

A Case of Canine Osteosarcoma

Ball Moss Extract-based therapy.



Misty

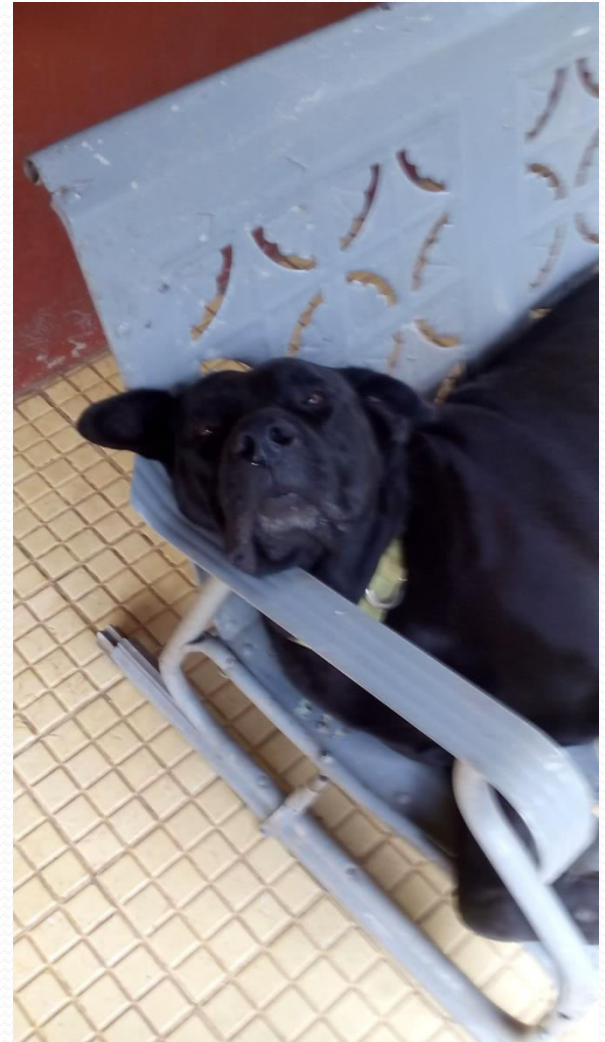


Dr. Paul Cadogan, B.Sc. D.V.M

Denbigh Veterinary Clinic
2 Georges St., Denbigh P.O.
Clarendon

MISTY... her History

- 10-year old large breed mix (Great Dane x Neapolitan Mastiff x Rottweiler x Doberman)
- 110 lbs
- Spayed shortly after her first heat, never bred
- Diet: Commercial dry dog food with tinned food
- Has been very healthy all her life
- Occasional bouts of interdigital dermatitis
- Spoiled rotten!



Bony Enlargement



- Late March 2019
- A bony enlargement appeared in the distal epiphysis of the radius of her right front leg
- There was no significant lameness at this time

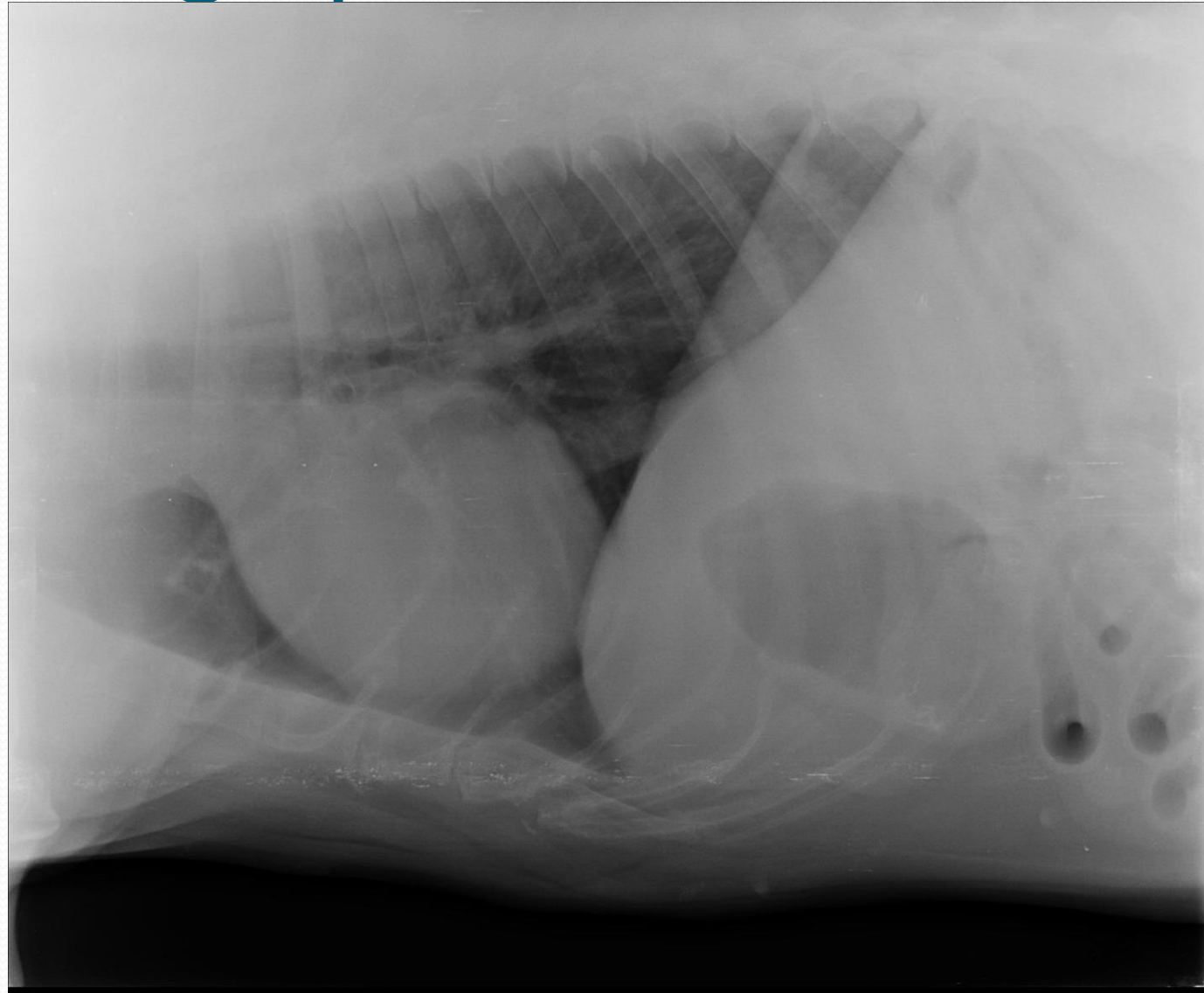


Radiography

- X-ray showed a lytic bone lesion with the characteristic appearance of an osteosarcoma

