



Why is this important for surgeons?

Key in deciding if patients are surgical or not

abdominal hemorrhage
septic vs non-septic
anastomotic leakage
urinary tract rupture

Of value in the pre, post and surgical period

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Radiography

- Small amounts of free abdominal fluid are not detected
- Loss of serosal detail
 - small amounts around liver and urinary bladder
 - large amounts mid-abdominal



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The novel ultrasound approach

- Traditionally performed by ultrasound specialists during work hours

 large console machines
- Now incorporated in ICU's and emergency services and performed by junior veterinarians

 small bed-side machines



Evaluation of a focused assessment with sonography for trauma protocol to detect free abdominal fluid in dogs involved in motor vehicle accidents

Søren R. Boysen, DVM; Elizabeth A. Rozanski, DVM, DACVECC, DACVIM; Amy S. Tidwell, DVM, DACVEC; Jen L. Holm, DVM; Scott P. Shaw, DVM; John E. Rush, DVM, MS, DACVECC

Conclusions and Clinical Relevance—Results indicate that FAST is a simple and rapid technique that can be performed on dogs in an emergency setting to detect intra-abdominal free fluid and can be performed by veterinary clinicians with minimal previous ultrasonographic experience. (*J Am Vet Med Assoc* 2004;225:1198–1204)

Clinical Practice Review

Journal of Veterinary Emergency and Critical Care 21(2) 2011, pp 104–122 doi:10.1111/j.1476-4431.2011.00626.x

Abdominal and thoracic focused assessment with sonography for trauma, triage, and monitoring in small animals

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Abdominal FAST definition and major goals

- Abdominal focused assessment with sonography for trauma, triage and monitoring
- Non-radiologist use of an abbreviated abdominal ultrasound exam
- Detecting free abdominal fluid/blood and assessing clinical impact for the patient
- Detecting disease at an earlier stage and keeping the patient alive

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Abdominal FAST key characteristics

- Non-radiologist
- Non-invasive
- Non-delay
- Short duration
- Limited patient restraint
- Safe



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In which patients should this be performed?

- All blunt trauma cases
- Collapsed patients with unexplained hypotension, tachycardia or mentation changes
- All anemic cases
- Post-intervention cases (surgery, biopsy)
- Patients suspected to suffer from peritonitis

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Some objectives for abdominal FAST

- Recognize free abdominal and retroperitoneal fluid
- Perform four preset views
- Apply an abdominal fluid scoring system
- In cases of hemoabdomen guide therapy by using the "small bleeder" versus "big bleeder" concept

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False positives and negatives

- False positives
 - fluids filled bowel - fluid-filled mid-abdominal
 - masses - fluid-filled uterus
- False negatives can be avoided
 - scan serially in 4 hours post-admission
 - scan serially as long as
 - 12-24 hours
 - scan after resuscitation and rehydration

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Patient positioning

- Right lateral recumbency - half sternal if needed
- Dorsal recumbency shoud be avoided
- Fur does not necessarily have to be shaved in order to save time



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What are we looking for?

- Anechoic black triangles in different shapes
- Not linear stripes



Technique for abdominal FAST

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Clockwise approach Longitudinal view 1. Diaphragmatico-hepatic view / DH 2. Spleno-renal view / SR 3. Cysto-colic view / CC Longitudinal and transverse view 4. Hepato-renal view / HR

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Diaphragmatico-hepatic view

- Longitudinal scanning (marker towards the head)
- Probe caudal to the xyphoid process
- Can give information on the pleural and pericardial space



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Spleno-renal view



- Visualisation of spleen (peritoneal cavity) and left kidney (retroperitoneal space)
- Classic positives are anechoic triangles
- Retroperitoneal fluid is not part of the abdominal fluid score (AFS)

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Cysto-colic view

- Scan the pocket formed between the bladder and the ventral body wall
- Look for anaechoic triangles



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Hepato-renal view

- Probe just ventral to the umbilicus
- Direct probe downward
- Liver and right kidney do not need to be scanned
- Scan longitudinal but even left transverse



