

# Surgery for vascular laryngeal lesions

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## KEYWORDS

Vascular laryngeal lesions;  
hemorrhagic vocal polyp;  
vocal nodules;  
fibrovascular lesions

Vascular lesions of the larynx are those created by phonotrauma resulting in subepithelial bleeding. These are typically divided into 2 categories, hemorrhagic polyps and fibrovascular lesions (vocal nodules). Both of these types of lesions can disrupt the natural vibration of the vocal folds and cause dysphonia. In those patients whose voices are their livelihood, complete removal with preservation of as much normal superficial lamina propria and squamous epithelium is paramount. Here, we describe proper in office assessment with stroboscopy, options for treatment, and techniques in surgical excision.

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## Introduction

Vascular laryngeal lesions are benign lesions of the true vocal folds that arise secondary to phonotrauma.<sup>1</sup> These can typically be divided into 2 main categories, hemorrhagic polyps and fibrovascular lesions (vocal nodules).<sup>1</sup> Hemorrhagic polyps develop acutely from extreme phonotrauma causing rupture of mucosal capillaries and subepithelial accumulation of blood.<sup>2</sup> This creates a small out-pouching of the epithelium and this exophytic lesion can cause premature partial glottic closure resulting in a dysphonic patient.<sup>3</sup> These can occur anywhere along the membranous portion of the true vocal folds and can vary greatly in size and appearance.<sup>2</sup> They are typically unilateral, but can occur bilaterally.

Vocal nodules on the other hand are a result of chronic moderate phonotrauma, and develop over months and years of voice use.<sup>1</sup> They are by definition bilateral, unless a unilateral lesion develops in opposition to a different pathol-

ogy. They occur on the mid portion of the membranous vocal folds from repeated collision, resulting in fluid accumulation in this area. This will lead to hyalinization of the superficial lamina propria (SLP) and eventually thickening of the epithelium itself.<sup>4</sup> As the nodules slowly grow, the loss of SLP and thickened epithelium can result in loss of vibration and a symptomatic patient.<sup>4</sup>

## Assessment

As always, work up begins with a detailed history and physical exam. Patients presenting with a hemorrhagic polyp give a typical history that involves a complaint of hoarseness for anywhere from a few days to months.<sup>3</sup> Symptoms develop acutely and are constant with complaints of a raspy voice. Inciting events are usually an upper respiratory tract infection with forceful and frequent coughing, or a period of increased voice use such as performing at a concert or attending a loud event. Pertinent negatives include no change in swallowing or breathing.

Vocal nodule patients have a slightly different presentation. Hoarseness has been present for years, starting

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gradually and worsening over this time period.<sup>4</sup> Degree of dysphonia can vary from day to day and is usually worsened with increased use and improves with rest. There is no inciting event, and similarly no issues with swallowing or breathing. Patients are typically self-described “talkers” and do work that requires voice use throughout the day—the classic description of teacher, preachers, and lawyers. In either case, a detailed voice history, including the patient’s occupation and degree of voice use is necessary as well, as this will have great bearing when discussing management options.

In addition to a complete head and neck exam, the vocal quality should be assessed. Patient’s with polyps can vary in their overall voice quality, but will almost always have some degree of roughness and breathiness as the polyp interferes with vibration and closure.<sup>5</sup> The voice will be unstable, sometimes achieving complete closure and smooth sound if the polyp is lying out of the way of glottic closure, but breaking and becoming rough when it does interfere.<sup>5</sup> Occasionally, patients will present with diplophonia.<sup>6</sup> This results from the vocal fold vibrating anterior and posterior to the polyp independently and producing 2 separate frequencies. This is a strong indicator of a mass lesion of the vocal fold and cannot be mimicked.<sup>6</sup>

Patients with vocal nodules can also vary in their degree of overall quality and roughness depending on the size of the nodules.<sup>7</sup> There will be uniformly a rougher breathier voice at higher pitches, however, as the SLP thins and the nodules take up more of the vibratory space, resulting in premature contact and air escape anterior and posterior to the nodules.<sup>7</sup> There is also usually a moderate degree of strain as these vocal abusers try to overcome their anatomic deficit to continue talking.