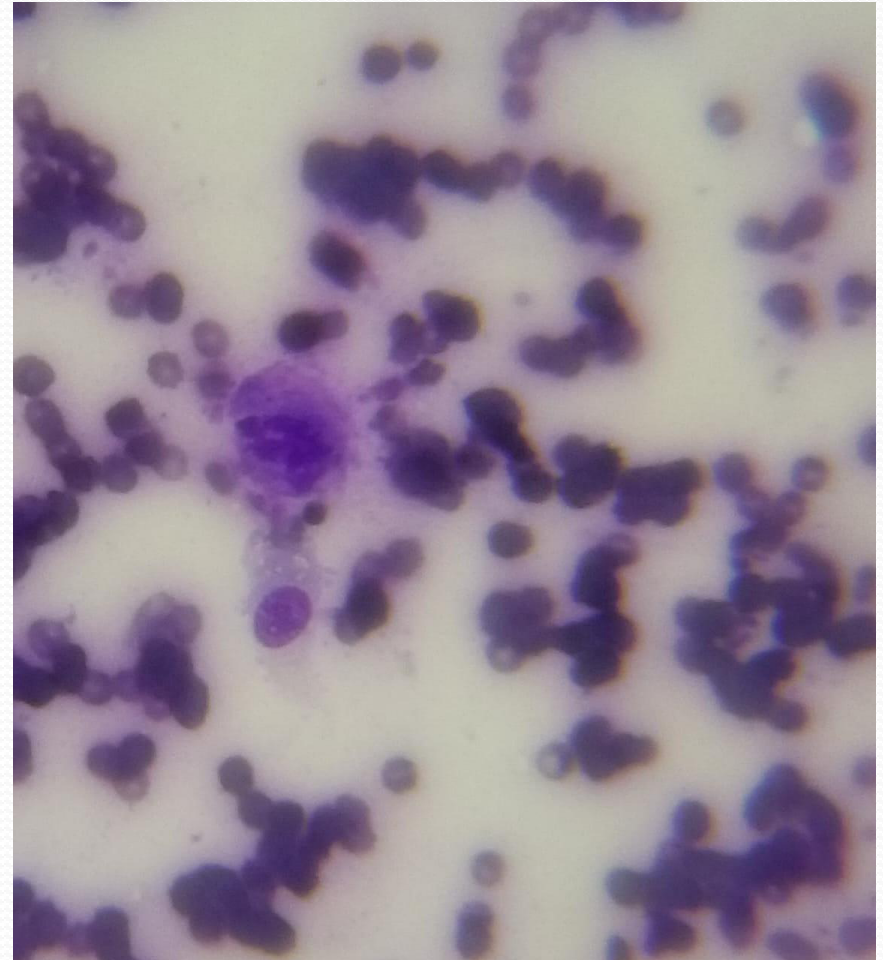


Chest Radiograph



Cytology

- Cytological examination of a stained smear of a fine needle aspirate from the lesion showed cells suggestive of neoplasia

