

# Case-based Applications of Abdominal FAST (AFAST<sup>SM</sup>) and Its AFAST-applied Fluid Scoring System (AFS)

Gregory R. Lisciandro, DVM, Dipl. ABVP, Dipl. ACVECC  
Hill Country Veterinary Specialists & FASTVet.com, San Antonio, Texas USA

**FASTVet<sup>TM</sup> and FAST Saves Lives!<sup>SM</sup>**

Email [FastSavesLives@gmail.com](mailto:FastSavesLives@gmail.com)

Website [www.FASTVet.com](http://www.FASTVet.com)

Phone 210.260.5576

Text [Focused Ultrasound Techniques for the Small Animal Practitioner, Wiley © 2014](#)

## Introduction:

The clinical utility of AFAST<sup>3</sup> and the applied fluid scoring system trauma, triage (non-trauma) and tracking (monitoring) cases in the emergent and critical care settings (Lisciandro et al., JVECC 2009, 2011; Boysen and Lisciandro, VCNA 2013; McMurray et al., JVECC 2014) will be reviewed. The T<sup>3</sup> designation encompasses these 3 subsets (Lisciandro, JVECC 2011; Boysen and Lisciandro, VCNA 2013) and avoids the onslaught of confusing acronyms in human medicine in which similar abbreviated formats are given different acronyms when applied to different subsets of human patients (Lisciandro, JVECC 2011). Thus, AFAST<sup>3</sup> becomes a universal term that has exact clarity in the 4-acoustic windows used by the veterinary sonographer.

The AFAST<sup>3</sup> ultrasound format has greater potential to positively guide clinical course and improve patient outcome by detecting conditions and complications otherwise occult based on traditional means of physical examination, laboratory and radiographic findings, and avoiding the delay associated with modes of more advanced imaging (jeopardizing patient care). Finally, AFAST<sup>3</sup> findings are made more clinically-relevant for the clinician, client, and referring veterinarian, by using a standardized ultrasound format (AFAST<sup>3</sup>), and standardized goal-directed templates for medical records (see below) (Lisciandro, JVECC 2011; Boysen, VCNA 2013).

## Terminology:

In the human literature, there has been a confusing onslaught of multiple acronyms for similar ultrasound examinations by non-radiologists, i.e. FFAST, EFAST, HHFAST, BOAST, INBU, FEEL, FALLS, FATE, RUSH, etc. Veterinarians would be best served by using AFAST<sup>3</sup>, TFAST<sup>3</sup> (thoracic) and Vet BLUE (lung exam). When all 3 formats are used together the exam is referred to as Global FAST or GFAST (Boysen and Lisciandro, VCNA 2013). Because any of the three GFAST ultrasound format (AFAST, TFAST and Vet BLUE) may be diagnostic, the author suggests that traditional exams of the abdomen and thorax be designated as “complete abdominal ultrasound” and “complete echocardiography” respectively, similar to the human literature (formal used instead of complete). Finally, terms such as “Focused” and “Targeted” and “COAST<sup>3</sup>” (cage-side organ assessment with sonography for trauma, triage and tracking) have been used for specific sonographic interrogation of organs in both human and veterinary medicine. For absolute clarity, we recommend the use of “Focused X” with X being the system being evaluated (e.g., “Liver”, “Gallbladder”, “Spleen”, “Kidney”, “Urinary Bladder”, “Gastro-intestinal”, “Reproductive”, “Heart”, “Eye”, etc.).

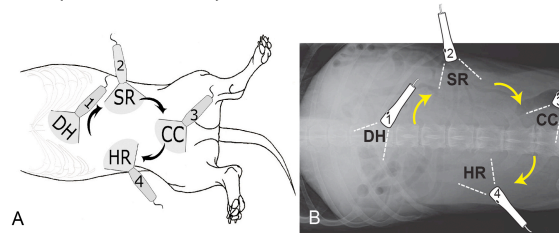
## Patient Positioning and Preparation:

Right lateral recumbency (over left lateral) is recommended for AFAST<sup>3</sup> because right lateral recumbency is the standard positioning for electrocardiographic and echocardiography evaluation; the left kidney at the SR view is more easily and reliably imaged (vs. the more cranially obliquely located right kidney often under the rib cage); and the gallbladder via the DH view is readily imaged by directing the probe slightly toward the table top. Lastly, the spleen located predominantly left of midline is arguably

