Chapter 15

Vocal Fold Medialization, Arytenoid Adduction, and Reinnervation

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Restoration of vocal function with laryngeal framework surgery (laryngoplastic phonosurgery) was introduced at the beginning of the 20th century. Today, these procedures have emerged as the dominant surgical management approach for the treatment of the aerodynamic incompetence and acoustic deterioration associated with vocal fold paralysis/paresis. Other indications include cancer defects, vocal fold scar, sulcus vocalis, bowing associated with vocal fold atrophy, laryngeal trauma, and neuromuscular disorders including abductor spasmodic dysphonia and parkinsonism. Laryngeal framework surgery has also been employed to alter pitch for gender reassignment; however, this topic is not discussed here.

Although medialization of the musculomembranous vocal fold by means of rearranging the laryngeal cartilage framework was described by Payr in 1915, and others in the mid–20th century, Isshiki et al. championed the systematic analysis and laryngoplastic treatment of glottal incompetence in the 1970s. He designed his medialization procedure of the musculomembranous vocal fold with the use of a synthetic implant in 1974.

In 1978, Isshiki et al designed the arytenoid adduction procedure to treat patients with large glottal gaps secondary to a malpositioned arytenoid. One of his outstanding contributions is that he taught surgeons that laryngeal framework procedures could be done with facility utilizing local anesthesia with sedation. The concept that the cricoarytenoid joint could be dissected and manipulated under local anesthesia to allow for phonatory feedback was revolutionary. Based on this seminal work, the adduction arytenopexy and cricothyroid subluxation procedures were introduced to further enhance phonatory reconstruction.

Laryngeal Framework Surgery

Isshiki’s Classification

Isshiki described four basic surgical procedures that he termed thyroplasty types I to IV for altering the conformation of the thyroid cartilage and the arytenoid adduction, which attempts to close the posterior (cartilaginous) glottis.

Thyroplasty Type I

Thyroplasty type I (Fig. 15.1) is the most widely used of Isshiki’s original thyroplasty techniques. It involves creating a rectangular cartilaginous window at the level of the true vocal fold and using cartilage, Silastic, Gore-Tex, or other implant material to medialize the true vocal fold. This procedure achieves closure of the musculomembranous vocal fold only; arytenoid position is not appreciably altered by the implant. Thyroplasty type I is a relatively simple and reversible procedure that is ideally performed with local anesthesia to facilitate fine-tuning of the voice with precise placement of the implant material. There have been a large number of manuscripts describing a multitude of variations of the original procedure, primarily introducing different implant materials and their placement. As thyroplasty type I does not primarily influence arytenoid position, this procedure is often coupled with an arytenoid adduction or arytenopexy to close both the anterior (musculomembranous) and posterior (cartilaginous) glottis.
Thyroplasty Types II to IV

Thyroplasty type II is a procedure in which the posterolateral thyroid lamina is lateralized; there are few indications for its use. Thyroplasty type III is used to lower the vocal pitch by shortening the anteroposterior (AP) dimension of the glottis. The primary function is to release vocal fold tension to lower pitch. Conversely, thyroplasty type IV increases the AP dimension of the glottis, thereby increasing the tension on the vocal folds and raising the vocal pitch. Thyroplasty types III and IV have been used in gender reassignment surgery to bring the fundamental frequency into the normal range for the newly assigned sex.

Arytenoid Adduction

Arytenoid adduction was described by Isshiki et al5 as a way of mimicking the medializing effect of the lateral cricoarytenoid muscle on the vocal process. A paralyzed arytenoid tends to fall forward and laterally on the cricoid facet, shortening the AP length of the vocal fold and moving the arytenoid away from the midline. The classic arytenoid adduction procedure is performed under local anesthesia with sedation by exposing the posterior aspect of the thyroid lamina. The cricoarytenoid joint is identified, and a suture is placed through the muscular process of the arytenoid and passed anteriorly through the thyroid lamina, thereby rotating the vocal process medially to meet the opposite vocal process during phonation. Prior to the conclusion of the surgical procedure the position is visually verified by means of a flexible fiberoptic laryngoscope.

