



Close to Curtain Time: Management of the Injured Singer in the Acute Setting (In-Office and Backstage Evaluation)

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Abstract

Purpose of Review The purpose of this review is to summarize the current literature on the management of injured singers in the acute setting. This review seeks to answer the question on how to properly evaluate and treat injured singers presenting close to curtain time.

Recent Findings Females and younger patients are more likely to present with vocal cord nodules, while males and older patients are more likely to present with polyps. The use of short-term glucocorticoid treatment has been found to be safe in singers, having a low incidence of vocal fold hemorrhage (3.6%) and thrush (5.5%), without long-term consequences.

Summary The management of injured singers is challenging and requires a multidisciplinary approach. Phonotrauma is the most common etiology of acute dysphonia in singers. Although short-term glucocorticoid treatment appears to be safe without long-term consequences, the development of an optimal glucocorticoid regimen for the injured singer still needs further investigation.

Keywords Vocal emergencies · Injured singer evaluation · Phonotrauma · Backstage evaluation · Singer evaluation

Introduction

Historically, the field of laryngology has been intimately connected with the study and healing of the singing voice. In fact, the voice issues experienced by students of the renowned singing teacher, Manuel Garcia, catalyzed his interest in the study of the anatomy and physiology of the human voice [1]. This ultimately led Garcia to discover mirror laryngoscopy and to describe his observations on the interior of the larynx, during the act of singing to the Royal Society of London in 1856 [2].

The evaluation and management of the professional voice user continue to be an important and challenging part of the practice of laryngologists. The care of injured singers has become a multidisciplinary field, that has gathered a tremendous amount of scientific knowledge, while enjoying significant advances in digital optical technology for the evaluation of the larynx. The evolution of the field is especially important, since the performing demands of singers

have continued to escalate, as touring has become a leading source of revenue in the music industry [3]. In addition, singers have an increased risk of laryngeal pathologies [4], making them potentially more prone to vocal emergencies. If this is coupled with the fact that the mean prevalence of self-reported dysphonia is higher in singers (46.01%) when compared to the general population (18.8%), it becomes imperative for the voice clinician to become well-versed in the complete management of voice emergencies, especially when they occur close to curtain time [5].

Medical History

The evaluation of the injured singer begins the moment the clinician is contacted by the performer, their tour manager, promoter, or personal assistant. It is at this point, that the severity of the symptoms can be assessed to determine if the patient may need pre-emptive treatment or testing (e.g., an at-home respiratory viral panel), prior to the in-person visit. This is also an important moment for the clinician to stress the importance of a proper in-office evaluation. I have found that in most cases, singers, and their teams, are very receptive and understanding of the benefits of an in-office

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examination, especially since videostroboscopy is needed for an optimal laryngeal evaluation. However, in some cases, it might be logistically impossible for the singer to come to the office. Therefore, this initial conversation can also allow the clinician to select the armamentarium needed for the on-site visit.

During the in-person encounter, the medical history should be centered on details pertaining to the voice complaint. However, it is important to also inquire about any symptoms present in the respiratory system. In fact, a study of singers with acute voice problems prior to a performance showed that although most patients presented with a chief complaint related to dysphonia (72.5%), they also had primary complaints associated with sinus congestion (15%), cough (7.5%), and pharyngeal irritation (5%) [6].

Phonotraumatic lesions are the most common etiology of dysphonia in performers, accounting for 63.5% of cases [7•]. Furthermore, a recent study has shown a gender and age-specific distribution of these lesions, with females and younger patients being more likely to develop vocal fold nodules, while males and older patients are more likely to develop polyps [8••]. In the same way, there are musical genre-based differences that exist in the development of phonotraumatic injuries [9]. For this reason, the historian should determine the extent to which a phonotraumatic injury may be contributing to the patient's voice problem.

Another important history that should be obtained is the onset of dysphonia. This is especially pertinent in cases of a sudden onset of dysphonia during phonation, as this could indicate the development of a vocal fold hemorrhage (VFH) or mucosal tear [10]. Although the incidence of VFH is low, patients with a history of vocal fold varices have 10 times the expected risk of hemorrhage, compared to patients without varices [11•]. Furthermore, in patients who develop VFH, there is a 25.5% risk of recurrence. In these cases, vocal fold varices are the most significant risk factor [12].