*AFAST<sup>SM</sup>, TFAST<sup>SM</sup>, Vet BLUE<sup>SM</sup> and Global FAST<sup>SM</sup> are service marks and proprietary to Lisciandro Enterprises, PLLC, San Antonio, Texas, USA. Requests for use of these service marks may be made to FASTVet.com and Gregory Lisciandro, DVM, Dipl. ACVECC at [FastSavesLives@gmail.com](mailto:FastSavesLives@gmail.com). Copyright FASTVet.com 2015, 2016*

less apt to incur iatrogenic puncture via abdominocentesis. AFAST<sup>3</sup> should not be performed in dorsal recumbency because it not only invalidates the fluid scoring system, but jeopardizes injured and critically ill, hemodynamically-fragile patients by compromising respiratory status and venous return. Fur is NOT shaved but rather parted and alcohol and/or gel applied. Alcohol should not be used if electrical defibrillation is anticipated. TFAST<sup>3</sup> may be started immediately following AFAST<sup>3</sup> when AFAST<sup>3</sup> is performed in right lateral recumbency because the depth is essentially the same moving from the abdomen to the TFAST<sup>3</sup> left and right Pericardial (PCS) Site Views; and the right PCS view is optimized in lateral recumbency with the heart moving against the thoracic wall displacing air-filled lung allowing for the left ventricular short-axis “mushroom” volume status view. In respiratory distressed or compromised patients, the TFAST<sup>3</sup> (and Vet BLUE lung ultrasound) formats are most safely performed in sternal or standing position.

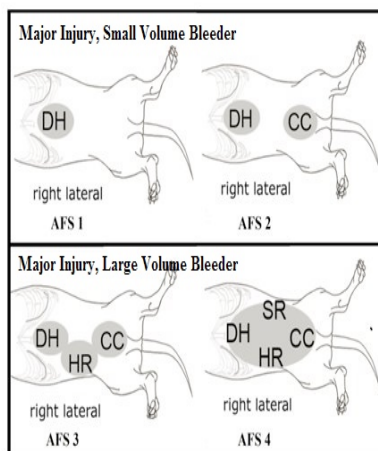
### Schematic of the AFAST<sup>SM</sup> (Abdominal) Ultrasound Exam:



This material is reproduced with permission of John Wiley & Sons, Inc, *Focused Ultrasound Techniques for the Small Animal Practitioner*, Wiley ©2014

The AFAST<sup>3</sup> sites (right lateral recumbency is preferred over left lateral). To the right of the pictorial labeled A) is a translational depiction on an abdominal radiograph of a dog. The AFAST<sup>3</sup> should always be performed in a standardized counter- clockwise manner as follows: 1) Diaphragmatic-Hepatic (DH) View also used to image the pleural and pericardial spaces 2) Spleno-Renal (SR) View also used as a window into the retroperitoneal space 3) Cysto-Colic (CC) View and 4) Hepato-Renal (HR) View which completes the AFAST<sup>3</sup> exam. The HR View in higher-scoring dogs and cats is often a favorable site for abdominocentesis. All AFAST<sup>3</sup> views are performed in the longitudinal (sagittal) orientation because it is easier to appreciate the anatomy of the respective target organs and less confusing especially for the novice sonographer. Importantly, Boysen et al. showed that when comparing longitudinal (sagittal) to transverse views, they matched 399/400 times.

### AFAST<sup>SM</sup>-applied Fluid Scoring System:



**The AFAST<sup>3</sup>-applied Abdominal Fluid Scoring System** is defined as follows (4-point scale): abdominal fluid score (AFS) of 0 (AFS 0) means negative at all 4 views to a maximum score of AFS 4 means positive at all 4 views.

**Low-scoring AFS 1 and 2**, are considered “major injury, small volume bleeders.”

**High-scoring AFS 3 and 4**, considered “major injury, big or large volume bleeders.”

*Reproduced with Permission Lisciandro, et al. JVECC 2009; 19(5):426-437. JVECC 2011;20(2);104-122.*

*AFAST<sup>SM</sup>, TFAST<sup>SM</sup>, Vet BLUE<sup>SM</sup> and Global FAST<sup>SM</sup> are service marks and proprietary to Lisciandro Enterprises, PLLC, San Antonio, Texas, USA. Requests for use of these service marks may be made to FASTVet.com and Gregory Lisciandro, DVM, Dipl. ACVECC at [FASTSavesLives@gmail.com](mailto:FASTSavesLives@gmail.com). Copyright FASTVet.com 2015, 2016*