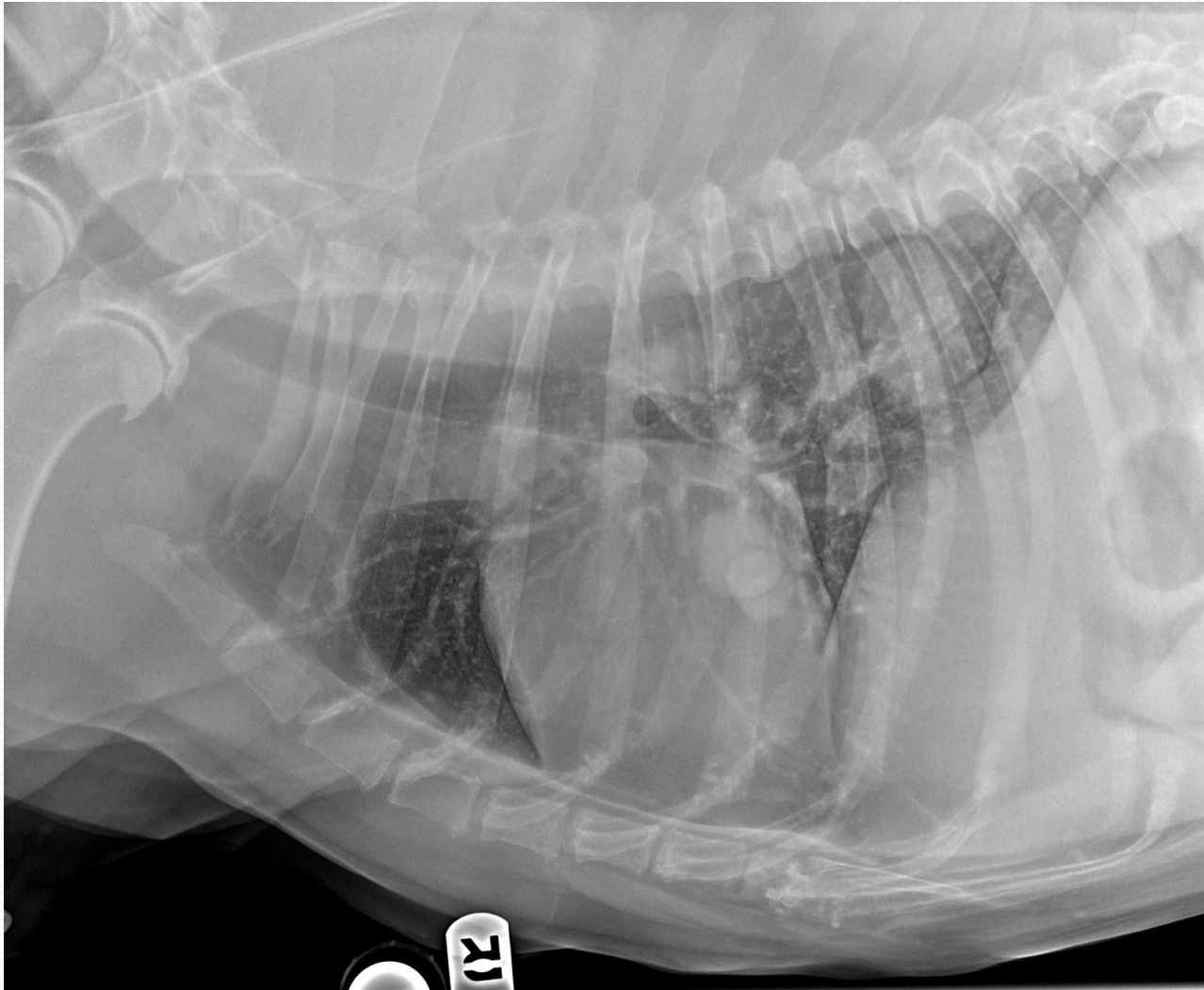


Cytology : Many red blood cells, some neoplastic cells suggestive of osteosarcoma

Osteosarcoma in Dogs

- One of the most common canine tumours
- One of the most aggressive canine cancers
- Generally affects older, large breeds
- Typical locations: distal radius, humerus, femur, tibia
- Usually has micrometastases by the time it is diagnosed
- Lung is main area for metastases to be found
- Painful
- Median survival time after diagnosis with no chemotherapy: 3 – 5 months

Lung metastases - general appearance



<https://animalpetdoctor.homestead.com/CancerOsteo.html>

Standard Treatment

- Amputation of limb
- Limb-sparing procedure for distal radius: removal of affected bone tissue, bone grafting, fusion of carpal joint
- Chemotherapy (e.g. Doxorubicin, Carboplatin, Biphosphonates)
- Radiation therapy (if no amputation)
- Pain management (if no amputation) NSAID's, Narcotic Analgesics (e.g. Tramadol), Gabapentin

Misty's Early Progression

- Within a week of diagnosis, lameness became apparent and subsequently she stopped eating completely, began losing weight
- She had to be force fed with porridge and blended dog food via syringe (twice daily)
- Pain management: injectable flunixin meglumine (Banamine[®]), Meloxicam, Tramadol
- April 14, 2019 – started her on Somnican[®] (*Cannabis sativa*) sublingual drops every evening.
- April 20 – she ate on her own for the first time since stopping

Lameness





AVS LABORATORY

Unit 34 Trade Centre
 30-32 Red Hills Road, Kingston 10
 Tel: (876) 906-1264
 www.avslabs.com

Client: Cadogan, Paul (CL-1905-028)
 Patient Name: Misty
 Species: Canine
 Breed:

Gender:
 Weight:
 Age: 10 Years
 Doctor: Paul CADOGAN

AVS LABS
 UNIT 34 THE TRADE CENTRE,
 30-32 Red Hills Road, Kingston 10
 876-906-1264

Test	Results	Reference Interval	LOW	NORMAL	HIGH
LaserCyte (May 9, 2019 2:44 PM)					
RBC	5.29 x10 ¹² /L	5.50 - 8.50	LOW		
HCT	55.8 %	37.0 - 55.0			HIGH
HGB	13.5 g/dL	12.0 - 18.0			
MCV	105.2 fL	60.0 - 77.0			HIGH
MCH	25.5 pg	18.5 - 30.0			
MCHC	24.2 g/dL	30.0 - 37.5	LOW		
RDW	16.1 %	14.7 - 17.9			
%RETIC	0.8 %				
RETIC	43.7 K/ μ L	10.0 - 110.0			
WBC	10.59 x10 ⁹ /L	5.50 - 16.90			
%NEU	66.8 %				
%LYM	12.4 %				
%MONO	11.5 %				
%EOS	8.9 %				
%BASO	0.4 %				
NEU	7.08 x10 ⁹ /L	2.00 - 12.00			
LYM	1.31 x10 ⁹ /L	0.50 - 4.90			
MONO	1.22 x10 ⁹ /L	0.30 - 2.00			
EOS	0.94 x10 ⁹ /L	0.10 - 1.49			
BASO	0.04 x10 ⁹ /L	0.00 - 0.10			
PLT	346 K/ μ L	175 - 500			
MPV	6.5 fL				
PDW	19.1 %				
PCT	0.23 %				
VetTest (May 9, 2019 2:36 PM)					
GLU	3.45 mmol/L	3.89 - 7.95	LOW		
CREA	133 μ mol/L	44 - 159			
BUN	4.3 mmol/L	2.5 - 9.6			
TP	70 g/L	52 - 82			
ALT	14 U/L	10 - 100			
ALKP	51 U/L	23 - 212			

Mild anaemia,
 Hematocrit &
 MCV readings
 erroneous,
 Manual
 hematocrit 36.5%

Normal WBC & Platelets

Note: Low glucose is
 artificial due to delay in
 getting sample to lab -
 allowing RBC's to
 consume

Manual Hematocrit : 36.5%

Ball Moss – *Tillandsia recurvata*



The Ball Moss



- An epiphytic plant in the Bromeliad family
- Grows on tree branches, utility cables etc.
- Absorbs water and nutrients from the air and bacteria/dust particles.
- Extract found to have medicinal – particularly anti-neoplastic properties.
- Dicinnamates, Caffeic acid and Cycloartanes isolated from it
- Research by Biotech R&D and its partners has found activity against various cancers, including prostate and breast.
- Marketed as herbal supplement Alpha Prostate Formula 1 by Eden Gardens Nutraceuticals in Jamaica

Ball Moss Extract Therapy

- 20% Ball Moss Extract therapy commenced May 11, 2019
- Supplied sterile, with added dimethyl sulfoxide , as a dark brown liquid
- DMSO added to enhance tissue penetration
- Lesion circumference 17 cm
- Intra-lesional injections of 0.25 ml every 2 days for 1 month
- Initially – done under acepromazine/ketamine anaesthesia
- This was VERY hard on the dog who was lethargic for the entire day thereafter
- Tried local lidocaine, then ball moss (initial lidocaine was painful
- Eventually done quickly, directly without anaesthesia
- No obvious increase in lameness following the injection

Ball Moss Therapy

- Maintained on Tramadol 50 mg twice daily, Meloxicam 5 mg once daily and Somnican 2 drops twice daily

Injection sites

- Rotated to enhance distribution of extract for tumour cell apoptosis and inhibition of neovascularization



