Bilateral pubic and ischial osteotomy for surgical management of caudal colonic and rectal masses in six dogs and a cat

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Case Description—Six dogs and a cat were evaluated because of caudal colonic and rectal masses.

Clinical Findings—Tumors were identified in the caudal portion of the colon (n = 2), in the area of the colorectal junction (2), or in the rectum (3).

Treatment and Outcome—In all 7 animals, bilateral pubic and ischial osteotomy was performed to provide exposure of the rectum and associated tumor. Masses were successfully removed, and all 7 animals were able to ambulate normally within 3 days after surgery. No complications associated with the osteotomy procedure were identified.


An 8-year-old 19.1-kg (42-lb) neutered male Shetland Sheepdog was admitted to the Veterinary Medical Teaching Hospital of the University of Missouri, Columbia, with a history of progressive hematochezia of 10 days’ duration. On initial examination, the dog was panting, lethargic, and overweight, with a body condition score of 7 on a scale from 1 to 9. The dog had blood clots on the exterior of and distributed throughout its feces. Results of a rectal examination were normal except that blood was seen on the examination glove. Cytologic examination of a fecal sample revealed normal bacterial flora. Colonoscopy revealed a pedunculated mass in the ventral aspect of the rectum approximately 7 cm proximal to the anus. Histologic examination of a biopsy specimen from the rectal mass indicated that it was an adenomatous polyp.

Computed tomography was performed 4 days after initial histologic results were obtained to verify that the polyp did not encroach on any surrounding structures, with surgical removal planned immediately afterwards. The patient was premedicated with buprenorphine (0.01 mg/kg [0.0045 mg/lb], IM), glycopyrrolate (0.01 mg/kg, IM), and acepromazine (0.05 mg/kg [0.0045 mg/lb], IM), and anesthesia was induced with propofol (6 mg/kg [2.73 mg/lb], IV). An orotracheal tube was placed, and anesthesia was maintained with isoflurane in oxygen. Lactated Ringer’s solution was administered IV at a rate of 5 mL/kg/h (2.3 mL/lb/h) during computed tomography and surgery. Analgesia was obtained by means of epidural administration of morphine (0.1 mg/kg [0.045 mg/lb]) and 0.5% bupivacaine (0.07 mL/kg [0.032 mL/lb]). Cefazolin (20 mg/kg [9.1 mg/lb], IV) was administered at the time of anesthetic induction.

On computed tomographic images, a soft tissue mass approximately 1 cm in height and 1.5 cm in width could be seen within the lumen of the rectum. There was no evidence that the mass was involved with any of the surrounding structures.

For removal of the mass, the dog was positioned in dorsal recumbency. A red rubber catheter was inserted in the urethra, and the penis was retracted laterally, so as to not interfere with the surgical field. A ventral midline incision was made from the xiphoid process to the caudal aspect of the pubis. Abdominal exploration did not reveal any abnormalities other than the rectal mass.

To increase exposure of the rectal mass, a bilateral pubic and ischial osteotomy was performed. The division between the right and left adductor muscles was incised sharply, taking care to stay exactly on the midline to minimize hemorrhage. The adductor muscles were then elevated subperiosteally from the pubis and ischium with a one-fourth–inch Keys periosteal elevator. Elevation was continued until the obturator nerves and approximately two thirds of the obturator foramina were visible. The prepubic tendon was incised along the pubis to the level of the proposed pubic osteotomy sites (Figure 1). A Jacob pin chuck was used to drill 2 holes on either side of the 4 proposed osteotomy sites. The right and left pubis and ischium were then osteotomized with a sagittal saw. The internal obturator nerves were protected with a malleable retractor while the osteotomy was performed. The internal obturator muscles were elevated subperiosteally from the right pubis and ischium, allowing reflection of the central bony plate to the left, and the rectal mass was identified through palpation. The peritoneal reflection and pelvic nerve located on the peritoneum lining the lateral wall of the rectum were separated carefully from the rectal wall by means of blunt dissection. The colon and rectum were then isolated from the surrounding viscera by means of moistened laparotomy sponges. Stay sutures were placed in the rectum just caudal and cranial to the mass, and individual vasa recta supplying the area to
be resected were ligated. Feces in the colon and rectum were milked cranially and caudally to the mass, and noncrushing Doyen intestinal forceps were placed 3 cm cranial and caudal to the mass. The colon was then transected orad and aborad to the mass. An end-to-end anastomosis of the distal colon to the rectum was performed with 4-0 polydioxanone in a simple interrupted pattern. Strands of size-0 polydioxanone were placed through the previously drilled holes at each osteotomy site. The bony plate was reduced, and the preplaced sutures were secured. The adductor muscles were reapposed with 3-0 polydioxanone in a cruciate pattern. A Jacob pin chuck and Kirschner wire were used to make 4 additional holes in the cranial aspect of the pubis to allow reapposition of the prepubic tendon. The prepubic tendon was secured to the pubis with 3-0 polydioxanone in a simple continuous pattern, and subcutaneous tissues and skin were closed routinely.