The clinician must also inquire about any changes in the vocal range quality. This could provide empirical information of potential inflammatory changes on the vocal folds. For instance, decreased voice quality in the upper vocal range may indicate vocal fold edema or exacerbation of pre-existing vocal fold pathology. Similarly, one should consider the possibility of laryngeal tension, if the patient's upper range cuts off, or becomes dissonant, above a certain note. This is especially relevant if the singer feels resistance while pushing airflow through the larynx to reach a high note.

The presence of upper respiratory infection (URI) symptoms should be discerned, as this can pose a complex clinical challenge. If there is suspicion of a URI, the patient should be tested with a viral panel that includes SARS-CoV-2 (COVID-19), influenza, and respiratory syncytial virus (RSV), as a positive test may require the patient to be in quarantine or isolation. Furthermore, if

the patient does have a URI, voice rest must be recommended, as laryngeal inflammation in the setting of a URI may predispose singers to mucosal damage and hemorrhage, which could lead to a risk of long-term vocal issues [13]. Fortunately, the incidence of a URI decreases with improved professional voice training experience [14]. In fact, there is a strong predisposing factor to having a URI if the singer does not adhere to vocal hygiene rules (i.e., appropriate diet, physical activity, day planning and sleep, and healthy work environment) [14]. Therefore, knowing the singer's level of voice training, and their adherence to vocal hygiene rules, can help counsel the patient, potentially decreasing the risk of future respiratory infections and resulting voice problems.

The clinician should ask about the singer's performance schedule, as this can help formulate a directed treatment plan. In general, a longer time interval between clinical presentation and show time may result in a more predictable and less drastic treatment plan. The clinician must educate singers on the importance of seeking an early evaluation when injured, to minimize the risk of vocal fold damage and show cancellation. This point becomes especially important when educating less experienced singers, as they have been found to be more likely to seek help for dysphonia closer to show time [6].

Symptoms related to laryngopharyngeal reflux (LPR) should be investigated, as this may cause further irritation of the laryngeal mucosa. In 71–79% of cases, patients with LPR will describe a history of throat clearing, chronic cough, heartburn, globus sensation, and dysphonia [15]. Although the pathophysiology of the occurrence of dysphonia in LPR still needs further research, it is likely that voice issues may develop due to a sequence of macroscopic and microscopic mechanisms catalyzed by a mucosal response to acid and pepsin exposure [16]. Singers are especially likely to present with LPR, as stress due to career obligations, uncomfortable schedules, and unhealthy late meals prior to bedtime make the singer particularly at risk for the development of LPR [16].

A history of laryngeal pathology and phonosurgery should be noted, to evaluate a risk of recurrence, or exacerbation. The incidence of vocal cord nodule recurrence has been shown to be 4.5% in patients who have undergone phonosurgery with post-operative voice therapy [17]. There is also data showing that the most important risk factor for recurrence is the absence of post-operative voice therapy [18]. Therefore, patients with a prior phonosurgery history should be asked about their adherence to post-operative voice therapy.

Of course, in addition to the above-mentioned voice-centered history, the clinician must obtain a complete medical, surgical, drug allergy, and social history, for a comprehensive assessment (Table 1).

Table 1 Medical history consideration for injured singers presenting close to curtain time

- Contributing factors to phonotrauma
- Changes in vocal range quality
- Onset of dysphonia
- Presence of upper respiratory infection (URI) symptoms
- Presence of laryngopharyngeal reflux (LPR) symptoms
- Level of vocal training
- Performance schedule
- History of laryngeal pathology and phonosurgery
- Social history (e.g., smoking history, alcohol use history)
- Drug allergies

Useful Clinical Qualities when Caring for Singers

A well-known operational pillar, anecdotally learned by residents to build a successful medical practice, is often referred to as the “3 As” [19]. In this concept, the “3 As” stand for the clinician’s availability, affability, and ability. In the development of a professional voice practice, these three qualities become a minimal requirement to build upon. In fact, Dr. Robert Sataloff goes further to propose an operational approach, when caring for singers, that includes the “3 Cs”, describing competence, communication, and compassion as key qualities that clinicians should possess [19]. The clinician should aim to hone all these qualities with equal importance, since they may be needed to develop initial rapport and, eventually, expand the relationship with the singer and their team. This is especially true when caring for more experienced singers, as they may have a higher expectation for the quality of care they receive.

The availability of the clinician becomes especially important when a singer has a vocal emergency. Hence, the clinician should always try to be available over the phone and have the operational ability to see the patient for an urgent in-person visit.