Ball Moss Therapy

- During therapy, Misty continued to eat well and regained the weight she lost (based on body condition observation, not actual weight).
- Last injection for the month given on June 8, 2019
- June 21, 2019: Oral Ball Moss & Cannabis therapy commenced



Oral Ball Moss/Cannabis

- Dosage: 2 capsules twice daily
- Somnican discontinued
- Tramadol discontinued
- Meloxicam used occasionally if indicated
- Later Ball Moss/Saw Palmetto capsules added
- One of each twice daily
- Periodic 20% Extract injections



August

- Happy, playful, eating normally, barking
- No obvious catabolic deterioration
- Lameness marked, sometimes non-weight bearing when standing or running.
- Circumference of lesion increased to 18 cm





September 2019

- Rapid growth of leg lesion with increase in circumference to 22 cm by the end of the month
- Non-weight bearing lameness most of the time
- Would carry leg when standing & walk/run on 3 legs
- Would yelp if leg bounced or manipulated
- Decision taken to check her overall status, and, depending on the results, amputate the leg.
- Objective: pain elimination – better to be on 3 legs, pain free, than on 3 legs in pain
- New ball moss/*Cannabis* formulation – capsules from extract rather than being herbal – once daily dose.

Misty's check-up

- Complete Blood Count
- Serum chemistry panel
- Radiograph of leg
- Chest radiographs
- Abdominal ultrasound



Preparing for X-ray



Ultrasound in progress



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Detailed Lab Results

Client: 4681 Animalcare Veterinary Hospital Phone: (876) 986-4747
 Patient: 49580 Patient: Cadogan Sex: Unknown Age: 10 Yrs. 0 Mos.
 Species: Canine Breed: Unknown Weight: 0.00 kilograms

Lab ID: VETSCAN VetScan
 Template: Hematology
 Staff: Animalcare Veterinary Hospital
 Status: Posted
 Req ID: 49580 - Wednesday 10/2/2019 09:08:43

Test	Results	Reference Range	Low	Normal	High
HCT	46.64 %	37.00 - 55.00			
HGB	13.9 g/dl	12.0 - 18.0			
MCHC	29.7 g/dl	31.0 - 39.0			
WBC	8.30 10 ⁹ /l	6.00 - 17.00			
LYMPHS	1.16 10 ⁹ /l	1.00 - 4.80			
%LYMPHS	14.0 %	0.0 - 100.0			
MONOS	0.26 10 ⁹ /l	0.20 - 1.50			
%MONOS	3.2 %	0.0 - 100.0			
NEUT	6.30 10 ⁹ /l	3.00 - 12.00			
%NEUT	76.0 %	0.0 - 100.0			
EOS	0.45 10 ⁹ /l	0.00 - 0.80			
%EOS	5.4 %	0.0 - 100.0			
BASO	0.12 10 ⁹ /l	0.00 - 0.40			
%BASO	1.5 %	0.0 - 100.0			
PLT	228 10 ⁹ /l	165 - 500			
RBC	6.26 10 ¹² /l	5.50 - 8.50			
MCV	75 fl	60 - 77			
MCH	22.1 pg	19.5 - 24.5			
MPV	8.4 fl	3.9 - 11.1			
PCT	0.19 %	0.00 - 0.00			
PDW _s	12.5 fl	0.0 - 0.0			
PDW _{cv}	34.7 %	0.0 - 0.0			
RDW _s	44.5 fl	0.0 - 0.0			
RDW _{cv}	14.9 %	14.0 - 20.0			

Virtually perfect
 blood cell
 parameters –
 slightly low MCHC
 reading
 insignificant

Lab Comments: Sample ID: 01302 Patient Name: Cadogan
 Mode: Dog Doctor: AVS Lab



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www.avslabs.com



MISTY CADOGAN

PET OWNER: **P CADOGAN**
SPECIES: **Canine**
BREED:
GENDER:
AGE: **10 Years**
PATIENT ID:

ANIMALCARE VETERINARY SERVICES
110a COnstyant Spring Road
KINGSTON JMAA W03, JA n/a
876-969-1356
ACCOUNT #:
ATTENDING VET: **Paul CADOGAN**

LAB ID:
ORDER ID:
DATE OF RECEIPT: **10/2/19**
DATE OF RESULT: **10/2/19**

IDEXX Services: **VetTest Chemistry Analyzer**

Chemistry

10/2/19

10:57 AM

TEST	RESULT	REFERENCE VALUE	
Glucose	84.13	70.08 - 143.22 mg/dL	
Creatinine	1.3	0.5 - 1.8 mg/dL	
BUN	8.96	7 - 26.89 mg/dL	
Phosphorus	5.02	2.51 - 6.81 mg/dL	
Calcium	10.74	7.94 - 12.02 mg/dL	
Total Protein	7.1	5.2 - 8.2 g/dL	
Albumin	2.9	2.2 - 3.9 g/dL	
Globulin	4.2	2.5 - 4.5 g/dL	
ALT	53	10 - 100 U/L	
ALP	97	23 - 212 U/L	
Bilirubin - Total	<0.12	0 - 0.88 mg/dL	
Cholesterol	218.48	109.82 - 319.41 mg/dL	
Amylase	778	500 - 1,500 U/L	

Completely normal
serum chemistry
values

Radiograph – leg

Oct 3, 2019

- Major progression of lesion
- Note that the tumour has remained in the radius – ulna and carpal bones intact.



