Case Report Rapport de cas

Multilobular osteochondrosarcoma of the os penis in a dog

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Abstract — Multilobular osteochondrosarcoma (MLO) of the os penis was diagnosed in a dysuric dog. Recurrence was confirmed or suspected twice over a 22-month period. This is the first reported case of MLO occurring in the os penis, and the 5th reported case of neoplasia of the os penis in the dog.

Résumé — Ostéochrondrosarcome multilobulaire de l'os pénien chez un chien. Un ostéochrondrosarcome multilobulaire (OML) de l'os pénien a été diagnostiqué chez un chien dysurique. La récurrence a été confirmée ou suspectée 2 fois en 22 mois. Il s'agit du premier cas rapporté d'OML dans l'os pénien et le 5e de néoplasie de l'os pénien chez le chien.

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An 8-year-old, castrated, male golden retriever was presented to the Veterinary Teaching Hospital, Ontario Veterinary College (VTH-OVC) with a 2-month history of progressive dysuria. The owners noted that urination was greatly prolonged and the size of the urine stream was diminished; however, the urine appeared normal in color and odor. Diagnostic testing performed by the referring veterinarian included a urinalysis on voided urine, and a positive contrast urethrogram and double contrast cystogram. Urinalysis showed no abnormal values. The positive contrast urethrogram indicated a smooth filling defect in the urethra just proximal to the os penis, while the double contrast cystogram was within normal limits.

Case description

On presentation to the VTH-OVC, physical examination of the dog and palpation of the os penis did not reveal any abnormalities. Initial diagnostic tests included a complete blood (cell) count (CBC), serum biochemical profile, prothrombin time (PT), and partial thromboplastin time (PTT). All results were within reference limits. All values on urinalysis on voided urine were also within reference limits. Urination was observed with both dysuria and stranguria noted. The results of an abdominal ultrasound was performed, and results were within normal limits. The dog was sedated with butorphanol (Torbugesic; Wyeth, St. Laurent, Quebec), 0.2 mg/kg bodyweight (BW), IV, and acepromazine (Atravet; Wyeth-Ayerst, Guelph, Ontario), 0.01 mg/kg BW, IV, to attempt urinary catheterization for a contrast urethrogram; however, the catheter could not be introduced beyond the level of the caudal half of the os penis. Contrast medium (Hypaque-M; Amersham Health, Oakville, Ontario) was introduced but it did not pass beyond the level of the obstruction (Figure 1). Radiographs of the caudal abdomen, pelvis, and urethra revealed that the caudal 1 cm of the os penis had an irregular margin and a central radiolucent appearance. A single dose of dexamethasone (Dexamethasone 5; Vétoquinol, Lavaltrie, Quebec), 0.25 mg/kg BW, IV, was administered to minimize urethral swelling and, within 2 h, the dog was able to pass small amounts of urine. Differential diagnoses for the urethral obstruction included direct obstruction of the urethral lumen (such as a neoplasm or granuloma compressing the urethral lumen, a radiolucent urolith obstructing the urethra, or fracture of the os penis) and a functional obstruction (urethral spasm). Based on the radiographic appearance, a mass of the caudal os penis was suspected to be partially obstructing the urethra. The dog was discharged and returned 2 d later for surgical exploration of the region.

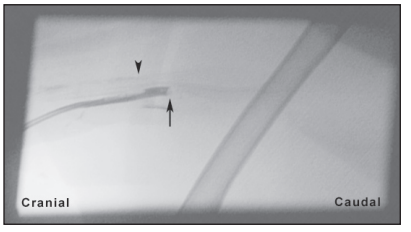

Figure 1. Fluoroscopic image of the distal urethra after introduction of contrast medium in a dog with MLO of the os penis. The dog is in right lateral recumbency. The bone crossing the image on the right is the femur and the cranial half of the os penis is just visible dorsal to the urethra (arrowhead). Note the cessation of contrast flow (arrow).

Prior to surgery, 3-view thoracic radiographs were performed to assess whether metastatic disease was present; the

