LIVS In Plain View

LIVS 20 YEARS 1998-2018

MAY/JUNE 2020
VOLUME 13 ▪ ISSUE 2

LONG ISLAND VETERINARY SPECIALISTS
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Brachycephalic (obstructive) Airway Syndrome, *Part 2 [OF 3 PART SERIES]*

Dr. Robert Waddell DACVS-SA

Diagnostics

History, clinical signs, and physical examination findings aid strongly in the suspicion or diagnosis of this condition. Diagnosis is via direct visualization of the aforementioned abnormalities that constitute brachycephalic airway syndrome. Therefore, diagnosis requires the patient to be heavily sedated or under general anesthesia. If the patient appears to be clinically stable, diagnostics are performed prior to the use of sedation or anesthesia for evaluation of comorbidities.

Blood panels

The complete blood count panel may reveal polycythemia due to chronic hypoxemia. Arterial blood gas evaluation may show a low PaO2 (partial pressure of oxygen in arterial blood) and a higher PaCO2 (partial pressure of carbon dioxide in arterial blood) that progresses with age.

History, clinical signs, and physical examination findings aid strongly in the suspicion or diagnosis of this condition.

Radiographs

A plain lateral pharyngeal radiographic view may show an elongated soft palate entering the rima glottidis. Plain orthogonal thoracic radiographic findings may include bronchopneumonia (presumably due to aspiration), cardiogenic or noncardiogenic pulmonary edema, evidence of congenital cardiac defects, hypoplastic trachea, and right-sided cardiac enlargement.

The diagnosis of hypoplastic trachea is based on thoracic radiographic and/or computed tomographic measurements. Various techniques have been described.

The ratio between the tracheal lumen diameter and thoracic inlet distance can be used to assess relative tracheal diameters. The thoracic inlet diameter can either be measured from the ventral border of the T1 vertebra to the inner surface of the manubrium or the tracheal diameter lumen can be measured where the trachea crosses the thoracic inlet on lateral thoracic radiographs. Tracheal hypoplasia is defined as a ratio of less than 0.16. In the English Bulldog breed this ratio (less than 0.12) is less than that of the nonbrachycephalic breeds. The English Bulldog puppy ratio is 0.07

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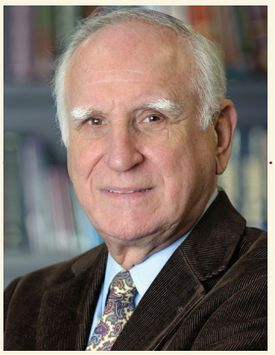
A Note from the Editor



While the COVID-19 virion was spreading in late 2019 into 2020, the Westminster Dog Show rewarded a Standard Poodle, "Siba" with Best in Show in February. A Whippet came in second with a Havanese, a Boxer, a Sheltie and a Wire Haired Terrier completing the final grouping. A Golden Retriever, a breed that has never won at Westminster was the crowd favorite; nonetheless, the winner was an exceptional champion. Soon after, "social distancing" aborted any gatherings of people who might be in close proximity to others.

This past month, we saw that two pet cats in New York tested positive for SARS-CoV-2, and at New York's Bronx Zoo, seven additional big cats tested positive for COVID-19. These cases caused concern for many pet owners, and veterinary teams saw an increase in questions regarding their pets: Can they contract it? Can they spread it? What should they do? So far, no cat to human contact has been demonstrated.

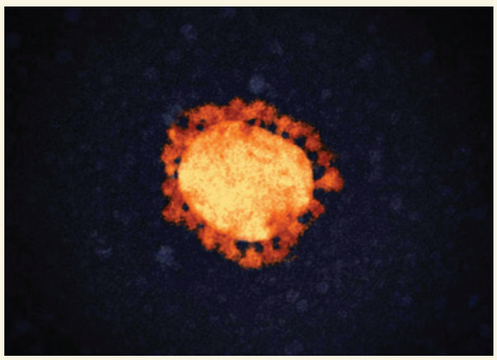


Figure 1: *Image of a single SARS-Co-2 Virion using Transmission Electro microscopy (shows much like a cross-section image)AR1S-*

As with all viruses, SARS-CoV-2, (the official name) exists in a limbo somewhere between the animate and the inanimate.

A virus in this stage is known as a virion. As they cannot replicate on their own, virions must find a suitable host in order to survive, and once inside a cell, they are called viruses.

