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CASE REPORT
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Hemangiosarcoma in the Radius of a Dog Treated by Limb-sparing Surgery

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ABSTRACT

***Background*:** Hemangiosarcoma is a malignant neoplasm particularly rare as a primary bone tumor. The standard treatment for dogs with this neoplasm usually takes limb amputation. The aim of this paper is to report a primary hemangiosarcoma on the distal radius, treated by *limb-sparing* surgery.

***Case*:** An 11-year-old mixed breed male intact dog with body weight of 30 kg was admitted to the Veterinary Teaching Hospital of the Federal University of Rio Grande do Sul (HCV-UFRGS) with previous history of progressive lameness on the right forelimb for a few months. Physical examination was unremarkable. The orthopedic examination revealed grade 4/5 lameness, swelling of the distal radioulnar joint with severe pain at palpation. Radiographs revealed intense osteolysis of the distal radial epiphysis with no involvement of the ulna and carpal bones. Biopsy revealed bone hemangiosarcoma. Chest radiographs and abdominal ultrasound showed no abnormalities or signs of metastases. The treatment of choice was *limb-sparing* surgery with the use of allogeneic cortical graft from bone bank preserved in glycerol 98% at room temperature. Arthrodesis was performed with a 4.5 mm dynamic compression plate with 10 holes and eight screws. Histological analysis of the bone fragment confirmed the diagnosis. The dog recovered satisfactory limb function and within 15 days postoperatively presented grade 2/5 lameness. Radiographs at 30 and 60 days after surgery displayed no radiographic signs of bone integration at the bone-graft interface, however orthopedic examination on both occasions showed walking improvement with grade 1/5 lameness. On the 90th day postoperatively, physical examination revealed edema, sinus and pus where the plate was located and pain at palpation. Radiographs were performed and displayed graft and bone resorption. Antimicrobial therapy was initiated. One hundred and twenty days after surgery the infection had not been effectively countered and osteolysis and signs of osteomyelitis were seen on radiographs. Orthopedic examination revealed worsening on lameness (grade 4/5), swelling and severe pain at palpation of the limb's distal aspect. The right forelimb lost its function and was severely contaminated so amputation was necessary.

***Discussion*:** This particular neoplasm is unusual in bone and has been satisfactorily identified by biopsy and subsequent histopathological analysis. The radiographic aspect of the tumor was characterized by extensive area of osteolysis of the radius, usual to hemangiosarcoma at this presentation. The limb salvage surgery is a viable alternative to amputation in dogs, especially in animals with concomitant orthopedic conditions, neurological problems or when the owner does not accept the amputation. The owner chose limb salvage as first option but with the infection installed and failure of the antibiotic treatment, amputation was needed. The dog recovered satisfactory limb function soon after graft implantation and had remarkable muscle gain in about three weeks, consistent with other studies. There was also weight gain and improvement in quality of life. Bacterial infection with subsequent osteomyelitis occurred, both common complications in *limb-sparing* cases due to the extensive surgical approach. Antibiotic therapy was not efficient. Uncharacteristically the dog from this study was in good health and free of metastases when this paper was finalized, reaching 15 months of survival after identification of the tumor, despite other reports. *Limb-sparing* is a viable technique, but like any surgical procedure, is subjected to complications.

Keywords: oncology, orthopedics, tumor, canine, animal.

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INTRODUCTION

Amongst primary bone tumors in dogs, hemangiosarcoma is the less common and accounts for approximately 1% of all diagnoses. Osteosarcoma is the most common (85%), followed by chondrosarcoma (about 10%), and fibrosarcoma (4%) [3,17]. The prognosis for all types of bone tumors is reserved, particularly for osteosarcoma and hemangiosarcoma that tend to metastasize in a short period after diagnosis [18]. The standard treatment for dogs with these neoplasms is usually limb amputation and chemotherapy. The limb salvage surgery is a viable alternative to amputation in dogs, especially in animals with concomitant orthopedic conditions, neurological problems or when the owner does not accept amputation [2]. It involves resection of the tumor and reconstruction of the bony column, with or without fusion of the adjacent joint [5,9]. The aim of this paper is to report a primary hemangiosarcoma on the distal radius of a dog, treated by *limb-sparing* surgery using cortical graft from a canine bone bank preserved in glycerin.