## **Use of Serial AFAST<sup>SM</sup> Exams and Determining the AFS:**

The use of serial AFAST<sup>3</sup> and serial application of the abdominal fluid score (AFS) is imperative to maximize information and improve sensitivity of the AFAST<sup>3</sup> exam including detecting free fluid, assigning an abdominal fluid score (0-4), evaluating for the presence or absence of the urinary bladder, and estimating urinary bladder volume (LxWxHx0.625 [Lisciandro and Fosgate, *in press*, JVECC 2016]). The author performs 4-hour post-admission serial AFAST<sup>3</sup> and AFS in all stable patients (sooner if unstable); and serial FAST exams are standard of care in human medicine (American College of Emergency Physicians Guidelines [2001]). AFS helps guide decision-making regarding the need for blood transfusion and exploratory laparotomy (see Table).

## **Traumatic Hemoabdomen**

The clinical utility of the AFAST<sup>3</sup>-applied fluid scoring system as predictor of anticipated degree of anemia and need for blood transfusion was shown in dogs with traumatic hemoabdomen (Lisciandro et al., JVECC 2009). Dogs with negative fluid scores (AFS 0), and as low-scorers (AFS 1 and AFS 2) that had no other sources of blood loss apparent on physical exam or AFAST<sup>3</sup> and TFAST<sup>3</sup> imaging (no free fluid in retroperitoneal, pleural and pericardial spaces), predictably did not develop anemia (and no dogs were anemic on their admission packed cell volume [PCV]). For example, in dogs with normal admission packed cell volume, low-scoring AFS 1 and 2 dogs that remained AFS 1 and 2 during their hospitalization, rarely became anemic from their intraabdominal hemorrhage (and if anemia did occur it was mild > 30%). Therefore, a general guideline used by the author is that if the PCV < 30% in an AFS 1 or 2 dog (or cat), the attending should look elsewhere for the source of bleeding (retroperitoneal and pleural spaces, fracture sites), and only then consider the possibility of hemodilution. Although not determined in the AFAST<sup>3</sup> study, clinicians should keep in mind that AFAST<sup>3</sup> does not interrogate the intra-pelvic region effectively; and that significant bleeding in dogs and cats through pelvic fractures and femoral fractures is possible that could lead to anemia and be missed by AFAST<sup>3</sup> and TFAST<sup>3</sup>.

On the other hand, high-scoring AFS 3 and 4 dogs are likely to develop anemia (~ 25% decrease in PCV from baseline [admission PCV]) with ~25% of high-scoring dogs becoming severely anemic (PCV < 25%); thus, are more likely to require blood transfusions (Lisciandro et al., JVECC 2009) and rarely emergent laparotomy (Lisciandro et al., JVECC 2009; Boysen et al., JAVMA 2004). The AFAST<sup>3</sup>-applied fluid scoring system is simple and easy to remember and provides a semi-quantification of the degree of hemorrhage; and analogous hemorrhage scoring systems have been shown to be helpful in clinical-decision making regarding blood transfusion and need for surgery or advanced imaging in human patients. Importantly, bluntly traumatized (hit-by-car, kicked, stepped on, falls) dogs RARELY need emergent laparotomy to control the hemorrhage and often are successfully managed with judicious fluid therapy and blood transfusion(s). Cats as a species typically do not survive large volume bleeds (Lisciandro, JVECC 2012); and large volume effusions are more likely to be due to uroabdomen. Moreover, by using the abdominal fluid score and recording locations of positive sites, the volume may be semi-quantified, and source potentially localized, respectively.

## **Non-traumatic Hemoabdomen and Post-interventional Bleeding Dogs and Cats**

The same concept may be applied to non-traumatic hemoabdomen (bleeding tumor, coagulopathic) and to at-risk post-interventional cases (surgical, percutaneous biopsy/aspirate, laparoscopy, interventional radiology, etc.). The abdominal fluid scoring system applied in serial manner allows for the detection of ongoing (increasing scores), static, and resolving hemorrhage (decreasing scores). Whereas bluntly traumatized dogs rarely need surgical intervention, post-interventional large volume bleeding OFTEN requires exploratory laparotomy and surgical ligation of the bleeding source.

