How to perform an abdominocentesis, cystocentesis and a prostatic wash

Thurid Freitag, DVM, PhD

University Veterinary Hospital · SACS

University College Dublin

Part I: Abdominocentesis

When should an abdominocentesis be performed?

An abdominocentesis is indicated as a diagnostic procedure when a distended, fluid-filled abdomen is present or one of the following is suspected: Septic peritonitis, rupture or perforation of bladder or gastrointestinal tract, intraabdominal bleeding, peritoneal neoplasia, right-sided congestive heart failure, vasculitis, hypoalbuminaemia or increased portosystemic pressure. Initial suspicion may be raised by observing decreased detail on abdominal radiographs in an animal with a normal body condition. Abdominocentesis is contraindicated when coagulopathies are present as it may cause persistent intraabdominal bleeding. When a large intraabdominal mass can be palpated, abdominocentesis is also contraindicated. If the mass is an abscess, iatrogenic laceration of the mass may cause septic peritonitis. If the mass is neoplastic, laceration of the mass may cause spread of neoplastic cells into the peritoneal cavity. If the mass is an enlarged organ, abdominocentesis may cause laceration and bleeding. Finally, abdominocentesis is contraindicated when gas-filled distended loops of intestine are present, as it may cause laceration of the intestine and subsequent septic peritonitis.

What is needed to perform an abdominocentesis?

In cases of diagnostic abdominocentesis, a simple needle-and-syringe procedure may be performed. In cases where fluid is being drained from the abdomen, catheters may be used. In any case, the following material is needed:

1) Material for aseptic preparation (clippers, chlorhexidine or povidone-iodine preparation, swabs, surgical alcohol)
2) Sterile gloves
3) 21-25 gauge needle or catheter
4) 5-10 ml syringe
5) EDTA and plain sterile vials

When a catheter is placed, a scalpel blade (No. 11) and local anaesthetic (e.g. lidocaine at maximal 4 mg/kg) are also needed.
Specific peritoneal lavage catheters may be obtained. These catheters can be left in place and allow drainage and subsequent evaluation of fluid on several occasions. Instructions on how to use peritoneal lavage catheters are usually supplied with the catheters or are available on request. Alternatively, a small feeding tube can be placed by feeding it through a catheter that is penetrating the abdominal wall. The catheter may then be removed and the feeding tube can be clamped and sutured in place (finger trap pattern). Placing a feeding tube has an advantage that several small openings can be cut into the front end of the feeding tube, allowing drainage through several holes (of importance when the fluid is viscous or abdominal organs block the front end hole of the catheter; Figure 1). Please note: When cutting the holes into the feeding tube, proceed in a sterile manner. Make sure that the borders of the holes are smooth and leave enough space between holes to avoid breaking of the feeding tube!

![Figure 1 Use of a feeding tube for abdominocentesis](image)

**Performing an Abdominocentesis**

The animal may be sedated if necessary. Most animals tolerate a diagnostic abdominocentesis (i.e. needle-and-syringe-procedure) without sedation. In quiet animals, local anaesthetic is often enough to allow introduction of catheters. Animals that move a lot should be sedated with an appropriate sedative. The bladder should be emptied before attempting abdominocentesis. The animal may be standing or in right recumbency. The left recumbency should not be chosen, as this increases the risk of laceration of the spleen. The ventral abdomen should be prepared aseptically. After aseptic preparation, proceed as follows:

1) For the diagnostic procedure (aiming to obtain small volumes for analysis):

Use a needle or butterfly catheter and a syringe if needed. If the animal is standing, introduce the needle at the most ventral point of the abdomen along the midline. If the animal is on the right side, introduce the needle just caudal to the umbilicus, but few centimetres from the midline towards the right side (fluid will flow towards the recumbent side). Once the needle has entered the peritoneal cavity, it may take a while for fluid to flow through the needle, particularly if the fluid is viscous. If no fluid has appeared after few minutes, a syringe may be attached and negative pressure applied. **If no fluid is obtained, do NOT redirect the needle repeatedly. Remove it and reconsider whether fluid is present or not.** A four-quadrant tap may be performed if small amounts of fluid are suspected and no ultrasound-guided aspiration is possible. To do so, a line is imagined at the height of the umbilicus, running from one site to the other and dividing the abdomen into cranial and caudal parts. The
ventral midline divides the abdomen into left and right sides. Each of the four visualised quadrants should be tapped in the middle by slowly introducing a 21-25 gauge needle and leaving it in place for few minutes. If no fluid is obtained after few minutes, a syringe may be attached and negative pressure may be applied. Please note that there is the risk of laceration of the liver, spleen, large blood vessels, intestine or bladder when performing this procedure. This risk increases with the gauge of the needle used and with repetition of the procedure! As mentioned above, when clotting deficiencies are suspected, abdominocentesis is not recommended and clotting deficiencies should be treated first!

