

Cornell
Animal Health Diagnostic Center

Thinning Out: A Logical Approach to Chronic Weight Loss in Older Horses

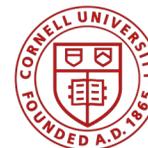
Toby Pinn-Woodcock, DVM, DACVIM

Associate Clinical Professor

Veterinary Support Services, Animal Health Diagnostic Center

Clinician Large Animal Internal Medicine, College of Veterinary Medicine

Cornell University



College of
Veterinary Medicine

Presenting Complaint

- 'Weight loss'
 - Generalized weight loss
 - Muscle wasting



Systematic Approach

1. Detailed history
2. Process of elimination via:
 - Physical exam
 - +/- oral exam
 - +/- rectal
 - Imaging – ultrasound, radiographs, endoscopy
 - Diagnostic testing
 - Bloodwork
 - Fluid cytology
 - Tissue biopsy

Top: Squamous gastric ulceration
Bottom: Pyloric gastric ulceration



Common Weight Loss Differentials in the Geriatric Patient

Inadequate caloric intake

- Dental disease
- Poor quality feed
- Inadequate volume feed
- Hyporexia due to EGUS
- Competition for feed – bottom of the pecking order

Muscle wasting

- PPID
- Vitamin E deficiency
 - Equine Motor Neuron Disease
 - Vitamin E responsive myopathy
- Selenium deficiency
- Myosin Heavy Chain Myopathy



Common Weight Loss Differentials in the Geriatric Patient

Malabsorption +/- diarrhea

- Inflammatory Bowel Disease (IBD)
- Alimentary lymphoma
- Colitis due to:
 - Parasitism (Cyathostomiasis, large strongyles)
 - Sand enteropathy
 - Non-steroidal anti-inflammatory drug toxicity (RDC)

Chronic organ failure

- Liver disease
- Kidney disease

Consumptive disease process

- Parasitism
- Neoplasia
- Chronic infection/abscess



Looking for clues:

What other clinical signs accompany weight loss?

Clinical signs that may accompany chronic weight loss:

- Loose manure
- Decreased appetite
- PU/PD
- Fever
- Dependent edema
 - Ventral abdomen, distal limbs, sheath
- Colic
- Lethargy or depression
- Respiratory signs



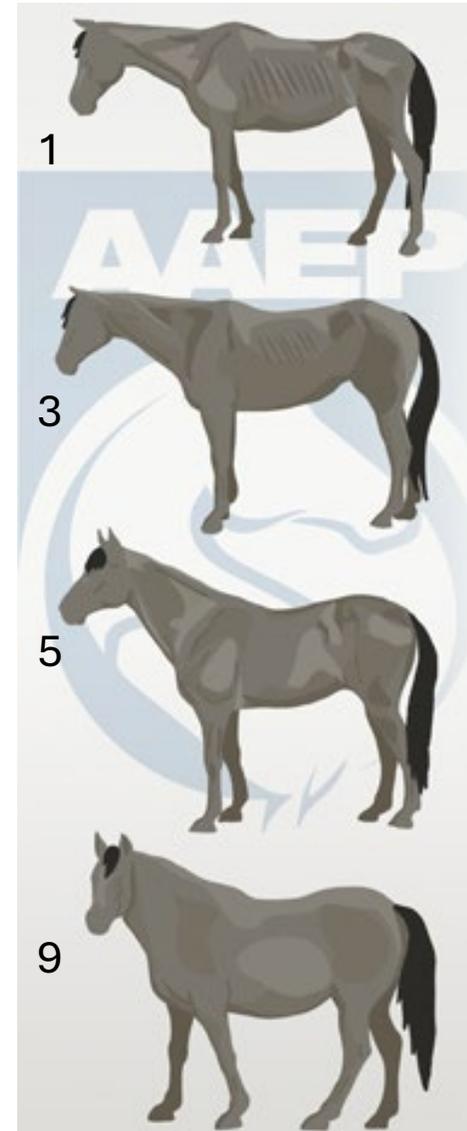
Assess current management regimen

- Housing and turnout
 - Eating in a group or individual stall?
 - Is there competition for feed?
- Diet – forage, grain, supplements
 - Look at the forage – is it excessively stemmy?
 - Thyro-L administration?
- Concurrent diagnoses (ie. PPID, osteoarthritis)
- Exercise regimen
- Body condition of other horses on the farm
- Deworming regimen



Physical Exam – Hunting for clues

- Body condition score
 - Heneke System: 1=emaciated; 5=ideal; 9=obese
 - If muscle wasted, is it symmetric?
- Vitals – fever, tachycardia or tachypnea?
- Palpate for lymphadenopathy
 - Submandibular, prescapular LNs
- Auscult for murmur, arrhythmia, increased bronchovesicular sounds
- Nasal discharge or inducible cough?



Physical Exam – Hunting for clues

- Edema hunt
- Evidence of loose manure
 - Perineal staining, manure in tail
- Assess general soundness
- Neurologic assessment
- Observe horse eating
 - Quidding or dropping feed?
 - Trouble prehending?
 - Sedated oral exam with speculum
 - Equine Odontoclastic Tooth Resorption and Hypercementosis

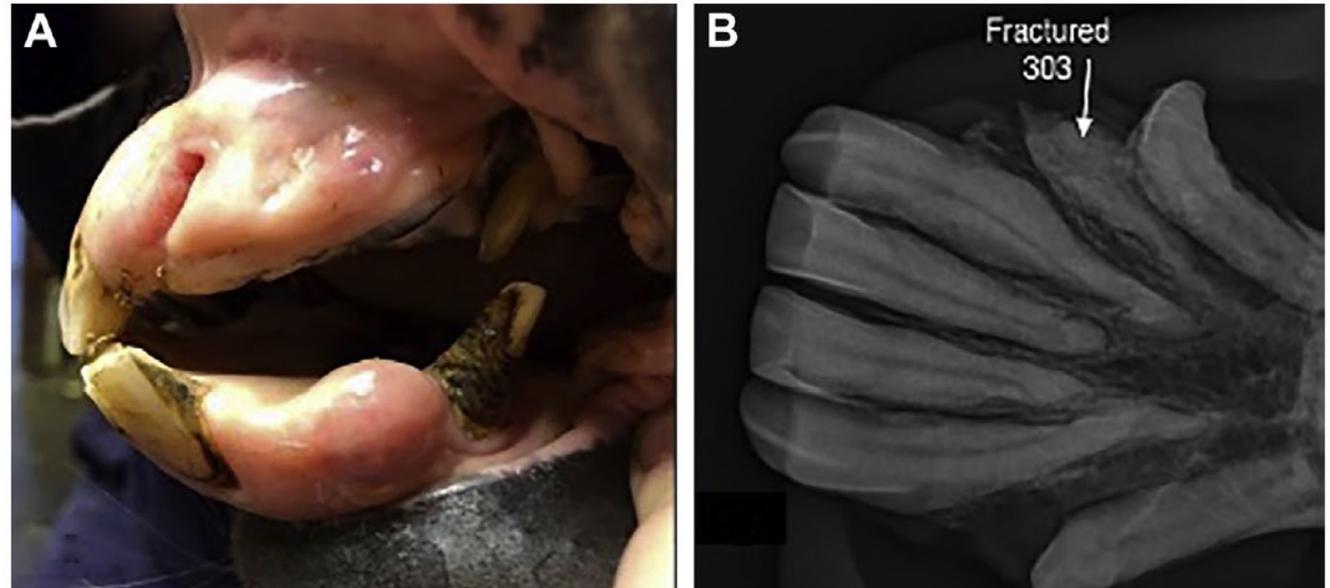


Fig. 3. (A) Painful gingival swellings and discharging tracts associated with the retained roots of 202, 203, and 303 following pathologic fracture of the incisors. (B) Ventrodorsal radiographic image of affected area. This pony was diagnosed with EOTRH and had been unable to eat forage. Extraction of the diseased incisors was performed. The pony began to eat forage the following day.

