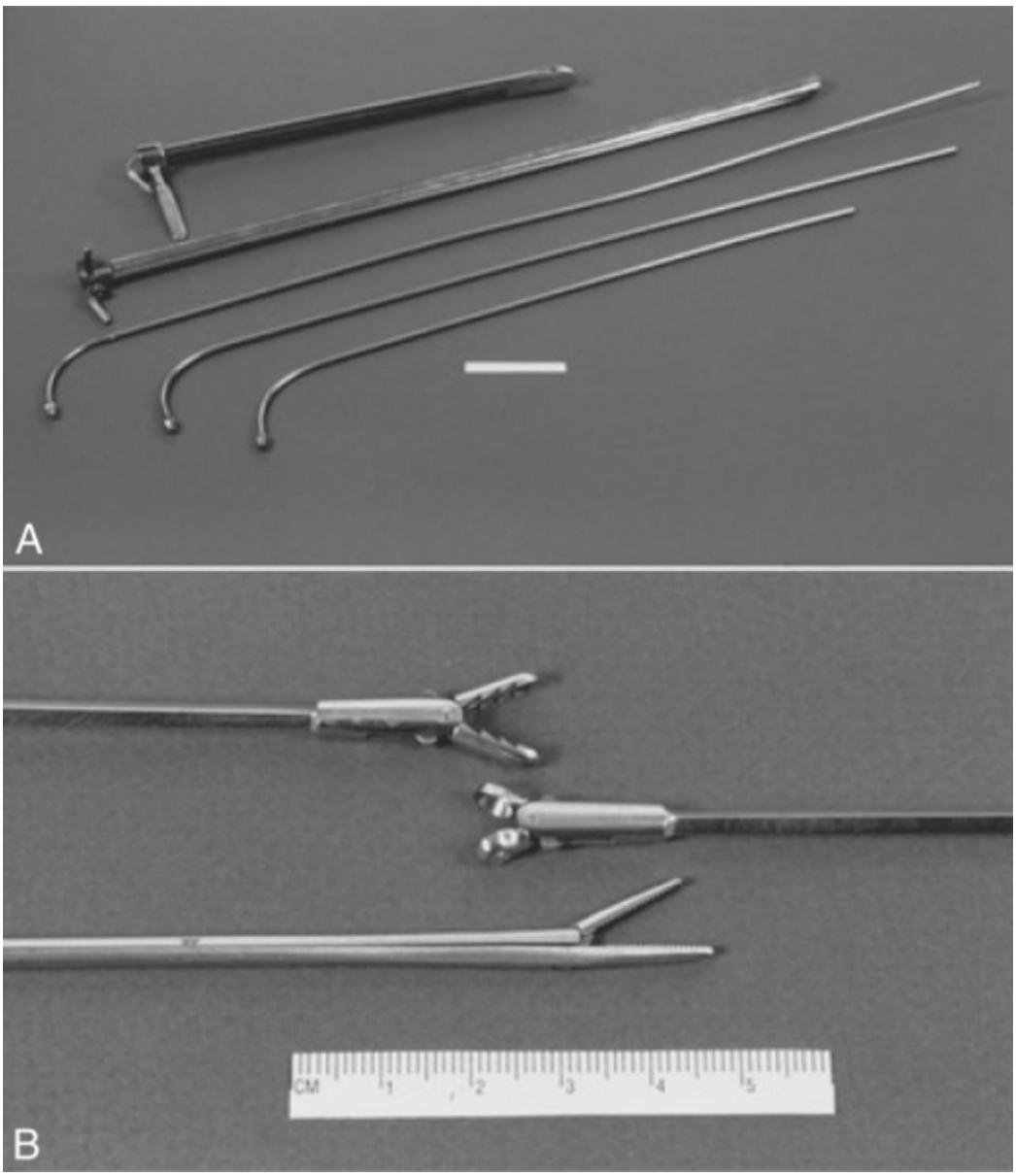

Figure 52-4 **A**, Esophagoscopes and suction cannulas. These instruments are available in a wide range of widths and lengths. **B**, Esophagoscopy forceps. From top to bottom are forceps with serrated edges, cup forceps, and alligator forceps. A cup forceps is most suitable for biopsies, whereas the other two are most useful for the retrieval of foreign bodies.