Each virus comes equipped with an outer layer, or viral envelope, that is designed to penetrate a cell and deliver its cargo of genetic material into the host. Virions are really just short fragments of genetic code.

Once that code gets into a cell, it hijacks the cell's replication machinery. It's now able to reproduce in extraordinary numbers; it's able to evolve; it's able to metabolize energy. Roughly spherical with a fringe of projections called spike proteins or peplomers, a SARS- CoV-2 virus particle typically measures about 100 nanometres in diameter. That's about 10,000 times smaller than a grain of salt and there's no escaping them, there are approximately ten "nonillion" viruses on earth — a nonillion is 1 x 1031 or a number with 1 followed by 31 zeros.

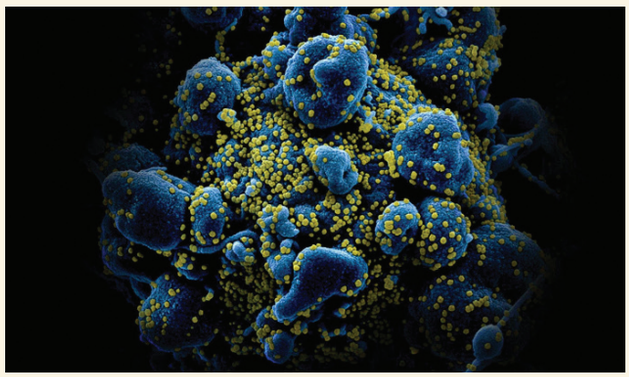


Figure 2: *Using Scanning Electro-Microscopy to show the surface of a cell infected by virions/viruses, the yellow spots.*

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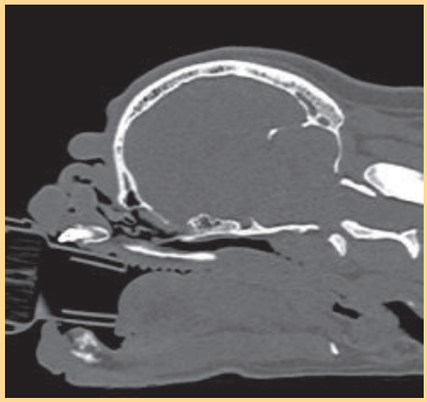
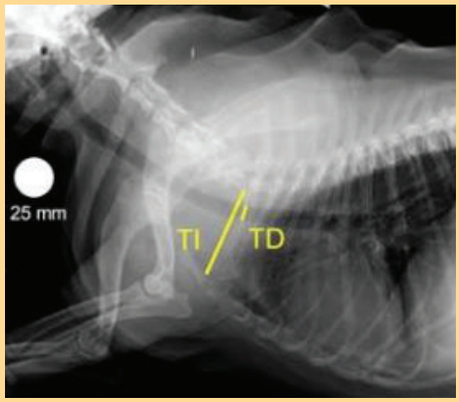
Brachycephalic (obstructive) Airway Syndrome, *Part 2*

➤ *Continued from Page 1*



CT Elongted soft palate

Elongated soft palate

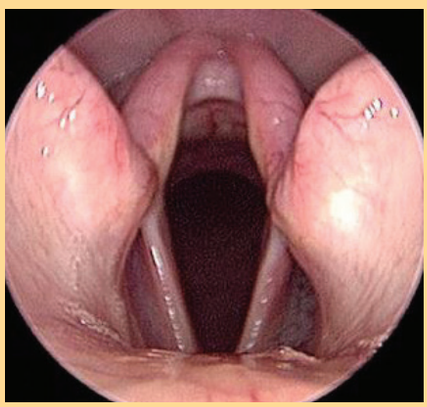


Trachea-thoracic inlet ratio

and the English Bulldog adult ratio is 0.116 to 0.14. The nonbrachycephalic breed puppy ratio is 0.14, the nonbrachycephalic breed adult ratio is 0.17, and the median ratio in the normal nonbrachycephalic dog breeds is 0.208. The median ratio in nonBulldog brachycephalic breeds is 0.157 (less than 0.2). The difference is significant between the English Bulldog puppy ratio and the English Bulldog adult ratio. As such, a tracheal lumen diameter:thoracic inlet distance ratio of less than 0.16 is considered diagnostic for hypoplastic trachea and a ratio of less than 0.12 is considered clinically relevant tracheal hypoplasia.