Jarvis and McKenzie. Nutritional Considerations when Dealing with an Underweight Adult or Senior Horse. VCNA 2021.

Eliminate low hanging fruit differentials:

Normal attitude/appetite

- Remove competition for feed
- Wean off of Thyro-L over ~2 months
- Address dental disease
 - Modify diet if not treatable
- Test and Treat:
 - Vitamin E
 - Separated serum
 - Treat with liquid water-soluble natural Vit E
 - Selenium
 - EDTA whole blood
 - Supplement 1-2mg per day orally
 - PPID - EDTA plasma for ACTH
 - Primary hyperparathyroidism
 - Serum for thyroid panel

Decreased appetite, normal attitude

- Gastrosocopy for EGUS diagnosis
- Solitary donkeys/mules – find a companion



Clues in the CBC

Leukocytosis

- Neutrophilia – chronic infection
- Lymphocytosis – lymphoma
 - CBC often WNL in cases of lymphoma

Leukopenia

- Pancytopenia – leukemia
- Neutropenia – acute infection (bacterial vs viral)

Test	Results	Unit	Lowest Value	Highest Value
FIB-SCH	500	mg/dL	0	200
HCT	29	%	34	46
HB	10.7	g/dL	11.8	15.9
RBC	5.9	mill/uL	6.6	9.7
MCV	50	fL	43	55
MCH	18	pg	15	20
MCHC	37	g/dL	34	37
RDW	19.8	%	16.3	19.3
NRBC	0	/100 WBC	0	0
WBC	1.5	thou/uL	5.2	10.1
SEG_NEUT	0.9	thou/uL	2.7	6.6
BAND_NEUT	0.0	thou/uL	0.0	0.1
LYMPH	0.4	thou/uL	1.2	4.9
MONO	0.1	thou/uL	0.0	0.6
EOSIN	0.1	thou/uL	0.0	1.2
BASO	0.0	thou/uL	0.0	0.2
PLATA	75	thou/uL	94	232
MPV	7.8	fL	5.3	8.4
PLT_SMEAR	Low			
TP REF	7.6	g/dL	5.2	7.8

Example of pancytopenia

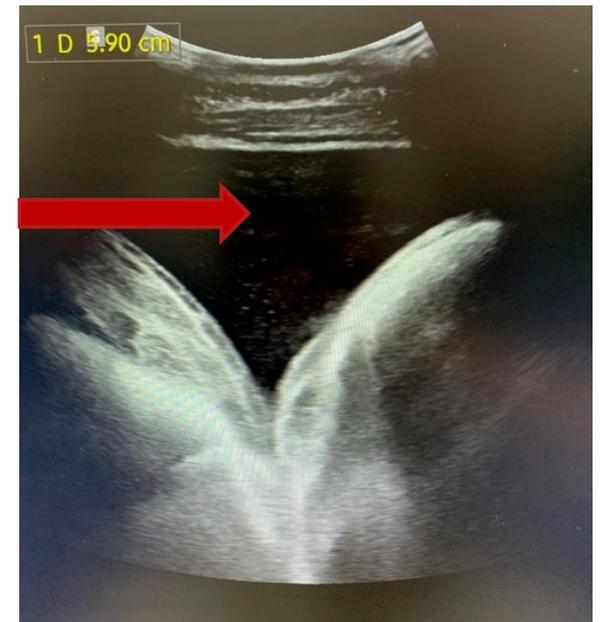
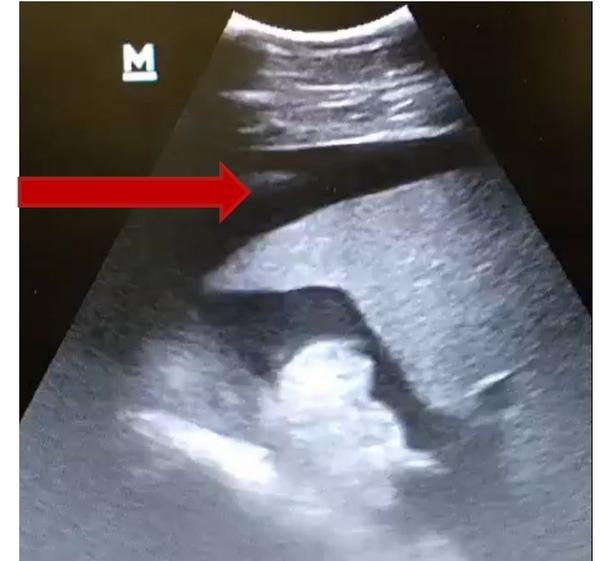
Clues in the chemistry panel

- Azotemia in chronic renal failure
- Hypercalcemia
 - Chronic renal failure (Na, Cl, K)
 - Neoplasia
 - Parathyroid hormone-related protein (PTHrP)
- Hyperproteinemia due to hyperglobulinemia
 - Neoplasia
 - Chronic infection
- Albumin-globulin shift
 - low albumin, higher globulin
- Hypoproteinemia with hypoalbuminemia
 - Protein loss
 - Protein losing enteropathy
 - Protein losing nephropathy

Test	Results	Unit	Lowest Value	Highest Value
NA	133	mEq/L	134	142
K	3.5	mEq/L	2.4	4.8
CL	96	mEq/L	95	104
HCO3	24	mEq/L	24	31
AN GAP	17	mEq/L	12	19
NA/K	38		Not Established	
BUN	17	mg/dL	10	22
CREAT	0.9	mg/dL	0.8	1.5
CA	12.1	mg/dL	10.8	12.9
P	2.8	mg/dL	2.1	4.7
MG	1.8	mEq/L	1.2	1.9
TP	7.4	g/dL	5.4	7.0
ALB	2.9	g/dL	2.9	3.6
GLOBULIN	4.5	g/dL	2.3	3.8
A/G	0.6		0.8	1.5
GLU	93	mg/dL	71	122
AST	593	U/L	222	489
SDH	5	U/L	1	6
GLDH	2	U/L	2	10
GGT	13	U/L	8	33

Abdominal and Thoracic Ultrasound

- Peritoneal, pleural or pericardial effusion (images to right)
 - Collect a sample for cytology – purple top tube
 - Aerobic and anaerobic culture – bacterial transport media
- Intestinal wall thickening
 - Normally $\leq 4\text{mm}$
- Abnormal appearance of organs
- Mass – abscess vs neoplasia



Case 1: 16yo Appendix QH gelding

Presenting complaints:

- Weight loss and sheath swelling of 3m duration
- Soft manure developed recently

Purchased 8y ago, no prior health problems



Case 1. Physical Exam

- BAR
- Normal vitals
- BCS 2/9
- Severe generalized muscle wasting
- No sheath swelling on day of visit
- No lymphadenopathy noted



Clinical Signs in IBD Cases

Findings and Prognosis in 149 Horses with Histological Changes Compatible with Inflammatory Bowel Disease.