Principles and Theory of Laryngeal Framework Surgery

The ideal procedure(s) to treat aerodynamic glottal incompetence that is associated with paralytic/paretic dysphonia should attempt to simulate the normal vocal fold position during phonation with regard to the following interdependent parameters: (1) position of the musculomembranous region in the axial plane, (2) position of the arytenoid in the axial plane, (3) height of the vocal fold, (4) length of the vocal fold, (5) contour of the vocal fold edge in the musculomembranous region, (6) contour of the vocal fold edge in the arytenoid region, and (7) mass and viscoelasticity of the vocal fold.

Furthermore, the procedure(s) ideally should be easy to perform, associated with few complications, reliable, reversible, and not threatening to the airway.11 The basic technique for medialization laryngoplasty is very similar for each of the implant materials. If one understands the fundamental principles behind placing the vocal cord into the physiologic phonating position, the choice of implant material is of secondary importance. One can achieve very good results with almost any implant, if the principles outlined below are adhered to. Some implants due to their size constraints may make it harder to place the vocal fold in the correct position. Other implants offer initial excellent voice results, but are not stable and may move from the initial location with delayed decrease in voice quality. Following the outlined steps in any described technique is secondary to a basic understanding of the physiologic phonating position of the vocal cord.

Unless contraindicated, some authors start patients on a Medrol DosePack the day before surgery, and patients are given 0.2 mg/kg of Decadron 1 hour prior to the procedure. This helps to minimize intraoperative swelling, which can interfere with determining the implant size, and reduces postoperative airway swelling.

The anesthetic preparation of the patient is extremely important. It is very easy to oversedate the patient, leading to slurred lethargic speech. With slight oversedation the muscle tone of the hypopharynx grows weak, making it very difficult to see the vocal folds on the monitor, or judge voice improvement in the lethargic patient. The majority of patients need only a few milligrams of Versed to undergo the entire procedure. It is critical to have an alert and oriented patient to obtain good results. Some anesthesiologists prefer to administer intravenous propofol, which can be quickly reversed when patient cooperation is necessary, and then the patient can be quickly sedated after implant placement.

Once the patient is mildly sedated, the patient’s nose is anesthetized by instilling 4 cc of 5% cocaine into the nasal cavity. A flexible fiberoptic scope is introduced transnasally, suspended above the patient, and attached to the video monitor system so that the larynx can be visualized on the monitor during the entire procedure (Fig. 15.2). Other surgeons pass an endoscope at critical times during the procedure when visualization is important. This makes the patient more comfortable during the procedure.

Preoperative intramuscular Robinal is administered to decrease the pharyngeal secretions during the procedure. To increase the likelihood of success, one needs both auditory and visual feedback, to access the position of the vocal fold during testing. Intraoperative visualization of the vocal fold provides two distinct advantages: (1) The relative position of the vocal fold within the window can be identified early in the procedure. (2) Initial hyperfunctional, pressed, strained voice, can be very confusing to the surgeon unless he can observe the position of the vocal fold on the monitor. In this case, the surgeon will be able to use the fiberoptic scope to guide the placement of the implant.
setting, with the vocal fold displaced toward the midline, the
hyperfunctional state of the larynx can be readily seen on
the monitor. As outlined below, the patient is coached to
relax his larynx during continued voice testing, until the
hyperfunctional state is released. This slow, relaxation of
the supraglottic larynx is seen on the monitor as the voice
begins to improve. In the rare patient, where the hyperfunc-
tional voice does not break, one can complete the operation,
by observing the television monitor and placing the para-
yzed vocal fold in the midline. Even though the periopera-
tive voice continues to be strained, the majority of these
patients will develop reasonable quality voice. Without
the ability to visualize the glottis it would be very difficult
to acquire good voice results in this subgroup of patients.

Local anesthesia is injected into the skin and subcuta-
neous tissues of the anterior neck. It is infiltrated along
the thyroid cartilage extending deeply to the posterior
border of this cartilage. This is usually sufficient to perform
the entire procedure. Local anesthesia is never injected
into the paraglottic space or the postcricoid region. As long
as the mucosa of the endolarynx, and the piriform sinuses,
are not violated, the patients will have very little sensation
in these two regions.

