The horse is an amazing athlete and in order to accommodate the tremendous oxygen demand of skeletal muscles the horse increases its ventilation of its lungs 50 fold. The limiting factor to oxygen delivery is the diameter of the upper airway. The horse is an obligate nasal breather and the horses’ upper airway must prepare for these large changes in airflow and pressure. There are many disease processes that can increase the resistance of the upper airway by decreasing its diameter. Failure of muscles of the pharynx and larynx to contract during inhalation can also increase resistance to airflow. This is a dynamic obstruction and is only seen during inhalation because of the sudden decrease in pressure and poorly supported tissue. The poorly supported tissue is pulled into the lumen with the sudden drop in pressure when the horse inhales.

Left Laryngeal Hemiplegia provides a good example of this.

Damage to the recurrent laryngeal nerve causes paralysis of the dorsal cricoarytenoid muscle. This muscle would normally abduct the arytenoid cartilage and in doing so pull the vocal chords out of the way when inhaling. When this nerve is no longer functional for various reasons the vocal fold gets sucked into the lumen and decreases the diameter of the larynx impeding the flow of oxygen. This causes a significant drop in performance in horses at maximal exercise like racing. Clinical signs consist of the production of abnormal respiratory sounds during exercise and exercise intolerance. The airflow over the paralysed vocal chord can produce a variety of noises from a whistle to a roar, hence the layman’s term “Roarer”.

Since this is a dynamic obstruction of the airway, the best way to diagnose it is to perform a dynamic endoscope. This is done either on a treadmill or with an overland scope while at work.
Certain grades of paralysis can be seen at rest and can therefore be diagnosed with a resting endoscope. There are various grades used to describe the severity of the problem.

**Grading system in standing unsedated horses:**

**Grade 1:** All arytenoids cartilage movements are synchronous and symmetrical and full arytenoids cartilage abduction can be achieved and maintained.

**Grade 2:** Arytenoid cartilage movements are asynchronous and/or larynx is asymmetrical at times but full abduction can be achieved and maintained.

Subgrade:

1. Transient asynchrony, flutter or delayed movements are seen.
2. Asymmetry of rima glottis much of the time due to reduced mobility of affected arytenoids and vocal fold but there are occasions, typically after swallowing or nasal occlusion when full symmetrical abduction is achieved and maintained.

**Grade 3:** Arytenoid cartilage movements are asynchronous and/or asymmetrical. Full arytenoids cartilage abduction cannot be achieved and maintained.

Subgrade:

1. Asymmetry of the rima glottis much of the time due to reduced mobility of affected arytenoids and vocal fold but there are occasions, typically after swallowing or nasal occlusion when full symmetrical abduction is achieved but not maintained.
2. Obvious arytenoids abductor deficit and arytenoids asymmetry. Full abduction never achieved.
3. Marked but not total arytenoids abductor deficit and asymmetry with little arytenoids movements. Full abduction is never achieved.

**Grade 4:** Complete immobility of the arytenoids cartilage and the vocal fold.

**Hypothetical Etiologies**

There are multiple theories as to how and why the laryngeal nerve fails to function. Hypotheses range from mechanical causes like tension on the nerve and blood supply during neck movement, embryonic development to environmental factors such as toxins. Perivascular injection of irritant substances is also thought to be a possibility in damaging the nerve. The length of the nerve was thought to play a role but when this was investigated it was found
that zebra don’t have the same problem and giraffe, which would have an even longer recurrent nerve, don’t have this problem either.

There seems to be a heritable problem in certain families and some people have theorized that it is a polyneuropathy involving many nerves and not a mononeuropathy involving this single nerve.

Another theory was that there is compression on the nerve where it curves around the aorta but on histological evaluations it was found that this is not true.

**Treatments**

Treatment of laryngeal hemiplegia includes prosthetic laryngoplasty (‘tie-back’ procedure), ventriculectomy (‘Hobday’ procedure), ventriculocordectomy, and neuromuscular-pedicle grafting.

A prosthetic laryngoplasty or ‘tie-back’ procedure is performed using nylon to permanently pull the arytenoids cartilage into an abducted position in order to allow airflow. Complications of this surgery can be aspiration pneumonia if the prosthetic is tightened too much. Another complication can be failure of the prosthetic (snapping of the nylon) and this usually occurs when the nerve is not sufficiently paralysed and there is too much movement on the prosthetic.

A ventriculectomy or Hobday procedure is the removal of the ventricles so that they are not sucked into the larynx during inhalation and thereby decreasing the diameter of the airway.

A ventriculocordectomy is the removal of both the ventricles and the vocal cords to maintain the diameter.

A neuromuscular-pedicle graft is the translocation of the first or second cervical nerve with or without some attached omohyoideus muscle to attempt to re-innervate the laryngeal muscles.