The tracheal diameter can be compared to the width of the proximal third of third rib. A ratio of less than 2.0 in the English Bulldog breed is considered consistent with tracheal hypoplasia. The normal value is greater than 2.0 to 3.0

A comparison of computed tomography, radiography, and endoscopy in the English Bulldog was performed. Mean radiographic ratio between the tracheal lumen diameter and thoracic inlet distance is 0.17. The mean radiographic ratio between the tracheal diameter and the diameter of the third rib is 2.48. The computed tomographic mean ratio between the tracheal lumen diameter and thoracic inlet distance was 0.26. The computed tomographic ratio between tracheal diameter and the third rib diameter was 2.27. Radiographic and computed tomographic ratios between the tracheal lumen diameter and thoracic inlet distance did correlate, whereas radiographic and computed tomographic ratios between the tracheal diameter and the third rib diameter did not correlate. Based on tracheoscopy, 100% of apparently nonclinical English Bulldogs over the age of 12 months have evidence of tracheal hypoplasia. Tracheoscopic scores lacked correlation with computed tomographic and radiographic scores.



Normal Glottis

Normal Soft Palate

Anesthesia

Visualization of the intra-oral, pharyngeal, and laryngeal structures may be simpler with the use of a temporary tracheostomy tube, with temporary extubation, or by displacing the endotracheal tube to one side. The need for a temporary tracheostomy tube occurs in 5 to 28% of cases and is associated with an up to 86% complication rate.

Intra-oral examination, pharyngoscopy, and laryngoscopy may be performed with the use of thiopental or propofol. For the diagnosis of elongated soft palate, intubation may cause an alteration of the palate positioning, and is avoided while the diagnosis is being made. The epiglottic tip also changes with positioning of the head and neck, endotracheal tube positioning, and tongue and jaw traction. Intubation is then performed after palatal evaluation to resume control of the airway and maintain anesthesia.

Pharyngoscopy and laryngoscopy

The following are common pharyngoscopic and laryngoscopic findings. The soft palate is considered elongated when it extends 1 to 3 mm beyond the epiglottic tip. Everted laryngeal saccules appear as white, shiny, convex structures that are positioned ventrolaterally and rostral to the vocal folds or vocal cords. The epiglottis is curled and flattened. The lack of vocal cord visualization and the laryngeal cartilage moving medially with tipping indicates laryngeal collapse. The presence of a paradoxical inward laryngeal cartilage deviation along with laryngeal collapse indicates a complicated case of laryngeal paralysis.

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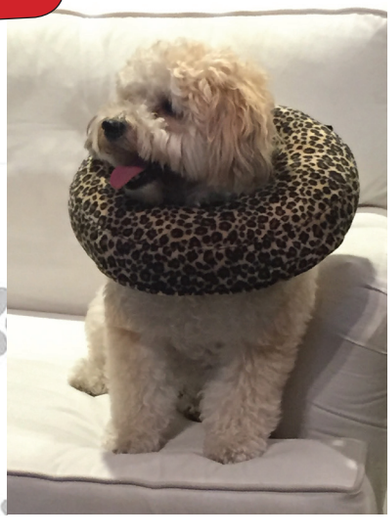

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Brachycephalic (obstructive) Airway Syndrome, *Part 2*

➤ *Continued from Page 4*

Whole-body barometric plethysmography

Whole-body barometric plethysmography is a method for collecting quantitative respiratory cycle measurements. This diagnostic chamber is considered noninvasive and can be used in awake patients. A grading system has been established in the French Bulldog breed with use of this diagnostic tool. Grades 0 and I have insignificant clinical signs and grade II and III have significant clinical signs. This testing modality allows clinicians to identify brachycephalic airway syndrome in those patients that have mild clinical signs, unbeknownst to their owners. Over half of such owners (60%) were unaware their pet had evidence of brachycephalic airway syndrome based on testing results. The sensitivity and specificity of this test is 97% and 93%, respectively.

Mechanical ventilation

Brachiocephalic dog breeds are more likely to receive mechanical ventilation than nonbrachycephalic dog breeds. Mechanical ventilation is recommended in affected brachycephalic dogs if evidence of hypoventilation (a PaCO2 over 60 mmHg), hypo-oxygenation or hypoxemia (a PaO2 less than 60 mmHg, with an incidence of 6%), and impending respiratory failure or fatigue (47% incidence) is found.