Affability coupled with communication and compassion becomes essential qualities to give the injured singer the reassurance they need, during a potentially stressful moment in their careers. These qualities are also important when collaborating with other medical colleagues caring for the patient.

Finally, ability and competence are also key to provide the best possible care for the singer. The ability (i.e., clinical skills) of the clinician becomes fundamental to assure the patient receives the best possible care. Furthermore, the clinician should recognize the competence and contributions of each member of the voice care team (i.e., laryngologist, speech-language pathologist, phoniatrist, vocal pedagogue) [19], as vital for the singer’s best outcome.

Location for the Evaluation of the Singer

The preferred setting for the evaluation of the injured singer is the clinician’s office [10]. This is especially true in patients with severe symptoms, who will need videostroboscopy for a complete evaluation and clinical documentation. The clinician must counsel the patient on the benefits of the in-office visit while describing the limitations of an on-site visit. In some cases, however, there may be logistical issues that might prevent the patient from leaving their location. In such situations, the clinician should be ready to gather the appropriate armamentarium for a proper on-site evaluation.

Backstage Evaluation

When an on-site evaluation is the only viable option to assess the injured singer, the setting must be private, quiet, and shielded from any possible interruptions by the production team, musicians, or the singer’s team. Also, the clinician must be prepared with the appropriate tools to not only to perform a comprehensive otolaryngology examination, but also for any therapeutic procedure the patient may need. In general, the following items may be useful in your armamentarium: a charged otoscope, a light source, nasal specula, tongue depressors, 4×4 gauze, syringes (1 mL, 3 mL, and 10 mL), needles (18 G, 25 G, and 27 G), nonlatex gloves, a headlight, ear cures, injectable glucocorticoids, alcohol swabs, and a defogging agent [9] (Fig. 1). Aside from injectable glucocorticoids, all other medications the patient may need can be prescribed electronically, for practical purposes and proper documentation.

For the on-site laryngeal exam, a portable flexible laryngoscope and a portable LED light source are perhaps the most important pieces of equipment when evaluating an injured singer [10]. Topical nasal anesthetics, decongestants, and lubricants can be useful for comfort during flexible laryngoscopy. However, it is important to ask the patient for their preference in the use of topical nasal medications prior to laryngoscopy, as some singers may refuse them to avoid the risk of laryngeal side effects that could affect their performance. In such cases, the clinician may consider carefully performing the trans-nasal flexible laryngoscopy without nasal medication preparation. Alternatively, the use of a portable trans-oral rigid laryngoscope may be considered. Clinicians should also be aware of the existence of portable videostroboscopy units, which can allow for a more complete on-site laryngeal examination.

In-Office Evaluation

The clinician’s office offers the best possible equipment and environment for an optimal patient evaluation. This space

Fig. 1 Useful armamentarium for the on-site evaluation and treatment of an injured singer



allows for improved parameters for patient care, such as privacy, silence, and the patient's full concentration on the clinical visit. The clinic also has a complete array of diagnostic instrumentation for a comprehensive otolaryngology exam. Furthermore, it is in the office setting where the clinician has access to videostroboscopy equipment of the highest optical quality, allowing for the best diagnostic evaluation and video documentation. This is especially important in cases where the patient may present with dysphonia caused by subtle laryngeal findings. Finally, the office setting provides the clinician with more extensive therapeutic options to address the patient's symptoms, including injectable glucocorticoids, antibiotics, and nebulized medications.

Diagnosics Considerations

The differential diagnosis for dysphonia, in singers presenting in the acute setting, can be daunting. However, the clinician should become especially well-versed in the management of acute dysphonia due to a respiratory infection, phonotrauma, and muscle tension. In this section, we will discuss those conditions with the most clinical relevance for singers, presenting close to curtain time.

Acute Laryngitis

Acute laryngitis is a common cause of dysphonia in singers. The etiology may be bacterial, viral, fungal, allergic, or phonotraumatic [10]. There are multiple triggers that can initiate the laryngeal inflammatory cascade, eventually resulting in edema of Reinke's space and the potential

disruption of the normal vocal fold epithelial layer, and its vibratory properties [10]. In fact, studies on the effects of prolonged phonation, and transient episodes of phonotrauma on the vocal fold epithelium, have shown microvilli degradation, microholes, and intercellular pathway dilation [20]. In addition, in canines, desquamation of epithelial cells and basement membrane injury have been reported after 4 h of phonation [21]. Overall, the histological changes present during an acute laryngeal inflammatory process may lead to decreased voice quality and difficulty reaching the upper vocal range. In some cases, these inflammatory changes may also cause acute edema in the mid-membranous vocal folds, causing premature contact on adduction in this region. This can result in a glottic "hourglass" configuration, allowing for air escape anteriorly and posteriorly to the glottic edema during phonation [10].