CASE

An 11-year-old mixed breed male intact dog with body weight of 30 kg was admitted to the Veterinary Teaching Hospital of the Federal University of Rio Grande do Sul (HCV-UFRGS) with previous history of progressive lameness on the right forelimb for a few months. Physical examination was unremarkable and orthopedic examination revealed grade 4/5 lameness and swelling of the distal radioulnar joint with severe pain at palpation. Radiographs displayed intense osteolysis of the distal radial epiphysis with no involvement of the ulna nor carpal bones (Figures 1A and 1B). Biopsy revealed malignant mesenchymal tumor with extensive areas of hemorrhage and thrombosis, suggestive of hemangiosarcoma. Chest radiographs and abdominal ultrasound showed no abnormalities or signs of metastases. The chosen treatment was *limb-sparing* surgery with the use of allogeneic cortical graft from a bone bank preserved in glycerin 98%. The patient was premedicated with intramuscular (IM) morphine[1] (0.5 mg/kg). Anesthesia was induced with propofol[2] (4 mg/kg) administered intravenously (IV), and maintenance was performed with isoflurane[3] inhalation and fentanyl[4] in continuous rate infusion (CRI) [15 mg/kg/h] IV. A craniomedial access to the distal epiphysis of the radius was performed exposing the tumor region (Figure 2A). Osteotomy was accomplished by a pneumatic oscillating saw and the distal radial epiphysis was released by section of the radiocarpal ligaments (Figure 2B). Removal of the carpal articular cartilage was performed with a pneumatic burr (Figure 2C). A 4 cm neoplastic bone fragment was removed including a 3 cm safety margin (Figure 2D). Radiocarpal arthrodesis was made by fixing the bone graft to normal bone with the use of a 4.5 mm dynamic compression plate (DCP)[5] with ten holes and eight cortical screws (Figure 2E). The plate was attached to the metacarpus by screws on holes #1 and #2, to the carpus by hole #3, hole #4 was left empty; the graft was fixed to the plate by holes #5 and #6, hole #7 was also left empty and the radius was fixed to the plate by holes #8, #9 and #10 (Figure 2F). The surgical site was lavaged with sterile saline. Subcutaneous tissues were apposed in 2 separate layers in simple continuous pattern with 3-0 poliglactine 910[6] and the skin edges were apposed in simple interrupted pattern with 3-0 polyamide nylon[7]. Ceftriaxone[8] (22 mg/kg), IV, was administered 30 min prior to and every 90 min during surgery. Postoperative treatment included meloxicam[9] (0.1 mg/kg) IV, tramadol[10] (4 mg/kg) IV and dipyrone[11] (25 mg/kg) IM. Postoperative (PO) radiographs were taken and revealed reduction, alignment and the correct positioning of the implants (Figure 3A and 3B). The prescribed treatment was: cephalexin12 (30 mg/kg) BID for 21 days, meloxicam[9] (0.1 mg/kg) SID for 4 days, dipyrone[11] (25mg/kg), TID for 5 days, and tramadol[10] (4 mg/kg) TID for 5 days all orally. Adjuvant chemotherapy was not employed due to satisfactory removal of the tumor with safety margin. Histological analysis of the bone fragment revealed malignant neoplastic proliferation of mesenchymal elongated cells with anisokaryosis, marked with solid arrangement sometimes forming vascular slits containing red blood cells. The cells had eosinophilic cytoplasm poorly delimited, rounded elongated nuclei with evident nucleoli compatible with bone hemangiosarcoma. At higher magnification (40x) it had typical rare mitotic figures and moderate hemosiderosis (Figure 4). The dog recovered satisfactory limb function and within 15 days postoperatively presented grade 2/5 lameness. Radiographs at 30 (Figures 3C and 3D) and 60 days after surgery revealed no radiographic signs of bone integration at the bone-graft interface, however orthopedic examination on both occasions showed walking improvement with grade 1/5 lameness.

On the 90th day postoperatively, physical examination revealed edema, sinus and pus where the plate was located and pain at palpation. Radiographs were performed and displayed graft and bone resorption. Antibiotic therapy was initiated with amoxicillin and clavulanic acid[13] (25 mg/kg), per oral for 30 days but the infection was not effectively countered. 120 days after surgery osteolysis and signs of osteomyelitis were seen at radiographs (Figures 3E and 3F). Orthopedic examination revealed worsening on lameness (grade 4/5), swelling and severe pain at palpation of the limb's distal aspect. The right forelimb lost its function and was severely contaminated, so amputation became necessary and was performed.

