



# Managing Feline Obstipation Secondary to Pelvic Fracture

Sara A. Colopy-Poulsen, DVM

Nichole A. Danova, DVM

Robert J. Hardie, DVM, DACVS, DECVS

Peter Muir, BVSc, MVetClinStud, PhD, DACVS, DECVS

University of Wisconsin-Madison

## ABSTRACT:

Most feline pelvic fractures are mechanically unstable because the pelvis typically sustains multiple fractures simultaneously, including fractures of a weight-bearing region. Axial displacement of the ilium and acetabulum combined with formation of bony callus can result in narrowing of the pelvic canal, leading to eventual obstipation and megacolon. If constipation is present for more than 6 months, subtotal colectomy is indicated because of irreversible damage to the colon. Pelvic widening procedures are recommended if clinical signs of constipation are present for 6 months or less. Options for pelvic widening include revision of the pelvic fractures by ostectomy of impinging bone, corrective osteotomy and stabilization, or pelvic symphyseal distraction osteotomy. Pelvic symphyseal distraction osteotomy is a successful and safe method for widening the pelvic canal to relieve obstipation.

Obstipation in cats results from prolonged and intractable constipation causing severe impaction of feces throughout the rectum and colon. Over time, obstipation usually leads to development of megacolon. Megacolon in cats can be acquired or congenital.<sup>1,2</sup> The most common form of acquired megacolon is idiopathic and accounts for approximately 60% of all cases.<sup>3,4</sup> Other causes of megacolon include obstruction due to malunion of pelvic fractures and stenosis of the pelvic canal, neurologic injury, sacral spinal cord deformity in Manx cats, complications of colopexy or ovariohysterectomy, and neoplasia.<sup>2,4</sup> Stenosis of the pelvic canal from pelvic fracture is the second most common cause of megacolon and accounts for approximately 25% of all cases<sup>2</sup>

(Figure 1). Pelvic fractures account for approximately 25% of all fractures in cats.<sup>5-7</sup> Common causes of pelvic fracture include motor vehicle trauma, falls, gunshots, fights, and blunt trauma.<sup>5,6</sup> If pelvic fractures are not managed correctly at the time of injury, collapse of the pelvic canal can lead to the development of major complications, such as dyschezia. This article describes the medical and surgical options for preventing and treating feline obstipation secondary to pelvic fractures.

## INITIAL MANAGEMENT OF CATS WITH PELVIC FRACTURES

Managing cats with pelvic fractures is challenging to clinicians for several reasons, including a lack of history, prevalence of multiorgan injury, and missed or delayed diagnosis.<sup>8</sup> Common concurrent injuries include other musculoskeletal injuries, abdominal trauma,

Send comments/questions via email [editor@CompendiumVet.com](mailto:editor@CompendiumVet.com) or fax 800-556-3288.

Visit [CompendiumVet.com](http://CompendiumVet.com) for full-text articles, CE testing, and CE test answers.

diaphragmatic hernias, pneumothorax, pulmonary contusions, cardiac arrhythmias, peripheral nerve injury, injury to the urogenital tract, and injury to the alimentary tract.<sup>5,6</sup> If possible, a history should be obtained and should include the cause and time of trauma as well as the cat's ability to ambulate, urinate, and defecate. A minimum database for cats with pelvic fracture should include a complete physical examination, a complete blood cell count, a biochemistry panel, an electrocardiogram, and thoracic and abdominal radiographs (including both lateral views) while the patient is conscious.<sup>4,5</sup> A prioritized physical examination should be performed, starting with the cardiopulmonary system. The clinician should check for body wall integrity, the rate and quality of breaths, cardiac arrhythmias, abnormal lung sounds, shifted cardiac sounds, and borborygmi within the thorax. A complete abdominal palpation, neurologic examination, and rectal examination should also be performed.<sup>5</sup> A rectal examination can help determine whether the pelvic canal is narrowed<sup>9,10</sup>; this is best performed with the patient under sedation or general anesthesia. Blood in the rectum may suggest the presence of a rectal tear. Although rectal tears are a rare complicating injury,<sup>11</sup> failure to identify this complication often results in sepsis and death of the patient. The development of clinical signs associated with trauma is often time dependent; therefore, physical examination should be repeated regularly to ensure early detection of all injuries. Appropriate supportive care, including intravenous fluid and analgesics, should be provided during initial management of the patient.