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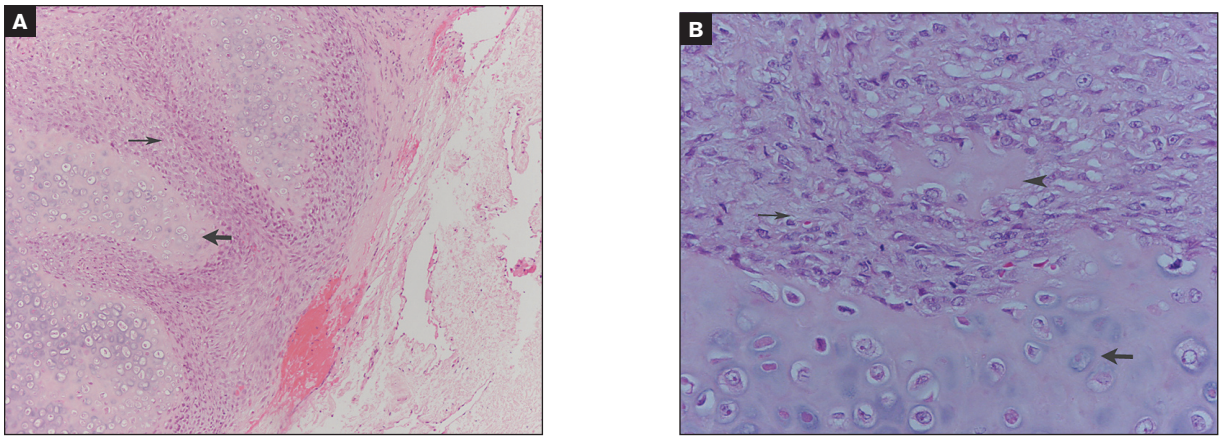

Figure 2. Microscopy of an MLO of the os penis in a dog at **(A)** 10× magnification and **(B)** 40× magnification (stain = hematoxylin and eosin). Note the lobules of hyaline cartilage (thick arrow), thick fibrous connective tissue (thin arrow) and bone formation (arrowhead) within the MLO.

radiographs were within normal limits. The dog was premedicated with oxymorphone (Numorphan; Endo Labs, Chadds Ford, Pennsylvania, USA), 0.05 mg/kg BW, IM, and acepromazine (Atravet; Wyeth-Ayerst), 0.01 mg/kg BW, IV, followed by induction with thiopental (Pentothal; Abbott, Montreal, Quebec), 5 mg/kg BW, IV, and diazepam (Diazepam; Sandoz, Boucherville, Quebec) 0.2 mg/kg BW, IV. The dog was maintained on isoflurane (Isoflurane; Pharmaceutical Partners of Canada, Richmond Hill, Ontario). Cystoscopy was attempted prior to surgery but an extraluminal mass at the level of the caudal os penis obstructed further advancement of the cystoscope. Surgical exploration revealed a 5-mm diameter, firm, round mass attached to the dorsal aspect of the left caudal os penis. The mass extended into the surrounding soft tissue and was adherent to one section of urethra. The mass was dissected away from the soft tissue and urethra and excised with a small portion of the os penis. The resected mass was fixed in 10% formalin and submitted for histopathologic evaluation. A scrotal ablation and scrotal urethrostomy were performed. Meloxicam (Metacam; Boehringer Ingelheim, Burlington, Ontario), 0.1 mg/kg BW, PO, q24h, was administered for short-term analgesia. The urine stream, voided via the urethrostomy site, returned to normal immediately after surgery. The dog was discharged 4 d post-operatively. The mass was histopathologically consistent with multilobular osteochondrosarcoma (MLO) (Figures 2A and 2B).

Complications temporally associated with surgery included sepsis, septic arthritis of the left stifle, and a subcutaneous abscess over the left humerus, which were all noted 5 d post-operatively. At this time, large numbers of *Staphylococcus aureus, S. intermedius*, and *S. canis* were grown from the urine, urethrostomy site, and blood, respectively. Treatment with a 6-wk course of broad spectrum antimicrobials and surgical drainage and lavage of the left stifle and subcutaneous abscess resulted in resolution of the lesions.

The dog next presented to the VTH-OVC 18 mo after surgical resection of the mass with a 1-week history of a hemorrhagic discharge from the prepuce. Urination was normal from the urethrostomy site and the dog was otherwise clinically normal. Physical examination revealed no abnormalities on extrusion of the penis; however, hemorrhagic discharge was noted from the prepuce. A firm, irregular mass was palpated in the region of the caudal aspect of the os penis. Initial diagnostic tests included a CBC, serum biochemical profile, PT, and PTT. All results were within reference limits. Urinalysis on urine obtained by cystocentesis revealed no abnormalities, and urine culture did not yield bacterial growth. Three-view thoracic radiographs were within normal limits.