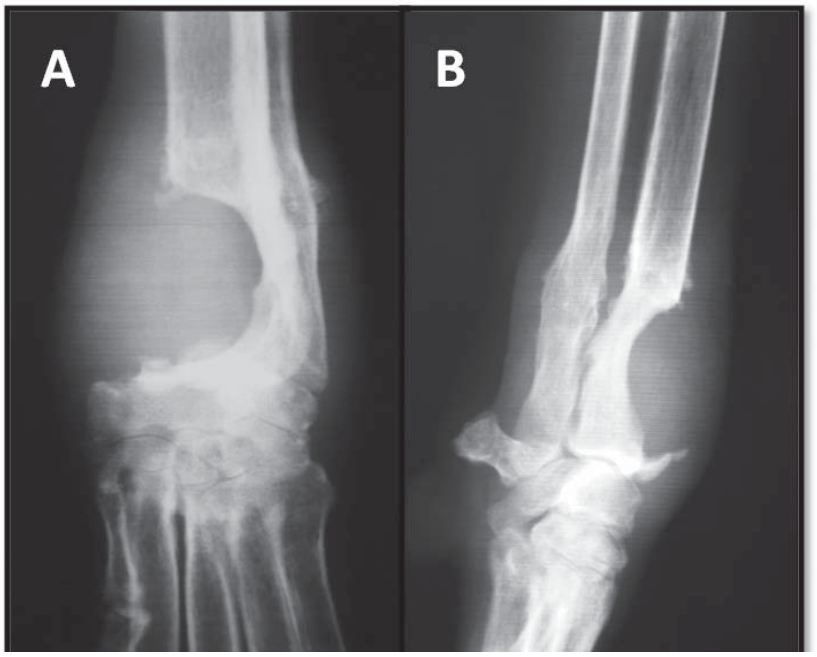

Figure 1. Craniocaudal preoperative radiographic view of the distal radius/ulna and carpus; notice the large area of bone osteolysis on the distal radius (A). Mediolateral preoperative radiographic view of the distal radius/ulna and carpus (B).

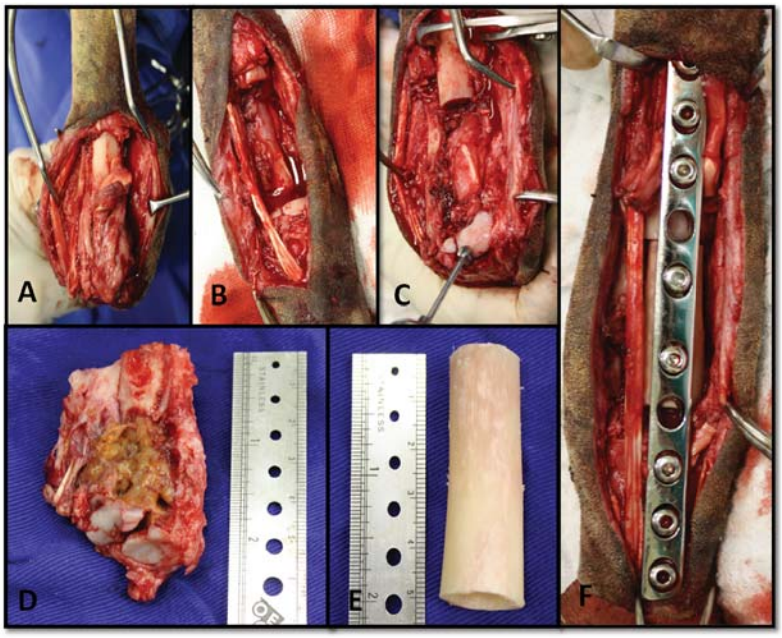

Figure 2. *Limb-sparing* surgical procedure images. Distal radius/ulna after carpal release, notice the tumor on the distal end of the radius (A). Appearance after fragment removal (B). Removal of the carpal articular cartilage with pneumatic burr to receive the graft (C). Radial fragment of 7 cm, notice the aspect of the tumor near the articular surface (4cm) and the safety margin (D). Cortical allograft (E). Final aspect of the radiocarpal arthrodesis fixed by a 4.5 mm DCP plate (F).

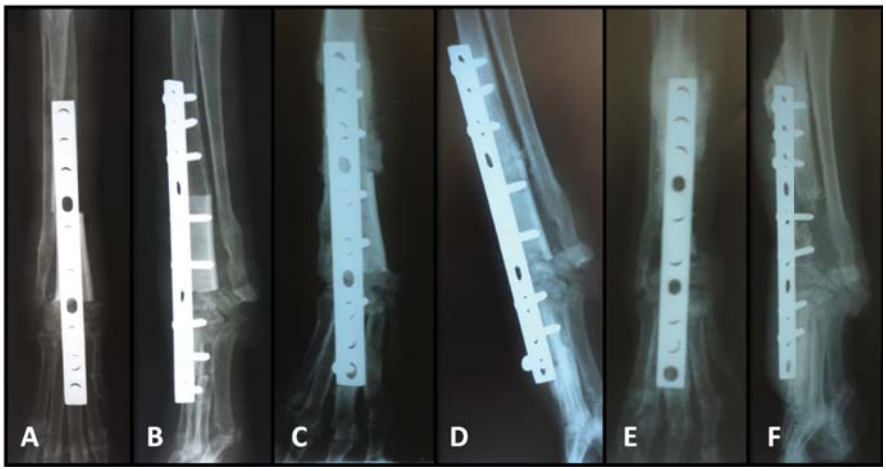

Figure 3. Orthogonal postoperative views of the distal aspect of the right forelimb. Craniocaudal view immediately after surgery (A). Mediolateral view immediately after surgery (B). Postoperatively aspect (30 days) of craniocaudal view (C). Postoperatively aspect (30 days) of mediolateral view (D). Craniocaudal aspect 120 days after surgery (E). Mediolateral aspect 120 days after surgery, notice the graft's resorption (F).

