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CE

Article #4 (1.5 contact hours)

Refereed Peer Review

KEY FACTS

- Compliance of the owner and animal is essential for proper maintenance of a cystostomy tube.
- Cystostomy tubes can be used for months if necessary.
- Ascending urinary tract infection is inevitable with long-term use of cystostomy tubes.

Use of Cystostomy Tubes in Small Animals

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ABSTRACT: Cystostomy tubes provide a practical method of temporary or permanent urinary diversion for animals with outflow obstruction of the bladder or urethra. Surgical placement of a cystostomy tube is relatively simple and can be performed without specialized instrumentation. Options for cystostomy tubes include Foley catheters, mushroom-tip catheters, percutaneous catheters, and low-profile tubes. Potential complications include leakage of urine around the tube, accidental dislodgment, and ascending urinary tract infection. Management requires careful handling of the tube and draining the bladder at least three or four times a day, depending on the medical condition of the animal. With good compliance from both the animal and the owner, cystostomy tubes can be maintained successfully for months if necessary.

Cystostomy tubes provide a practical method for urinary diversion when more radical surgical procedures are not feasible. In humans, cystostomy tubes are used routinely to bypass urinary outflow obstruction or as an alternative to urethral catheterization.¹⁻³ Successful use of cystostomy tubes has been reported in animals, although relatively few descriptions appear in the literature.⁴⁻¹² With continued improvement in our ability to diagnose and treat various urinary tract diseases, particularly neoplastic conditions, understanding of the indications and management techniques for cystostomy tubes has become increasingly important. This article reviews the indications, surgical technique, complications, and management related to use of cystostomy tubes in small animals and discusses the application of new low-profile tube systems that may offer some advantage over conventional cystostomy tubes.

INDICATIONS FOR CYSTOSTOMY TUBES

Cystostomy tubes are indicated for urinary diversion in animals with either functional or mechanical obstruction of the bladder or urethra or excessive urine retention. Some of the most common causes include trauma, calculi, inflammation, neoplasia, and neurologic diseases resulting in detrusor atony or reflex dysnergia.⁴⁻¹³ Cystostomy tubes can be used for temporary or short-term (days to weeks) or long-term (weeks to months) diversion. Examples of the former include management of traumatic injuries to the urethra or bladder, postoperative drainage after urethral repair, treatment of transient neurologic dysfunction of the bladder, or management of patients during the interim period while waiting for a response to other treatments such as chemotherapy or radiation therapy. Long-