Technique of Rigid Esophagoscopy

After induction of anesthesia or after sedation (MAC) and topical anesthesia, the patient is placed supine with the neck in a neutral position. Extension of the neck increases the natural lordosis of the cervical spine and thus increases the difficulty of passing a rigid esophagoscope. The teeth are protected with a tooth guard or wet surgical sponges (Fig. 52-5). The endoscope is held between the thumb and index finger of the nondexterous hand (e.g., left hand for a right-handed surgeon), and the third finger is used to open the mouth and support the endoscope over the incisors (Fig. 52-6). The tip of the endoscope is introduced into the oral cavity and advanced over the tongue to the posterior pharyngeal wall. The instrument then passes along the posterior pharyngeal wall into the hypopharynx, with the angle of entry changed from 90 degrees to an angle parallel to the pharyngoesophageal tract (Fig. 52-7). The instrument is advanced under direct visualization with the thumb of the nondexterous hand. The other hand is used only to change the angle of entry, thus preventing undue pressure over the walls of the esophagus (see Fig. 52-6). A blunt-tipped suction catheter is used as necessary to remove secretions that impair identificationof the lumen and inspection of the walls of the pharynx and esophagus. Occasionally, the operator will encounter difficulty passing the esophagoscope through the cricopharyngeal sphincter. Administration of muscle relaxants, deflation of the endotracheal cuff, and the use of an esophagoscope with a smaller diameter generally resolve this problem. Alternatively, the upper esophageal sphincter may be dilated with a balloon dilator to facilitate passage of the scope. As a general rule, the instrument is passed down to the gastroesophageal junction and then retrieved slowly while the walls of the esophagus are inspected.

Figure 52-5 The patient is placed in the supine position with the head in a neutral position. A common mistake is to try to perform esophagoscopy with the head in an extended position (as for direct laryngoscopy). The extended neck exaggerates the normal lordosis of the cervical spine and makes passage of the esophagoscope more difficult. In fact, the esophagoscope is sometimes easier to advance if the neck is flexed when the instrument passes the upper esophageal sphincter.

Figure 52-6 The thumb of the left hand is used as a fulcrum for the instrument to prevent pressure over the incisors and is used to advance the instrument. The right hand is never used to force passage of the instrument; rather, it is used only to guide the esophagoscope by changing the angle of entry.

Figure 52-7 Insertion of the esophagoscope. The tip of the instrument is advanced over the posterior pharyngeal wall. The base of the tongue and the larynx are displaced anteriorly until the axis of the endoscope is parallel to the longitudinal axis of the lumen.

It is best to biopsy suspicious lesions at the end of the procedure to prevent blood from obscuring the field. Obtaining an adequate specimen requires multiple biopsies, including the interface between the suspected lesion and normal mucosa (biopsy of the center of a tumor often yields necrotic tissue).

Technique of Transnasal Esophagoscopy

The patient is kept in a sitting or reclined position (head of the bed raised 45 degrees), and the nose is sprayed with 4% lidocaine and 0.05% oxymetazoline. After the nose is decongested, cotton pledgets with 0.5% tetracaine (Pontocaine) are placed bilaterally for 5 to 10 minutes. Ten milliliters of 2% gel lidocaine is administered by mouth for gargling and swallowing to anesthetize the pharynx. The flexible esophagoscope is then passed transnasally through the widest nasal cavity and advanced into the pharynx to assess the laryngopharyngeal segment. Passage from the pharynx into the esophagus is facilitated by having the patient burp, which opens the upper esophageal sphincter. Alternatively, the patient can be asked to sustain an “ee” sound, which contracts the larynx and exposes the apex of the piriform sinuses. The scope is advanced into the apex of the left piriform sinus and the patient is asked to swallow. The scope is then passed into the esophagus as the patient swallows. After evaluating the lower esophageal sphincter and gastroesophageal junction, it is advanced into the stomach and then retroflexed to examine the gastric cardia. Insufflation should be kept to a minimum. The esophageal walls are again examined as the scope is retrieved.

POSTOPERATIVE CARE

Rigid or transoral esophagoscopy is generally performed in an outpatient or same-day surgery setting. Patients are observed for several hours, during which clear liquids are administered. Dysphagia, odynophagia, chest pain, or tachycardia may indicate perforation of the pharynx or esophagus, which must be addressed urgently (see "Complications"). If recovery is uneventful, the patient is discharged home with instructions to return to the hospital if any of the aforementioned problems are noted.