Voice rest and humidification should be initially recommended for mild cases of acute laryngitis. In general, cases of moderate to severe acute laryngitis can be treated with a combination of complete voice rest, humidification, and a regimen of glucocorticoids (Table 2). The glucocorticoid regimen should be customized to the level of inflammation seen during the laryngeal exam, the patient's weight, and the time the singer has prior to showtime. It is important to emphasize that a laryngeal examination is a clinical necessity for every patient, especially if they are being considered for glucocorticoid treatment. The laryngoscopy provides information on the severity of the laryngeal inflammation while helping rule out aggressive vocal fold pathology that may require complete voice rest and show cancellation.

In cases of infectious laryngitis, it is important to diagnose the possible causative pathogen. This will help

Table 2 Clinical consideration in the management of acute phonotraumatic laryngitis in injured singers

<i>Time to Showtime</i>			
	Weeks	Days	Hours
<i>Acute phonotraumatic laryngitis without URI</i>			
Mild	<ul style="list-style-type: none"> • Complete voice rest • Humidification • Anti-reflux therapy • Reassess 1 week before show 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • +/- Oral glucocorticoids^b • Anti-reflux therapy • Reassess 24 h before show 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • +/- IM^a glucocorticoids^b • Anti-reflux therapy • Reassess 3 h prior to show
Moderate	<ul style="list-style-type: none"> • Complete voice rest • Humidification • +/- Oral glucocorticoids^b • Anti-reflux therapy • Reassess 1 week prior to show 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • + Oral glucocorticoids^b • Anti-reflux therapy • Reassess 24 h prior to show 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • + IM^a glucocorticoids^b • Anti-reflux therapy • Reassess 3 h prior to show
Severe	<ul style="list-style-type: none"> • Complete voice rest • Humidification • + Oral glucocorticoids^b • Anti-reflux therapy • Reassess 1 week prior to show 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • + Oral glucocorticoids^b • +/- IM^a glucocorticoids^b • Anti-reflux therapy • Reassess 24 h prior to show • Consider show cancellation 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • + Oral glucocorticoids^b • +/- IM^a glucocorticoids^b • Anti-reflux therapy • Consider show cancellation
<i>Acute phonotraumatic laryngitis with URI</i>			
	<ul style="list-style-type: none"> • Complete voice rest • Humidification • Anti-tussive therapy • Respiratory viral panel • Consider quarantine / isolation • Treat underlying infection • Once URI resolves^c, consider management as Acute Phonotraumatic Laryngitis without URI 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • Anti-tussive therapy • Respiratory viral panel • Consider quarantine / isolation • Treat underlying infection • Consider show cancellation 	<ul style="list-style-type: none"> • Complete voice rest • Humidification • Anti-tussive therapy • Respiratory viral panel • Consider quarantine / isolation • Treat underlying infection • Consider show cancellation

^aIntramuscular

^bDosage and administration route of glucocorticoids must be determined based on patient’s weight, medical history, and findings on laryngoscopy exam

^cAssumes completion of quarantine, or isolation, requirements based on respiratory viral panel results

begin treatment rapidly, and determine if the patient needs to be quarantined, or isolated, as it is recommended for some viral upper respiratory infections (e.g., SARS-CoV-2). Complete voice rest must be recommended until the infection is resolved. This is especially important for the prevention of further laryngeal injury. As patients with infectious laryngitis may also have constitutional symptoms, the clinician should caution singers to avoid non-steroidal anti-inflammatory drugs (NSAIDs), as this class of medications may increase the risk of vocal fold hemorrhage [22].

The clinician should consider recommending adjuvant upper airway steam humidification, as it has been shown to improve perceptible and acoustic voice parameters of singer presenting with acute laryngitis [23]. The benefits of steam humidity to the larynx are theorized to stem from its vasodilatory properties, which may lead to improved tissue perfusion and eventual clearance of inflammatory metabolites and edema [23].