Procedures

Netterville’s Technique for Silastic Implants

An incision is created in a skin crease overlying the cricothy-
roid membrane. If an arytenoid adduction is planned, the
incision should be at least 5 to 6 cm in length. Initial eleva-
tion is performed superficial to the strap muscle layer. If one
anticipates atrophy of the thyroarytenoid muscle, then fat is
carefully left approximated to the fascia overlying the strap
muscles. If needed later in the procedure, this can be devel-
oped into a laterally based vascularized fat flap to use in
reconstruction of the paraglottic space. After the strap mus-
sels have been separated in the midline, the medial 2 cm of
the sternohyoid muscle is divided 6 to 7 mm inferior to its
attachment to the hyoid bone. The sternothyroid muscle is
lifted up as the perichondrium is elevated off the thyroid car-
tilage. If the addition of an arytenoid adduction (AA) is anti-
pated, the perichondrium is elevated to the posterior border
of the thyroid cartilage. The window is laid out on the lateral
surface of the cartilage. There has been considerable debate
over the location of this window. Many formulas have been
described to accurately locate this window just lateral to the
vocal fold. Most of these formulas result in a window that is
too high. The implant, if placed in the center portion of these
higher windows, leads to overmedialization of the false vocal
fold and the ventricle, resulting in rough or diplophonic
voice. The lower the window is, the easier it is to accomplish
medialization in the appropriate plane. Therefore, the win-
dow is placed as low on the thyroid cartilage as possible,
leaving a 2- to 3-mm inferior strip of cartilage below the
edge of the window (Fig. 15.3).

In other descriptions of the surgical technique, the carti-
lage island is left within the window and displaced into the
paraglottic space as a biologic tissue implant. Leaving the is-
land as a natural tissue barrier is not necessary, and in reality
the island impedes consistently good voice results. Early in
our series we realized that the cartilage island was not
stable. The island often shifted out of position, or atrophied,
resulting in loss of the initial improvement in voice quality.

Also, if the cartilage island is left within the window, and
used to displace the vocal fold, the window must be placed
in exactly the right location to achieve optimal results. It is
also common for the needed plane of medialization to be so
discrete that medialization within the superior portion of a
6-mm-wide window results in poor strained voice, whereas
medialization within the lower third results in normal voice.
It is far more practical to use the window as an entry into the
paraglottic space, using an implant system that allows one
infinite variability in placing the vocal fold in the physiologic
phonating position, no matter where the position of the vocal
fold is in relation to the window. Another common
mistake is creating a window that is too small. This makes
it very difficult to test medialization in all aspects of the
paraglottic space. It is also very difficult to place an appropri-
ate-size implant through a small window. In view of this, we
recommend creating a window that is at least 6 by 13 mm in
size. The window is placed parallel to the imagined plane of
the vocal fold as low as possible on the thyroid cartilage, as
outlined above. The window is started back from the anterior
commissure approximately 5 mm in the female and 7 mm in
the male. The window may need to extend to 15 to 16 mm in
length in large men to have access to the paraglottic space to
appropriately test and medialize the posterior one third of
the vocal fold. In a female of small stature, it may be neces-
sary to extend the window toward the anterior commissure of
the thyroid cartilage. These intraoperative window adjust-
ments are usually easy to determine as one tests for the loca-
tion of the vocal fold within the window.

Fig. 15.3 The window is outlined as low as possible leaving a 2- to
3-mm strut of cartilage below the window. The anterior border of the
window is placed back from the anterior commissure 5 mm in women
and 7 mm in men.
A high-speed drill with a 3-mm cutting burr is used to remove the cartilage from the window. The inner perichondrium is carefully protected as the cartilage is removed, to prevent damage of the underlying muscle by the drill bit. The early descriptions of medialization laryngoplasty (ML) recommended preservation of the inner perichondrium as a biologic barrier to prevent implant extrusion. In 1987 we began to remove the entire cartilage island and carefully divide the inner perichondrium to consistently obtain discrete medialization at the level of the vocal fold. We recommend dividing the perichondrium at the edge of the window and removing it from within the window. This can be done carefully with a small sharp knife blade without injuring the underlying thyroarytenoid (TA) muscle fascia. As the perichondrium is divided, one can see the natural space between the perichondrium and the TA muscle fascia (Fig. 15.4). The vascular supply of the paraglottic space runs deep to the TA fascia; therefore, this potential space between the two layers can be quite dry and avascular. At this point one carefully elevates the paraglottic soft tissue away from the inner perichondrium, leaving the inner perichondrium still in place attached to the medial surface of the thyroid cartilage. The position of the vocal fold in relation to the window can now be ascertained by gently displacing the TA muscle with a blunt probe in all quadrants of the window while observing the soft tissue movement on the monitor. Displacement of the soft tissue in the superior half of the window often results in prolapse of the ventricle and or the false vocal fold. In most men, the maximum plane of medialization, necessary to obtain quality voice, is in the lower third of the window. Even in females, with the window placed near the lower border of the cartilage, the plane of medialization is usually in the middle to lower half of the window. Determination of the appropriate plane of maximum medialization (the level within the window) is critical in obtaining good voice. One of the major causes of poor voice results, leading to revision surgery, is an appropriately sized implant that is placed 2 to 3 mm too high. This results in rough raspy voice quality, with marked vocal fatigue.