Orthogonal radiographic views of the pelvis should be taken after initial evaluation and stabilization of the cat. High-quality radiographs of the pelvis are best made after sedation or general anesthesia. Oblique radiographic views or computed tomographic images are often helpful in the comprehensive assessment of the pelvis for fractures.

### COMMON TYPES OF PELVIC FRACTURE IN CATS

Most feline pelvic fractures are mechanically unstable because the pelvis has typically sustained multiple fractures, including fracture of a weight-bearing region.<sup>6</sup> This type of fracture is often associated with pelvic canal narrowing. In cats with pelvic fractures, approximately 90% have fractures of the pubis and ischium, 60% have unilateral sacroiliac luxation, 50% have a fracture of the body of the ilium, 25% have bilateral sacroil-



**Figure 1.** Lateral radiograph of a 10-year-old, castrated domestic shorthaired cat that presented with obstipation to the University of Wisconsin-Madison. Three weeks earlier, the cat had sustained multiple pelvic fractures when hit by a car. Obvious dilation of the colon can be seen (arrowheads), together with multiple pelvic fractures.

iac luxation, and only 2% of fractures involve the sacral wing.<sup>6</sup> Acetabular fractures are rare in cats.<sup>6</sup> The major weight-bearing regions of the pelvis are the acetabulum, body of the ilium, and sacroiliac joint. Unilateral fracture of the body of the ilium combined with injury to the contralateral sacroiliac joint and fractures of the pubis and ischium comprise approximately 17% of fracture combinations.<sup>6</sup> Either unilateral fractures of the body of the ilium (approximately 13%) or injury to the sacroiliac joint (approximately 13%), combined with fractures of the pubis and ischium, comprise the second and third most common fracture patterns, respectively.<sup>6</sup> Bilateral sacroiliac luxations combined with injury to the pubis and ischium comprise the fourth most common fracture pattern (approximately 9%).<sup>6</sup> Thus the four most common fracture patterns, comprising over 50% of all pelvic fracture patterns in cats, lead to a mechanically unstable pelvis.<sup>6</sup>

Indications for surgery include fracture of a weight-bearing region of the pelvis, narrowing of the pelvic canal, severe pain, the presence of a neurologic deficit, and the presence of another major fracture outside of

**Figure 2.** Ventrodorsal radiographs of a cat that presented with multiple pelvic fractures after being hit by a car. The radiographs demonstrate fractures of the ilium and acetabulum.



Axial displacement of the left acetabular segment.



Open reduction and rigid internal stabilization was performed within a few days of injury to correct axial collapse of the acetabular segment. The acetabular fracture was treated using femoral head and neck excision.

the pelvis. Stenosis of the pelvic canal results from two different processes<sup>12,13</sup>:

- Axial displacement of a component of the pelvic canal
- Formation of bony and fibrous callus during fracture healing

At initial presentation, open reduction and internal fracture fixation is often the treatment of choice to minimize the risk of complications, such as stenosis of the pelvic canal. Surgery is best performed within the first 7 days after injury (Figure 2), after which time manipulation and reduction of fracture fragments can be difficult.<sup>5,6,14</sup> If surgery is not performed, the patient should be managed conservatively with confinement for 4 to 6 weeks, kept clean and dry, turned regularly to prevent ulcers over bony prominences, and given analgesics for pain control.<sup>14</sup> During treatment, follow-up radiographs

should be obtained to monitor fracture healing and for early detection of pelvic stenosis.

## MANAGING OBSTIPATION IN CATS WITH PELVIC FRACTURES

In most instances, constipation is not evident until days to weeks after the injury, when displacement of fragments and formation of callus have impeded the passage of feces.<sup>10,15</sup> It is important to determine the duration of clinical signs because pelvic widening is unlikely to be effective if clinical signs of constipation have been present for more than 6 months. After this point, the risk of irreversible neuromuscular damage to the colon and pathologic dilation is increased so that even if the inciting cause is corrected, the colon is unlikely to function normally.<sup>9,12,15</sup> Therefore, if clinical signs of constipation have been present for more than 6 months, subtotal colectomy is the treatment of choice.