Vocal Fold Hemorrhage

Vocal fold hemorrhage (VFH) usually occurs when an acute phonotraumatic event results in a rupture of a submucosal blood vessel. This leads to a diffuse migration of blood through the low-resistance tissue of the superficial layer of the lamina propria [24•]. The resulting changes in mass and rheology of the vocal fold cause dysphonia. The onset of the symptom is usually sudden and may be associated with performing a strenuous vocal task [10, 22].

Risk factors associated with VFH include phonotrauma, premenstrual hormonal status, the use of anticoagulants, an upper respiratory infection, and the presence of vocal fold varices. In fact, performers with a history of a vocal fold varix are 10 times more likely to develop a VFH, as compared to performers without a vocal fold varix [11•]. In addition, patients with a history of VFH have a 25.5% rate of recurrence, with the most significant risk factor for recurrence being a history of vocal fold varices [12]. Interestingly,

the use of anticoagulation agents and a recent URI have not been shown to be statistically associated to a risk of VFH recurrence [12].

In most cases, VFH resolve spontaneously, healing within 7 to 10 days [22]. During the first week after injury, the patient must remain on complete voice rest, avoiding coughing or throat clearing. Clinical observation should continue in the subsequent weeks with relative voice rest until vocal fold pliability and periodic vibration returns [22, 25]. Patients usually make full recovery with appropriate treatment, voice rest, and follow-up. In fact, no significant long-term adverse consequences have been found in promptly treated singers diagnosed with VFH [24•].

Mucosal Tears

Although very little has been written about mucosal tears, it is important for clinicians to be aware of this diagnosis and to include it as part of the differential diagnosis of any patient who presents with dysphonia after persistent phonotrauma to the vocal folds. Vocal fold mucosal tears present with phonotraumatic breaks in the epithelium and, in some cases, the superficial layer of the lamina propria [26]. As the phonotrauma continues, the vocal fold tear may extend into the intermediate and deep layer of the lamina propria, placing the patient at risk for scarring and permanent dysphonia. Patients with mucosal tears may present with sudden-onset dysphonia after high-intensity phonotrauma (e.g., cough, screaming, improper singing technique, prolonged voice use) [26]. In addition, the patient may also present with decreased vocal range, throat discomfort, a sensation of “mucus” on the glottis, or a sensation of “thick” vocal folds. The clinician must be aware that although the symptoms are usually sudden, a gradual symptomatic progression is also possible [26].

The diagnosis of a mucosal tear can be made on a stroboscopy exam under magnification. The examination may show a visible break in the vocal fold mucosa with epithelial jagged edges. Erythema, vocal fold hemorrhage, and abnormal vocal fold rheology may also be present [10].

When the diagnosis of mucosal tears has been confirmed, voice rest for 3–7 days allows for mucosal healing. Voice therapy should also be recommended.

Functional Dysphonia

Muscle tension dysphonia (MTD) is caused by excessive tension of the extrinsic laryngeal musculature, causing a change in the position of the larynx. This new laryngeal position within the neck can lead to an inclination of the cartilaginous structures of the larynx, affecting the function of the intrinsic laryngeal muscles [27]. The dysfunction of the vocal tract muscles can result in dysphonia,

loss in pitch control, excess vocal effort, vocal fatigue, and neck tightness.

In patients with suspected MTD, the physical exam must include the evaluation of visible and palpable tension around the larynx, which may include tightness of the para-laryngeal muscles, laryngeal rise, decreased thyrohyoid space, and localized muscular tenderness [27].

The treatment of MTD requires a multidisciplinary approach to address the myriad of potential contributing factors affecting the patient. Vocal hygiene teaches the patient to identify factors potentially affecting voice issues while providing modifying behavior for improved vocal health. In addition, direct voice therapy approaches can be used to work on the patient’s posture, breathing, phonation, and articulation. One such approach includes circumlaryngeal manual therapy, used by speech-language pathologists to directly decrease laryngeal muscle tension through superficial and deep massages [27].

Glucocorticoids in the Treatment of the Injured Singer

The use of glucocorticoids to treat acute dysphonia in singers is common. In fact, a study done on Broadway singers found that 32% of participants reported being treated with glucocorticoids for their vocal symptoms [28], while a survey of 212 otolaryngologists showed that 54% of them were more likely to prescribe glucocorticoids for vocal performers [29]. For this reason, it is imperative for the clinician to have a basic understanding of the pharmacology and the laryngology-related data available on glucocorticoids.