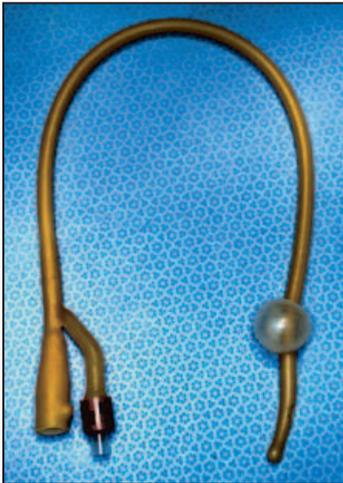


Figure 1A—Foley catheter

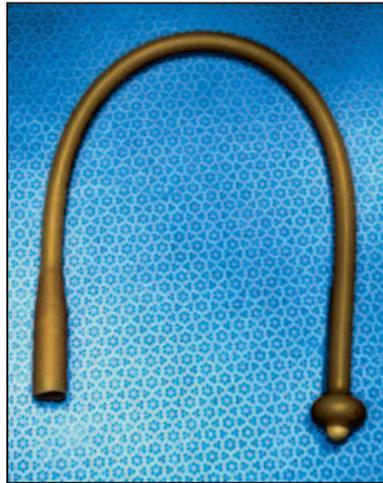


Figure 1B—Mushroom-tip catheter

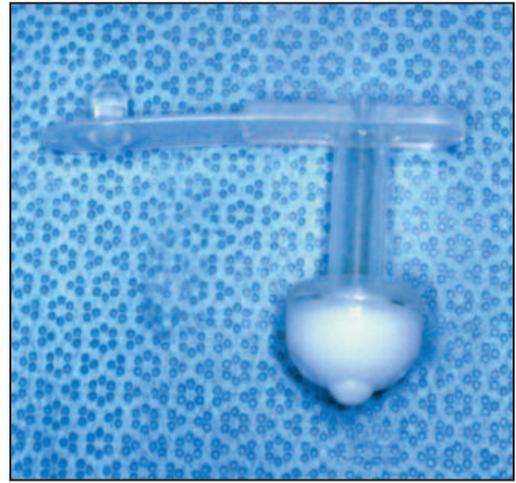


Figure 1C—Low-profile gastrostomy tube

Figure 1—Three different catheters suitable for use as cystostomy tubes.

term use of cystostomy tubes is indicated for management of permanent or slowly responsive neurologic conditions of the bladder or as palliative treatment for non-resectable tumors of the bladder or urethra when more radical urinary diversion procedures are not feasible.^{14,15}

OPTIONS FOR CYSTOSTOMY TUBES

Catheters

Several different types of tubes are available, including Foley catheters, mushroom-tip (de Pezzer) catheters, and percutaneous catheters; more recently, low-profile gastrostomy tubes have been adapted for use as cystostomy tubes (Figure 1). Foley catheters are available in many different sizes and have an inflatable balloon at the tip that helps maintain the tube within the bladder. Their successful use as temporary cystostomy tubes has been reported in 10 dogs and one cat.⁹ Reasons for use included urethral trauma in six cases, prostatic surgery in four cases, and bladder atony in one case. The cystostomy tubes were in place ranging from 7 to 14 days. Leakage of urine around the tube was noted in all cases; however, this problem resolved within 4 days, and no intraabdominal leakage occurred. All cases developed nosocomial bacterial infections; however, the infections were successfully treated with antibiotics after removal of the tube. The authors concluded that short-term cystostomy with Foley catheters could be performed with few unexpected or serious complications. However, we have experienced accidental dislodgment because of deflation or deterioration of the balloon.

Mushroom-tip catheters have a more rigid tip, which makes them less likely to become dislodged, and their successful use as permanent or long-term cys-

tostomy tubes has been described in six dogs with transitional cell carcinoma of the bladder or urethra.⁶ Clinical signs of urinary obstruction were present for 1 week to 9 months (median 6 weeks) prior to treatment. Median survival time after the cystostomy tubes were placed was 106 days (range, 28 to 148 days). Minimal drainage around the tube was reported in all cases. Urinary tract infection (UTI) was confirmed in four cases at 2- or 4-week reexaminations but was successfully treated with antibiotics. Difficulty with draining the tube was reported in two cases because of occlusion by the tumor. All owners were satisfied with the quality of life for their dogs and the ease of tube management. The authors concluded that permanent tube cystostomy is an acceptable treatment for obstructive neoplasia when owners do not wish to pursue more aggressive surgical treatments or do not wish to euthanize their dogs because they are otherwise clinically healthy.

Malecot catheters (over-the-needle type) can be placed percutaneously for temporary diversion. The catheters can be inserted rapidly with ultrasound guidance in an animal under sedation. However, because of the mobile nature of the bladder in dogs and cats, care must be taken to ensure that the catheter does not become dislodged or cause leakage of urine into the abdomen.¹⁶

Low-Profile Cystostomy Tubes

Low-profile tubes were originally designed as gastrostomy tubes but have been adapted for use in the bladder, similar to other conventional tubes.¹⁷ Several low-profile tube systems that are suitable for animals are

Resources

Low-profile gastrostomy tube systems adaptable for use as low-profile cystostomy tubes in small animals are available from the following:

Button, Wizard, and Genie low-profile gastrostomy tube systems

Bard Endoscopic Technologies
C.R. Bard, Inc.
129 Concord Road, Building #3
Billerica, MA 01821

Cubby low-profile gastrostomy device

Medical Instrumentation for Animals
MILA International Inc.
7604 Dixie Highway
Florence, KY 41042

MIC-KEY low-profile gastrostomy feeding device

Kimberly-Clark
Ballard Medical Devices
12050 Lone Peak Parkway
Draper, UT 84020

available from various manufacturers (see box *above*). The cost of low-profile tubes is considerable compared with that of conventional tubes; however, the primary advantage of low-profile tubes is that their design makes them easier to maintain and potentially less likely to be traumatized or accidentally dislodged (Figure 2).

The exterior button or flange of the tube sits flush with the skin and contains the plug and valve system that seals the tube. The tip of the tube may be mushroom shaped or have a balloon that is inflated like a Foley catheter to maintain it within the lumen of the bladder. Tubes are available in various diameters (14 to 24 Fr) and stem lengths (0.8 to 4.5 cm) to accommodate animals of different sizes. To drain the bladder, the stopper plug is opened and a separate drainage tube is connected to the catheter, which opens the one-way valve system and allows the bladder to empty.

A low-profile gastrostomy tube system (Genie, Bard Endoscopic Technologies, Billerica, MA) was used successfully as a cystostomy tube for urinary diversion in two dogs and one cat.¹⁷ Both dogs had tumors of the bladder (transitional cell carcinoma); the cat had detrusor atony. The tubes were in place for 3 weeks and 3 months in the two dogs and for 2 months in the cat. Owners emptied the bladder every 6 to 12 hours by using a separate drainage tube and catheter tip syringe. Complications included mild leakage of urine around the tube just after surgery in three animals, UTI in one dog and one cat, and leakage of the one-way valve system in one dog. The authors reported positive results



Figure 2—A dog with a low-profile cystostomy tube in place 48 hours after surgery.

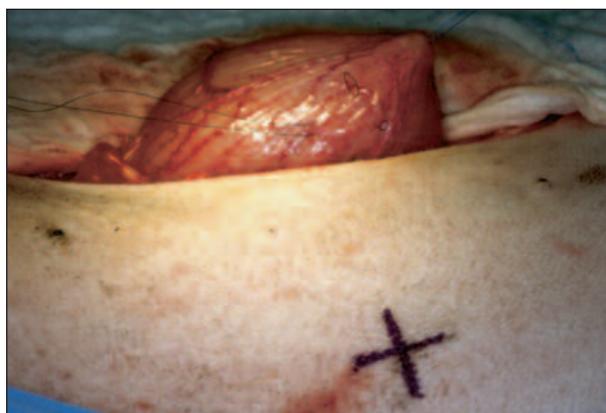


Figure 3—The mark on the skin indicates the appropriate exit site for the cystostomy tube, as seen during surgery.

with the low-profile tube system and were encouraged to continue its use in selected cases.

SURGICAL TECHNIQUE

Before surgery, the animal should be examined while it is in a standing position, and an appropriate site for exiting the tube from the body wall should be identified. This site is marked on the skin so that it can be identified during surgery (Figure 3). When possible, the tube should exit cranial to the flank skinfold and lateral to the ventral midline for easier handling of the tube. Tubes can be placed in the bladder by using either a ventral midline approach or a “mini” paramedian approach. When a ventral midline approach is used, the tube is placed through a separate incision in the body wall at the previously marked site. When a mini paramedian approach is used, the incision is made directly over the previously marked site, and the tube is placed through the same incision. Once the abdomen has been entered, the bladder should be identified and stabilized