COMPLICATIONS

The most common complications of esophagoscopy include injury to the upper aerodigestive tract and aspiration of esophagogastric fluid, oral secretions, or blood. Faulty technique can lead to a wide variety of dental trauma ranging from a chipped tooth to fracture or even complete avulsion of a tooth. A chipped tooth may require elective repair by a cosmetic odontologist. Fracture of a tooth may threaten the viability of the tooth and warrants urgent evaluation by a dentist. Avulsion of a healthy tooth should be rare. An avulsed tooth should not be replaced into the socket until the endoscopy has been completed, because a loose tooth can dislodge and be aspirated into the airway. After esophagoscopy, the tooth can be replaced in the socket and secured in place with interdental wire or wire-acrylic fixation. The patient is referred for assessment of the viability of the tooth and possible endodontic treatment. Poor dentition as a result of severe periodontal disease or advanced caries is a contraindication to this technique, because the viability of the teeth is already compromised and the prognosis for reimplantation is poor.

Perforation of the esophagus during esophagoscopy is most common during therapeutic procedures such as dilatation or during evaluation, biopsy, or de-bulking of malignant tumors. To avoid this complication, the surgeon should never force passage of the esophagoscope through a significant stricture or through tumor that involves the circumference of the esophagus. Judicious use of lumen finders, guidewires, and filiform dilators helps identify the lumen and dilate strictures. The surgeon should maintain a high index of suspicion during these procedures or if unusual difficulty is encountered during the case (e.g., cervical osteophytes). Bleeding from the esophageal mucosa is a definite sign of injury (or friable neovascularization associated with neoplasia) and should increase the operator's awareness.

If a perforation is suspected, intravenous antibiotics with broad-spectrum coverage of the flora of the upper aerodigestive tract should be administered immediately (e.g., clindamycin). The esophageal procedure should be terminated, but a nasogastric tube can be passed under direct visualization, and if necessary, direct laryngoscopy can be completed. The surgeon and the anesthesiologist should evaluate the patient for signs of pleural injury, such as subcutaneous emphysema, diminished breath sounds, high ventilatory peak pressure, or increased CO_2 in exhaled air. If any of these signs is detected, a chest radiograph should be obtained in the operating room to rule out pneumothorax. If findings on clinical examination are negative, the patient may be transferred to the recovery room, where a chest radiograph is taken. When the patient is fully awake, an esophagogram enhanced with Gastrografin is performed to rule out a leak (Fig. 52-8).