2) For the diagnostic or therapeutic procedure (aiming to drain the abdomen or to perform a peritoneal lavage):

Prepare the animal as above. It is recommended to restrain the animal in right lateral recumbency and to drape the abdomen. Infiltrate the skin and muscle layers with an appropriate amount of local anaesthetic at the site of the abdominocentesis (see above). Make a small skin incision with the scalpel blade (do not penetrate the abdomen). Introduce the catheter through the skin incision. Once the stylet has penetrated the abdominal wall, a small ‘pop’ is felt. Insert the catheter few millimetres more and remove the stylet. Allow few minutes for the fluid to drain passively through the catheter. If no fluid is seen after a minute, a small amount of negative pressure may be applied with a syringe. If no fluid is seen, none may be present or it may be too viscous. In these cases, a peritoneal lavage may be useful. As described above, a feeding tube or abdominal catheter may be placed to perform these procedures.

To perform a peritoneal lavage, proceed as follows: If no fluid drains freely, 20 ml/kg warm isotonic crystalloid fluid, such as 0.9% NaCl, may be introduced into the abdominal cavity. The catheter should then be clamped and the animal rolled gently from side to side for few minutes. The catheter should then be re-opened and the first few millilitres of fluid obtained should be discarded before collecting samples. In all cases collect samples in EDTA and plain vials for cytology and culture, respectively.

When samples have been obtained

A substantial amount of information can be obtained by simple diagnostic tests after the sample has been obtained. These tests are:

1) Macroscopic examination
   a. Colour, turbidity, odour
2) Total protein measurement
3) Microscopic examination
   a. Cells, Bacteria, Fibres
4) Biochemistry (particularly glucose and creatinine)
   a. Compare to serum biochemistry

However, it is also recommended to submit appropriate samples to diagnostic laboratories for cytology and culture of the abdominal fluid.
Interpretation of Sampled Fluid

Abdominal fluid is categorised as follows:

1) Transudate
   a. Total Protein < 25 g/L
   b. Total nucleated cell count (TNCC) < 1.5 * 10⁹/L
   c. Clear or straw-like colour

2) Modified transudate
   a. Total Protein > 25 g/L
   b. Total nucleated cell count (TNCC) = 5-7 * 10⁹/L
   c. Yellow or blood-tinged colour

3) Exudate
   a. Total Protein > 25 g/L
   b. Total nucleated cell count (TNCC) > 7 * 10⁹/L
   c. Turbid, different colours

Transudates usually represent severe hypoalbuminaemia (as seen in severe hepatopathy, protein-losing nephropathy and protein-losing enteropathy) and/or increased portosystemic pressure. Severe malnutrition or decreased venous or lymphatic drainage are uncommon causes of transudates.

Modified transudates are usually the result of an increased hydrostatic pressure, as is sometimes present in cardiovascular or hepatic disease or neoplasia.

Exudates are seen when an inflammation is present. Exudates may be septic (as seen in bacterial peritonitis) or non-septic (as may be seen with organ inflammation or neoplasia). Septic exudates may be differentiated from non-septic exudates by cytology and culture. Simultaneous measurement of glucose in blood and effusion sample may also help to differentiate septic from non-septic processes. In septic processes, the glucose concentration in peritoneal fluid is often lower than the serum glucose concentration and <2.7 mmol/L. Glucose should be measured from heparinised samples within 15 min or sent for analysis in fluoride oxalate vials.

Measurement of creatinine is particularly useful when an uroabdomen is suspected. In these cases, abdominal fluid will contain a higher creatinine concentration than serum, because equilibration of creatinine between serum and abdominal fluid takes time. Please note that a falsely low serum creatinine can be caused when fluid boluses are given intravenously. Thus, creatinine should be compared before a fluid bolus is given.