Comparison to first X-ray



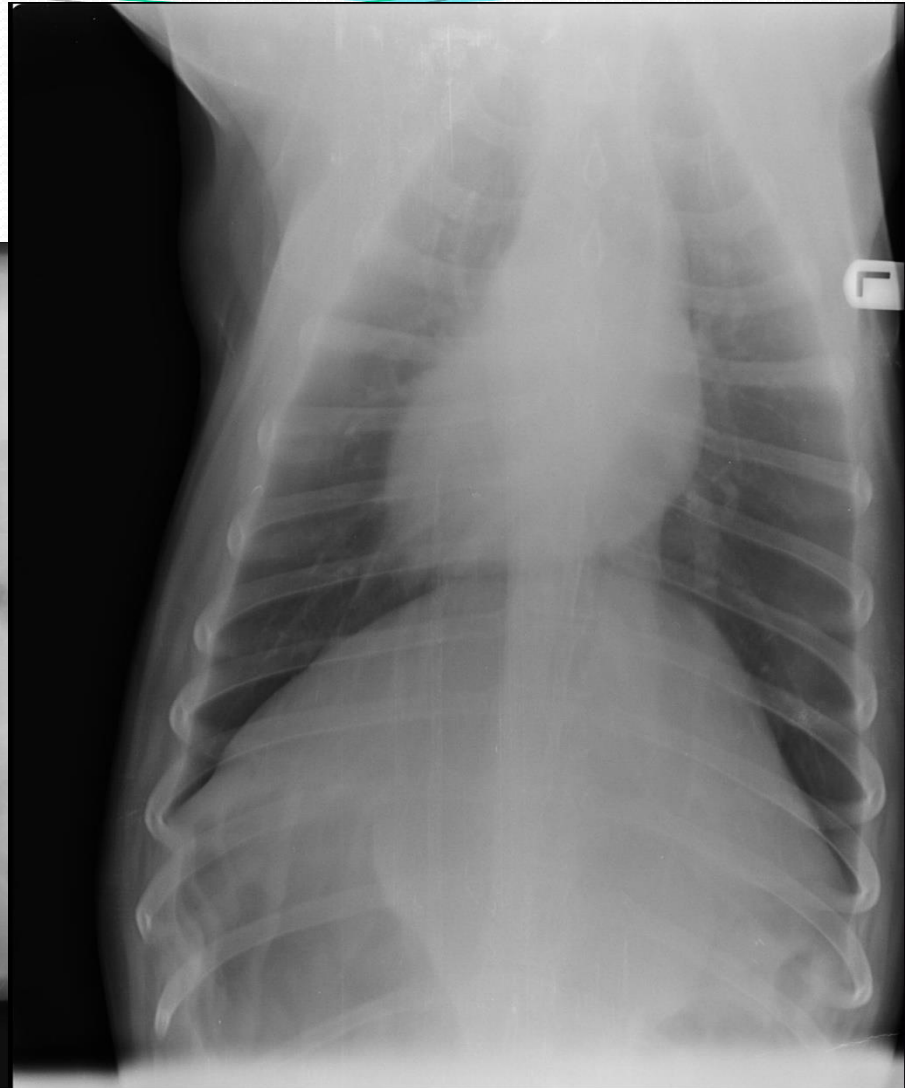
April 4



October 3

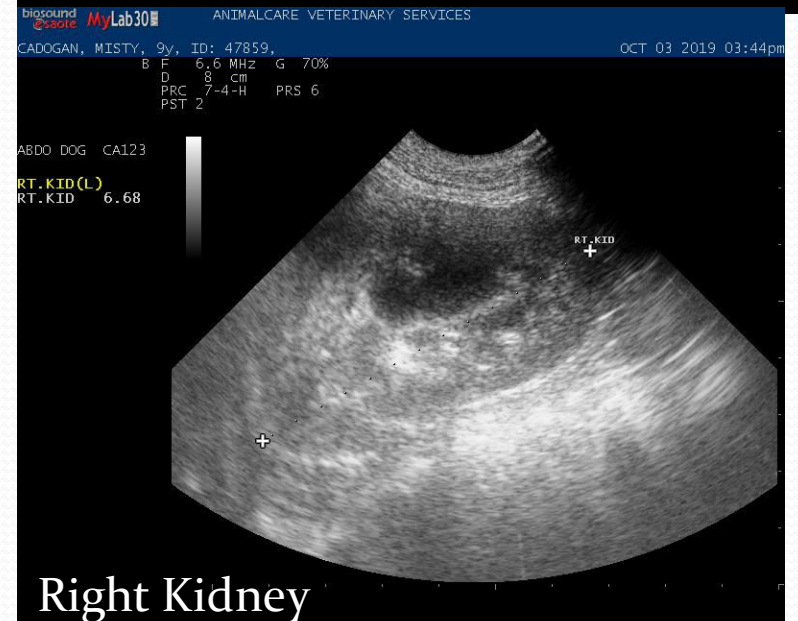
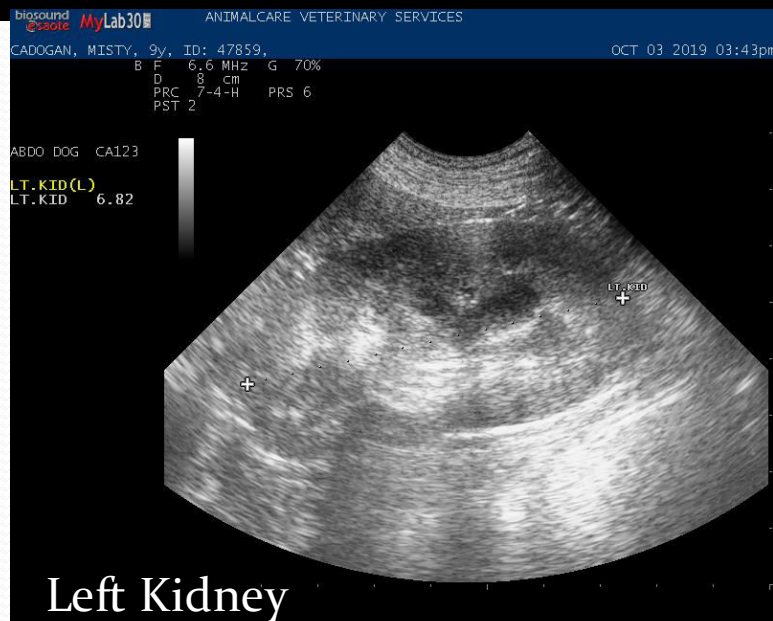
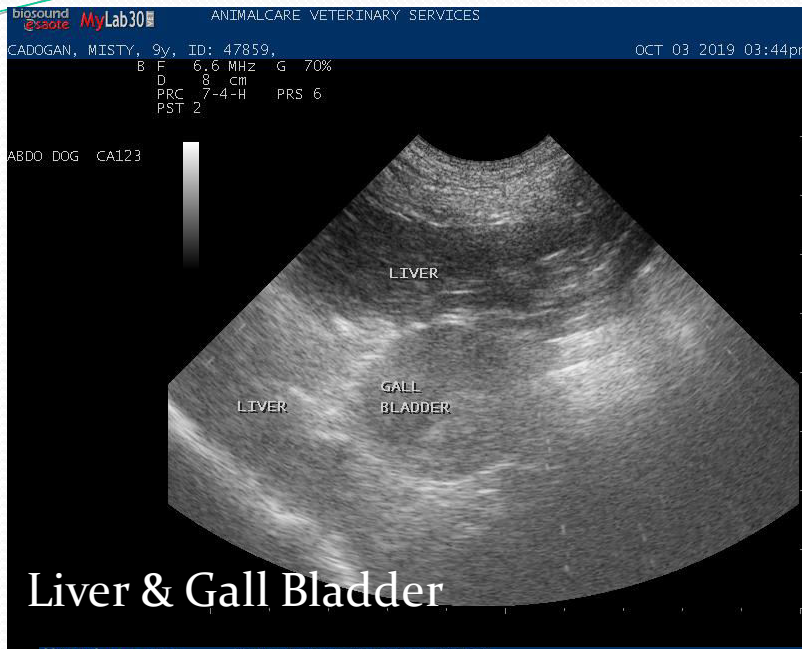
Chest Radiographs