Kranenburg et al. *Animals*, 2024

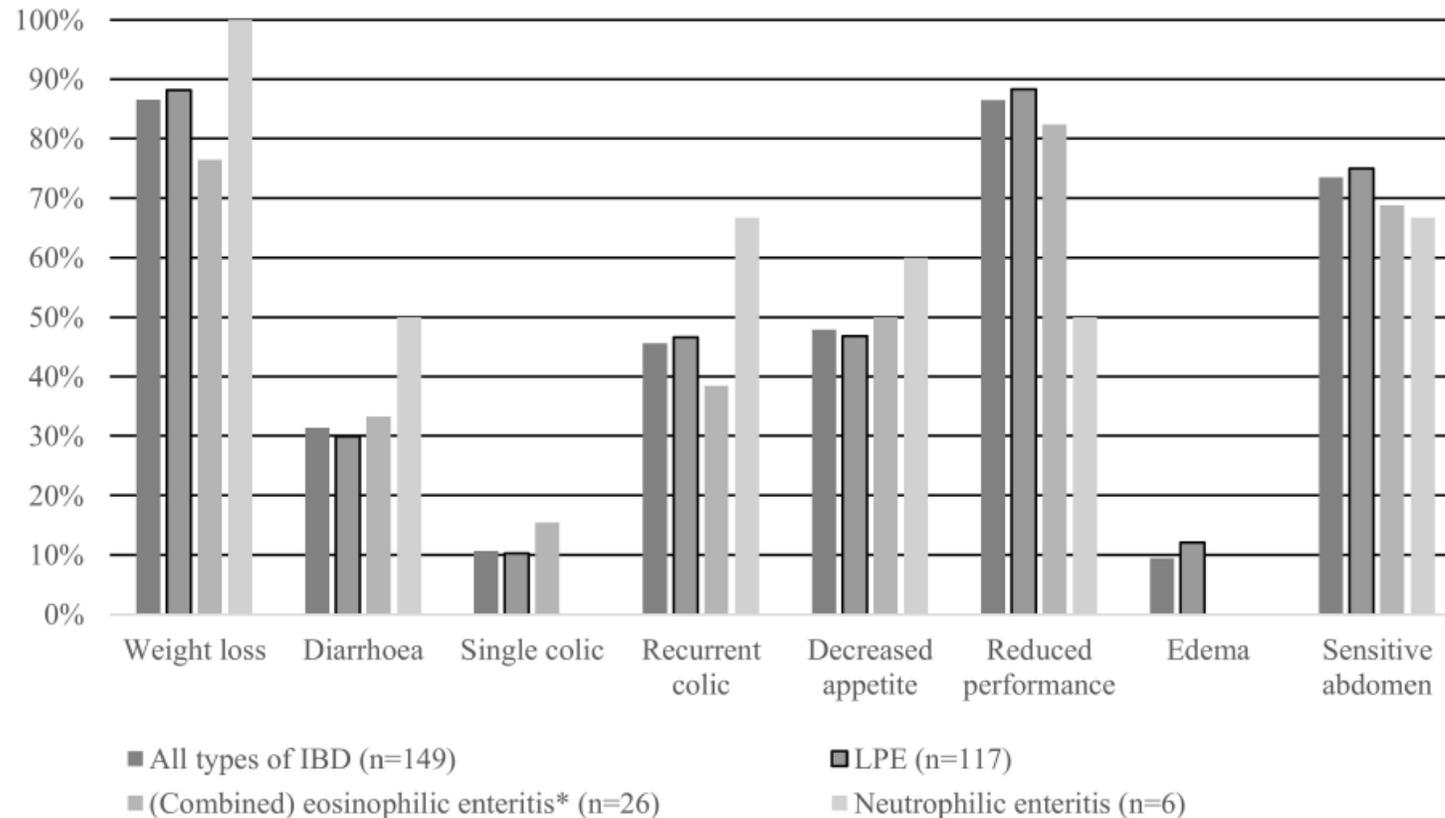


Figure 1. The percentages of horses demonstrating various clinical symptoms for each type of IBD.

* The group '(Combined) eosinophilic enteritis' consists of horses with EC, MEED and a combination of LPE and EC.

Case 1

Problem List

- Weight loss
- Muscle wasting
- Decreased appetite
- Historical sheath edema
- Soft manure

Differentials

- Gastrointestinal
 - Dentition
 - Parasitism
 - Malabsorption (IBD vs lymphoma)
- Nutritional
 - Inappropriate diet
 - Competition
 - Vitamin E/selenium deficiency
- Chronic disease of other body system

Case 1

Bloodwork

- CBC unremarkable
- Hypoproteinemia 4.6 g/dL
 - Ref. 5.4-7.0
- Hypoalbuminemia 1.9 g/dL
 - Ref. 2.9-3.6
- Globulins normal 2.5 g/dL
 - Ref. 2.3-3.8
- Mild hyperfibrinogenemia 400 mg/dL
 - Ref 0-200

Sedated rectal exam

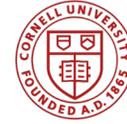
- Unremarkable

Sedated oral exam with speculum

- Unremarkable

Fecal float

- No eggs detected



Case 1: Investigate causes of protein loss

- ✓ Abdominal ultrasound – unremarkable
- ✓ Gastroscopy – unremarkable
- ✓ Abdominocentesis – unremarkable

Not performed:

- Oral glucose absorption test
- Thymidine Kinase(TK1)
 - Lymphoma marker
 - Variable sensitivity reported for diagnosis of lymphoma
 - Increase can be nonspecific and secondary to other inflammatory processes



Case 1. Rectal Mucosal Biopsy

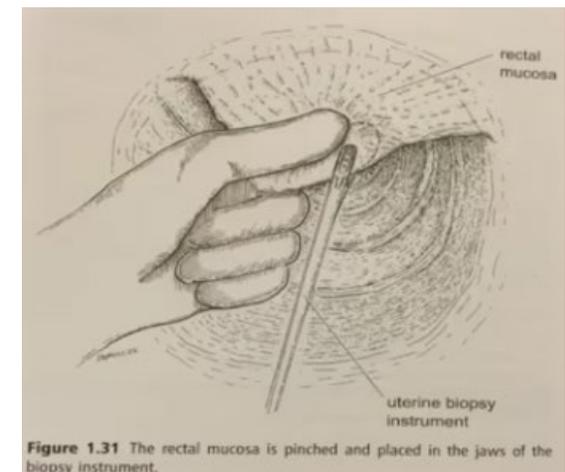
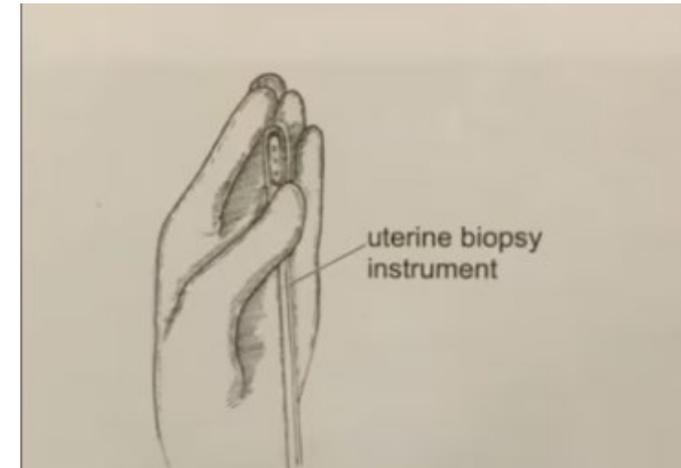
1. Sedate with xylazine or detomidine + butorphanol
 - Administer Buscopan IV to relax rectum
2. Wear rectal sleeve covered in surgical glove for dexterity
 - Lots of lube
 - Evacuate manure
 - Infuse 60cc lidocaine into rectal lumen using red rubber catheter to numb mucosa



Case 1. Rectal mucosal biopsy

Carefully introduce uterine biopsy forceps guarded by your hand

- Slip mucosa away from wall of rectum with your fingers, then take biopsy
 - Do not take biopsy at 12 O'clock due to aorta
 - Place biopsy in formalin immediately for histopathology
- ✓ Can administer flunixin meglumine to manage any mild discomfort post-procedure



Case 1. Rectal mucosal biopsy

- Rectal biopsy has been reported to have variable accuracy in detection of GI inflammation.
- Recovering representative lesions depends on:
 - Distribution of the lesions
 - Involvement of the distal colon and rectum.
 - A lack of lesions in a rectal biopsy obviously does not rule out GI disease



Case 1. Epitheliotropic Lymphoma

Histopathology Report

- Lymphocytic infiltrate expanding the lamina propria and invading the submucosa
- Anisocytosis and anisokaryosis with mitotic figures

Plan

- Dexamethasone taper starting at 0.1 mg/kg IV or IM for 3 days followed by 20% taper PO
- Monitor initial response
 - appetite, manure quality, albumin

Case 1. Outcome

- No response to treatment, euthanized



What if biopsy suggested IBD?