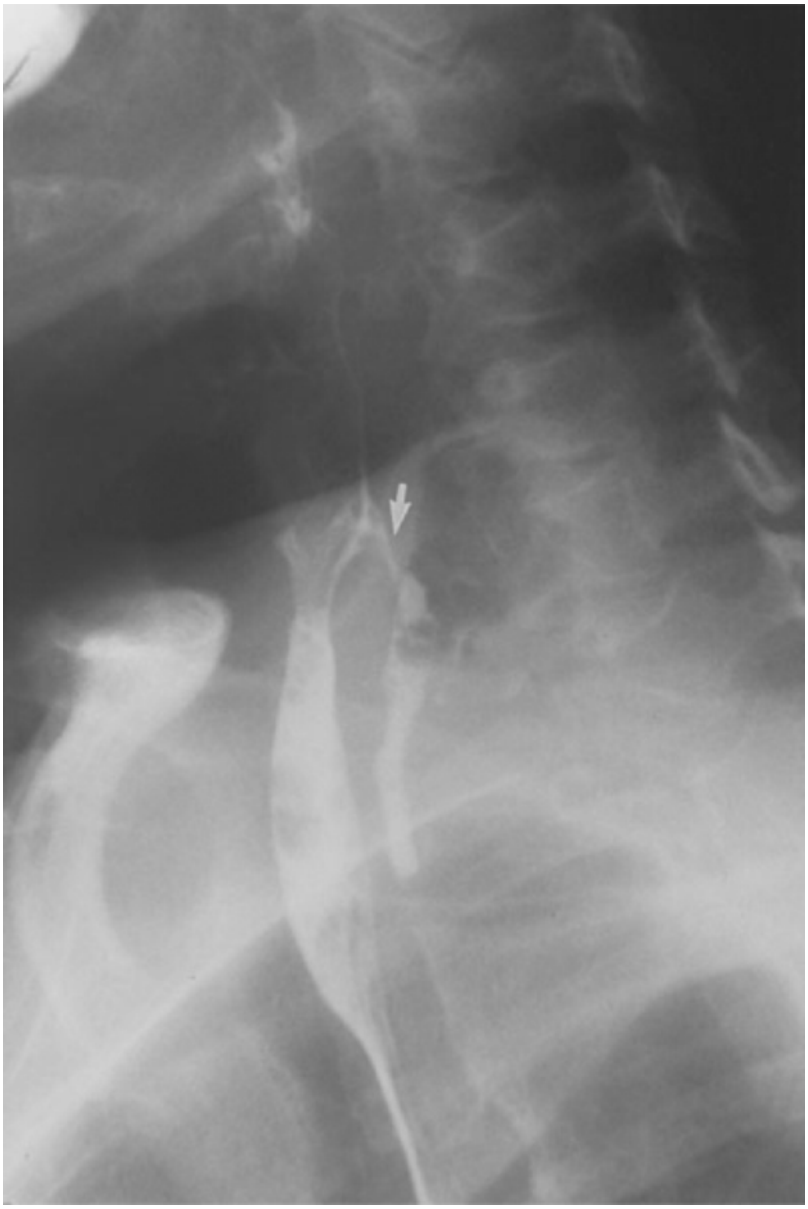

Figure 52-8 Gastrografin esophagogram, lateral view, demonstrating an esophageal perforation *(arrow)* with extravasation of contrast material into the mediastinum.

Small leaks from the pharynx or cervical esophagus may be managed conservatively by leaving a nasogastric tube in place, restricting oral intake, and continuingthe intravenous antibiotics and H_2-blockers or proton pump inhibitors. Large leaks, such as those produced when the esophagoscope is passed transmurally into a false lumen, should be explored and repaired as soon as possible (see Chapter 53). Leaks at the thoracic level are better managed in consultation with an experienced thoracic surgeon because they usually require exploration and repair and often necessitate diversion procedures (e.g., cervical esophagostomy).

Aspiration of gastroesophageal contents is more common in patients with complete obstruction of the esophagus secondary to foreign bodies, strictures, or neoplasms and in patients with impaired consciousness (e.g., alcohol intoxication, stroke). The airway of these patients should be protected by endotracheal intubation, but before intubation is attempted, the pharynx should be thoroughly suctioned and digital pressure maintained over the cricoid cartilage to prevent regurgitation of esophageal contents into the laryngopharynx.

Other intraoperative complications, such as arrhythmia or changes in blood pressure, are generally secondary to vasovagal reflexes and may be self limited. Removal of the instrument is usually helpful in stopping the arrhythmia. If the arrhythmia is repetitive or if the patient experiences hemodynamic compromise, intravenous atropine or glycopyrrolate should be administered.

PEARLS

- Esophagoscopy continues to be a reliable diagnostic and therapeutic tool with a wide variety of applications, including biopsy, dilatation of strictures, repair of Zenker's diverticulum, placement of stents, and retrieval of foreign bodies.
- Both rigid and flexible esophagoscopic techniques are available, each with their respective indications, advantages, and disadvantages.
- Transnasal esophagoscopy is rapidly becoming common practice in the outpatient otolaryngology office and offers the primary advantage of avoiding general anesthesia or conscious sedation.
- Administration of muscle relaxants, deflation of the endotracheal tube cuff, and the use of a smaller-diameter esophagoscope can facilitate passage of the esophagoscope through the cricopharyngeus.
- Anatomic limitations, such as cervical spine fusion, rheumatoid arthritis, and osteophytes, may prohibit safe rigid esophagoscopic examination and are often an indication for flexible esophagoscopy.

PITFALLS

- The risk of esophageal perforation is generally higher with therapeutic interventions such as dilatation of a stricture or removal of a tumor or complex foreign body.
- During rigid esophagoscopy, the upper/dexterous hand is used only to change the angle of the scope and never to push or force the instrument through an area of resistance.
- Extension of the neck increases the natural lordosis of the cervical spine and may therefore increase the difficulty of passing the rigid esophagoscope.
- The postcricoid or cricopharyngeal area is often not well visualized by flexible esophagoscopy, and thus small tumors in this area may be missed by transnasal esophagoscopy.
- Performing the biopsy before the end of the procedure may obscure the surgeon's vision with blood for the remainder of the esophagoscopy.