A minimum database for cats with chronic pelvic fracture and obstipation should include a complete physical examination, rectal examination, complete blood cell count, biochemistry

panel, and radiographs of the thorax and abdomen while the patient is conscious. Pelvic radiographs are best obtained with the patient under sedation or general anesthesia. Radiographs should be assessed for evidence of megacolon as well as the types of pelvic fractures.

Medical management of cats with obstipation may include oral administration of stool softeners and laxatives, a high-fiber diet, and enemas.<sup>9,12</sup> Phosphate enemas are contraindicated in cats because of the risk of inducing hypernatremia, hyperosmolality, hyperphosphatemia, and hypocalcemia. Prokinetic agents, such as cisapride, are contraindicated in cats with obstruction of the pelvic canal. In cats with severe obstipation, manual removal of feces with the patient under general anesthesia is usually necessary after fluid and electrolyte balance has been restored using parenteral fluid therapy. A combination of colonic irrigation with warm isotonic saline and transabdominal manipulation can be used to remove fecal masses. It is important to handle the ali-

mentary tract very gently. If obstipation does not respond to medical therapy, surgical treatment involving either subtotal colectomy or pelvic canal widening is indicated.

### Subtotal Colectomy

Subtotal colectomy is the treatment of choice if constipation has been present for more than 6 months.<sup>5,9</sup> The goal of subtotal colectomy is to remove the affected portion of the colon, resulting in production of soft, semi-formed feces, which are then able to pass through the narrowed pelvis. The colon absorbs water along an osmotic gradient. Bicarbonate is secreted in exchange for chloride ions, and potassium is lost from extracellular fluid as well as from mucus and cells shed in the colon.<sup>2</sup> After subtotal or total colectomy, compensatory changes in the small intestine, including increased villi height as well as increased enterocyte height and density, occur so that feces are usually formed and soft by 3 months after surgery.<sup>2</sup> There is no significant clinical or subclinical evidence of long-term abnormal bowel function. Cats have a slight increase in the frequency of defecation but no change in fecal volume or water content.<sup>16</sup>

preserved to ensure maximal blood supply to the colonic anastomosis.<sup>2</sup> The descending colon should be transected 2 to 4 cm cranial to the pubic brim and the ascending colon transected approximately 3 cm distal to the cecum. An end-to-end anastomosis should be performed using a synthetic absorbable suture material in a simple continuous or simple interrupted pattern. An appositional pattern, rather than an inverting suture pattern, is recommended to minimize the risk of stricture formation after surgery. An end-to-end anastomosis-stapling device may also be used to complete the anastomosis. In some patients, excessive tension from the mesentery may make it difficult to perform a colonic-colonic anastomosis; thus the cecum has to be resected and an ilial-colonic anastomosis performed instead.<sup>2</sup> It is important to avoid tension on the suture line to reduce the likelihood of dehiscence of the anastomosis. After the anastomosis is complete, the abdomen should be thoroughly lavaged and routinely closed. Intravenous administration of crystalloids for 1 to 3 days after subtotal colectomy is often necessary to prevent dehydration. The cat should be encouraged to eat; most begin eating 1 to 5 days after surgery.<sup>13,18</sup>

## ***Most feline pelvic fractures are mechanically unstable because the pelvis typically sustains multiple fractures simultaneously, including fractures of a weight-bearing region.***

Preoperative management includes correction of fluid and electrolyte imbalances before surgery. Broad-spectrum parenteral antibiotics that are active against anaerobes and gram-negative aerobes should be provided before induction of general anesthesia. To minimize spillage of fecal contents into the peritoneal cavity while manipulating the colon during resection, it is not recommended that an enema be administered before surgery.<sup>13</sup>

When performing subtotal colectomy, it is preferable to preserve the ileocolic junction. Rarely does this increase the risk of recurrent constipation.<sup>2</sup> Preservation of the ileum and ileocolic valve helps reduce postoperative diarrhea secondary to small intestinal bacterial overgrowth, deconjugation of bile acids, and steatorrhea.<sup>4,16,17</sup>