Oct 3



NO VISIBLE METASTASES AFTER 7 MONTHS

Abdominal Ultrasound Normal study

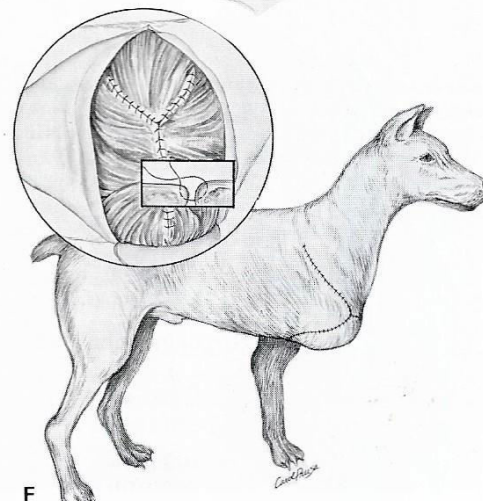
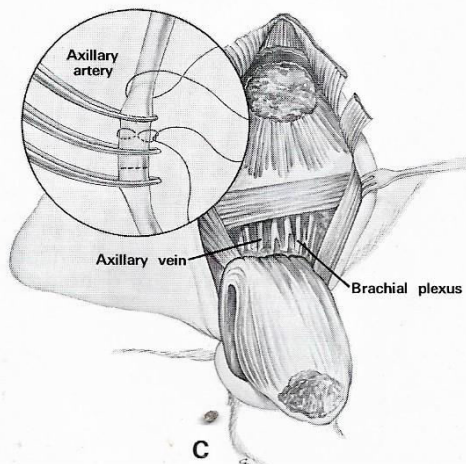
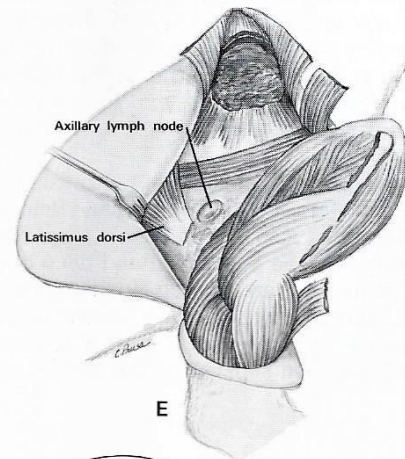
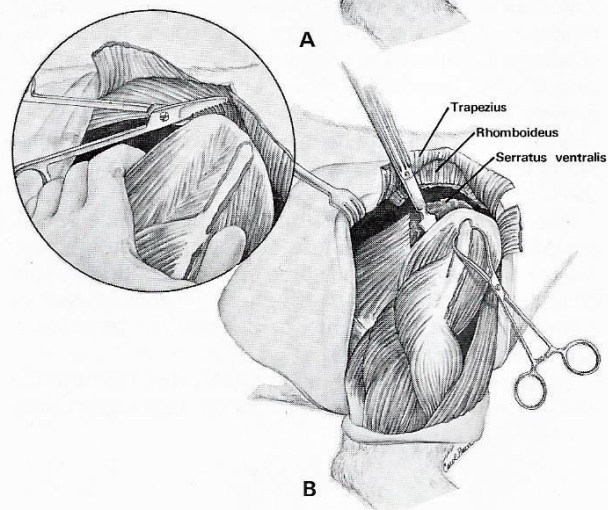
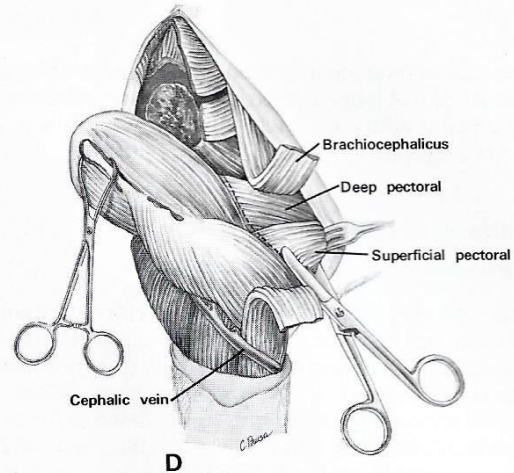
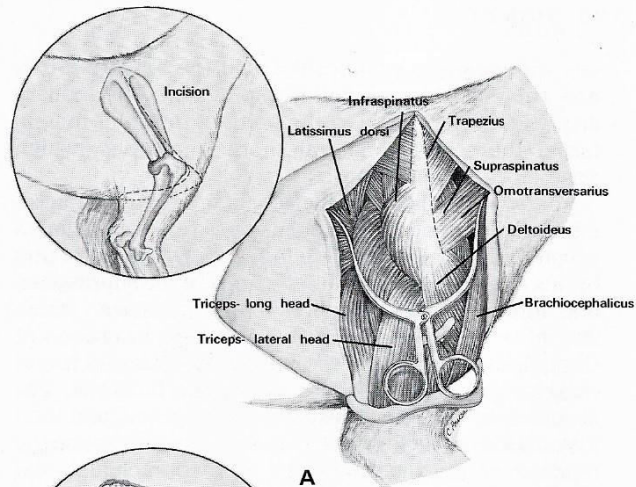


Amputation Surgery

- Monday, October 7, 2019
- 4 hour surgery
- Complete removal of limb, including scapulectomy