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The importance of serial exams

- Repeat an abdominal FAST within 4 hours post-admission
- Repeat quicker if clinically needed
- Repeat after rehydration or resuscitation
- Serial exams (12-24 hr) will increase sensitivity







Abdominal Fluid Scoring System

- 0 negative at all four AFAST views
- 1 positive at one AFAST view (DH)
- 2 positive at two AFAST views (DH/CC)
- 3 positive at three AFAST views (DH/CC/HR)
- 4 positive at four AFAST views (DH/CC/HR/SR)

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Clinical significance

• DH and CC views become positive first, HR thereafter and SR last

- AFS 1-2 small bleeder: no surgery, no anemia, no transfusions
- AFS 3-4 big bleeder: anemia, blood transfusions, surgery
- Abdominocentesis often performed at HR view

Clinical monitoring

• Serial jugular lactates

• Serial blood pressure

measurements

• Pulse controll

• In cats: correlation between free abdominal blood and anemia is not proven

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Approach to traumatic hemoabdomen

- Conservative treatment can be successful in 75-80 % of cases
- Early surgery could increase mortality
- If, after an initial stabilisation, the patient deteriorates surgery could be indicated
- The patient should be monitored cautiously

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Abdominal FAST monitoring

- Repeat abdominal FAST q 30/60/120 min
- Repeat the Abdominal Fluid Score



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Monitoring abdominal hemorrhage

- Placement of a sampling catheter near the umbilicus
- Multiple abdominal fluid samples are taken
- Compared to peripheral blood PCV



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Sampling catheters

- 14 G "Hästkanyl"
- 14 G MILA fenestrated multiple purpose catheter
- 5-6 fr Pigtail catheter



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Abdominal FAST and AFS in cats

- Many cats with hemoabdomen will die and not reach the veterinary clinic
- In surviving cats free fluid is more likely to be urine
- AFS in cats will not reliably predict the development of anemia or the need of blood transfusions

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Non-traumatic abdominal hemorrhage

- Post-interventional
 - surgery
- aspiration/biopsy
- Ruptured mass
- Coagulopathy
- GI-ulcus/neoplasia
- Anaphylaxia



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Post-surgical abdominal hemorrhage

Leaking weak ligatures - ovario-hysterectomy - male dog castration - GI tract - other ligations



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Ventricular hemorrhage

- Ventricular ulcus or neoplasia
- Coagulopathy
- Diagnosed with FAST
- Patients with a ventricular ulcus or neoplasi are absolute surgical candidates









Post-aspiration or biopsy

- Post- interventional vital signs like heart rate, pulse quality and mucous membrane color can be insensitive
- Serial monitoring with FAST is of value in detecting ongoing bleeders
- Exploration can be indicated in AFS 3-4



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Post-biopsy monitoring

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- Repeated clinical exams
- Cage-rest with pulse controll - ECG-monitoring
- Abdominal FAST tracking
 - 5 minutes post-biopsy
 - 2-4 hours post-biopsy
- Repeated jugular lactates in case of significant hemorrhage



Treatment post-biopsy hemorrhage

- Cage rest
- Abdominal pressure bandage
- Hemostatic drugs
- tranexamic acid
- desmopressin
- No or restrictive fluid therapySurgery



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Cyklokapron 100 mg/ml

- Tranexamid acid TXA
- Utsöndras 95% genom njurarna
- Hämmar plasminogen aktivering
- · Biverkning vid giva: hypotension vid snabb giva; GI signs, kräkning diarre
- Var försiktig vid njursjukdomar--> minska dosen
- Dos: 10-15 mg/kg långsamt IV över 15 min följd av en CRI 1 mg/kg/t under 5-8 t
- OBS ge 10 mg/kg vid njursjukdom