## **Other Abdominal Effusions**

The use of the AFAST<sup>3</sup>- abdominal fluid scoring system also provides a means to detect and monitor response to therapy of other non-hemorrhagic effusive conditions including for example transudates (liver/GI disease), modified-transudates (right-sided heart failure, liver disease) and exudates

*AFAST<sup>SM</sup>, TFAST<sup>SM</sup>, Vet BLUE<sup>SM</sup> and Global FAST<sup>SM</sup> are service marks and proprietary to Lisciandro Enterprises, PLLC, San Antonio, Texas, USA. Requests for use of these service marks may be made to FASTVet.com and Gregory Lisciandro, DVM, Dipl. ACVECC at [FASTSavesLives@gmail.com](mailto:FASTSavesLives@gmail.com). Copyright FASTVet.com 2015, 2016*

(peritonitis). The use of the AFAST<sup>3</sup>- applied abdominal fluid scoring system also is helpful for the surveillance of post-operative patients at-risk for hemorrhage and peritonitis since ultrasound is superior in sensitivity to physical examination and abdominal radiography.

<b>Summary of Abdominal Fluid Score (AFS 1,2 (small volume) vs. AFS 3,4 (large volume)) and Medical vs. Surgical Decisions in Bleeding Dogs</b>		
Type of Trauma	Major Injury, Small Volume Bleeder (AFS 1,2)	Major Injury, Large Volume Bleeder (AFS 3,4)
<b>Blunt Trauma – Think Medical 1<sup>st</sup></b>  <i>*Blood rapidly defibrinates thus is seen acutely as anechoic black triangles.</i>	<ul style="list-style-type: none"> <li>– <i>If stays AFS 1,2 no blood transfusion necessary if only bleeding intra-abdominally because do NOT expect anemia (PCV&gt;35%) if only bleeding intra-abdominally</i></li> <li>– <i>If stays AFS 1,2 and anemic &lt;30% rule out another site of bleeding (retro-peritoneal, pleural cavity, fracture site, externally)</i></li> </ul>	<ul style="list-style-type: none"> <li>– <i>If is an AFS 3,4 or becomes AFS 3,4 then expect anemia (&lt;35%) to develop and use graduated fluid therapy (1/3 shock dose and repeat as fluid challenge needed)</i></li> <li>– <i>If becomes severely anemic &lt;25% generally need a blood transfusion FIRST because most bleeding will stop with 1 or 2 rounds of blood transfusion +/- fresh frozen plasma; and uncommonly need exploratory surgery</i></li> </ul>
<b>Penetrating Trauma – Think Surgical for Any Positive AFS</b>  <i>*Blood from ripping, tearing, crushing, is often clotted and thus often missed acutely during AFAST because clotted blood looks like adjacent soft tissue; however, in time blood clots will defibrinate and become visible during AFAST, thus Serial Exams are Key in cases unsure if Medical vs. Surgical.</i>  <i>*Generally best to err that is Surgical with ANY Positive</i>	<ul style="list-style-type: none"> <li>– <i>Think Surgical for Any Positive</i></li> <li>– <i>Combine with other Clinical Findings and Surgical Indications (hernia, free air, septic abdomen, refractory pain, etc.)</i></li> <li>– <i>Serial Exams are Key!</i></li> </ul>	<ul style="list-style-type: none"> <li>– <i>Think Surgical even for Any Positive</i></li> <li>– <i>Combine with other Clinical Findings and Surgical Indications (hernia, free air, septic abdomen, refractory pain, etc.)</i></li> <li>– <i>Serial Exams are Key!</i></li> </ul>
<b>Post-interventional Trauma – Think Medical for AFS 1,2 and Surgical for AFS 3,4</b>  <i>*Large volume bleeding (AFS 3,4) is generally not going to stop without surgical ligation of the bleeding.</i>  <i>*Correct Coagulopathy if present</i>	<ul style="list-style-type: none"> <li>– <i>If stays AFS 1,2 on Serial Exams, then generally NOT surgical</i></li> <li>– <i>Do Serial Exams to make sure does not change score and become a Large Volume Bleeder (AFS 3,4)</i></li> </ul>	<ul style="list-style-type: none"> <li>– <i>If is an AFS 3,4 and not anemic, then generally it is still best to Explore Emergently and NOT wait (if you wait you will likely have to transfuse your patient with its added extra cost and risk)</i></li> <li>– <i>If is an AFS 3,4 and already anemic, transfuse as per patient assessment and Explore Emergently!</i></li> </ul>