To judge the size of the implant the voice is tested during medialization of the focal fold with the depth gauge. The size and shape of a depth gauge should simulate the medialization that will be obtained with the implant (Fig. 15.5). Due to the smaller size and more obtuse angle of the thyroid cartilage in females, a smaller depth gauge is needed for the female larynx. The voice is tested by moving the depth gauge in all aspects of the window with varying degrees of medialization. The medialization of the vocal fold is observed on the television monitor as this testing occurs.

The majority of patients who present with vocal cord paralysis have developed compensatory speech patterns with a hyperfunctional pressed voice quality. During the initial aspect of testing, as the paralyzed vocal fold is displaced toward the midline this hyperfunctional, pressed voice quality only becomes worse. Instead of the beautiful voice the surgeons hope to hear, it is very common for the patient to develop an extremely strained voice during the initial aspect of testing. When this occurs, the surgeon, while observing the position of the vocal fold on the monitor, depresses and holds it as near the midline as possible. The patient is then coached to relax and try to speak in a softer voice, releasing the strained quality. It may take anywhere from 2 to 20 minutes of continued coaching for this hyperfunctional speech pattern to break. With a persistent, stubborn, pressed voice, the patient is asked to start each word by humming, which relaxes the larynx. The patient is instructed to count to 10, starting each word with the humming sound. In the majority of patients this hyperfunctional speech breaks within 5 to 10 minutes. It takes patience on
the part of the surgeon to wait for a good voice to develop. After the pressed voice begins to break, and reasonable voice quality develops, one can then judge the size of the implant needed by the position of the depth gauge within the window. The average depth of medialization in most men and women is approximately 5 mm in the posterior aspect of the implant, with 1 mm or less medialization needed in the anterior aspect of the window.

An implant is fashioned matching the measurements that produced excellent voice during testing with the depth gauge. The lower flange is placed into the window first as the implant is rotated and compressed through the window. The flanges and lateral strut lock the implant into position (Fig. 15.6). A 4-0 Prolene suture placed through the implant around the lower strut of the window further stabilizes the implant. As one gains experience with this procedure, it is impressive how subtly different patients are. To achieve consistently good voice results, one must tailor the size of the implant and the level of medialization to each patient. As can be realized from the above discussion, starting with a limited selection of prefabricated implants can compromise the voice results in some patients.

**Meyer and Blitzer’s Rationale and Technique for Using the VoCoM (Nonporous Hydroxylapatite Ceramic) Prosthesis**

**Rationale** The VoCoM thyroplasty method is a self-contained system of implants and instruments to allow accurate vocal fold medialization. The implants come in five sizes and are secured with one of four shims, allowing placement of the implant in several different positions. Specifically, the implant can be secured in a horizontal or vertical position, at the superior or inferior border of the thyroplasty window, and at any position along the anterior to posterior position of the thyroplasty window (Fig. 15.7).

There are several advantages inherent in the design of this system, which streamlines the actual surgical procedure. This is critical to the success of the thyroplasty technique, as tissue edema, which develops from excessive operative time or manipulation, can make it difficult for the surgeon to judge the appropriate vocal endpoint. A specially designed surgical instrument set facilitates window placement, determination of implant size and optimal location, and insertion of the implant. The graduated prefabricated implants and shims obviate the need to hand carve implants on the back table during the procedure, saving valuable operative time. The implant is made of hydroxylapatite with proven biocompatibility that generates a thin fibrous encapsulation. In some individuals there may be osteogenesis in the region of the fenestra, creating lamellar bone bridging between the implant and the thyroid lamina. For individuals with paresis and residual motion, this provides implant stability and minimizes the risk of migration or extrusion. Although the osteogenesis is localized and does not preclude implant removal, this system should not be used in individuals in whom removal is anticipated.