Performers may develop acute vocal fold inflammatory changes due to phonotrauma, infection, or allergy. In such cases, interstitial fluid accumulates in the superficial lamina propria, resulting in dysphonia due to edema and a disruption of the rheologic properties of the vocal fold [30••]. Usually, voice rest and treatment of the underlying inflammatory etiology provide appropriate healing of the damaged vocal folds [31]. However, at times, the singer may have a pressing, career-changing performance, for which there may be insufficient time for healing, using these measures alone. In such cases, glucocorticoids may be considered to accelerate the attenuation of these inflammatory changes. In general, the use of short-term glucocorticoids has been found to be safe in singers, having a low incidence of vocal fold hemorrhage (3.6%) and thrush (5.5%), without long-term consequences [30••]. Nevertheless, the decision to use glucocorticoids needs to be carefully evaluated with the patient, to avoid potential side effects and recurrent dependence to the medicine. The clinician must counsel the patient on the short-term side effects (e.g., hyperglycemia, hypertension, mood changes, and insomnia) and potential long-term

risks (e.g., immune suppression, osteoporosis, and avascular necrosis) of glucocorticoid use [32]. Furthermore, it is important that patients considered for glucocorticoid treatment have a laryngeal examination before glucocorticoids are given and for persistent post-treatment dysphonia.

A basic understanding of the mechanism of action of endogenous glucocorticoid steroids can help predict the effects of glucocorticoids on laryngeal inflammation. Free cortisol is the body's active endogenous glucocorticoid. This hormone is produced and secreted by the adrenal cortex after induction of the hypothalamic–pituitary–adrenal axis through neural, endocrine, and cytokine signals. Free cortisol activates and binds to the intracellular glucocorticoid receptor (GCR), forming the cortisol-GCR complex, which, once activated, begins a cellular response that affects genomic and nongenomic pathways to suppress inflammation [33].

A high concentration of GCRs has been found within the epithelial layer of the vocal fold in a rat model [34]. This finding is especially important when one considers that raised intensity phonation can be detrimental to the integrity of the vocal fold epithelial layer [20], and glucocorticoids may improve the barrier function of the epithelial layer by increasing tight junction protein expression [35]. In the same way, GCRs have also been localized in the vocal fold capillaries, which coupled with the known vasoconstrictive properties of glucocorticoids, may help decrease vocal fold edema [34].

There is interesting scientific data on the laryngeal effects of glucocorticoids to the larynx. For instance, dexamethasone injections have been found to decrease collagen deposition 3 and 7 days after a surgical procedure in a rabbit model [36]. Evidence also shows that 20 hours after oral hydrocortisone treatment, there is a decrease in the proinflammatory mediators IL- β and IL-6 in the secretions of human vocal folds that have undergone phonotrauma. The same study showed an increase in the anti-inflammatory marker mediator IL-10 at the 20-hour post-steroid treatment interval [37].

The clinical benefits of glucocorticoids on the vocal function of singers go beyond being intuitive, anecdotal observations. In fact, a study of 55 performers showed statistically significant improvement on EASE scores and CAPE-V ratings after a 6-day methylprednisolone taper [38••]. While voice rest and glucocorticoids have been proven useful as a “cool down” approach to improved visualization of pathology obscured by acute inflammation [32].

Conclusions

The care of injured singers is a multidisciplinary field that relies on clinicians that are well-versed in the complete specialized evaluation of the singer in any clinical setting and

location. Although anecdotal evidence has usually influenced the clinical decision-making, recent studies are providing evidence-based data to improve the care of the singer. Nevertheless, more data is required to help develop a standardized optimal treatment plan for injured singers, presenting at any point, and for any reason, prior to curtain time.