AFAST<sup>SM</sup>, TFAST<sup>SM</sup>, Vet BLUE<sup>SM</sup> and Global FAST<sup>SM</sup> are service marks and proprietary to Lisciandro Enterprises, PLLC, San Antonio, Texas, USA. Requests for use of these service marks may be made to FASTVet.com and Gregory Lisciandro, DVM, Dipl. ACVECC at [FASTSavesLives@gmail.com](mailto:FASTSavesLives@gmail.com). Copyright FASTVet.com 2015, 2016



## **AFAST<sup>SM</sup> is a Cerebral Exam, Not just Fluid-positive, Fluid-negative:**

**The Diaphragmatico-Hepatic (DH) View** is loaded with clinically-relevant information that is readily appreciated during the minutes it takes to perform the AFAST<sup>3</sup>.

- 1) The DH View is nicknamed the “Designated Hitter” because it is part of BOTH the abdominal FAST (AFAST<sup>3</sup>) and thoracic FAST (TFAST<sup>3</sup>) formats.
- 2) The DH View is used for the rapid and confirmatory sonographic diagnosis of pleural and pericardial effusion (Racetrack Sign).
- 3) Patient volume status, central venous pressure, is appreciated by observing the distensibility of the caudal vena cava as it passes through the diaphragm (characterized as FAT, flat or bounce) along with the presence of hepatic venous distension (Tree trunk Sign) for evidence of right-sided cardiac volume overload.
- 4) The gallbladder should generally be adjacent to the diaphragm when starting the DH view in dogs. When the sonographer is unable to get this orientation in dogs, then liver enlargement should be suspected and when the gallbladder cannot be located than its displacement (hernia) or its rupture or sonographically obscuring pathology (calculi/mineralization, emphysema) should be suspected. In cats, this orientation is less reliable but should be attempted.
- 5) Gallbladder wall edema can be supportive evidence for anaphylaxis; however, there are several causes of gallbladder wall thickening (the halo sign) including right-sided heart failure (Lisciandro, unpublished), pericardial effusion/tamponade (Lisciandro, unpublished), volume overload, 3<sup>rd</sup> spacing, primary gallbladder disease, pancreatitis, immune-mediated hemolytic anemia, and post-transfusion (see Gallbladder Halo Sign Proceedings).
- 6) Liver masses can often be appreciated.

**The Spleno-Renal (SR) View** is unique since it interrogates both the abdominal cavity and retroperitoneal space. The left kidney is longitudinally fanned until it is lost in both directions. Linear stripes are generally not free fluid but rather small intestine or the great vessels. The transverse colon banks to become the descending colon at the SR View. An air-filled colon when present whites out (ultrasound does not transmit through air) everything more caudally through the far field; and the head of the spleen, attached to the stomach by the short gastric vessels, is seen by rocking the probe cranially. An air-filled stomach similarly whites out everything through the cranial far field. Hydronephrosis, pyelectasia, mineralization, calculi, masses and cystic structures are often readily suspected by performing the AFAST<sup>3</sup> SR View in this repetitive manner. In smaller dogs and in many cats BOTH left and right kidneys may be imaged through the SR View.

**The Cysto-Colic (CC) View** lends itself to suspecting urinary bladder pathology similarly to the gallbladder at the DH View, since both structures are normally fluid-filled and ultrasound images best through fluid. The colon is a tricky structure that can cause mistakes by the air-filled colon appearing like bladder stones; and when fluid-filled or fecal-filled, the colon may look like masses. Care should be taken because blood clots may also appear like, and be mistaken for, urinary bladder neoplasia. The CC View is the most common AFS-positive site in low-scoring AFS 1 and AFS 2 dogs (and cats) by directing the probe toward the table top into the “CC pouch” where the urinary bladder is immediately against the abdominal wall. Keep in mind, the opposing thigh muscles are often visible in the far field.