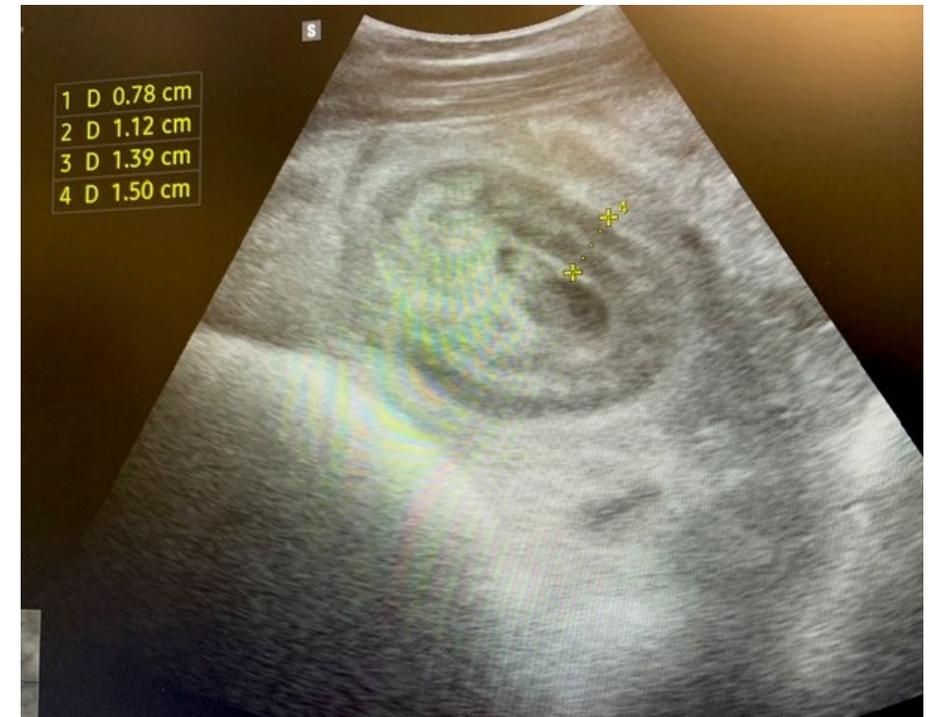
- History and clinical signs in cases of IBD can be similar

Types of IBD

- Eosinophilic enteritis
- Multisystemic eosinophilic epitheliotropic disease
 - MEED
- Granulomatous enteritis
- Lymphocytic/plasmacytic enteritis/colitis

Treatment

- Corticosteroid taper – typically dexamethasone
 - Transition to azathioprine in some cases
- Low bulk diet
- Gluten-free diet



Outcomes in IBD cases

Kranenburg et al, 2024

149 horses diagnosed with IBD by duodenal biopsy

- Lymphoplasmacytic enteritis was the most common type of IBD (78.5% of cases)
- Overall, 71% of the cases had improved clinically after six weeks, mostly following treatment with corticosteroids.
- Horses that improved after 6 weeks were more likely to be alive after one year

Case 2: 26yo STB gelding

Presenting complaints

- Weight loss despite good appetite for 2 months
- No improvement with increased caloric intake

Management:

- Receives routine deworming and dentistry
- No feed competition
- Was in daily moderate work until weight loss appreciated and performance declined



Case 2: Initial Work-Up

Physical Exam

- Thin BCS 2/9
- Great appetite
- Normal manure
- Normal vitals

Initial Diagnostics WNL

- Vitamin E
- Selenium
- ACTH
- Sedated:
 - Oral exam with speculum
 - Rectal exam

Case 2: CBC and Chemistry

Pancytopenia and hyperglobulinemia

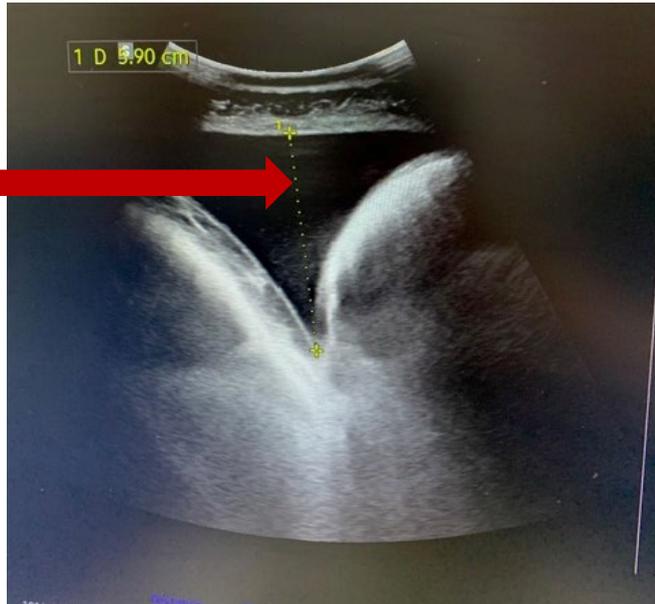
Test	Results	Unit	Lowest Value	Highest Value
FIB-SCH	500	mg/dL	0	200
HCT	29	%	34	46
HB	10.7	g/dL	11.8	15.9
RBC	5.9	mill/uL	6.6	9.7
MCV	50	fL	43	55
MCH	18	pg	15	20
MCHC	37	g/dL	34	37
RDW	19.8	%	16.3	19.3
NRBC	0	/100 WBC	0	0
WBC	1.5	thou/uL	5.2	10.1
SEG_NEUT	0.9	thou/uL	2.7	6.6
BAND_NEUT	0.0	thou/uL	0.0	0.1
LYMPH	0.4	thou/uL	1.2	4.9
MONO	0.1	thou/uL	0.0	0.6
EOSIN	0.1	thou/uL	0.0	1.2
BASO	0.0	thou/uL	0.0	0.2
PLATA	75	thou/uL	94	232
MPV	7.8	fL	5.3	8.4
PLT_SMEAR	Low			
TP REF	7.6	g/dL	5.2	7.8

Test	Results	Unit	Lowest Value	Highest Value
NA	133	mEq/L	134	142
K	3.5	mEq/L	2.4	4.8
CL	96	mEq/L	95	104
HCO3	24	mEq/L	24	31
AN GAP	17	mEq/L	12	19
NA/K	38		Not Established	
BUN	17	mg/dL	10	22
CREAT	0.9	mg/dL	0.8	1.5
CA	12.1	mg/dL	10.8	12.9
P	2.8	mg/dL	2.1	4.7
MG	1.8	mEq/L	1.2	1.9
TP	7.4	g/dL	5.4	7.0
ALB	2.9	g/dL	2.9	3.6
GLOBULIN	4.5	g/dL	2.3	3.8
A/G	0.6		0.8	1.5
GLU	93	mg/dL	71	122
AST	593	U/L	222	489
SDH	5	U/L	1	6
GLDH	2	U/L	2	10
GGT	13	U/L	8	33