The main disadvantage of the system is that the firm nature of the implant does not allow for further carving, and additional modification of the shape must be done with a diamond drill. Additionally, osteointegration in the area of

**Fig. 15.6** The final implant is placed within the pocket just deep to the thyroid cartilage displacing the thyroarytenoid (TA) muscle toward the midline. The implant is carved with wide flanges to fit snugly against the inner surface of the thyroid cartilage, creating a stable implant that resists movement or migration.
the thyroid lamina may make the procedure less easily reversible than other implants such as Silastic.

**Technique**  
A 4- to 5-cm horizontal incision is made over the lateral aspect of the thyroid lamina and extended 1 cm across the midline (Fig. 15.8). Subplatysmal flaps are elevated superiorly and inferiorly, and the strap muscles are separated in the midline and retracted laterally. Fibers of the thyrohyoid are divided with electrocautery to delineate the inferior border of the thyroid cartilage, and the thyroid lamina is exposed by retraction of the strap muscles laterally and by rotating the larynx to the contralateral side using a single hook placed at the thyroid notch.

To prevent coughing during implant manipulation, topical anesthetic can be injected into the subglottic airway or 50 to 100 mg of lidocaine can be given intravenously just prior to the entry through the thyroid lamina. Interestingly, no local anesthetic is needed in the paraglottic tissues during implant manipulation.

The position of the cartilage window is determined. The superior aspect of the window should be placed at the level of the true vocal fold. This position lies at the halfway vertical distance between the fundus of the thyroid notch and the anterior inferior edge of the thyroid cartilage. A line from this point extending posteriorly parallel to the inferior border of the thyroid cartilage will approximate the level of the true vocal fold (TVF). For females, the anterior aspect of the window is positioned 5 to 8 mm lateral to the midline and for males 8 to 10 mm. The window is carefully outlined using the template, and the outer perichondrium and cartilage are removed taking care to accurately maintain the dimensions of the window (this is important to ensure a snug fit of the prosthesis). The cartilage can be removed using a scalpel, a Kerrison punch, or a small otologic drill. If possible, the integrity of the inner perichondrium is preserved.

Some experts place the implant external to the inner perichondrium, and others feel that the perichondrium tethers the medialization and strip it away. Regardless, care should be taken to ensure hemostasis and to make sure that the airway is not violated. The paraglottic tissues are carefully freed from the inner table of the thyroid cartilage using the perichondrial elevator.

A series of trial implants are then placed ranging from 3 to 7 mm of displacement (Fig. 15.9). The implants can be rotated into four orientations and placed throughout the four quadrants of the window to determine the placement for optimal phonation (Fig. 15.10). We have found that the most common position is in the inferior posterior quadrant in the vertical position with the bevel facing inferiorly. To medialize the vocal process of the arytenoid, the implant can be rotated to the horizontal position and placed posteriorly. The patient is asked to vocalize to confirm optimal placement. The trial implant is then removed.

If inadequate voicing is obtained, and a persistent posterior glottic gap is evident on laryngoscopy, an arytenoid adduction procedure can be considered at this point, prior to placement of the final implant. Medialization thyroplasty does not affect the level of the vocal fold in the vertical plane. If there is significant discrepancy, it may be necessary to add an arytenoids repositioning procedure to the medialization.

It is important that once the window is created to proceed with implant placement with alacrity to minimize distortion of the voice from glottic edema. The appropriate implant and shim are chosen. Just before placement of the final prosthesis, the field is flooded with saline and the patient is asked to perform a Valsalva maneuver. Any appearance of air bubbles suggests violation of the airway, in which case the procedure should be terminated.

Assuming the integrity of the airway has been maintained, the implant is loaded onto the handle of the implant.
**Fig. 15.8** Thyroplasty technique. 

(A) Skin incision. 

(B) After elevation of subplatysmal flaps, the strap muscles are divided and retracted laterally. 

(C) The larynx is rotated using a single hook, and the fenestra template tool is used to mark the location of the window. 

(D,E) The window can be fashioned using a scalpel, Kerrison punch, or drill. 

(F) The paraglottic tissues are freed from the inner table of the thyroid cartilage. 

(G) A series of trial inserts are placed to determine optimum implant size and position, after which the final implant will be placed and secured with the appropriate shim. The position of the vocal fold relative to external landmarks is shown. 

(H) The implants can be placed vertically or horizontally to achieve optimum phonation. 

inserter and placed in the proper position. The correct shim is then placed using a smooth dressing forceps, thus securing the implant in the desired position in the fenestra (Fig. 15.11). The wound is irrigated with antibiotic solution. A drain is placed deep to the strap muscles. The strap muscles and platysma are closed with an absorbable suture and the skin is closed as desired.