Rationale

- If scapula left in place, in the aftermath, with muscle atrophy, the scapular spine will become prominent and create a pressure point for decubital ulceration of the skin when the dog lies on that side
- Also, with above, there is a better cosmetic appearance



Bojrab, M.,
Joseph -
Current
Techniques in
Small Animal
Surgery, 2nd
Edition Lea &
Febiger 1983

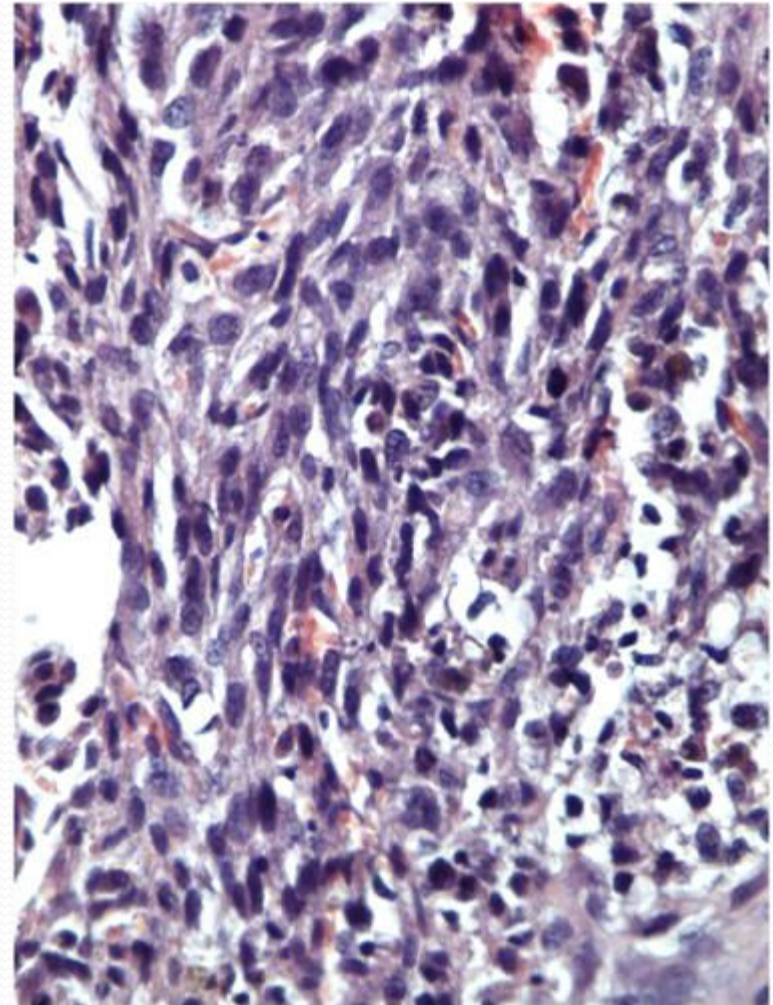
Post-op



Anaesthesia: Propofol induction, Isoflurane maintenance

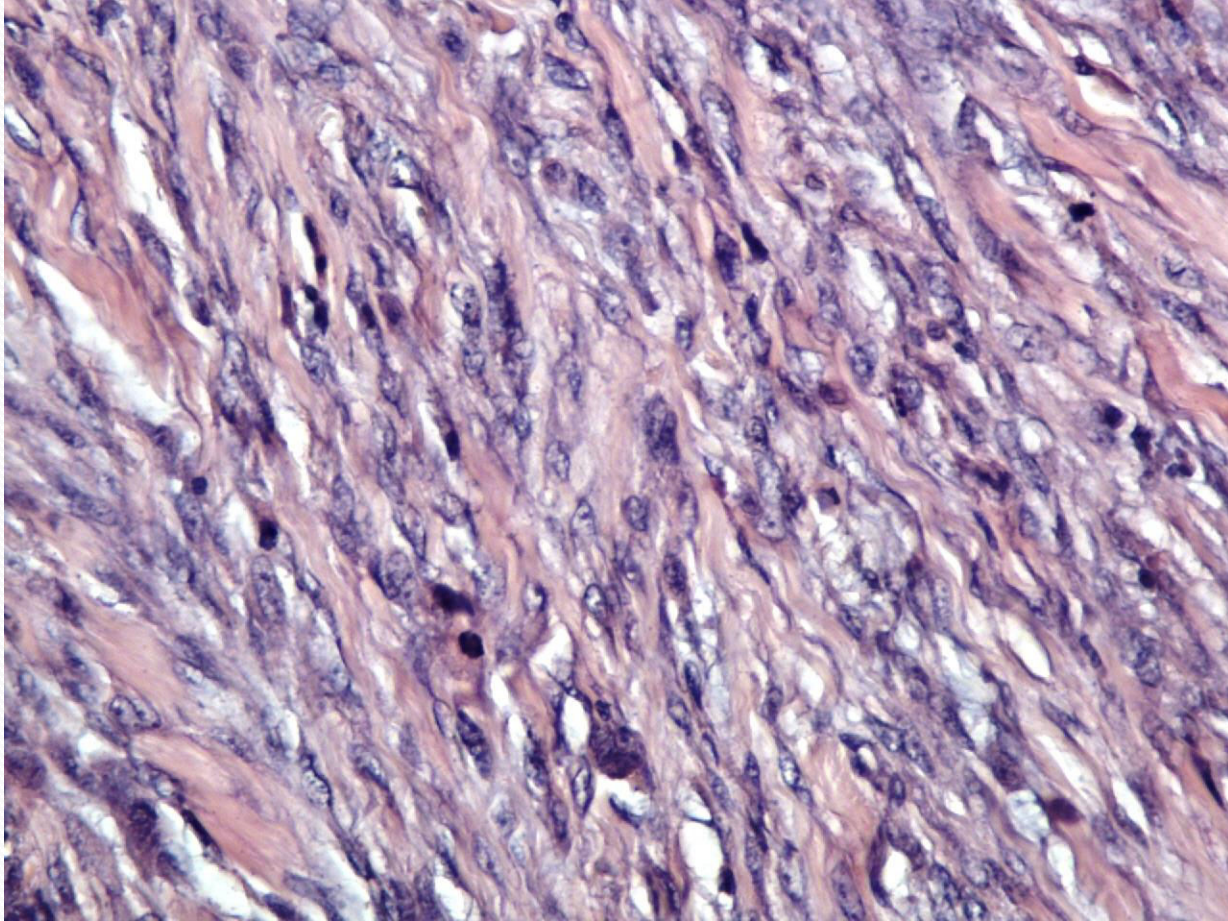
Histology of lesion

- Histologic diagnosis: highly malignant sarcoma – either osteosarcoma or synovial cell sarcoma.
- Unable to distinguish since osteoid was NOT seen
- Clinical distinction:
Osteosarcoma will not cross to adjacent bones or across a joint.
Synovial cell sarcoma will.
Synovial – slow growing, pain first for months before mass appears.
- This tumour was distal radius ONLY



Note fusiform tumour cells characteristic of fibroblastic osteosarcoma

Histology of lesion



Note the mitotic figures visible within the nuclei.