Case 2: Abdominal and Thoracic Ultrasound

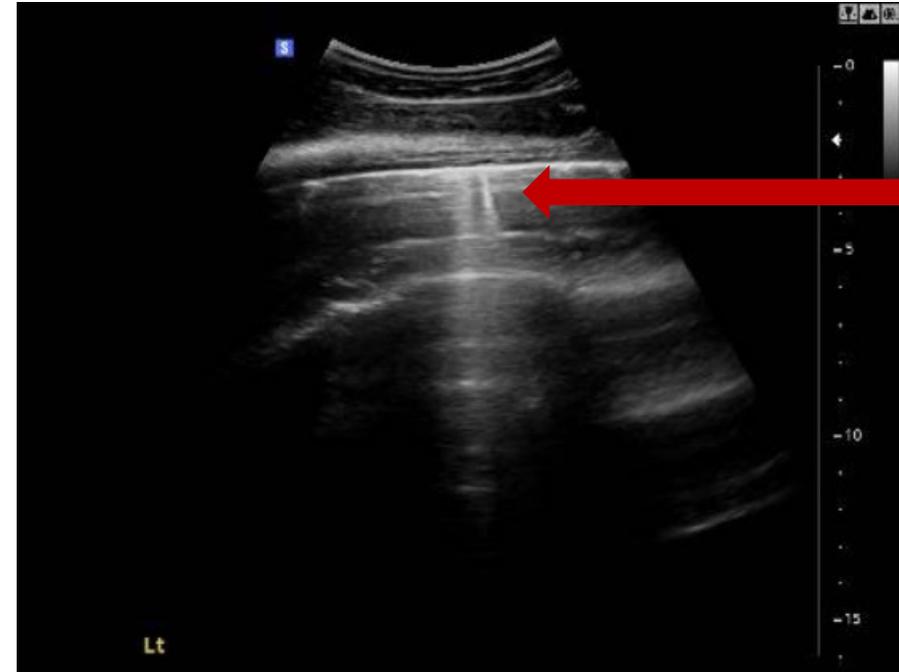
Abdominal Ultrasound

- Mild to moderate anechoic free peritoneal fluid



Thoracic Ultrasound

- Bilateral, diffuse, mild b-lines



Case 2. Abdominocentesis and Peritoneal Fluid Cytology

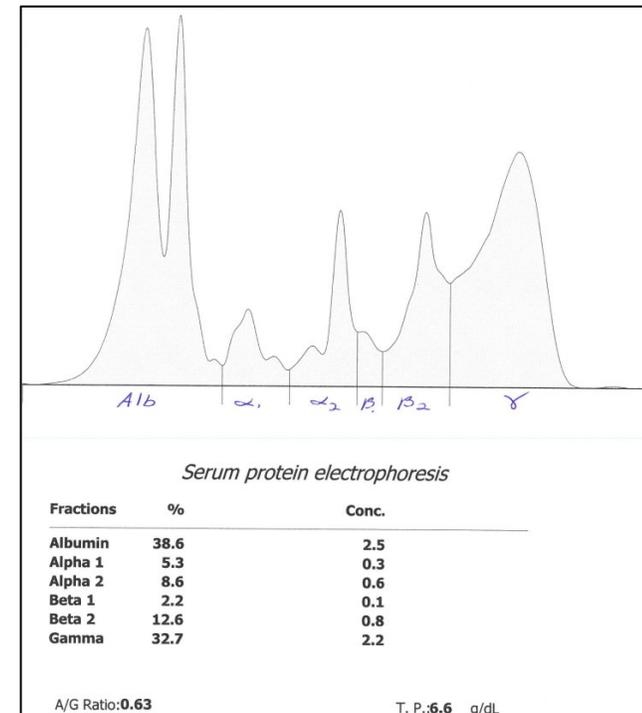
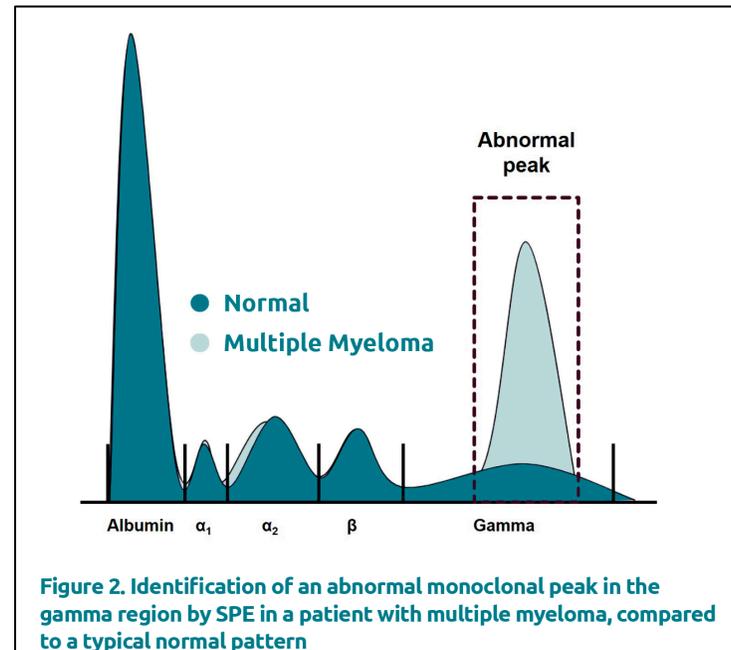
- Slightly cloudy
 - Total protein WNL (<2.5 mg/dL)
 - Nucleated cell count WNL: 600 nucleated cells/uL
 - **Rare (<1%) atypical round cells, large in size with deeply basophilic cytoplasm and occasional indistinct nucleolus**
- Low protein transudate with rare atypical round cells
- Reactive lymphocytes vs. neoplastic population

Case 2: Additional Diagnostics

Protein electrophoresis

- Investigate monoclonal gammopathy associated with some neoplastic conditions
- Result – polyclonal gammopathy indicative of infectious or immune-mediated process
 - **Can not rule out neoplasia**

Right: Example of abnormal peak in multiple myeloma



Left: Case 2 results

Case 2: Additional diagnostics and outcome

- Rectal mucosal biopsy performed – not indicative of IBD or lymphoma
- Bone marrow aspirate – inadequate hematopoiesis, inconclusive
- Plan: Dexamethasone taper prescribed for presumed neoplastic process
 - No response at home, continued to lose weight and become weaker
 - Euthanized and necropsy performed
- **Diagnosis: Aleukemic T-cell leukemia**
 - t-cell lymphocytes with blastic morphologies appreciated within the splenic, pulmonary, renal circulation as well as within bone marrow

Case 3: 18yo Tennessee Walking Horse gelding

History

- Fever and inappetence 2 weeks prior, treated with tetracycline
 - Presumed *A. phagocytophilum* infection
- Fever waxed and waned while on antibiotics with continued inappetence
- No travel in years, otherwise healthy and receives routine wellness care