The dog was premedicated with hydromorphone (Hydromorphone hydrochloride; Sandoz) 0.05 mg/kg BW, IM, and midazolam (Midazolam; Sandoz) 0.2 mg/kg BW, IM, induced with ketamine (Ketalean; Bimeda-MTC, Cambridge, Ontario) 10 mg/kg BW, IV, and diazepam (Diazepam; Sandoz) 0.5 mg/kg BW, IV, and maintained on isoflurane (Isoflurane; Pharmaceutical Partners of Canada). A penile amputation was performed to excise the mass with 3 cm margins, which included removal of the prepuce. The mass was submitted for histopathologic evaluation. The dog recovered uneventfully and was discharged with meloxicam (Metacam; Boehringer Ingelheim), 0.1 mg/kg BW, PO, q8h, and cephalexin (Novo-lexin; Novopharm, Toronto, Ontario), 25 mg/kg BW, PO, q8h, for 10 d. Histologic evaluation of the mass was consistent with grade II MLO of the os penis (1). A section from the original mass resected 18 mo previously was histologically graded and was also consistent with a grade II MLO. No additional treatment was instituted.

Four months after penile amputation, the dog presented to the referring veterinarian with a 1 cm bleeding sublingual mass. The mass was resected; however, hemorrhage from the surgical site persisted throughout the next day and the dog was referred to the VTH-OVC. On presentation, the dog was lethargic and both a mid-abdominal mass and multiple subcutaneous masses were palpable. Continued hemorrhage was noted from the sublingual surgical site. The penile amputation and urethrostomy sites were normal. Diagnostic tests included a CBC, serum biochemical profile, PT, and PTT. Abnormalities included thrombocytopenia (102×10^9/L; reference range: 117 to 418 $\times 10^9$/L), mature neutrophilia (17.1×10^9/L;

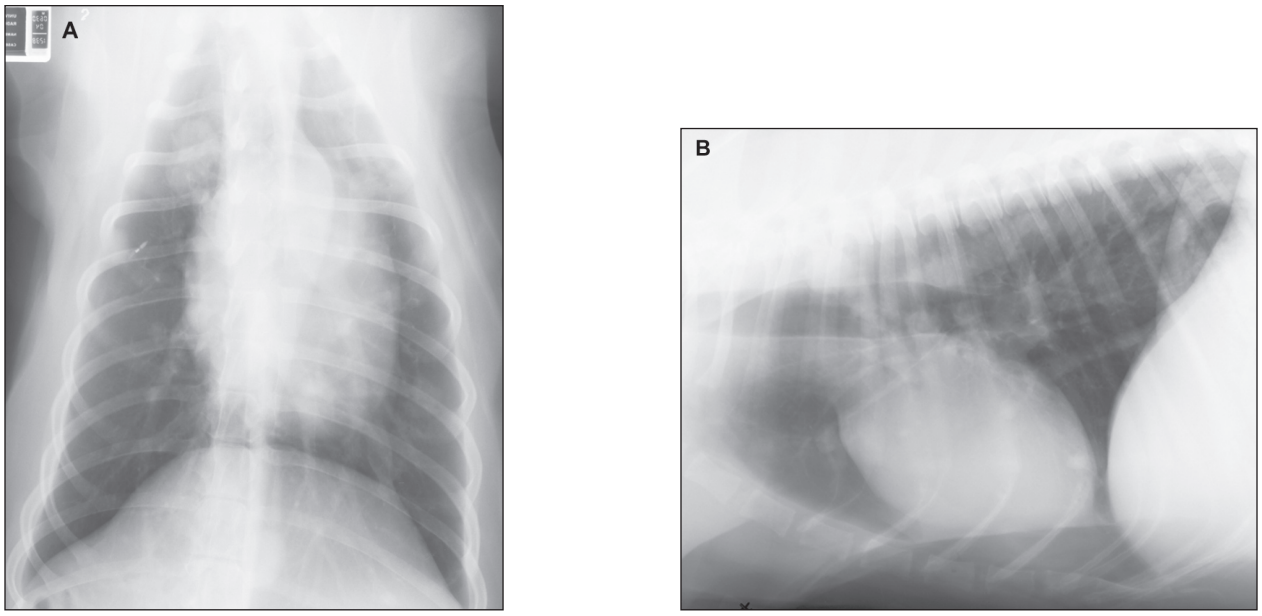

Figure 3. (A) Dorsoventral and **(B)** right lateral projections of the thorax in a dog with MLO of the os penis. Note the nodules within the pulmonary parenchyma detected 680 d postoperatively, consistent with metastatic disease. Although it was suspected that these represented metastatic spread from the MLO, this could not be confirmed as postmortem examination was declined.

reference range: 2.9 to 10.6 $\times$ 10^9/L) and prolongation of both PT (22.2 s; reference range: 9 to 15 s) and PTT (30.0 s; reference range: 15 to 23.5 s). Disseminated intravascular coagulation was suspected based on these results. Three-view thoracic radiographs were performed that revealed several pulmonary nodules consistent with metastatic disease (Figures 3A and 3B). The owners elected euthanasia but a postmortem examination was not permitted. Histopathologic evaluation of the submitted section of the resected oral mass was consistent with granulation tissue. Diffuse metastatic disease to the lungs, abdomen, and subcutaneous tissue from the MLO was suspected but could not be confirmed.