Clinical exam with high resolution distal chip laryngoscopy with either a flexible or rigid 70 or 90 degree laryngoscope is necessary for complete assessment and surgical planning. On exam, a hemorrhagic polyp presents usually as a unilateral lesion towards the middle portion of the membranous true vocal fold protruding into the airway.<sup>1</sup> The appearance can vary greatly anywhere from a more sessile whitish lesion of only 1-2 mm (Figure 1) up to a very pedunculated 10 mm mass with acute blood in the lesion and along the length of the fold (Figure 2). During stroboscopy, the polyp usually intermittently interferes with vibration and will do so more at certain pitches depending on size and location. This will result in intermittent complete glottic closure with a decreased closed phase ratio in an hourglass pattern (Figure 3).<sup>3</sup> Special attention should be paid to whether there is any blood along the length of the vocal fold as this will change management (Figure 4).

Nodules on the other hand have a fairly uniform appearance although they can vary in size and degree of inflammation. They occur bilaterally at the mid portion of the membranous vocal fold and are usually symmetric subepithelial swelling of the true vocal folds with smooth protrusion medially (Figures 5 and 6).<sup>4</sup> In order to fully



**Figure 1** Flexible distal chip laryngoscopic view of a chronic left posterior true vocal fold (TVF) polyp. This had been present for 15 years and the patient deferred treatment. Note there is no discoloration of the lesion. Some laryngeal secretions are present, but would clear with cough.

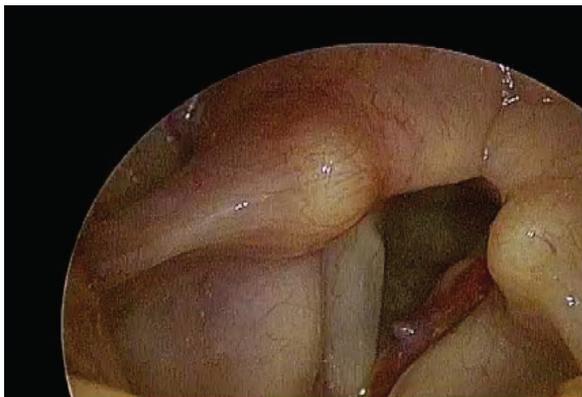


**Figure 2** Flexible distal chip laryngoscopic view of an acute left anterior TVF polyp. This large, pedunculated polyp is discolored with prominent capillaries within the polyp itself.



**Figure 3** Rigid distal chip laryngoscopic view of a left mid TVF polyp. Still image captures polyp interference in glottic closure with gaps anterior and posterior to the lesion.

evaluate these lesions, stroboscopy at higher frequencies is necessary.<sup>1</sup> This will usually reveal incomplete glottic closure at higher frequencies with a consistent hourglass shaped glottic gap.<sup>4</sup>



**Figure 4** Rigid distal chip laryngoscopic view of a left mid TVF polyp. Still image during abduction clearly shows acute hemorrhage along the left TVF. This patient was instructed on complete vocal rest for 1 week with a marked improvement in the appearance of both the TVF and the polyp itself.



**Figure 5** Flexible distal chip laryngoscopic view of inflamed vocal cord nodules. This patient was a teacher in a combined classroom who required constant loud voice use throughout the day.

## Treatment

Consideration must always be given to observation. As these are benign lesions, surveillance is certainly an option, especially for patients who are not bothered by their hoarseness, or who have very significant comorbidities and cannot safely undergo general anesthesia. It is rarely the case that patients opt for no intervention, however. Both polyps and nodules can be treated initially with voice therapy, with surgery reserved for those patients who do not respond.<sup>8</sup> Depending on the size of the polyp, however, the likelihood of voice therapy being helpful may vary. A large pedunculate polyp is unlikely to resolve with voice therapy alone, like that shown in [Figure 2](#). Nodules on the other hand more often respond well to voice therapy along with other supportive care such as rationing voice use throughout the day and using a personal amplifier. Complete voice rest should be reserved for those patients with active hemorrhage in the vocal fold as noted in [Figure 4](#). Continued



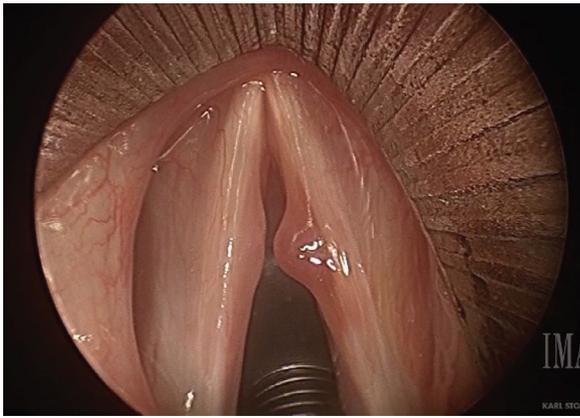
**Figure 6** Flexible distal chip laryngoscopic view of very mild vocal cord nodules. Note the very subtle prominence of the mid membranous vocal folds.