Mechanical ventilation complications include cardiovascular disease, corneal ulcerations, oral ulcerations, pneumonia, and pulmonary injury. Death occurring in the face of mechanical ventilation occurs within one day in 35 to 80% of patients and within 6 to 24 hours in 45% of patients. Dogs that can be expected to become weaned off mechanical ventilation show a higher ratio of end tidal PaO2 to FiO2 (the fraction of inspired oxygen).

Weaning off mechanical ventilation requires hemodynamic stability, no organ failure, normal gas exchange, partial recovery from the disease, and spontaneous breathing. Of those brachycephalic breed dogs that require mechanical ventilation, the incidence of patients being weaned off the mechanical ventilation is 47% and those that are weaned off temporary tracheostomy tube placement is 71%. In such cases, 22 to 27% of patients are discharged from the hospital overall.

Medical treatment

Early medical therapeutic intervention prevents airway changes, tissue inflammation, and mucosal hypertrophy. Medical therapy is meant to be palliative or used as an adjunct treatment option to surgery. Medical management is a combination of veterinary in-hospital care and owner out-patient care.

Medical treatment instituted at a veterinary hospital or clinic may include administration of antibiotics, acepromazine (0.005 to 0.02 mg/kg IV, IM, or SQ), antacid medications, butorphanol (0.2 to 0.4 mg/kg IV, IM, or SQ), dexamethasone sodium phosphate (0.05 to 2 mg/kg IV, IM, or SQ), diazepam (0.2 mg/kg IV), histamine H2 receptor antagonists, oxygen supplementation, prokinetic agents, proton pump inhibitors, and room-temperature isotonic intravenous fluid therapy.

Methods of oxygen supplementation include intranasal tube placement, nasotracheal intubation, orotracheal intubation, oxygen cage placement, oxygen hood usage, percutaneous transtracheal catheter placement, and temporary tracheostomy tube placement. Oxygen supplementation is not required in 22% of cases.

Oxygen supplementation via nasotracheal intubation can be successfully performed in 55% of patients, with no dogs developing respiratory distress as a result of its placement. Complications from nasotracheal intubation occur in 40% of cases with coughing being the most common, followed by regurgitation and vomiting. Benefits include its ease, noninvasiveness, increasing of fractioned inspired oxygen, and increased arterial oxygen partial pressure. Other forms of oxygen administration are used in 22% of cases with complications in 44% of those dogs. These complications include respiratory distress (33% incidence), regurgitation, and vomiting.

Percutaneous transtracheal catheter placement can be performed under local anesthesia. Percutaneous transtracheal catheter complications include catheter dislodgment (resulting in emphysema or pneumomediastinum), catheter kinking at the level of the skin, need for surgical dissection for placement, and tracheal mucosal jet lesions.

Temporary tracheostomy tube placement is either utilized in those dogs presenting to the veterinary hospital in an upper respiratory obstruction crisis, as an aid to pharyngoscopy, laryngoscopy, and anesthesia, or for those patents with breathing difficulties post-operatively. Temporary tracheostomy tube placement is used in those cases exhibiting severe respiratory distress, severe laryngeal swelling, pulmonary pathology, and in those cases suffering from post-operative complications, allowing for slower improvement of their ailing condition over time. Severe complications seen with placement of a temporary tracheostomy tube include aspiration, regurgitation, soft tissue swelling, and vomiting. Overall mortality associated temporary tracheostomy tube placement is 5 to 6.25%, and is increased in the English Bulldog at 12.5% due to aspiration pneumonia. Success seen with temporary tracheostomy tube placement ranges from 61.94 to over 88%.

Medical treatment that is recommended to the owners for long-term home care includes body weight management at a lean body condition score, decreasing stress, conducting short leashed walks, maintaining a dry environment set at room or cool temperature, and maintaining a moderate energy level status. There is a correlation between the body condition score and the severity of respiratory signs in dogs with brachycephalic airway syndrome.