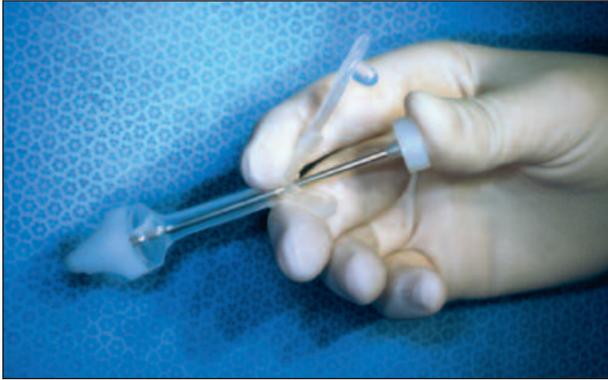


Figure 4—The blunt obturator is used to extend and narrow the mushroom tip of a low-profile gastrostomy tube.

with several stay sutures. A purse-string suture of synthetic absorbable material should be placed in the ventrolateral aspect of the apex of the bladder wall. For some animals, the location of the purse-string suture may have to be modified because of the condition of the bladder.

For a ventral midline approach, a stab incision should be made in the body wall at the previously marked site on the skin and the tip of the cystostomy tube pulled into the abdomen. Another stab incision should be made through the purse-string suture and the tube placed into the bladder. For a low-profile mushroom-tip tube, a blunt obturator should be used to extend and narrow the tip so that it is easier to place through the body wall and into the bladder (Figure 4). If necessary, a second purse-string suture or several inverting sutures can be placed around the tube for an additional seal. When a Foley catheter is used, the balloon should be inflated with the appropriate volume of saline to secure the tube within the bladder. The tube should be pulled against the body wall, and several sutures of synthetic, absorbable material should be placed between the bladder and the body wall to create a cystopexy. Alternatively, a “box” suture pattern can be used to create a cystopexy. The tube should be checked for patency and leakage by injecting enough sterile saline to achieve moderate distention of the bladder.

The body wall, subcutaneous tissue, and skin are closed in routine fashion. When a long tube is used, the end of the tube is capped with a Luer-Lock adapter or three-way stopcock and the tube is secured to the skin with a finger-trap suture or flange fashioned from additional tubing material (Figure 5). If necessary, a light bandage can be placed around the exit site to protect it until healthy granulation tissue has formed at the stoma.

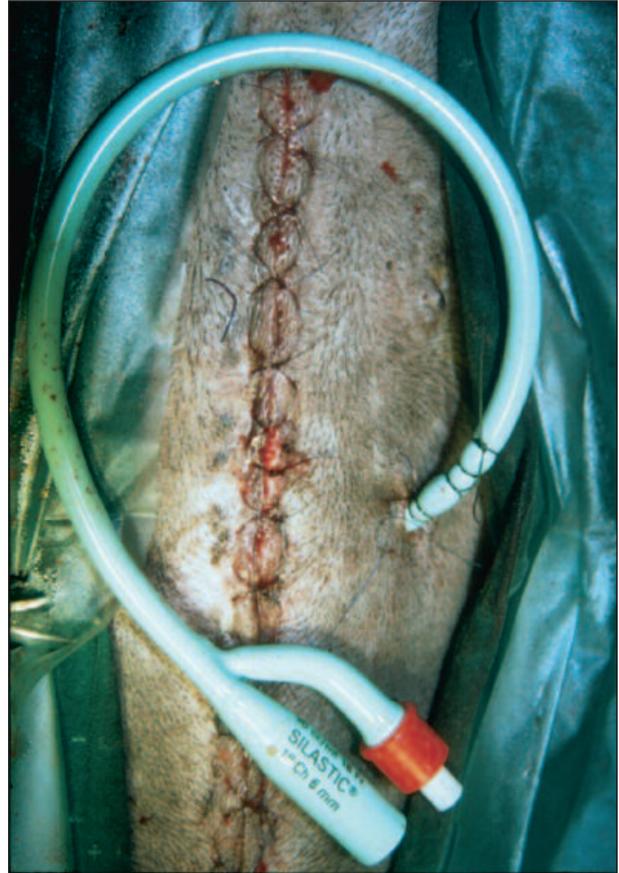


Figure 5—A Foley catheter is secured in place with a finger-trap suture.