Discussion

Multilobular osteochondrosarcoma (MLO) is an uncommon, slow-growing tumor (1); the term multilobular tumor of bone is used synonymously (2). Previously used terminology included chondroma rodens, multilobular osteosarcoma, multilobular osteoma, multilobular chondroma, calcifying aponeurotic fibroma, cartilage analogue of fibromatosis, and juvenile aponeurotic fibroma (2). Multilobular osteochondrosarcoma is suggested to arise from the periosteum of bones that are formed by intramembranous ossification (1). Although most commonly arising from the skull, MLO has also been reported in the pelvis, ribs, axilla, and hard palate in the dog (1,3–5). There have been no previous reports of MLO arising from the os penis. Multilobular osteochondrosarcoma usually affects middle-aged medium to large breed dogs, with no apparent breed or sex predilection (1,2,5). Clinical signs depend on the location of the tumor and are typically caused by compression of adjacent structures, as was noted in the dog reported herein, with urethral compression causing dysuria and stranguria (2,5).

Radiographically, MLO lesions are frequently mineralized with well-defined borders and a characteristic "popcorn" or lobulated appearance with bony lysis (1,5). In the present case, however, the radiographic appearance was not typical as the mass had ill-defined borders and a predominantly lytic apperance. Although radiographic and advanced imaging findings for MLO (6,7) can be pathognomonic, it has also been diagnosed in a dog with no radiographic changes (8). It is possible, therefore, that canine MLO will present with a spectrum of radiographic changes that are not necessarily typical for MLO.

Local recurrence and metastatic disease is relatively common following surgical excision and is dependent on histologic grade and completeness of surgical resection (1,2,9,10). Aggressive surgical excision with wide margins remains the treatment of choice (2). In one retrospective study of 39 dogs with MLO, dogs with histological grade II MLO had a 47% local recurrence rate with a median time to local recurrence of 782 d (1). In the present case, the grade II MLO recurred 584 d after the original surgery. Margins were not assessed on the excised mass, but it is likely excision was incomplete because the os penis tumor was resected with $<$ 1 cm margins. Local tumor recurrence is significantly more likely following incomplete excision of MLO (1,2). The ability to resect MLO lesions with complete surgical margins is also prognostic for the development of metastatic disease, with a 25% metastatic rate in dogs with completely resected tumors and a 75% metastatic rate following incomplete resection (2). However, despite completely excising the os penis MLO following penile amputation, metastasis to the subcutaneous tissue, abdomen, and lungs was suspected 4 mo post-operatively. The metastatic rate and median time to metastasis for dogs with grade II MLOs are 60% and 405 d, respectively (1). Adjuvant chemotherapy has been recommended because of this high rate of distant metastasis (11), but this has not been investigated. Single or multiple agent protocols used for dogs with other highly metastatic sarcomas (that is, doxorubicin and/or carboplatin) may have been beneficial for

the dog reported herein, but prolonged survival has also been reported in dogs with metastatic disease without the use of chemotherapy; these dogs had a median survival time of 239 d (2,5). The reported median survival time for dogs with grade II MLO is 520 d (1) and the survival time of the dog reported in the present case was 680 d.

Tumors of the os penis are rare (12–15). To date, only 4 cases have been reported, including chondrosarcoma in an 8-year-old, castrated, male great dane, osteosarcoma in a 13-year-old, intact, male mixed breed dog, ossifying fibroma in a 13-year-old, castrated, male border collie, and mesenchyoma in a 10-year-old, castrated, male mixed-breed dog (12–15). All 4 dogs presented with a history of dysuria, as did the dog in this report. Treatment for the 4 previous reports of tumors of the os penis varied for each case but all involved surgical resection (12–15). The survival time varied from 2 mo to more than 36 mo (12–14). In this case of MLO of the os penis, the survival time was 22 mo.

This case is unique in that it is only the 5th report of a tumor of the os penis in dogs and the first reported case of MLO of the os penis. Based on this and the previously reported cases, malignant sarcoma should be suspected in dogs with an os penis mass. Preoperative biopsy is recommended because os penis sarcomas should be widely excised with a minimum of 3 cm margins and thus penile amputation may be necessary. The necessity for adjuvant therapy is dependent on completeness of excision and the type of tumor. CVJ

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