Medical management of those patients afflicted with gastrointestinal signs include cisapride (promotes upper gastrointestinal tract motility), corticosteroids (indicated for parietal fibrosis and severe gastritis and duodenitis), magnesium hydroxide (antacid), omeprazole (inhibiting gastric hydrogen secretion), sucralfate (a gastric surface protector). ❑

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LIVS Neurology Department:

Curtis W. Dewey, DVM, MS, CTCVMP, DACVS, DACVIM (Neurology/ Neurosurgery)

Patrick Roynard, DVM, MRCVS, DACVIM (Neurology/Neurosurgery)

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A Note from the Editor

➤ Continued from Page 3

Due to this pandemic, a new mode of practicing veterinary medicine has evolved such as online scheduling, texting, apps, upgraded websites, social media outreach, telemedicine, telehealth, telemedicine — our profession is entering the 21st century; lets hope it's better as well as newer.

An inaugural class of 110 students is expected to enroll in the University of Arizona College of Veterinary Medicine in August 2020 and together with Long Island University, they will launch the nation's 31st and 32nd DVM programs.

Our IT team members, Spiro and Chris are keeping communications of all sorts humming during the demolition/construction phases at LIVS which are well underway. A new 8000 square foot area is being added to LIVS; the exam rooms will increase to 23 from the existing 15, the waiting room area will allow for the new norm of "social and pet distancing', and there will be an amphitheater seating 100 in the expanded area. The façade will be upgraded and improvements made to the existing areas. All should be completed by mid 2021 to better serve the patients, clients, veterinary community and the new veterinary college opening this fall at the Long Island University campus in Brookville.

At the request of Stony Brook University Hospital, to assist in their efforts against the devastation caused by COVID-19, Long Island Veterinary Specialists loaned its critical care ventilator to our brave colleagues. The specialized piece of equipment was handed over to the SBU team by Dr. Dominic J Marino, LIVS Chief of Staff and Hospital Director of Operations, Ms. Lexi Kanes. "The computerized ventilator is a human device, like many pieces of sophisticated equipment we have, that was adapted to treat our patients. Now it can be best utilized in helping to save human lives in the hands of the Stony Brook team. We will rely on our three veterinary specific ventilators to treat our critical patients for the foreseeable future and wish our colleagues the very best as they confront this global pandemic" said Dr. Marino

So many of LIVS's team members deserve accolades for the superb work performed and still being done during this extraordinary time; we thank them all including some family members who pitched in as well- - Maria Vlahakis-Kalatzis' mom Orsa Vlahakis, turned her sewing machine over from making wedding gowns to face masks! Born on Andros Island, Greece, she came to the U.S. in

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Long Island Veterinary Specialists

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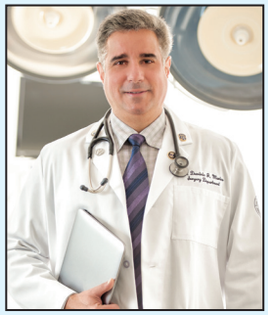
Surgical Oncology

Fernando Leyva, DVM, Dip. ACVS (Surgical Oncology)

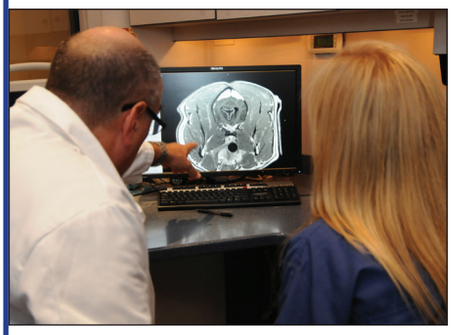
Catherine A. Loughin, DVM, Dip. ACVS, Dip. ACCT (Surgical Oncology)



Dominic J. Marino, DVM, Dip. ACVS, Dip. ACCT, CCRP (Surgical Oncology)

Jaclyn Holdsworth, DVM (Surgical Oncology)

Robert Waddell, DVM, Dip. ACVS (Surgical Oncology)



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A Note from the Editor

➤ *Continued from Page 8*

1966 and began working as a seamstress in a factory in Astoria, making dresses. In 1989, she worked for top Bridal Designer, Richard Glasgow and then for Escada, A breast cancer survivor, she continues to work from home doing private alterations. When she is not sewing she spends her time cooking, reading and spoiling her grandkids, but in 2020, she's making face masks.

During construction, all our departments remain fully staffed to serve our patients all hours of every day and night. Consultations and appointments can be made by calling (516) 501-1700. As before we welcome all comments, please submit them to lmarino@livs.org

Leonard J. Marino, MD, FAAP, LVT

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