**The Hepato-Renal (HR) View** completes the AFAST<sup>3</sup> format and is thus called the “Home Run Site.” In high-scoring dogs and cats, the HR View will likely have abundant fluid amenable to abdominocentesis. Since ultrasound cannot sonographically characterize free fluid, sampling is necessary with fluid analysis, including cytology and chemistry analysis. The HR View is nicknamed by the author the “big lie” since routinely the right kidney and liver are not directly imaged but rather the probe is placed in the mid-section at the umbilical region and directed in the most gravity-dependent “HR Pouch” for the detection of free

*AFAST<sup>SM</sup>, TFAST<sup>SM</sup>, Vet BLUE<sup>SM</sup> and Global FAST<sup>SM</sup> are service marks and proprietary to Lisciandro Enterprises, PLLC, San Antonio, Texas, USA. Requests for use of these service marks may be made to FASTVet.com and Gregory Lisciandro, DVM, Dipl. ACVECC at [FASTSavesLives@gmail.com](mailto:FASTSavesLives@gmail.com). Copyright FASTVet.com 2015, 2016*

fluid. In cases in which the right retroperitoneal space and kidney are of interest, the author will interrogate the HR View target-organs as a 5<sup>th</sup> AFAST<sup>3</sup> view. It has not been determined what clinical importance of routinely performing the AFAST<sup>3</sup> 5<sup>th</sup> view is; however, with AFAST<sup>3</sup> proficiency, the HR 5<sup>th</sup> View should be evaluated *although it is not part* of the abdominal fluid scoring system.

### Clinical Indications/Applications of AFAST<sup>SM</sup>:

*\*The use of AFAST<sup>SM</sup> should be simply stated as an “extension of the physical exam” for nearly ALL dogs and cats that are abnormal. FAST<sup>3</sup> formats (AFAST<sup>SM</sup> and its applied fluid scoring system [AFS], TFAST<sup>SM</sup> and Vet BLUE<sup>SM</sup>) should be adopted as BASIC “screening tests” just as we have been trained to perform minimally basic blood tests (so-called Quick Assessment Tests [PCV/TS, serum character, BUN, Creatinine, Blood Glucose, and ALT]).*

Blunt trauma, Penetrating trauma, Collapse, apparent collapse, Undifferentiated hypotension  
Respiratory distress (since there are non-respiratory look-a-likes [hemoabdomen, cardiac tamponade, anaphylaxis, high fever, and others]), Post-interventional at-risk bleeding (surgery, percutaneous procedures, laparoscopy), Post-interventional at-risk peritonitis (surgery, percutaneous procedures, laparoscopy), Patient monitoring during fluid resuscitation and during hospitalized care

### Goal-directed Template for AFAST<sup>SM</sup>

**Patient positioning:** right or left lateral recumbency (right preferred)  
**Gallbladder:** present or absent, contour, wall, content, unremarkable or abnormal  
**Urinary bladder:** present or absent, contour, wall, content, unremarkable or abnormal

#### Positive or negative at the 4-views (0 negative, 1 positive)

Diaphragmatico-Hepatic site: 0 or 1  
Spleno-Renal site: 0 or 1  
Cysto-Colic site: 0 or 1  
Hepato-Renal site: 0 or 1

**Abdominal Fluid Score: 0-4** (0 negative all quadrants to a maximum score of 4 positive all quadrants)

**DH View:** **Pleural effusion:** absent, present (mild, moderate, severe) or indeterminate  
**Pericardial effusion:** absent, present (mild, moderate, severe) or indeterminate  
**Hepatic venous distension:** present, absent or indeterminate  
**Caudal vena cava characterization:** FAT, flat or bounce or indeterminate

**Comments:** \_\_\_\_\_

(Note: The AFAST<sup>3</sup> exam is a rapid ultrasound procedure used to detect the presence of free abdominal fluid (which is generally abnormal) as a screening test in order to better direct resuscitation efforts, detect complications, and manage critically ill patients. AFAST<sup>3</sup> allows rapid but indirect assessment for evidence of major internal abdominal organ injury or disease. The AFAST<sup>3</sup> exam is not intended to replace a complete abdominal ultrasound exam of the abdomen.)

**References:** See TFAST and Vet BLUE Proceedings

*AFAST<sup>SM</sup>, TFAST<sup>SM</sup>, Vet BLUE<sup>SM</sup> and Global FAST<sup>SM</sup> are service marks and proprietary to Lisciandro Enterprises, PLLC, San Antonio, Texas, USA. Requests for use of these service marks may be made to FASTVet.com and Gregory Lisciandro, DVM, Dipl. ACVECC at [FASTSavesLives@gmail.com](mailto:FASTSavesLives@gmail.com). Copyright FASTVet.com 2015, 2016*