The presence of organic fibres, degenerative neutrophils, large quantities of bacteria, intracellular bacteria or >2000 leukocytes/ml suggests that a severe septic infection and/or dehiscence or rupture of the gastrointestinal tract is present. Immediate and appropriate surgical treatment, taking into consideration the anaesthetic risks, is indicated. If large amounts of blood are obtained trauma to the vascular supply may be present. Shock treatment and blood transfusions may need to be initiated and a pressure bandage should be applied to the abdomen. A guarded prognosis is indicated if gastrointestinal tract rupture and abdominal bleeding is present.

When abdominocentesis goes wrong

Abdominocentesis is not a benign procedure. Complications may arise during or after the procedure. Such complications are:
1) Bleeding caused by injury to liver, spleen, blood vessels or secondary to coagulation difficulty
2) Perforation of gastrointestinal tract, gall bladder or urinary bladder and subsequent peritonitis
3) Spread of neoplasia along the needle tract

The risk of complications increases with the gauge of the needle, when the animal is not properly restrained or positioned, when improper technique is used or when repeated attempts of abdominocentesis are made. Before performing an abdominocentesis, the clients should be advised of the risks and one should prepare to resolve potential complications (e.g. bleeding) immediately. A follow-up examination or phone call within few days of the procedure is also recommended.

Part II: Cystocentesis

When is cystocentesis useful?

Cystocentesis is a quick and simple procedure that can be performed in most dogs and cats with minimal restrain. It is useful when a sample cannot be obtained by other means (e.g. when obtaining a free-catch sample in a cat is not possible). Comparing free-catch samples with cystocentesis-derived samples may also aid in differentiating between a disease process located in the upper urinary tract and lower urinary- or genital tract. Free-catch and catheter samples may differ from cystocentesis samples in concentration of bacteria, protein, white blood cells and epithelial cells. These constituents are to some degree present in the distal urogenital tract (i.e. urethra, vagina) and may be flushed out during micturition. Please note that all animals have a normal bacterial flora in the distal urethra. Thus, urine should be collected by cystocentesis when attempting to diagnose a urinary tract infection. Cystocentesis may be performed in animals with a urine outflow obstruction but should be performed with care and a small gauge needle, as a urine leakage through the bladder wall or even rupture of the bladder could potentially occur if the bladder is extremely stretched.

What is needed to perform a cystocentesis?

Cystocentesis requires few materials:
   1) Material for aseptic preparation (clippers, chlorhexidine or povidone-iodine preparation, swabs, surgical alcohol)
   2) 1 to 1.5" 21 to 25 gauge needle
   3) Appropriate syringe
   4) Plain sterile vials
   5) Refractometer (for initial interpretation)
   6) Dipsticks (for initial interpretation)
Performing a Cystocentesis

The animal may be standing, in lateral or dorsal recumbency. The abdomen should be palpated to localise the bladder. In lateral recumbency the bladder may be trapped with the hand that is not holding the syringe. To do so, place the fingers around the bladder on the recumbent side and place the thumb cranial to the bladder to push it caudal. When the animal is in dorsal recumbency, a cross between the last 2 mammary complexes and the midline may be used as landmarks. Alternatively, the needle may be introduced in the midline where the ethanol pools. In males the prepuce must be reflected from the midline before inserting the needle. An aseptic preparation should be performed before inserting the needle from cranioventral to caudodorsal in a 45° angle. Introducing the needle on a 90° angle may increase the risk of iatrogenic bladder wall laceration when the bladder empties. Introducing the needle too far cranially may cause not yield enough sample as the bladder retracts caudally when it empties. Release any negative pressure on syringe before withdrawing syringe to avoid contamination of the peritoneal cavity with urine.

When the sample has been obtained

After the urine sample is obtained, it may be examined macroscopically (i.e. colour, turbidity and odour). Furthermore, the specific gravity and a dipstick procedure can easily be performed. Take care to keep a sterile sample for urine culture. A small amount of blood should be considered normal in a cystocentesis sample. This may be due to iatrogenic injury to the bladder wall. Please note that the reading for leukocytes and nitrite on the dipstick is not accurate in dogs and cats and should therefore not be interpreted. A sediment evaluation can be done if a microscope and centrifuge are available. Alternatively, urine may be sent for sediment evaluation (urinalysis). Urine sediment evaluation should be done as soon after sampling as possible. If urine is stored at low temperatures, the amount of crystals in urine may increase over time. Urine may also be sent to diagnostic laboratories for urine culture and urine protein:creatinine ratio. Urine should be submitted for culture within 4 hours of sampling. If this is not possible, the urine should be stored at 4°C until it is cultured to prevent the growth of contaminants. The urine protein:creatinine ratio is a useful diagnostic measurement of urinary protein loss and may be indicated in patients with concurrent hypoalbuminaemia.