COMPLICATIONS

Complications involving cystostomy tubes include surgery-related problems such as urine leakage, wound infection, or dehiscence; problems with the tube itself such as irritation at the stoma site, obstruction, or accidental dislodgment; and problems related to ascending infection due to the presence of the tube.^{5,6,9,17} Surgical complications can be minimized by using aseptic technique and ensuring that the tube is adequately sealed within the bladder and secured to the body wall. Placing an additional purse-string suture or inverting sutures around the tube help reduce the risk of leakage should the bladder become overdistended before a secure adhesion has developed. Creating a secure fixation between the bladder and body wall should also help reduce the risk of urine leakage into the abdomen if the tube is accidentally dislodged. Irritation at the stoma site can be minimized by keeping the stoma clean and protecting the surrounding skin with petroleum jelly or an antibiotic ointment. Unnecessary motion or traction on the tube should also be avoided by properly securing the tube to the body. For most

animals, irritation of the stoma is self-limiting and improves as the site matures.

Accidental tube dislodgment or damage may occur for many different reasons, including biting or chewing on the tube, stepping on the tube or snagging it on various objects, and deterioration of the tube because of prolonged usage. Most of these difficulties can be prevented by ensuring that the tube is handled carefully and remains covered when not in use. Low-profile tubes offer an advantage over longer conventional tubes because they do not protrude as far from the body and are potentially less likely to become dislodged.

Ascending UTIs are an inevitable complication of cystostomy tubes.^{18–24} The tube acts as a constant source of bacterial contamination and disrupts the normal defense mechanisms of the bladder, which leads to recurrent infections. The consequences of chronic or recurrent infections should be considered before the tube is placed, and the owners should be made aware of the potential difficulties of managing catheter-related UTI.

MANAGEMENT

Owners should be instructed to empty the bladder at least three or four times a day to prevent overdistention of the bladder and stagnation of urine. The cystostomy tube should be kept as clean as possible, and owners should wear examination-type gloves when handling the tube to protect themselves and minimize contamination of the tube. The stoma site should also be monitored daily and cleaned as necessary to prevent local irritation or infection. A long cystostomy tube should be secured with a light bandage, jacket, or T-shirt to prevent accidental dislodgment. Also, the animal's temperament may require that an Elizabethan collar or neck brace be worn to prevent tube damage.

Because of the risk of ascending infection, animals should be monitored carefully for such signs as fever, abdominal pain, hematuria, pyuria, or discharge from the stoma site (urethra). However, some of these signs may develop due to the underlying disease process or the presence of the tube and may not necessarily be an indication of infection. When infection is suspected, urinalysis and aerobic bacterial culture and sensitivity should be conducted to detect the presence of bacteria and to direct appropriate antibiotic treatment. The urine sample should be obtained via sterile technique; however, with neoplastic conditions such as transitional cell carcinoma, cystocentesis in the area of the tumor should be avoided to reduce the chance of seeding the abdomen during sampling.^{25–27} Collecting urine directly from the tube is a simple alternative, although samples collected in this manner may be contaminated with different bacteria or may contain bac-

teria in higher concentrations than are present in the bladder, so culture and sensitivity results should be interpreted carefully.²⁴

The use of systemic antibiotics in an animal with an indwelling urinary catheter is controversial because of concerns about development of drug-resistant bacteria.^{18,20,22,23,28} For most healthy animals requiring a cystostomy tube for only a short period (3 to 7 days), prophylactic use of systemic antibiotics is generally not recommended unless necessary for other medical reasons or unless the consequences of developing a UTI far outweigh the risks of developing a drug-resistant infection. After removal of the tube, a urinalysis and culture and sensitivity should be conducted to determine whether an infection has developed and to direct appropriate antibiotic therapy, if necessary.

