Upper Airway Abnormalities Affecting Performance

Jennifer Taintor DVN, DACVIM-LA, DACVSMR-EQ

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Abstract: This is a review of the most common upper airway abnormalities resulting in poor performance in the equine athlete. Upper airway anatomy and mechanics will be discussed. Dorsal displacement of soft palate, epiglottic entrapment, laryngeal neuropathy, arytenoid chondritis, and medial deviation of aryepiglottic be covered including pertinent anatomy, clinical presentation, etiology, diagnosis, and treatment.

Airway Mechanics

- Upper airway and trachea provide majority of frictional resistance
- Counteracted by
    - Dilation of external nares
    - Opening of the nasal valve
    - Catecholamines shrinks nasal mucosa
    - Pharynx dilates
        - Stylopharyngeus that lifts the roof of the pharynx
        - Tensor veli palatini that prevents dorsal bulging of the soft palate
        - Hyoepiglotticus that pulls the epiglottis ventrally
- Abduction of larynx thru contraction of cricoarytenoid muscle

Dynamic obstruction

- Poorly supported tissues of pharynx and larynx
    - Failure of abductor muscles
    - Negative pressure during inhalation
- When to suspect dynamic obstruction
    - Poor performance
        - When head and neck in flexion
    - Airway noise during exercise
        - Inhalation: laryngeal
        - Exhalation: dorsal displacement of soft palate

DDSP

- Caudal border of the soft palate is dislocated dorsally to the epiglottis
- Swallowing corrects position
- Clinical presentation
    - Nosie during exhalation
        - Soft palate billows dorsally into the nasopharyngeal lumen
        - Mouth breathing during exhalation
            - 30% do not make noise
    - Poor performance
- Prevalence
    - In racing TB 10-20%

- Unknown in other sport disciplines
- Possible contributing factors
  - Previous respiratory infection
    - Previous “tie back” or prosthetic laryngoplasty

- Etiology- possible
  - Neuromuscluar dysfunction
    - Pharyngeal branch of the vagus
    - Thyrohyoid muscle
    - Distal hypoglossal nerve
  - Epiglottic malformation

- Diagnosis
  - Endoscopic examination
    - At rest
    - Does not correlate with what occurs during exercise
    - May suggest occur at exercise if
      - Displacement is not corrected with multiple swallowing attempts
    - Abnormal epiglottis
    - Abnormal palate
    - Bruising of nasopharynx at level of guttural pouch openings

  - Exercise endoscopic exam
    - Treadmill
    - Over the ground

- Treatment options
  - Conservative
    - Medical
      - Inflammation
      - infection
    - Tack alterations
      - Noseband
        - Drop
        - Figure eight
        - Australian
      - Bits
        - Bitless
        - Serena bit
        - “W” bit
    - Tongue tie
    - Cornell throat support
  - Surgical
    - Soft palate
      - Thermal palatoplasty
      - Tension palatoplasty

        - Palatal scleropathy
        - Staphylectomy
    - Epiglottis
        - Epiglottic augmentation
        - Subepiglottic resection
    - Larynx and hyoid
        - Tenectomymyectomy of sternothyroid/sternohyoid/omhyoid
        - Laryngeal tie forward

Epiglottic Entrapment

- Aryepiglottic and subepiglottic mucosal folds envelopes the epiglottis, turning it inside out
- Clinical presentation
    - Noise during both respiratory cycles
    - Poor performance
    - Severe cases may appear similar to aspiration pneumonia
- Diagnosis- Endoscopic Exam
- Treatment
    - Surgical
        - Midline division of the entrapping aryepiglottic membrane
        -

Laryngeal Hemiplegia

- Recurrent laryngeal neuropathy
- Dysfunction and atrophy of the intrinsic laryngeal muscles, in particular M. cricoarytenoideus dorsalis
- Clinical presentation
    - Inspiratory noise during exercise
    - Poor performance
- Prevalence
    - Heavy and tall breeds more commonly affected
        - Drafts > Warmbloods > TWH > Saddlebreds > TB > STB > QH
        - 95% of horse > 160 cm tall affected with clinically significant LN
        - Can affect animals at almost any age but the most commonly noted time of clinical disease is between 1 and 6 years of age.
- Etiology
    - Neuropathy as a result of distal axonopathy
        - Inherited ?
        - Nerve length
        - Local inflammation
        - Local injury
- Diagnosis- Endoscopic Exam-
    - Resting
        - Grade 1-4
    - Dynamic
        - Grade A-C

- Ultrasound
  - Histopathologic changes of CAL muscle appear prior to CAD
- Treatment
  - Surgical options
    - Prosthetic laryngoplasty (tie-back)
    - Ventriculectomy,
    - Ventriculoedectomy
    - Arytenoidectomy
    - Laryngeal reinnervations
  - Surgical outcomes
    - Prosthetic laryngoplasty
      - Highly variable, with 48% to 94% of horses starting 1 race
      - Reasonable estimates for success range from 50% to 70% in racehorses
      - Reasonable estimates from 86% to 93% in nonracehorses
  - Complications of surgery
    - Prosthetic laryngoplasty
      - Continued exercise intolerance and respiratory noise in 30 to 40% of horses during exercise
      - Chronic coughing due to abduction of the left arytenoid cartilage and the resulting inability of the larynx to protect the trachea from aspiration of ingesta in 20 to 40% of horses,
      - Loosening of the prosthetic suture(s) and loss of an initial degree of abduction in approximately 10% of horses

Arytenoid Chondritis

- Chronic inflammation
- Granulation tissue originating from the arytenoid cartilage and protruding into the lumen of the rima glottides
- Severe arytenoid cartilage abscessation and deformity

- Clinical Presentation
  - Respiratory noise that mimics LN
  - Poor performance
- Diagnosis
  - Endoscopic exam
  - Ultrasound
- Treatment
  - NSAIDS
  - Antimicrobial treatment 2-3 weeks
  - Surgical excision of granulomas
  -

Medial Deviation of Aryepiglottic Fold

- Previously axial deviation

- Aryepiglottic folds deviates axially towards the rima glottidis
- Sometimes seen prior to DDSP at exercise.
- Usually bilateral
    - Right more often affected
- Clinical presentation
    - Occurs during strenuous exercise
    - Respiratory noise
    - Poor performance
- Etiology
    - Suggested that loss of arytenoid cartilage abduction or elevation of the epiglottis may reduce tension of the fold
        - Enable them to collapse towards the laryngeal lumen during
- Diagnosis
    - Endoscopic Exam
- Treatment
    - Surgical
        - Surgical resection of the aryepiglottic tissue between the lateral edge of the epiglottis and the corniculate processes of the arytenoid cartilages