Postoperatively, the patient is monitored overnight in the hospital for possible hematoma formation and airway obstruction. The drain is removed on postoperative day 1. The patient is given a regular diet but encouraged to minimize aggressive vocal activity such as coughing, throat clearing, or yelling, although absolute voice rest is not necessary. Patients are told that the voice may deteriorate on
Reduced by Hoffman and McCulloch and has been employed for the musculomembranous vocal fold was introduced by Zeitel for 7 years. The primary advantages of Gore-Tex are its ease of handling, placement, and adjustability, all of which enhance the speed and precision with which the operation can be performed. The position of the Gore-Tex can be fine-tuned extensively while the implant remains within the patient rather than removing it for modification as is done with Silastic. This is unlike virtually all other implant approaches. Furthermore, precise positioning of the thyroid-lamina window is less critical since Gore-Tex can be placed into appropriate position despite a slightly malpositioned window.

Because of these characteristics, Gore-Tex is also well suited to restore aerodynamic glottal competence in scenarios in which there are complex anatomic defects such as those encountered with trauma and cancer resections. Even subtle contour changes from the loss of superficial lamina propria associated with sulcus vergeture can be reformed to treat a small glottal gap. The versatility of Gore-Tex is evidenced by its ease of use in the treatment of these varied irregular tissue abnormalities. The clinical experience in part reported in a recent review entailed minimal complications in over 200 cases.

**Revision**  The surgical approach for revision is the same as for the primary surgery. After exposure of the implant, any osteogenesis is disrupted using a Freer elevator or a diamond drill. Closure and postoperative care are the same as in the original surgery.

**Complications**  The most serious complication is postoperative airway compromise. In light of this, all patients are monitored in the hospital overnight. The performance of concomitant arytenoid adduction increases this risk and also the risk of hematoma formation. Other complications include penetration of the endolaryngeal mucosa, implant migration, infection, chondritis, and implant extrusion.

**Results**  A study from Johns Hopkins evaluated 35 patients implanted for vocal fold paralysis and reported subjective improvement in 89%. There were two complications including one implant extrusion and one case of airway obstruction. These results compare favorably with the results of other implant techniques in the literature.

**Summary**  The VoCoM implant system is a simple, efficient, and flexible method to achieve accurate vocal fold medialization. It is compatible with concomitant arytenoid adduction, although in itself may provide modest medialization of the vocal process. The implant material is biocompatible with a clinical history of more than 10 years of use. The procedure is technically reversible, although it should be used in individuals who are candidates for a permanent implant.

**Zeitel’s Rationale and Technique for Gore-Tex Implants**

**Rationale**  Gore-Tex medialization has become Zeitel’s implant of choice for medialization due to the unique qualities of the material. The use of Gore-Tex as a medialization implant for the musculomembranous vocal fold was introduced by Hoffman and McCulloch and has been employed widely with Stevens scissors, and the curved, glistening...
white surface of the cricoid facet is identified (Fig. 15.16). The posterior cricoarytenoid muscle is separated from the posterior plate of the cricoid so that the posterior aspect of the cricoarytenoid joint is well visualized and there is room to place a suture through this region (Fig. 15.16). A 4-0 Prolene suture on a cutting needle is placed through the posterior plate of the cricoid just medial to the facet, and the needle is brought out through the medial aspect of the cricoarytenoid joint (Fig. 15.17). The needle is then passed through the body of the arytenoid, followed by the inner aspect of

Fig. 15.12 (A,B) A needle-tipped electrocautery knife is used to separate the inferior constrictor from the thyroid lamina.

Fig. 15.13 The inferior cornu is identified and isolated so that the cricothyroid joint can be separated with Mayo scissors.

Fig. 15.14 Separating the cricothyroid joint and associating the inferior constrictor muscle from the thyroid cartilage allows for further anteromedial rotation of the thyroid lamina. Blunt dissection is performed in a cephalad and slightly anterior direction from the cricothyroid facet along the cricoid cartilage until the superior rim of the cricoid is encountered. The lateral aspect of the pyriform mucosa is bluntly dissected from the inner aspect of the thyroid lamina and the medial aspect of the pyriform mucosa is separated from the posterolateral aspect of the cricoid.