Declarations

Competing Interests The author declares no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
 - Of major importance
1. Ingalls TH, Hemming SM. Laryngology's hundred-year-old debt to grand opera. *N Engl J Med*. 1955;253(11):468–9. <https://doi.org/10.1056/NEJM195509152531107>.
 2. Garcia M IV. Observations on the human voice. *Proc R Soc Lond [Internet]*. 1856;7:399–410. <https://doi.org/10.1098/rspl.1854.0094>.
 3. Christensen F. Streaming stimulates the live concert industry: evidence from YouTube. *Int J Ind Organ*. 2022;85:102873. <https://doi.org/10.1016/j.ijindorg.2022.102873>.
 4. Kwok M, Eslick GD. The impact of vocal and laryngeal pathologies among professional singers: a meta-analysis. *J Voice*. 2019;33(1):58–65. <https://doi.org/10.1016/j.jvoice.2017.09.002>.
 5. Pestana PM. Prevalence of voice disorders in singers: systematic review and meta-analysis. *J Voice*. 2017;31(6):722–7. <https://doi.org/10.1016/j.jvoice.2017.02.010>.
 6. Mishra S. 24 Hours prior to curtain. *J Voice*. 2000;14(1):92–8. [https://doi.org/10.1016/S0892-1997\(00\)80098-3](https://doi.org/10.1016/S0892-1997(00)80098-3).
 - 7.● Guss J. Dysphonia in performers: toward a clinical definition of laryngology of the performing voice. *J Voice*. 2014;28(3):349–55. <https://doi.org/10.1016/j.jvoice.2013.10.004>. **Case-control study designed to identify the etiology of dysphonia in performers, as compared to non-performers.**
 - 8.●● Childs LF. Profile of injured singers: expectations and insights. *Laryngoscope*. 2022;132(11):2180–6. <https://doi.org/10.1002/>