Aftermath

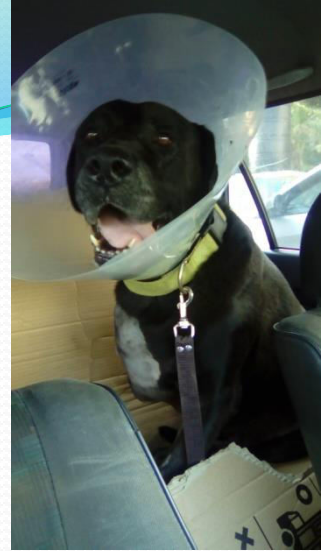
- Recovered well from surgery
- Went home the following afternoon
- Went off food again – had to be syringe fed
- Significant dependent oedema, haematoma formation/bruising
- Serosanguinous drainage from incision over subsequent 2 weeks

Medication:

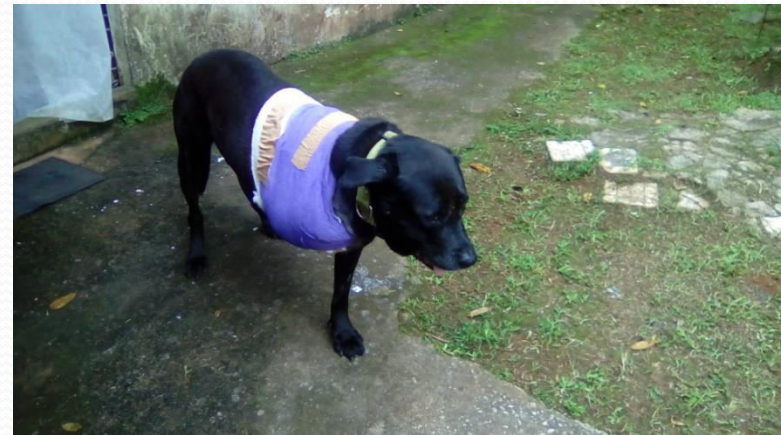
- Cefuroxime axetil (later Clindamycin)
- Tramadol BID (3 days)
- Meloxicam OD (SID) (7 days)
- Ball Moss/Cannabis OD

At 1 month – well healed, eating normally, normal behaviour

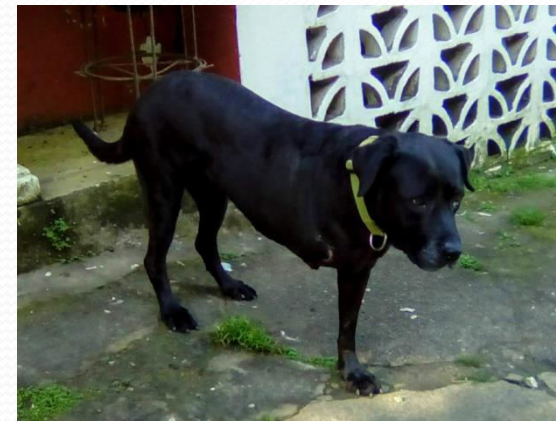
Going home



Day 2 post-op



3 weeks post op



Conclusions & Next steps



- Ball Moss regimen slowed, but failed to stop the primary lesion – reasons uncertain.
- Appears to have arrested (hopefully eliminated!) metastatic disease.
- Further trials required: Parenteral vs. oral administration
- Dosage, frequency of administration

Plans:

- Continue Ball Moss/Cannabis oral supplementation indefinitely
- X-ray chest periodically
- Let Misty enjoy life as much as possible!

Canine and Human Paediatric

Osteosarcoma – the One Health approach

- Osteosarcoma is the most common form of malignant bone cancer in children and dogs
- Occurs in dogs approximately 10 times more frequently than in humans

Share many key clinical and molecular features:

- Tumor location, presence of microscopic metastatic disease at diagnosis
- Development of chemotherapy-resistant metastases
- Altered expression/activation of several proteins
- Overlapping transcriptional profiles and shared DNA copy number aberrations

Canine OS can provide additional insight into the biology of the tumor and lead to advancements in the care of both children and dogs.

Osteosarcoma Vaccine

- Clinical trials are taking place in the US on a vaccine
- Various veterinary schools are involved
- Immunotherapeutic developed using a *Listeria*-based antigen delivery system
- lyophilized formulation of a modified live, attenuated strain of *Listeria* that activates cytotoxic T-cells.
- Redirects the dog's immune system against the cancer cells

Osteosarcoma Vaccine

Clinical study: 18 client-owned dogs with osteosarcoma,

- Vaccine may delay or prevent metastatic disease and may prolong overall survival in these patients.
- Study evaluated dogs that had primary tumor removal and four doses of carboplatin chemotherapy, followed the therapeutic vaccine every three weeks for three doses
- Median survival time was **956 days** compared with 423 days for a historical control group ($p < 0.05$)

Acknowledgements

Ball Moss Therapy

- Dr. Aisha Jones
- Dr. Henry Lowe
- Staff of Biotech R&D
- Dr. Joseph Bryant (USA)

Physicians

- Dr. Elaine Williams
- Dr. Jackie Jaggon
- Dr. Kimone Fraser
- Dr. Dwight Lowe

**Thank you ALL
for everything
you did!!**

Veterinarians & Related

- Dr. Katalin Brown
- Dr. Graham Brown
- Claudius “Hanz” Johnson
- Staff of Animalcare Vet Hospital & AVS Laboratory
- Dr. Farrah Bailey-Trowers
- Dr. Patrick Craig
- Dr. Simone Martin-Shaw

**Many other colleagues and
friends**



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Thank you!

And now.....

MEET
MISTY.....