vocal trauma in this case can lead to sustained bleeding and increased likelihood of scar formation in the SLP with eventual loss of vibration.<sup>9</sup> At least 1 week of voice rest is recommended, or until resolution of the acute hemorrhage. It is also not advisable to operate during this acute phase, as the increased inflammation and bleeding during surgery puts normal SLP and epithelium at increased risk for iatrogenic injury.

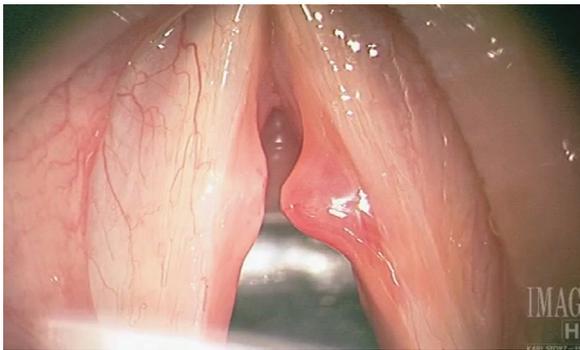
Surgical excision can and should be performed if voice therapy does not allow patients to return to reasonable voice use. Risks and benefits of the surgery should be discussed including bleeding, infection, worse voice, damage to teeth or soft tissues of the mouth and throat, tongue numbness, and need for repeat procedure.

## Surgical techniques

Despite their different presentations, vocal nodules and hemorrhagic polyps are treated very similarly surgically. After induction of general anesthesia and placement of a small (preferably 5.0), laser safe endotracheal tube, the patient is turned 90 degrees. Dental and eye protection is placed. At our institution the modular glottiscope is the laryngoscope of choice, as it allows for a complete view of the glottis, including the anterior commissure, while simultaneously allowing working room for 2 handed surgery. Other institutions prefer the Ossoff-Pilling laryngoscope for phonosurgery. A Dedo laryngoscope can be used if the polyp is not near the anterior commissure. The blunted superior aspect of the Dedo laryngoscope makes it a less than ideal instrument for anterior commissure work. The glottiscope is introduced through the mouth and along either glossotonsillar sulcus and used to bring the glottis into view. The patient is put into suspension at our institution with the Boston suspension gallows, however a Lewy suspension arm can also be used with other laryngoscopes. Here it is important to ensure that the entire glottis can be seen from the anterior commissure to the vocal processes. As needed, anterior pressure can be placed using 1 inch silk tape to obtain an optimal view.

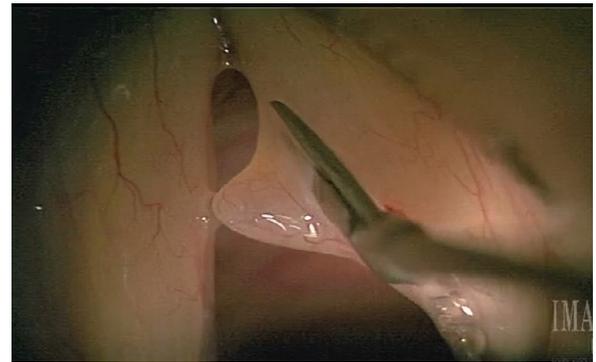


**Figure 7** Zero degree telescopic surgical image of a right mid-membranous TVF polyp. Note the opposing left sided irritation.