- [lary.30015](#). **Retrospective cohort study designed to find patterns of phonotraumatic lesions in singers and to determine factors that made patients more prone to undergo surgery.**
9. Childs LF. Association of genre of singing and phonotraumatic vocal fold lesions in singers. *Laryngoscope*. 2022;00:1–7. <https://doi.org/10.1002/lary.30414>.
 10. Klein AM, Adam M, Johns MM. Vocal emergencies. *Otolaryngol Clin N Am*. 2007;40(5):1063–80. <https://doi.org/10.1016/j.otc.2007.05.009>.
 - 11.● Tang CG-Z. Vocal fold varices and risk of hemorrhage. *Laryngoscope*. 2016;126(5):1163–68. <https://doi.org/10.1002/lary.25727>. **Retrospective cohort study designed to establish the risk of vocal fold hemorrhage in patients with and without vocal fold varices.**
 12. Lennon CJ. Vocal fold hemorrhage: factors predicting recurrence. *Laryngoscope*. 2014;124(1):227–32. <https://doi.org/10.1002/lary.24242>.
 13. Bové MJ. Influenza and the vocal performer: update on prevention and treatment. *J Voice*. 2008;22(3):326–32. <https://doi.org/10.1016/j.jvoice.2006.09.012>.
 14. Zimmer-Nowicka J, Januszewska-Stańczyk H. Incidence and predisposing factors of common upper respiratory tract infections in vocal students during their professional training. *J Voice*. 2011;25(4):505–10. <https://doi.org/10.1016/j.jvoice.2010.01.015>.
 15. Lechien JR. Laryngopharyngeal reflux and voice disorders: a multifactorial model of etiology and pathophysiology. *J Voice*. 2017;31(6):733–52. <https://doi.org/10.1016/j.jvoice.2017.03.015>.
 16. Lechien JR. Laryngopharyngeal reflux disease in singers: pathophysiology, clinical findings and perspectives of a new patient-reported outcome instrument. *Eur Ann Otorhinolaryngol Head Neck Dis*. 2019;136(3):39–43. <https://doi.org/10.1016/j.anorl.2018.08.008>.
 17. Zeitels SM. Phonomicrosurgery in singers and performing artists: treatment outcomes, management theories, and future directions. *Ann Otol Rhinol Laryngol*. 2002;111(12_suppl):21–40. <https://doi.org/10.1177/0003489402111S1203>.
 18. Béquignon E. Long-term results of surgical treatment of vocal fold nodules. *Laryngoscope*. 2013;123(8):1926–30. <https://doi.org/10.1002/lary.23768>.
 19. Sataloff RT, Milstein CF. The Professional Voice Practice. In: Benninger MS, Murry T, Johns III MJ, editors. *The Performer's Voice*. San Diego, CA: Plural Publishing, Inc.; 2015. p. 409–420.
 20. Rousseau B. Raised intensity phonation compromises vocal fold epithelial barrier integrity. *Laryngoscope*. 2011;121(2):346–51. <https://doi.org/10.1002/lary.21364>.
 21. Gray S, Titze I. Histologic investigation of hyperphonated canine vocal cords. *Ann Otol Rhinol Laryngol*. 1988;97(4):381–8. <https://doi.org/10.1177/000348948809700410>.
 22. Paknezhad H. Vocal fold hemorrhage. *Ear Nose Throat J*. 2021;100(6):276–7. Available from: <https://doi.org/10.1177/0145561319869914>. Accessed 15 May 2023.
 23. Pimenta J. Sensation and repercussion of the use of humid heat in the treatment of dysphonia due to laryngitis in singers. *J Voice*. 2022. <https://doi.org/10.1016/j.jvoice.2021.09.038>.
 - 24.● Kerwin LJ. Long-term consequences of vocal fold hemorrhage. *Laryngoscope*. 2017;127(4):900–6. <https://doi.org/10.1002/lary.26302>. **Retrospective cohort study designed to assess the long-term sequelae of vocal fold hemorrhage on vocal function.**
 25. Sataloff RT, Hawkshaw MJ, Sataloff JB. Common Medical Diagnoses and Treatments in Patients with Voice Disorders: An Introduction and Overview. In: Sataloff RT, editor. *Professional Voice: The Science and Art of Clinical Care*. 4th ed. San Diego, CA: Plural Publishing Inc; 2017. p. 561–584.
 26. Hoover CA. Vocal fold mucosal tears: maintaining a high clinical index of suspicion. *J Voice*. 2001;15(3):451–5. [https://doi.org/10.1016/S0892-1997\(01\)00045-5](https://doi.org/10.1016/S0892-1997(01)00045-5).
 27. Houtte E. Pathophysiology and treatment of muscle tension dysphonia: a review of the current knowledge. *J Voice*. 2011;25(2):202–7. <https://doi.org/10.1016/j.jvoice.2009.10.009>.
 28. Gehling D. Backstage at Broadway: a demographic study. *J Voice*. 2014;28(3):311–5. <https://doi.org/10.1016/j.jvoice.2013.11.002>.
 29. Govil N. Glucocorticoids for vocal fold disease: a survey of otolaryngologists. *J Voice*. 2014;28(1):82–7. <https://doi.org/10.1016/j.jvoice.2013.04.015>.
 - 30.●● Murphy Estes C. Prospective evaluation of safety of singing on steroids: testing the truth of received wisdom. *Laryngoscope*. 2021;131(10):2298–304. <https://doi.org/10.1002/lary.29437>. **Prospective cohort study designed to determine the safety of glucocorticoids in the treatment of vocal fold edema in singers.**
 31. Mishra S, Rosen C, Murry T. Acute management of the performing voice. *Otolaryngol Clin North Am*. 2000;33:957–65.
 32. Childs LF, Mau T. Combining voice rest and steroids to improve diagnostic clarity in phonotraumatic vocal fold injury. *J Voice*. 2022;36(3):403–9. <https://doi.org/10.1016/j.jvoice.2020.06.003>.
 33. Rafii B, Sridharan S, Taliercio S, Govil N, Paul B, Garabedian MJ, et al. Glucocorticoids in laryngology: a review. *Laryngoscope*. 2014;124:1668–73. <https://doi.org/10.1002/lary.24556>.
 34. Zhou H, Sivasankar M, Kraus DH, Sandulache VC, Amin M, Branski RC. Glucocorticoids regulate extracellular matrix metabolism in human vocal fold fibroblasts. *Laryngoscope*. 2011;121:1915–9. <https://doi.org/10.1002/lary.21920>.
 35. Zettl KS. Glucocorticoid-induced formation of tight junctions in mouse mammary epithelial cells in vitro. *Proc Natl Acad Sci - PNAS*. 1992;89(19):9069–73. <https://doi.org/10.1073/pnas.89.19.9069>.
 36. Campagnolo AM, Tsuji DH, Sennes LU, Imamura R, Saldiva PHN. Histologic study of acute vocal fold wound healing after corticosteroid injection in a rabbit model. *Ann Otol Rhinol Laryngol*. 2010;119:133–9. <https://doi.org/10.1177/000348941011900211>.
 37. Ingle JW. Role of steroids in acute phonotrauma: a basic science investigation. *Laryngoscope*. 2014;124(4):921–7. <https://doi.org/10.1002/lary.23691>.
 - 38.●● Murphy Estes C. Performers' perceptions of vocal function during oral steroid treatment of vocal fold edema. *Laryngoscope*. 2022;132(12):2434–41. <https://doi.org/10.1002/lary.30072>. **Prospective cohort study designed to examine singers' self-perception of vocal function after steroid treatment.**
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