Constant-rate infusions of lidocaine (1.2 mg/kg/h [0.55 mg/lb/h], IV) and morphine (0.1 mg/kg/h, IV) were begun for pain relief. The dog was able to stand 1 day after surgery, began to ambulate normally 3 days after surgery, and was discharged 7 days after surgery. There was no evidence of hematochezia while the dog was hospitalized. At the time of discharge, the owners were instructed to provide towel support when walking the dog on slick floors for the next 9 days and to

Figure 1—Intraoperative photographs illustrating a method for bilateral pubic and ischial osteotomy for removal of caudal colonic and rectal masses in dogs and a cat. A—Following exposure of the ventral aspect of the pelvis, the prepubic tendon (PT) was transected along the cranial edge of the pubis to the level of the proposed pubic osteotomy sites. B—The adductor muscles (AD) were elevated subperiosteally to expose the pubis and ischium, and a Jacob pin chuck was used to drill 2 holes (arrows) on either side of the 4 proposed osteotomy sites (lines). IO = Internal obturator muscle. C—Osteotomies of the right and left pubis and ischium were then performed with a sagittal saw. The internal obturator nerves were protected with a malleable retractor while osteotomies were performed. D—The right internal obturator muscle was elevated subperiosteally from the right pubis and ischium with a Keys periosteal elevator, allowing reflection of the central bony plate to the left. The left internal obturator muscle was left attached to the left pubis and ischium. Figure 1 continued on next page.
restrict all exercise for 4 weeks after surgery, with no running, jumping, or off-leash activity allowed during this time.

The owner was contacted by telephone 6 months after surgery and specifically questioned as to the dog's ability to ambulate, healing of the surgical wound, frequency and consistency of bowel movements, ability to urinate, and color of the stool. The owner reported that there was no evidence of lameness, surgical wound dehiscence, or hematochezia.

Between 1995 and 2007, 5 additional dogs and a cat underwent bilateral pubic and ischial osteotomy at the University of Missouri Veterinary Medical Teaching Hospital for removal of rectal or caudal colonic masses (Table 1). This included 2 dogs with rectal tumors, 2 dogs with colorectal tumors, 1 dog with a caudal colonic tumor, and a cat with a caudal colonic tumor. Masses ranged from 1 to 10 cm in diameter.

For 5 of the 7 animals, bilateral pubic and ischial osteotomy was the first choice for mass removal because of the location of the mass at the colorectal junction or in the rectum. In the 2 animals with caudal colonic masses, an abdominal approach was first attempted, but bilateral pubic and ischial osteotomy was required to achieve adequate exposure. In 6 animals, a portion of the rectum or colon was resected, with resected portions ranging from 5 to 12 cm in length. The remaining animal (case animal 2) had a 10-cm-diameter leiomyoma that was attached to the rectum by a 3.5 × 1.5-cm stalk that was removed by bluntly dissecting it away from the wall of the rectum with hemostatic forceps wrapped with gauze. An end-to-end anastomosis of the distal colon to the rectum was performed in 5 dogs and 1 cat. The cranial rectal artery and vasa recta from the left colic artery supplying the area to be resected were ligated in 3 dogs, only the cranial rectal artery was ligated in 1 dog and the cat, and individual vasa recta supplying the area to be resected were ligated in the fifth dog that underwent end-to-end anastomosis of the distal end of the colon to the rectum.