**Figure 8** Microscopic surgical image of the same polyp.

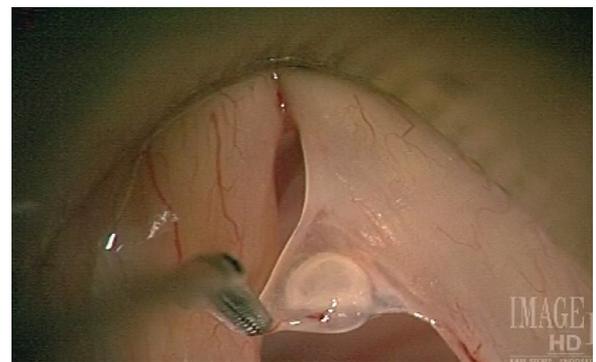
Next photographs can either be taken with a 0 degree telescope, or the microscope can be brought in immediately (Figures 7 and 8). The glottis is sprayed with lidocaine for topical anesthesia and to prevent subtle movement. The lesion or lesions are palpated with a blunt probe such as the right angle probe to better assess the 3-dimensional orientation. Next an infusion of the vocal fold is performed. At our institution saline with 1:10,000 epinephrine is used as this provides for some hemostasis during dissection. The orotracheal straight injector syringe with a 30 g needle is used after placing a 45 degree bend in the tip of the needle. The needle is placed posterior and inferior to the lesion and the SLP is infused. This helps to separate abnormal tissue from normal SLP and rotates the lesion into a better surgical position. A superior cordotomy is performed at the junction of normal epithelium and the lesion through the epithelium in a shallow manner to disrupt as little of the SLP as possible (Figure 9). This cut should start just posterior to the lesion and continue just anterior to it. A subepithelial dissection is then performed using the appropriate instruments depending on the size and shape of the lesion (Figures 10 and 11). This includes a combination of triangle forceps, curved alligators, and curved micro-scissors. The medial edge of the cut epithelium is held medially while the underlying either polypoid or fibrovascular tissue is dissected bluntly away, initially on the superficial aspect and then deeply.



**Figure 9** After saline with 1:10,000 epinephrine infusion of the right posterior inferior TVF is performed, a superior cordotomy is made with the upgoing micro-scissors starting just posterior to and continuing just anterior to the pathology and at the junction of normal and abnormal tissue.



**Figure 10** Subepithelial dissection is performed used a curved alligators and curved micro-scissors. The scissors are used to dissect bluntly normal SLP from abnormal polypoid or fibrovascular tissue.



**Figure 11** This right mid-membranous vocal fold polyp has been dissected away from surrounding normal tissue. The anterior and posterior attachments have been sharply cut and it is ready for extraction with either a suction or small cupped forceps.

Once this is done, the anterior and posterior attachment of the abnormal tissue needs to be sharply cut, releasing the tissue (Figure 12). At this point this abnormal tissue may be removed either with a small suction or cups forceps (Figure 12). It should be removed until the overlying epithelium is completely transparent, but should not progress until the epithelium tears (Figure 13). Once the abnormal



**Figure 12** Additional view of the same polyp as in image 11 during removal.



**Figure 13** View of the epithelium following removal of the polypoid abnormal tissue. Additional thinning of the epithelium should be performed until all pathologic tissue is gone and the epithelium is transparent. This can be achieved with a suction or small cupped forceps.



**Figure 14** When the epithelium is laid back down over the defect, any redundant tissue may now be trimmed away to allow for a smooth surface. Here there is a moderate amount of epithelium that must be trimmed away.

tissue is removed, the epithelium should be laid back flat over the defect (Figure 14). Any redundant tissue may be trimmed away with the curved micro-scissors (Figure 15). 1:10,000 epinephrine soaked pledgets are used throughout the procedure for hemostasis so that a clear surgical field can be maintained for optimal visualization of the pathology. Vocal fold infusion is performed again after complete



**Figure 15** Finished smooth epithelial edge following excision of polyp and trimming of redundant epithelium.

excision to assess the extent of the epithelial and SLP defect. Lastly, if there are any large capillary ectasias, the KTP or CO<sub>2</sub> laser at a low pulsed dose is used to ablate them in order to prevent recurrence. Laser safety precautions include maintaining end tidal oxygen less than 30%, wet eye pads and wet blue towels placed on any exposed skin areas of the patient, as well as laser safe goggles given to all OR staff. Lidocaine is again topically sprayed onto the larynx to prevent laryngospasm, the laryngoscope is removed and the patient is turned over to the anesthesia team for emergence.

## Postoperative Care

One week of voice rest is recommended following surgery at our institution, although guidelines for this varies from surgeon to surgeon. Given the epithelial disruptions however, the thought is that voice rest will allow for the best resulting voice with least chance of epithelial disruption. Patients are also advised to avoid heavy lifting for 2 weeks and to stick to a soft bland diet to avoid throat irritation. Patients are seen in follow-up at 2-3 weeks and 2-3 months to assess for recovery. Postoperative voice therapy is essential to prevent recurrence, especially of nodules.

## Disclosures

The authors report no proprietary or commercial interest in any product mentioned or concept discussed in this article.

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