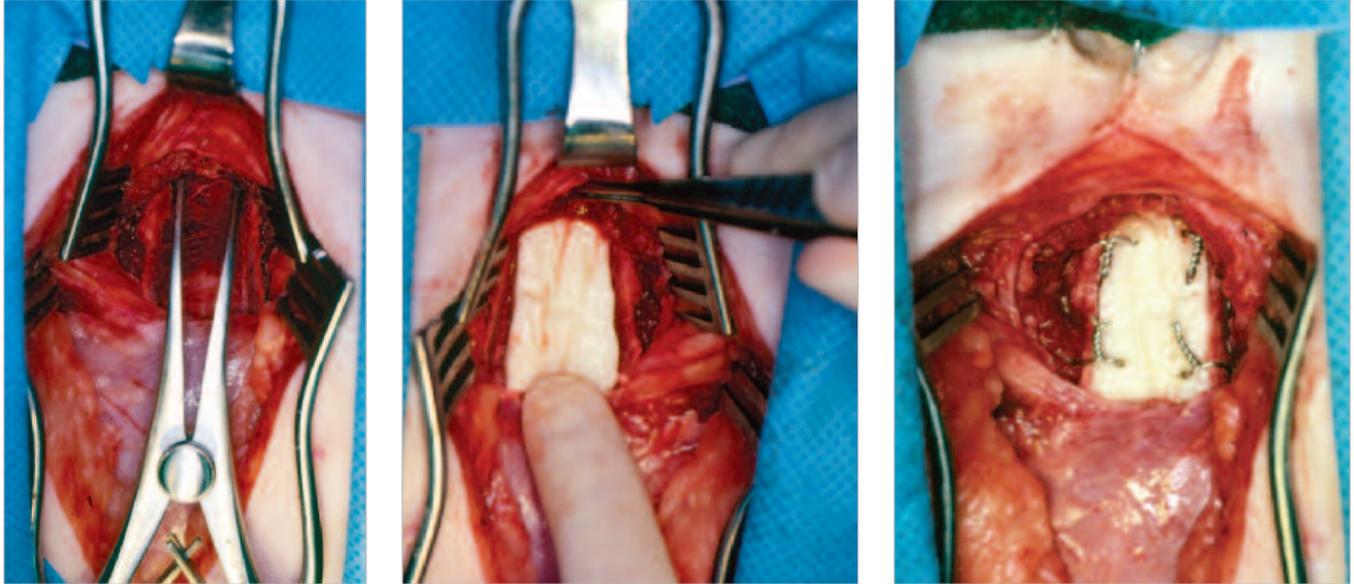
Moist sponges should be used to isolate the colon from the abdomen to minimize contamination of the peritoneal cavity. The ileocolic and caudal mesenteric arteries and their major branches should be isolated and

Potential complications after surgery include protracted diarrhea, recurrent constipation, stricture, wound infection, hemorrhage, dehiscence, and sepsis.<sup>19</sup> Approximately 80% of cats have formed feces by 6 weeks, after the ileum has adapted to the colectomy. Protracted diarrhea may be due to malabsorption, maldigestion, small intestinal bacterial overgrowth, abnormal bile salt metabolism, and gastric hypersecretion and may be treated with a diet change, oral antibiotics, antidiarrheal agents, and bile salt binders.<sup>2,18,20</sup> Constipation after surgery resulting from incomplete removal of the damaged colon is uncommon and can usually be managed medically.<sup>13</sup>

### Pelvic Canal Widening

Pelvic canal widening is the treatment of choice for cats that have experienced constipation for fewer than 6 months after pelvic fracture because irreversible megacolon is less likely in this situation. The pelvic canal can

**Figure 3.** Intraoperative photographs of a 2-year-old, castrated domestic shorthaired cat that presented to the University of Wisconsin-Madison for evaluation of obstipation secondary to a pelvic malunion after falling from a tree 7 months earlier. Referral radiographs demonstrated left ilial, acetabular, ischial, and pubic fractures. The cat also had a fractured proximal femur, and a femoral head and neck excision had been performed by the referring veterinarian. Open reduction and internal fixation of the pelvis had also been performed, but the cat continued to have intermittent problems with constipation and was referred to the University of Wisconsin-Madison for acquired megacolon. Although it had been 7 months since the onset of clinical signs, pelvic widening was elected for treatment because it was close to the 6-month time frame during which pelvic widening is indicated, clinical signs were mild and intermittent, and there is less risk of serious complications associated with this procedure versus subtotal colectomy.