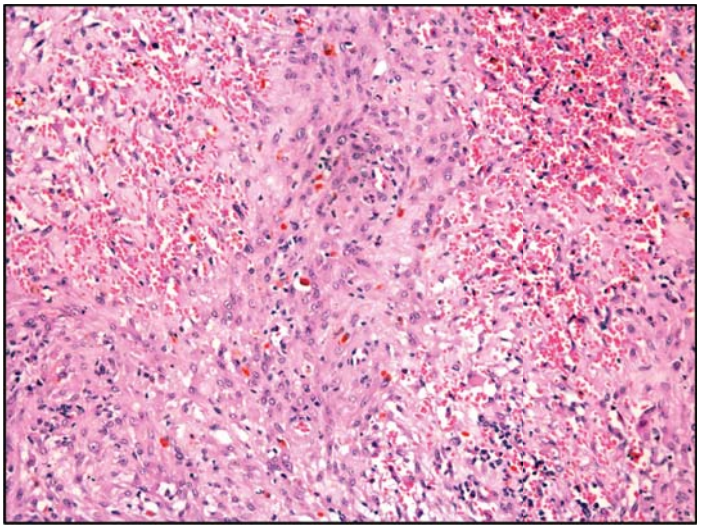

Figure 4. Histological analysis. Magnification (40x): typical rare mitotic figures and moderate hemosiderosis.

DISCUSSION

The radiographic aspect of the tumor was characterized by extensive area of osteolysis at the distal radius, usual to hemangiosarcoma at this presentation [7]. This neoplasm is uncommon primarily on bone [1,3,5,6,13,17] and has been satisfactorily identified by biopsy and histopathological analysis. The dog was elderly and large breed so it was attempted to maintain the limb, as suggested by others authors [2,5,9,12]. Since the patient was male and large, it belonged to a risk group for this pathology according to other studies [14,16].

Glycerol at high concentrations is known to have antibacterial, antifungal, and antiviral action. Several studies have shown that a 98% solution of glycerol at room temperature is effective in preserving biological tissues [19] but a limb salvage surgery takes excessive manipulation exposing the tissue to the environment for a long period of time and maybe contributed to contamination [9]. Ankylosis was not achieved due to bacterial infection with subsequent osteomyelitis, a common complication reported in this type of surgery [2]. Reduced osteogenic capacity due to the dog's advanced age might be a negative aspect to bone integration. Good limb function was restored after surgery and remarkable recovery from muscle atrophy in about three weeks was seen; there was also weight

gain and improvement in quality of life, consistent with different surveys [4,8,10].

The limb salvage surgery is a viable alternative to amputation in dogs, especially for those with concomitant orthopedic conditions, neurological problems or when the owner does not accept the amputation [2]. This patient's owner chose *limb-sparing* as a first option but when there was infection and the empiric antibiotic treatment failed amputation was required. Uncharacteristically, this dog was in good health and free of metastases when this report was concluded [3,11,18], exceeding 15 months after identification of the tumor, despite other studies [15]. It was opted for the non-use of chemotherapy due to surgical removal of the tumor with margin and the non-identification of metastases. *Limb-sparing* is a viable technique, but like any surgical procedure, is subjected to complications.

SOURCES AND MANUFACTURERS

[1]Dimorf®, Cristália, Itapira, SP, Brazil.

[2]Propovan®, Cristália, Itapira, SP, Brazil.

[3]Forane®, Abott, São Paulo, SP, Brazil.

[4]Fentanest®, Cristália, Itapira, SP, Brazil.

[5]Caomedica, Campinas, SP, Brazil.

[6]Vicryl®, Ethicon, São José dos Campos, SP, Brazil.

[7]Mononylon®, Ethicon, São José dos Campos, SP, Brazil.

[8]Rocefin®, Roche, Rio de Janeiro, RJ, Brazil.

[9]Maxicam®, OuroFino, Ribeirão Preto, SP, Brazil.

[10]Tramal®, Pfizer, Guarulhos, São Paulo, SP, Brazil.

[11]Analgex® V, Agener União Saúde Animal, São Paulo, SP, Brazil.

[12]Rilexine®, Virbac Saúde Animal, São Paulo, SP, Brazil.

[13]Clavulin®, Smith Kline Beecham, Rio de Janeiro, RJ. Brazil.

***Declaration of interest*.** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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