Follow-up pelvic radiography was performed in 2 dogs (case animals 3 and 4) 4 and 2 months, respectively, after surgery. Smooth callus formation was evident at the ends of the osteotomy sites and along the lateral aspects of the left and right pubic bones in both dogs.

Follow-up information was obtained by means of recheck examination at the Veterinary Medical Teaching Hospital or through telephone interviews with owners. Owners were specifically questioned as to the animal's ability to ambulate, healing of the surgical wound, frequency and consistency of bowel movements, ability to urinate, and color of the feces. None of the animals...
had any evidence of complications related to bilateral pubic and ischial osteotomy, such as lameness or surgical wound dehiscence, or related to dissection of the caudal colon and rectum, such as fecal incontinence, urinary incontinence, stricture, or dehiscence.

Discussion

Obtaining adequate exposure of the pelvic cavity is crucial to surgical removal of lesions involving the rectum, proximal portion of the urethra, vagina, and prostate. In this regard, bilateral pubic and ischial osteotomy was initially developed as a method to access the intrapelvic portion of the urethra and vagina in female dogs.1 In the original description of this technique,1 the entire urethra and vagina were readily accessible for surgical manipulation, but sufficient exposure of the rectum for surgical manipulation was not provided because lateral dissection that could endanger the pelvic nerves and the middle rectal arteries originating from the internal pudendal artery was avoided. The pelvic nerve originates from neurons in sacral segments 1, 2, and 3 and is located on the peritoneum lining the lateral wall of the distal portion of the rectum.2 The peritoneal reflection and the pelvic nerve located on the peritoneum lining the lateral wall of the rectum can be separated from the rectal wall with blunt dissection, taking care to dissect as close to the rectal wall as possible. The middle rectal artery can be double ligated and divided when it supplies the rectal area to be resected. In the dogs described in the present report, extensive exposure of the intrapelvic structures was obtained by continuing elevation of the adductor muscle until the obturator nerves and approximately two thirds of the obturator foramina were visible, and care was taken to separate the pelvic nerves from the rectum. Adequate exposure of the rectum was obtained to allow the viscera to be easily manipulated.

Choosing an appropriate technique for a ventral approach in dogs and cats with a caudal colonic or intrapelvic rectal tumor can be difficult. Options include pubic osteotomy, pelvic sympathectomy (sagittal pubic osteotomy), and bilateral pubic and ischial osteotomy. Pubic osteotomy has been described for the management of dogs with prostatic hyperplasia, neoplasia, and abscesses3 and as a method for gaining access to the rectum within the pelvic canal.3 However, this technique provides restricted access to the pelvic canal, allowing exposure of only the most cranial intrapelvic lesions.

Pelvic sympathectomy has been described for evaluation and treatment of intrapelvic neoplasms, such as rectal, prostatic, vaginal, and urethral tumors.3–8 An osteotomy of the pubic symphysis is performed with an oscillating saw, and a rib spreader is used to distract the edges of the osteotomy to provide greater access to the pelvic canal than is achieved with pubic osteotomy.

A previous report9 described use of bilateral pubic and ischial osteotomy for treatment of a rectal tumor in a dog and for treatment of urethral and vaginal tumors in a second dog. Another report10 described use of bilateral pubic and ischial osteotomy for treatment of a catheter-induced intrapelvic urethral tear in a dog. In the animals described in the present report, bilateral pubic and ischial osteotomy provided adequate exposure for excision of intrapelvic neoplasms. Our findings suggest that this procedure may be particularly helpful in cases in which preoperative diagnostic imaging fails to completely define the lesion and in cases with lesions that require greater exposure than can be obtained with pelvic sympathectomy or pubic osteotomy.

To our knowledge, there have been only a few published reports of the use of bilateral pubic and ischial osteotomy in dogs and cats, with most of these involving only 1 or 2 cases.3,10–12 Nevertheless, there may be a large number of cases that would benefit from this approach. The apparent reluctance to use this procedure may be attributable to misconceptions regarding postoperative complications, including inability to ambulate, extended recovery time, and the level of difficulty associated with the approach. Additionally, surgeons may be reluctant to perform this technique because of a lack of information about clinical outcome. For all 7 animals described in the present report, ambulation was normal within 3 days after surgery, suggesting that protracted disability should not be anticipated in most animals undergoing bilateral pubic and ischial osteotomy.