The pelvic symphysis was cut with an oscillating saw and then spread apart using a laminectomy spreader.

A methylmethacrylate spacer was placed in the defect.

The spacer was fixed to the pelvis using four cerclage wires.

be widened by revising the fracture malunion via osteotomy of impinging bone or corrective osteotomy and stabilization after correcting the pelvic canal narrowing.<sup>5,12,15</sup> However, because of the substantial dissection of fibrotic soft tissue necessary to perform this type of procedure, it carries a substantial risk of major complications, such as iatrogenic ischiatic nerve injury, urethral damage, and rectal injury.<sup>5</sup>

An alternative approach is to use a ventral approach to the pelvis and gently distract each hemipelvis laterally after osteotomy of the entire pelvic symphysis. Distraction is then maintained by using a spacer made of metal,<sup>7,21</sup> plastic,<sup>22</sup> ilial bone,<sup>10,12,23</sup> or methylmethacrylate. Distraction is usually successful at widening the pelvic canal, regardless of whether the sacroiliac joints are disrupted or intact. This surgical approach is much safer because the tissues ventral to the pelvis are usually not particularly fibrotic and the risk of neurovascular or urethral injury is minimal.

The surgical procedure involves placing the cat in

dorsal recumbency and inserting a red rubber or tomcat urinary catheter to help identify the urethra during surgery. A ventral midline incision extending from the midabdomen to the ischium should be made. A combination of blunt and sharp dissection should be used to reflect the soft tissue overlying the pelvic symphysis laterally. The pelvic symphysis should then be cut using an oscillating saw, and soft tissue attachments should be elevated using blunt and sharp dissection. Care should be taken to avoid the urethra, which lies dorsal to the pelvic symphysis. The two halves of the symphysis should be spread apart using a laminectomy spreader (Figure 3), and four holes should then be drilled through the pelvic bone (i.e., one cranially and one caudally on each side). Orthopedic cerclage wire should be passed through these holes. The space between each hemipelvis should be measured and a methylmethacrylate spacer fashioned to fit in the space using commercial bone cement (Figure 3). It is possible to use the other materials already described as pelvic spacers, but

**Figure 4.** Ventrodorsal radiographs of the cat in Figure 1 before and after surgery.



Before surgery, there was narrowing of the pelvic canal secondary to luxation of the right sacroiliac joint, together with fractures of the ischium and pubis.



After surgery, placing a methylmethacrylate cement spacer increased the diameter of the pelvic canal, and obstipation was subsequently relieved.

we prefer methylmethacrylate because it is readily available, obtainable in a sterile form, and easily shaped to fit within the gap created in the pelvic symphysis. The methylmethacrylate should be allowed to polymerize outside the surgical field before final shaping of the spacer to prevent thermal injury to soft tissues. Four holes should then be drilled through the spacer, which should be fixed to the pelvis using the preplaced cerclage wires (Figure 3). The ventral midline should be closed in a routine fashion. Postoperative radiographs should be obtained and a rectal examination performed to confirm correct placement of the spacer and successful widening of the pelvis (Figure 4).

Postoperative management includes intravenously administering crystalloids for 1 to 3 days until the cat is able to maintain its hydration status and encouraging the cat to eat. Oral laxatives or enemas may be required in the postoperative period to aid in defecation, and the cat may go home once it is eating, drinking, and defecating on its own.

We have now performed this procedure on four cats without major complications. Follow-up is available for

three cats. One cat was treated with cisapride, lactulose, and a high-fiber diet for a few months after surgery. Two months after surgery, the cat had one more episode of constipation, which resolved with an enema; since then, the cat has had no more episodes of constipation according to a 2-year follow up. At a 2-year follow-up for another cat, clinical signs resolved after surgery, although it is still fed a high-fiber diet with a Metamucil (Procter & Gamble) supplement at each meal. Clinical signs also resolved in a third cat, although it had only a 1-month follow-up at the time this article was written.

Although this procedure may alter hip joint biomechanics by altering the alignment between the acetabulum and the femoral head, we have not identified complications such as persistent lameness, subluxation of the hip, or hip osteoarthritis. Although complications such as implant loosening, infection, and foreign body reaction are possible, they are not common with this procedure. Failure to relieve obstipation, thereby necessitating

subtotal colectomy, is also a potential complication of pelvic widening. However, this complication is less likely if the widening procedure is performed within 6 months of the onset of clinical signs of constipation.