Part III: Prostatic Wash

When is performing a prostatic wash useful?

A prostatic wash can aid to the diagnosis in dogs that present with tenesmus, haematuria, recurrent urinary tract infections or hind limb lameness AND an enlarged, irregular or painful prostate on rectal examination. It is commonly performed when ultrasound-guided fine needle aspiration of the prostate is not available. A prostatic wash may be the method of choice if a diffuse disease is present, an area of interest for aspiration cannot be imaged or neoplasia is suspected (as ultrasound-guided aspiration carries the risk of spread of neoplastic cells along the needle tract).
A prostatic wash should not be performed when the dog suffers from acute prostatitis. These dogs are commonly systemically ill (fever, anorexia, leukocytosis with left shift, other abnormalities) and has usually a large and extremely painful prostate. This animal should be stabilised and treated empirically with broad spectrum antibiotics before performing a prostatic wash. Performing a prostatic wash in these dogs may increase the risk of development of bacteraemia and septicaemia! A prostatic wash should also not be performed in dogs that have a large palpable abscess (felt as a smooth structure with fluctuant content). A prostatic abscess is best treated with an appropriate surgical procedure (e.g. partial excision and omentalisation). Performing a prostatic wash in dogs with prostatic abscesses may cause abscess rupture and subsequent peritonitis and/or septicaemia.

What is needed to perform a prostatic wash?
The following material is needed to perform a prostatic wash:
1) One or two urinary catheter
2) Sterile KY jelly
3) 100-200 ml sterile saline
4) Gloves
5) One to two empty 50 ml syringes
6) A 10 ml syringe containing sterile saline
7) Several EDTA and plain (sterile) vials
8) Kidney dish

One other person will be involved in performing the prostatic wash. One or 2 other people may be needed to restrain the animal in lateral recumbency.

Preparation for the Prostatic Wash
The dog may need to be sedated if he is not compliant. Sedation is usually not needed in quiet dogs with non-painful conditions. The dog should be held in lateral recumbency. The bladder should be catheterised and completely emptied in a sterile manner, using the urinary catheter, KY jelly and the 50 ml syringe(s). Avoid applying too much negative pressure with the large syringes, as this may cause bladder wall irritation and injury. Keep some of the urine collected for urine culture and, possibly, urinalysis in a (plain sterile vial). Flush the bladder repeatedly with saline until straw-coloured to clear fluid is retrieved from the bladder. Empty the bladder again completely and leave the urinary catheter in place.

Performing a Prostatic Wash
After the preparation is completed, the prostate and urethra should be palpated rectally. The urinary catheter is then slowly withdrawn (retrograde) by a helper, until the catheter tip can be felt rectally within the urethra just caudal to the prostate. The helper should then advance the catheter antegrade for few centimetres, in order to place the catheter tip ventral to the prostate. The helper attaches a 10 ml syringe with saline. Once the syringe is attached, the prostate is massaged rectally for 1 minute. During the massage, the helper slowly injects the saline. After the massage is completed and all the saline has been flushed through the catheter, the catheter is advanced antegrade into the bladder to collect the fluid. Obtained fluid usually looks
turbid and blood-tinged. It should be divided between EDTA and plain vials. From each prostatic wash procedure, 2 samples are submitted for culture (a pre-wash urine sample and an actual wash sample). Similar to urine samples, prostatic wash samples should be cultured within 4 hours or stored at 4ºC until analysis. An EDTA wash sample is submitted for cytology.

**Interpreting Prostatic Wash Samples**

Cytological results obtained by prostatic wash concur in approximately 75% with “gold standard” histopathology results. This is because a prostatic wash is a blind procedure. A localized change may be missed with this procedure. Furthermore, nondiagnostic samples with low cellularity may give false negative results. In some cases of neoplasia or metaplasia, a definitive diagnosis cannot be given as changes are better visible when cells are observed within the tissue complex. However, bacterial infections are usually better diagnosed with prostatic wash. This may be because bacteria may be reduced by histopathological preparation or may be disguised by surrounding tissue. In general, cytological and microbiological examination is used to establish whether hyperplasia, inflammation (septic or non-septic), primary/secondary metastatic neoplasia or squamous metaplasia are present.

**Further reading**