Minirin 4mcg/ml

- Desmopressin
- Vasopressin analog
- 30-60 min post IV giva ökar koncentrationen av vWf och fVIII
- Förbättrar trombocytfunktionen vid uremisk trombocytopati
- Fungerar vid blödning sek till leversjukdomar
- <u>Dos:</u> nasal vätska 0,2 mcg/kg ges sc får upprepas q6t 3-4 ggr
- <u>Dos:</u> 1 mcg/kg långsamt IV (15 min). Bör spädas med 10 ml (< 10 kg kroppsvikt), med 50 ml (>10 kg kroppsvikt). Använd <u>NaC</u>I 0,9 %

Hemorrhage abdominal mass



Ultrasound screen after GI surgery

- Abdominal FAST monitoring day 2 and 5 post-surgically
- When fluid is detected perform abdominocentesis
- The diagnosis of dehiscence is made when intracellular bacteria are visualised



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Fluid analysis

- Total nuclear cellcount
- Total protein

Transudates Modified transudates Exudates



Transudates

Protein < 2,5 g/dl TNCC < 1000-1500 cells/μl

- Effusions of low cell count and low protein
- Clear and odorless
- Mononuclear cells: lymfocytes, macrophages, mesothelial cells
- Causes: hypoproteinemia /hypoalbumenimia/ uroperitoneum

Modified transudates

Protein 2,5-5,0 g/dl TNCC 1000-8000 cells/μl

- Vascular fluids leaking out of vessels
- Non-inflammatory disease proces
- Color may be turbid, opaque, pink, white
- Mostly mononuclear cells
- Causes: CHF, neoplasia, trauma, diaphragmatic hernia, obstruction of veins, chylus, FIP

Exudates

Protein > 3,0 g/dl TNCC > 7000 cells/μl

- Can be septic or non septic
- Leakage of fluid from abnormal vasculature
- Color varies amber, turbid, pink

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Septic abdominal exudates

- Ruptured stomach or bowel
- Anastomotic leakage
- Ruptured pyometra
- Penetrating bite wounds
- Prostatitis



Non septic abdominal exudates

- Feline infectious peritonitis
- Bile peritonitis
- Pancreatitis
- Steatitis
- Torsion of organs
- Neoplasms
- Uroperitoneum



Cytology



Bacterial culture

- Often mixed bacterial culture: anaerobes and aerobes
- Very important with antimicrobial therapy guided by resistancepatterns



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Fluid biochemistry •Lactate • Glucose •Lipase/amylase •Creatinine • Bile acids



Lactate as a Diagnostic Test for Septic Peritoneal Effusions in Dogs and Cats

J Am Anim Hosp Assoc 2004;40:364-371.

- An effusion lactate concentration > 2,5 mmol/l is highly suggestive of a septic abdominal etiology
- An effusion lactate greater than a blood lactate is highly suggestive of a septic abdominal etiology



Usefulness of whole blood, plasma, peritoneal fluid, and peritoneal fluid supernatant glucose concentrations obtained by a veterinary point-of-care glucometer to identify septic peritonitis in dogs with peritoneal effusion

J Am Vet Med Assoc 2015;247:1027–1032

Amie Koenig, DVM, and Lindsey Lane Verlander, DVM

- Most useful was the glucose difference of plasma versus peritoneal fluid (P-PF) and plasma versus peritoneal fluid supernatant (P-PFS)
- A glucose difference of 2,1 mmol/l supports an accurate diagnosis of septic peritonitis

Pancreatitis

- Large numbers of neutrophils and macrophages
- Macrophages contain vacuoles
- Lipase and amylase are markedly higher in fluid compared to peripheral blood



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Rupture or leakage of the lower urinary tract

- Abdominal /retroperitoneal/subcutaneous
- Turbid, blood tinged, yellow effusion
- Painful abdomen, arrhythmias
- Hyperkalemia and metabolic acidosis
- Fluid creatinine is markedly higher compared to peripheral blood









Bile peritonitis

- Intra- and extracellular bilirubin christals
- Hypersegmented neutrophils in large numbers
- Sometimes septic
- Effusion bilirubin 5-10 fold higher than peripheral blood



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