## CONCLUSION

Managing obstipation secondary to malunion of pelvic fractures can be challenging. Most feline pelvic fractures are mechanically unstable because the pelvis typically sustains multiple fractures simultaneously, including fractures of weight-bearing regions. Appropriate reduction and stabilization of acute pelvic fractures are key in preventing this major complication. If constipation has been present for fewer than 6 months, pelvic widening is indicated and best achieved by pelvic symphyseal distraction osteotomy. Beyond 6 months of constipation, this procedure is no longer indicated and subtotal colectomy is recommended because of irreversible damage to colonic smooth muscle. To date, we have performed pelvic symphyseal distraction osteotomy using a methylmethacrylate spacer on four cats without a major operative complication.

## REFERENCES

1. Hudson EB, Farrow CS, Smith SL: Acquired megacolon in the cat. *Mod Vet Pract* 60(8):625–627, 1979.
2. White RN: Surgical management of constipation. *J Feline Med Surg* 4(3):129–138, 2002.
3. Hasler AH, Washabau RJ: Cisapride stimulates contraction in feline idiopathic megacolon smooth muscle. *J Vet Intern Med* 11(6):313–318, 1997.
4. Bertoy RW: Megacolon in the cat. *Vet Clin North Am Small Anim Pract* 32(4):901–915, 2002.
5. Lanz OI: Lumbosacral and pelvic injuries. *Vet Clin North Am Small Anim Pract* 32(4):949–962, 2002.
6. Bookbinder PF, Flanders JA: Characteristics of pelvic fracture in the cat. *Vet Comp Orthop Traumatol* 5:122–127, 1992.
7. Ward GW: Pelvic symphysiotomy in the cat: A steel insert to increase the pelvic diameter. *Can Vet J* 8(4):81–84, 1967.
8. Griffon DJ, Walter PA, Wallace LJ: Thoracic injuries in cats with traumatic fractures. *Vet Comp Orthop Traumatol* 7:98–100, 1994.
9. Washabau RJ, Holt D: Pathogenesis, diagnosis, and therapy of feline idiopathic megacolon. *Vet Clin North Am Small Anim Pract* 29(2):589–603, 1999.
10. Schrader SC: Pelvic osteotomy as a treatment of obstipation in cats with acquired stenosis of the pelvic canal: Six cases. *JAVMA* 200(2):208–213, 1992.
11. Muir P: Rectal perforation associated with pelvic fracture in a cat. *Vet Rec* 142:371–372, 1998.
12. McKee WM, Wong WT: Symphyseal distraction-osteotomy using an ulnar autograft for the treatment of pelvic canal stenosis in three cats. *Vet Rec* 134:132–135, 1994.
13. Rosin E: Megacolon in cats: The role of colectomy. *Vet Clin North Am Small Anim Pract* 23(3):587–594, 1993.
14. DeCamp CE: Principles of pelvic fracture management. *Semin Vet Med Surg* 7(1):63–70, 1992.
15. Ferguson JF: Triple pelvic osteotomy for the treatment of pelvic canal stenosis in a cat. *J Small Anim Pract* 37(10):495–498, 1996.
16. Gregory CR, Guilford WG, Berry CR, et al: Enteric function in cats after subtotal colectomy for treatment of megacolon. *Vet Surg* 19(3):216–220, 1990.
17. Sweet DC, Hardie EM, Stone EA: Preservation versus excision of the ileocolic junction during colectomy for megacolon: A study of 22 cats. *J Small Anim Pract* 35:358–363, 1994.
18. Rosin E: Subtotal colectomy for treatment of chronic constipation associated with idiopathic megacolon in cats: 38 cases (1979–1985). *JAVMA* 193(7):850–853, 1988.
19. Orsher RJ: Problems and complications associated with colorectal surgery. *Prob Vet Med* 1(2):243–253, 1989.
20. Matthiesen DT, Scavelli TD, Whitney WO: Subtotal colectomy for the treatment of obstipation secondary to pelvic fracture malunion in cats. *Vet Surg* 20(2):113–117, 1991.
21. Leighton RL: Symphysectomy in the cat and the use of a steel insert to increase pelvic diameter. *J Small Anim Pract* 10:355–359, 1969.
22. Webb SM: Surgical management of acquired megacolon in the cat. *J Small Anim Pract* 26:399–405, 1985.
23. Evans I: Use of an allogeneic bone graft to enlarge the pelvic outlet in a cat. *Vet Med Small Anim Clin* 75:218–220, 1980.