Presenting complaint

Persistent fever and inappetence despite antibiotics of 2wk duration

Case 3: Physical Exam

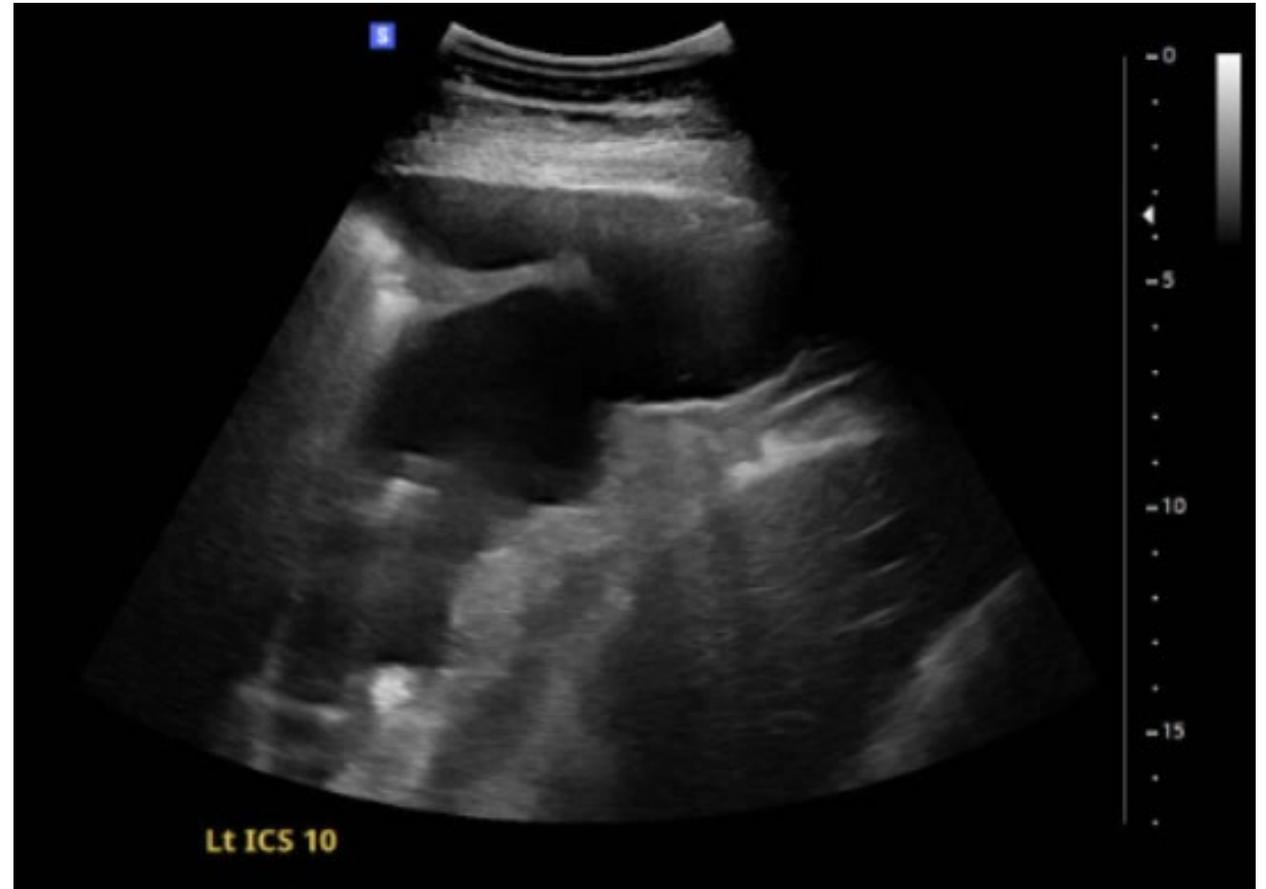
- Temp 99F, HR 60 bpm, RR 40 bpm
 - Flunixin given by owner prior to exam
- Ventral pitting edema below thorax
- Increased abdominal effort on expiration
- Serous nasal discharge
- Bronchovesicular sounds:
 - Decreased ventrally bilaterally
 - Increased dorsally bilaterally



Case 3. Bloodwork

WBC	5.3		5.2 - 10.1	
Segmented Neutrophils	3.2		2.7 - 6.6	
Band Neutrophils	1.5	(H)	0.0 - 0.1	
Lymphocytes	0.5	(L)	1.2 - 4.9	
Monocytes	0.2		0.0 - 0.6	
Eosinophils	0.0		0.0 - 1.2	
Basophils	0.0		0.0 - 0.2	
Platelet Count	231		94 - 232	
MPV	5.9		5.3 - 8.4	
Platelet Smear Estimation	Adequate			
Total Protein	7.8	(H)	5.4 - 7.0	g/dL
Albumin	1.8	(L)	2.9 - 3.6	g/dL
Globulin	6.0	(H)	2.3 - 3.8	g/dL
A/G Ratio	0.3	(L)	0.8 - 1.5	

Case 3. Thoracic Ultrasound



Case 3. Pleural Fluid Culture and Cytology

Culture

- *Streptococcus equi* subsp. *zooepidemicus*

Cytology

- Highly suspicious for a neoplastic process
- Low numbers of individualized medium to **large blue round cells** with rare aggregates of 2-3 cells.
- **Sightly blebbing nuclei** with coarsely clumped chromatin and deep blue cytoplasm
- **Rare mitotic cells** and aberrant **mitotic figures**



Case 3. Clinical Progression

- Owner elected to treat bacterial pleuropneumonia
- Despite resolution of infection, horse continued to lose weight and pleural effusion persisted
- Necropsy
 - **Mesothelioma**
 - Streptococcus equi subsp. zooepidemicus-induced fibrinous pleuropneumonia

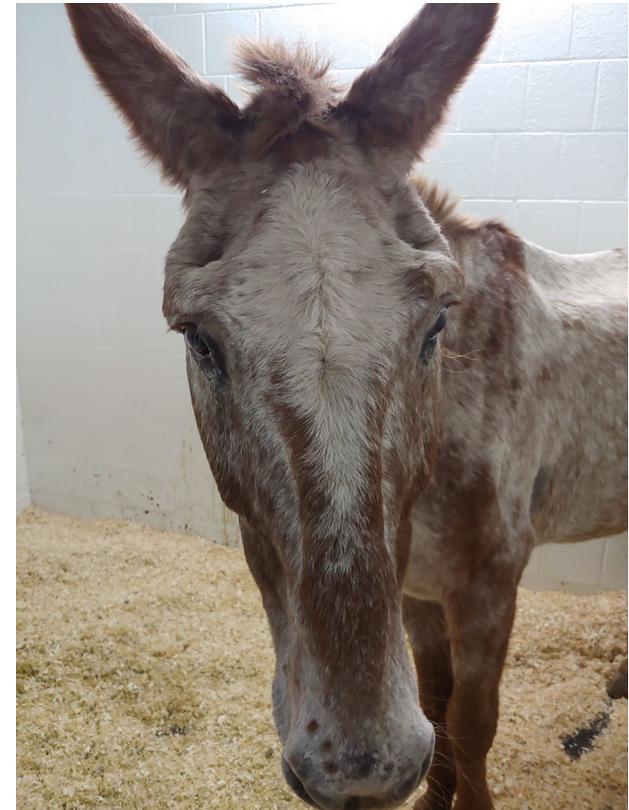


Case 4: 20+ year old mule gelding

Rescued 3 months prior to presentation

Presenting complaints

- Thin body condition despite polyphagia
- Mass in region of throat latch



Physical Exam

- BAR but restless
- BCS 2/9
- Tachycardic (60 bpm)
- V/VI pansystolic heart murmur
 - Region of mitral valve
- Enlarged thyroid glands
 - L>R
 - Firm, round, asymmetric masses
- Severe dental disease
 - Significant wear
 - Missing cheek teeth