Some anatomic considerations may increase the likelihood of success following bilateral pubic and ischial osteotomy. In our opinion, the division between the right and left adductor muscles should be sharply incised, taking care to stay exactly on the midline to minimize hemorrhage. The internal obturator nerves should be protected, such as with a malleable retractor, during osteotomy, and the prepubic tendon must be incised to obtain wide exposure. Finally, the pelvic nerves should be identified on the peritoneum lining the lateral wall of the distal portion of the rectum and avoided.

In previous reports3,10–12 of bilateral pubic and ischial osteotomy, orthopedic stainless-steel wire was used to stabilize the osteotomized portion of bone. In 3 of the animals described in the present report, orthopedic stainless-steel wire was used, but in the other 4, polydioxanone was used. Orthopedic stainless-steel

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Table 1—Details of 6 dogs and a cat that underwent bilateral pubic and ischial osteotomy for surgical management of caudal colonic and rectal masses.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Breed</th>
<th>Age (y)</th>
<th>Sex</th>
<th>Mass location</th>
<th>Histologic diagnosis</th>
<th>Follow-up time (mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shetland Sheepdog</td>
<td>8</td>
<td>MC</td>
<td>Rectal</td>
<td>Adenomatous polyp</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Rottweiler</td>
<td>8</td>
<td>MC</td>
<td>Rectal</td>
<td>Leiomyoma</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Shih Tzu</td>
<td>11</td>
<td>FS</td>
<td>Colorectal</td>
<td>Leiomyosarcoma</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Mixed-breed dog</td>
<td>13</td>
<td>FS</td>
<td>Colorectal</td>
<td>Leiomyoma</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>Soft Coated Wheaten Terrier</td>
<td>10</td>
<td>MC</td>
<td>Colonic</td>
<td>Leiomyoma</td>
<td>72</td>
</tr>
<tr>
<td>6</td>
<td>German Shorthaired Pointer</td>
<td>12</td>
<td>FS</td>
<td>Rectal</td>
<td>Polyp with osseous metaplasia</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Domestic shorthair cat</td>
<td>14</td>
<td>MC</td>
<td>Colonic</td>
<td>Adenocarcinoma</td>
<td>7</td>
</tr>
</tbody>
</table>

MC = Male, castrated. FS = Female, spayed.
wire should provide greater stability to the osteotomy site than suture material. However, because the pubis and ischium are non-weight-bearing segments of the pelvis, stabilization of pubic and ischial osteotomies might not require the strong stability afforded by wire. Body weight could influence the choice between wire and suture; however, the 3 dogs in the present report in which wire was used weighed 9.0, 23.7, and 55.4 kg (19.8, 52.1, and 121.9 lb), whereas the cat and 3 dogs in which suture was used weighed 5.9, 7.3, 19.1, and 25.4 kg (13, 16.1, 42.0, and 55.9 lb). In the 4 patients in which absorbable suture material was used, the osteotomy site was presumed to be stable on the basis of the early return of ambulation. Follow-up pelvic radiography was performed in 2 dogs, both of which had smooth callus formation interpreted as normal bone healing. Thus, our findings suggest that suture material can afford sufficient stability following bilateral pubic and ischial osteotomy in dogs and cats. Polydioxanone was used in these patients on the basis of the attending surgeon's preference and has been shown to be effective for closure of other osteotomy sites.13

A potential concern with bilateral pubic and ischial osteotomy is that the avascular bone segment that is created may be susceptible to infection and sequestration.14 Preserving soft tissue attachments to the bone flap can avoid such complications.14 For animals described in the present report, the right or left internal obturator muscle remained attached to the bone segment.

In summary, findings of the present report suggest that bilateral pubic and ischial osteotomy should be considered for treatment of dogs and cats with intrapelvic tumors in which wide exposure of the pelvic canal is needed for removal. Additional studies are warranted to determine overall success and complication rates associated with bilateral pubic and ischial osteotomy.

References