For animals with cystostomy tubes in place for longer periods, it becomes much more difficult to determine when antibiotic treatment is appropriate because routine urine samples will inevitably reveal bacteriuria. As a rule, infections should be treated only when accompanied by significant clinical signs; however, the decision to treat an animal should be based on multiple factors such as the severity of clinical signs, the anticipated length of time the tube will be in place, the species of bacteria and degree of antibiotic resistance, the presence of pyelonephritis or preexisting renal disease, the presence of other systemic problems, and the type and progression of the underlying disease process.^{18,19,28} It is important to develop a rational strategy for managing recurrent infections in animals with permanent cystostomy tubes so that chronic, long-term antibiotic use is avoided as much as possible and the risk of developing drug-resistant infections is reduced.

Animals that develop clinical signs of chronic infection should have a complete blood count and serum biochemistry profile evaluated periodically to identify renal insufficiency or other systemic problems. Also, periodic ultrasound examination of the kidneys, ureters, and bladder is recommended to identify pyelonephritis or other changes related to progression of neoplastic or infiltrative diseases such as ureteral obstruction, hydronephrosis, loss of bladder volume caused by enlargement of a mass, obstruction of the tube, or possibly signs of lymphadenopathy caused by local or regional metastasis.¹⁹

Replacement of Cystostomy Tubes

Accidental dislodgment of the tube is a potential complication with any animal. Whether a tube can be replaced through the same stoma depends on the size and condition of the stoma, the length of time that the tube has been out, and the size of the replacement tube.

Dislodged tubes should be replaced promptly because granulation tissue that forms within the stoma may make it difficult or impossible to replace the tube after 48 hours. If the original tube had been in place long enough to establish a mature stoma, a new tube of similar or slightly smaller size may be placed through the same stoma. Replacing the tube should be done under sterile conditions with the animal sedated or anesthetized. The stoma should be carefully probed to identify the direction of the tract and, if necessary, gently dilated with a hemostat. A stylet or blunt obturator can be used, if needed, to make a tube more rigid and easier to pass. The tube is then carefully inserted into the bladder taking care to avoid disruption of the adhesion. After the tube is replaced, the animal should be observed for signs of urine leakage and peritonitis and the stoma site should be monitored and cleaned. If necessary, correct placement of the tube can be confirmed by injecting an aqueous contrast medium through the tube and obtaining a lateral abdominal radiograph.

When a tube cannot be replaced through the same stoma or when the original tube has been in place for such a short time (less than 7 to 10 days) that the adhesion between the bladder and body wall has not fully developed, a surgical approach should be used to replace the tube.

Removal of Cystostomy Tubes

Cystostomy tubes should remain in place for at least 14 days before removal to ensure an adequate adhesion between the bladder and body wall and to reduce the possibility of urine leakage or peritonitis. Tubes can usually be removed without the need for general anesthesia. For a Foley catheter, the balloon should be deflated and the catheter can easily be removed from the bladder. For a mushroom-tip catheter, a blunt obturator can be used to extend and narrow the tip of the catheter, thus making it easier to remove. The stoma is usually left to close by contraction and epithelialization over the next 3 to 5 days. During that time, the site should be cleaned as necessary and the surrounding skin protected with petroleum jelly to prevent irritation from any leakage of urine.

CONCLUSION

Cystostomy tubes provide a practical method of temporary or permanent urinary diversion for animals with outflow obstruction or urine retention caused by trauma, calculi, inflammation, neoplasia, or neurologic disease of the bladder or urethra. Surgical placement of a cystostomy tube is relatively simple and can be performed without specialized instrumentation. Tube selection should be based on the anticipated length of

time the tube will be needed, the size and temperament of the animal, and the owner's ability to care for the tube. Important management requirements such as proper handling of the tube, emptying the bladder, and monitoring for signs of UTI should be considered and discussed with the owners before the tube is placed. Potential complications include leakage of urine around the tube, accidental dislodgment, and ascending UTI. With proper compliance from both the animal and the owner, cystostomy tubes can be maintained successfully for extended periods and provide good quality of life for animals that otherwise may have limited treatment options.