Case 4: Thyroid Evaluation

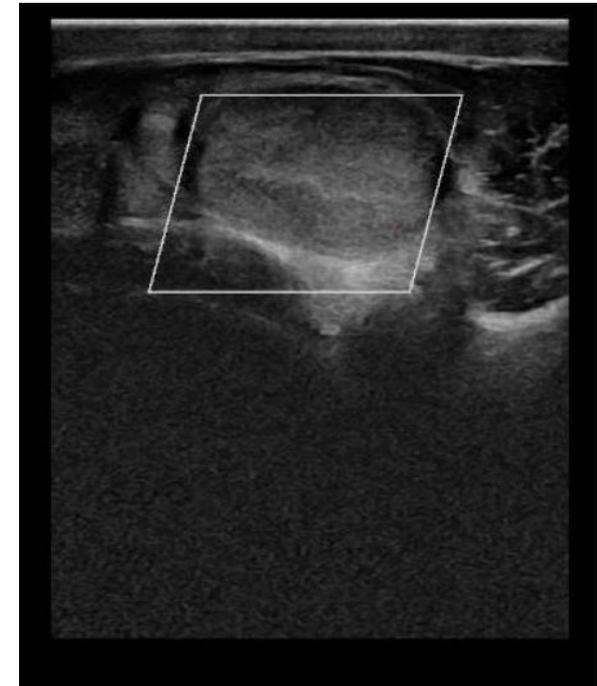
Thyroid Panel

- Free T4 7.22 ng/dL (Ref. 1.2-1.8)
- T3 289 ng/dL (Ref. 30-80)
- T4 6.7 ng/dL (Ref. 1-3)

Thyroid Ultrasound



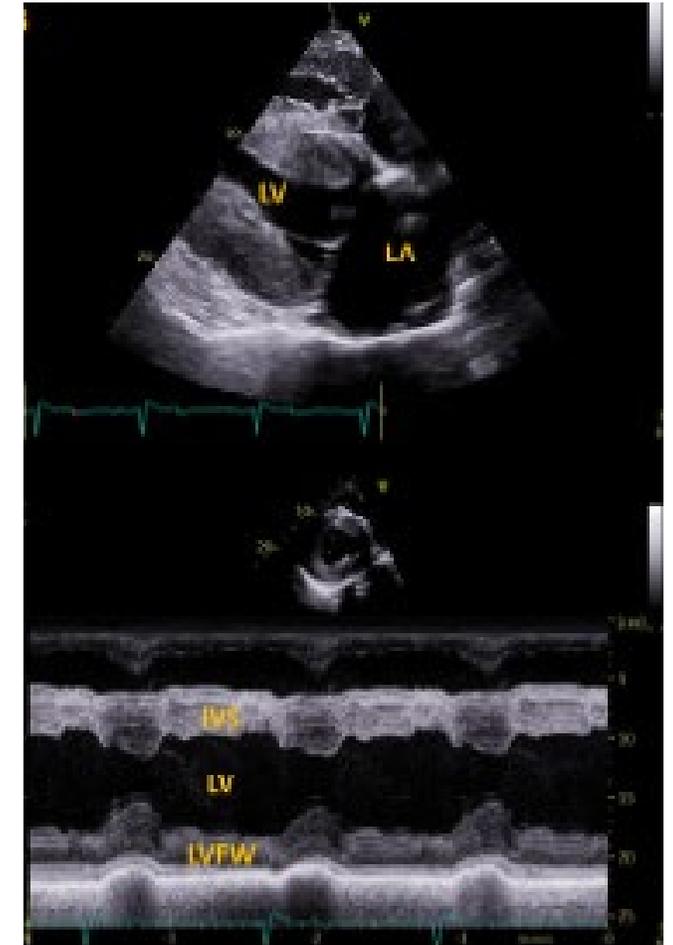
Left



Right

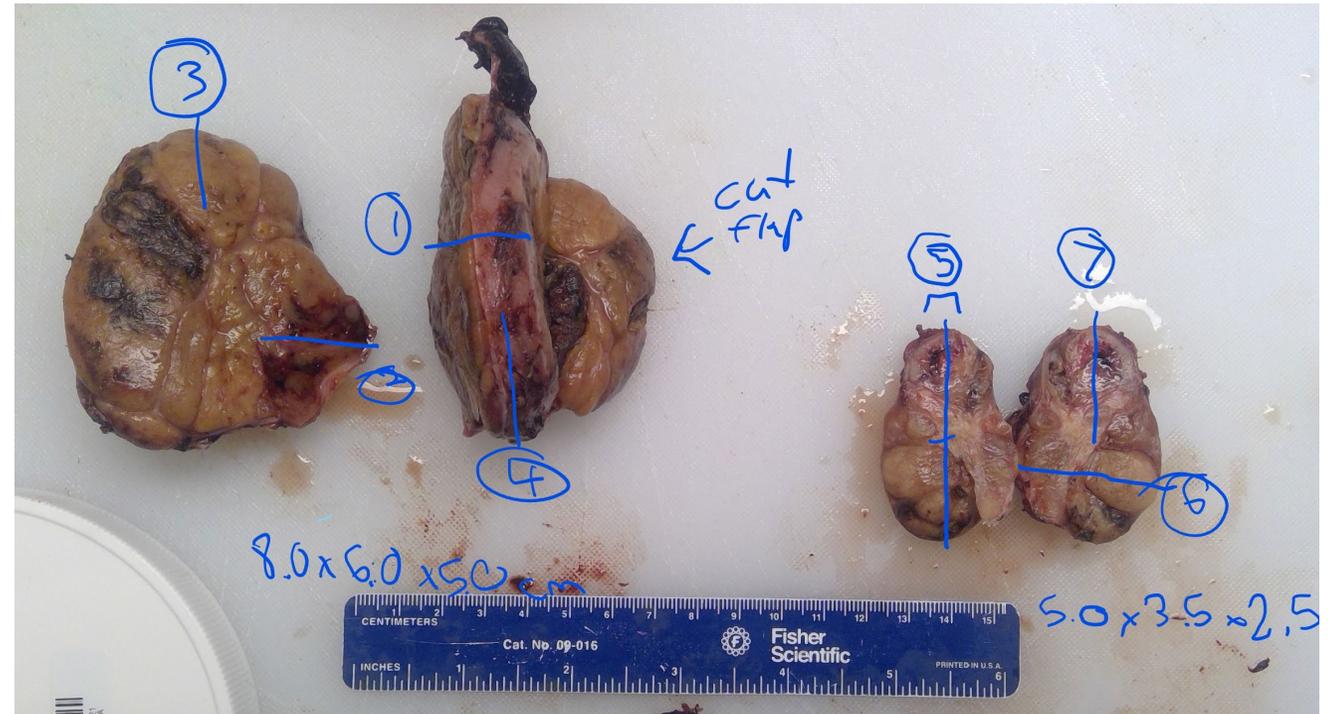
Case 4: Cardiac Evaluation

- Persistent mild tachycardia (54-60bpm)
- Left ventricular concentric hypertrophy
- Subjective right ventricular hypertrophy
- Murmur due to turbulent flow
 - No valvular regurgitation



Case 4: Thyroidectomy

- Performed under standing sedation
- Thyroid mass very carefully exteriorized and important vasculature ligated
- Auto-implantation of the left parathyroid gland



Thyroid panel

	Pre-op	1 day post-op	3 days post-op	14 days post-op
Free T4 (1.2-1.8 ng/dL)	7.22 ng/dL	4.28 ng/dL	0.62 ng/dL	<0.15 ng/dL
T3 (30-80 ng/dL)	289 ng/dL	43.8 ng/dL	43.5 ng/dL	<10.0 ng/dL
T4 (1-3 ug/dL)	6.7 ug/dL	3.4 ug/dL	0.451 ug/dL	<0.05 ug/dL

Chemistry

	Pre-op	1 day post-op	3 days post-op	6 days post-op
Calcium (10.8-12.9 mg/dL)	12.5 mg/dL	11.9 mg/dL	13.3 mg/dL	11.9 mg/dL
Phosphate (2.1-4.7 mg/dL)	3.0 mg/dL	1.7 mg/dL	1.9 mg/dL	2.6 mg/dL