## ARTICLE #1 CE TEST

This article qualifies for 2 contact hours of continuing education credit from the Auburn University College of Veterinary Medicine. Subscribers may purchase individual CE tests or sign up for our annual CE program. Those who wish to apply this credit to fulfill state relicensure requirements should consult their respective state authorities regarding the applicability of this program. To participate, fill out the test form inserted at the end of this issue or take CE tests online and get real-time scores at [CompendiumVet.com](http://CompendiumVet.com).

- 1. Megacolon is secondary to stenosis of the pelvic canal via pelvic fracture in approximately \_\_\_\_ of affected cats.**
  - a. 2%
  - b. 15%
  - c. 25%
  - d. 60%
- 2. The three major weight-bearing regions of the pelvis are the**
  - a. ischium, pubis, and acetabulum.
  - b. ischium, acetabulum, and sacroiliac joint.
  - c. acetabulum, sacroiliac joint, and pubis.
  - d. acetabulum, body of the ilium, and sacroiliac joint.
- 3. Surgery to correct a pelvic fracture is best performed within**
  - a. 24 hours.
  - b. 7 days.
  - c. 6 months.
  - d. 1 year.
- 4. Pelvic widening is unlikely to be effective if clinical signs of obstipation have been present for longer than**
  - a. 1 week.
  - b. 6 months.
  - c. 1 year.
  - d. 5 years.
- 5. Stenosis of the pelvic canal results from**
  - a. axial displacement of the ilium and acetabulum during weight bearing on an unstable fracture.
  - b. formation of bony and fibrous callus during fracture healing.
  - c. bilateral sacroiliac luxations.
  - d. a and b
- 6. When performing subtotal colectomy,**
  - a. an elliptical incision should be made in the region of colonic enlargement to decrease the colon diameter.
  - b. the patient should first be given enemas to decrease the amount of stool in the colon and facilitate manipulation of the colon.
  - c. the ileocolic junction should be preserved.
  - d. the intestinal anastomosis should be apposed in a double-layer, inverting suture pattern.
- 7. Which statement regarding pelvic symphyseal distraction osteotomy is correct?**
  - a. Ischiatic nerve injury during surgery is the most common complication of pelvic symphyseal distraction osteotomy.
  - b. Pelvic symphyseal distraction osteotomy is unlikely to lead to iatrogenic injury of the ischiatic nerve or urethra.
  - c. Pelvic symphyseal distraction osteotomy may alter the hip joint biomechanics by decreasing the acetabular depth; thus it commonly results in complications such as lameness or subluxation of the hip.
  - d. Widening of the pelvic canal by pelvic symphyseal distraction osteotomy cannot be successfully performed if the sacroiliac joints are intact.
- 8. Which statement regarding management of obstipation in cats is incorrect?**
  - a. Phosphate enemas are contraindicated in cats.
  - b. Prokinetic agents such as cisapride are not recommended for managing feline obstipation secondary to pelvic stenosis.
  - c. Medical management of cats with obstipation can include oral administration of stool softeners and laxatives, a high-fiber diet, and enemas.
  - d. Constipation is typically evident 24 to 48 hours after pelvic injury occurs.
- 9. Which statement regarding subtotal colectomy is incorrect?**
  - a. Cats that have undergone subtotal colectomy typically have an increased frequency of defecation but rarely have a change in fecal volume or water content.
  - b. The goal of subtotal colectomy is to remove the dilated colon and stimulate production of soft, semi-formed feces that can pass through the narrowed pelvic canal.
  - c. It generally takes 12 to 18 months after colectomy for production of formed feces.
  - d. The small intestine compensates for the loss of colonic function by increasing villi height as well as enterocyte height and density.
- 10. Pelvic fractures in cats typically involve the**
  - a. acetabulum.
  - b. ilium and one or both of the sacroiliac joints.
  - c. pubis and ischium.
  - d. b and c