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3. Which disorder would not be an indication for using a cystostomy tube?
 - a. urethral trauma
 - b. detrusor atony
 - c. nonresectable urethral tumor
 - d. ectopic ureter
 4. Which statement regarding low-profile cystostomy tubes is false?
 - a. They were originally designed to be used in the stomach as feeding tubes.
 - b. They protrude less from the skin compared with conventional tubes.
 - c. They are not associated with ascending UTIs.
 - d. They can be surgically placed similar to longer conventional tubes.
 5. Which statement regarding the replacement of a cystostomy tube is true?
 - a. Replacement should be done promptly to prevent granulation tissue from forming within the stoma.
 - b. Replacement must be done surgically so that a different stoma can be created.
 - c. Replacement should be delayed to allow a firm adhesion to develop between the bladder and body wall.
 - d. The tube should always be replaced through the original stoma to avoid a surgical procedure.
 6. Which statement about removing a cystostomy tube is true?
 - a. Removal should be considered a surgical procedure and done with the use of general anesthesia.
 - b. Tubes remain in place for at least 30 days to ensure that a firm adhesion has developed at the stoma site.
 - c. Surgical closure of the stoma is necessary to prevent urine from leaking into the abdomen.
 - d. After the tube is removed, the stoma will close by contraction and epithelialization in several days.
 7. Which statement regarding ascending UTIs that develop because of the presence of a cystostomy tube is true?
 - a. Infections should not be treated with antibiotics to avoid development of a drug-resistant infection.
 - b. Infections can be easily prevented with proper handling of the cystostomy tube.
 - c. Infections are an inevitable complication of using a cystostomy tube.
 - d. Infections should be treated with long-term antibiotics to prevent recurrent infection.
 8. Which procedure is not considered essential for managing an animal with a cystostomy tube?
 - a. monitoring and cleaning the stoma site as necessary
 - b. infusing antiseptic solution into the bladder periodically to prevent ascending infection
 - c. emptying the bladder at least every 6 to 8 hours
 - d. monitoring for signs of UTI and conducting a urinalysis and culture and sensitivity if necessary

ARTICLE #4 CE TEST

The article you have read qualifies for 1.5 contact hours of Continuing Education Credit from the Auburn University College of Veterinary Medicine. Choose the best answer to each of the following questions; then mark your answers on the postage-paid envelope inserted in *Compendium*.

1. Which diagnostic evaluation would be most useful for evaluating the kidneys for evidence of pyelonephritis secondary to chronic UTIs?
 - a. survey abdominal radiography
 - b. ultrasound examination
 - c. contrast cystourethrography
 - d. urinalysis and culture and sensitivity assays
2. Which complication is least likely to occur after a cystostomy tube is placed?
 - a. urinary incontinence
 - b. accidental dislodgment
 - c. irritation at the stoma site
 - d. ascending UTI

9. Which statement about the surgical placement of a cystostomy tube is true?
- Placement requires specialized equipment and instrumentation.
 - The tube should be placed in the caudal dorsal aspect of the bladder to provide easier drainage.
 - An appropriate exit site for the tube should be determined before surgery.
 - Nonabsorbable suture material should be used for the purse-string suture to secure the tube in the bladder.
10. Which statement regarding the use of cystostomy tubes in animals is true?
- Cystostomy tubes have been used successfully only in dogs.
 - The use of a cystostomy tube has been limited to 14 days.
 - Owners have been unsatisfied with their decision to use cystostomy tubes as a urinary diversion technique.
 - Cystostomy tubes have been used successfully for months as a palliative treatment for obstructive tumors of bladder.
-