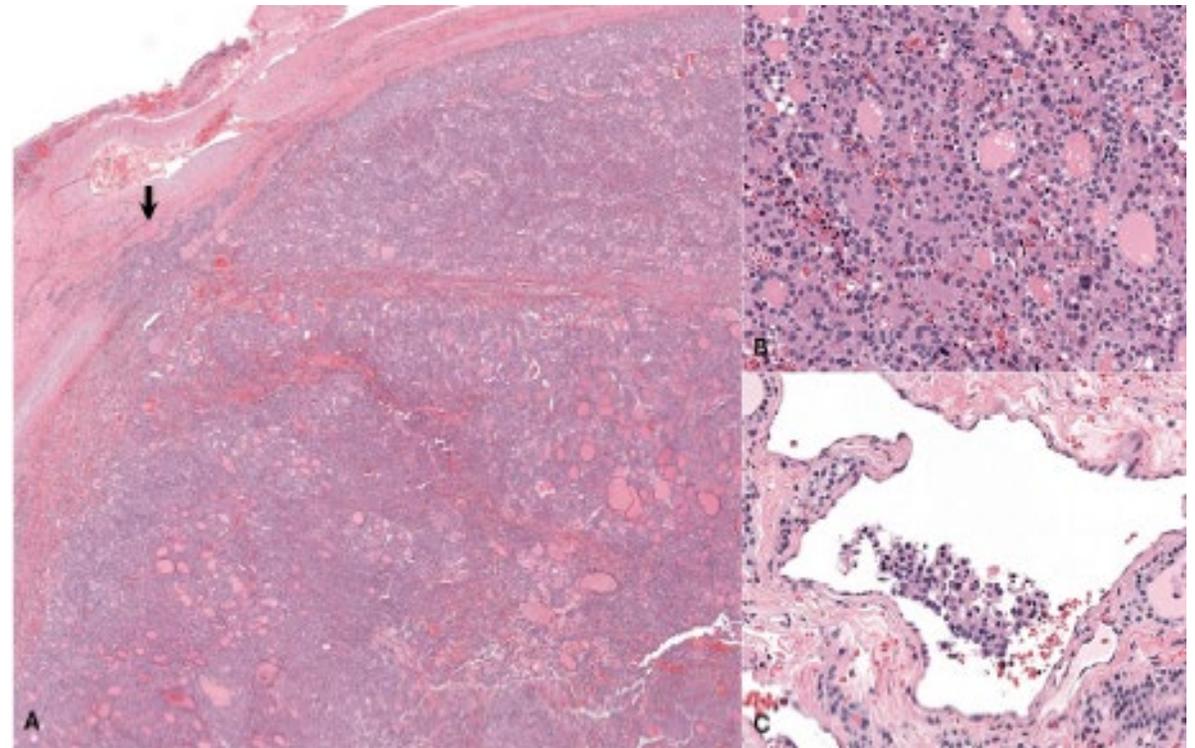
Ionized calcium (1.4-1.72 mmol/L)

Pre-op	18h post-op	24h post-op	2d post-op	3d post-op	6d post-op
1.78 mmol/L	1.65 mmol/L	1.68 mmol/L	1.80 mmol/L	1.81 mmol/L	1.68 mmol/L

Case 4: Histopathology of left thyroid gland

Adenocarcinoma

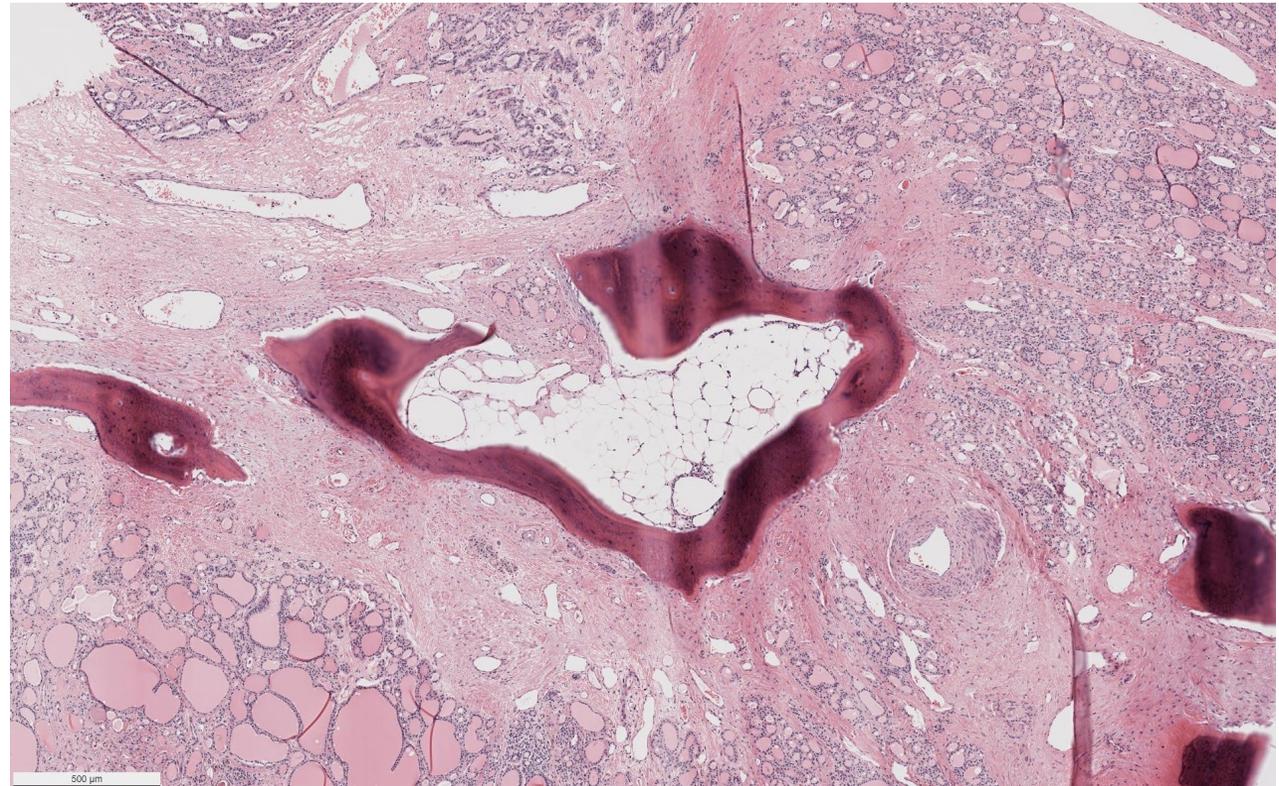
- Neoplastic cell invasion of capsule, lymphatics, and vasculature
- Anaplastic cells with anisokaryosis



Case 4: Histopathology of right thyroid gland

Multiple adenomas

- Neoplastic nodules that do not invade capsule or vasculature
- Osseous metaplasia



Case 4: Follow-up

- Requires life-long Thyro-L supplementation
- Polyphagia resolved, gained weight
 - Did not reach ideal weight
 - PPID diagnosed ~1y after thyroidectomy



Case 4: Follow-up

- Rare case!
- Recheck echo at 2 years post-op
 - Normal heart rate
 - Improved left ventricular wall thickening
 - Smaller left atrial dimensions



Case Report

Cardiac Disease Related to Primary Hyperthyroidism in a 20-Year-Old Mule

Kaitlin Brown ¹, Elizabeth Williams Louie ¹, Toby Pinn-Woodcock ¹, Erin Pearson ¹, Garrett B. Pearson ¹, Jacqueline Marr ², Eileen S. Hackett ¹, Laura Rath Brown ³ and Katharyn J. Mitchell ^{1,*}



Thank you!

Any Questions?

tlp52@cornell.edu

