

I mezzi di contrasto  
nelle patologie urinarie:  
perché non possiamo  
farne a meno



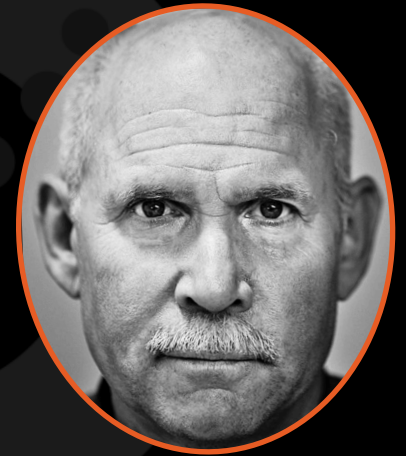
Diagnostic Mindset



Giliola Spattini  
DVM, PhD, DECVDI

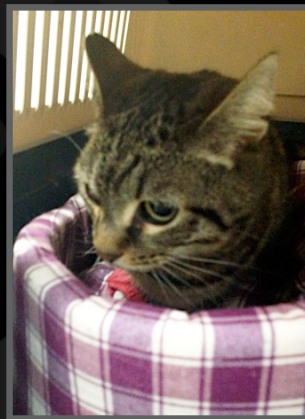
## Objectives

- Radiographic contrast studies are the best modalities to assess urinary system rupture and function
- It is an easy and safe procedure



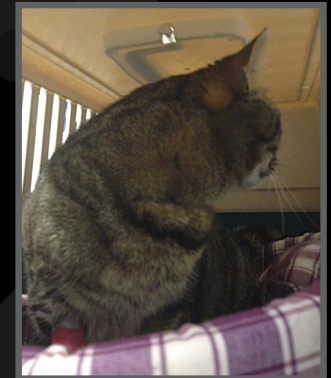
## Mimi, DSH, FS, 4 years

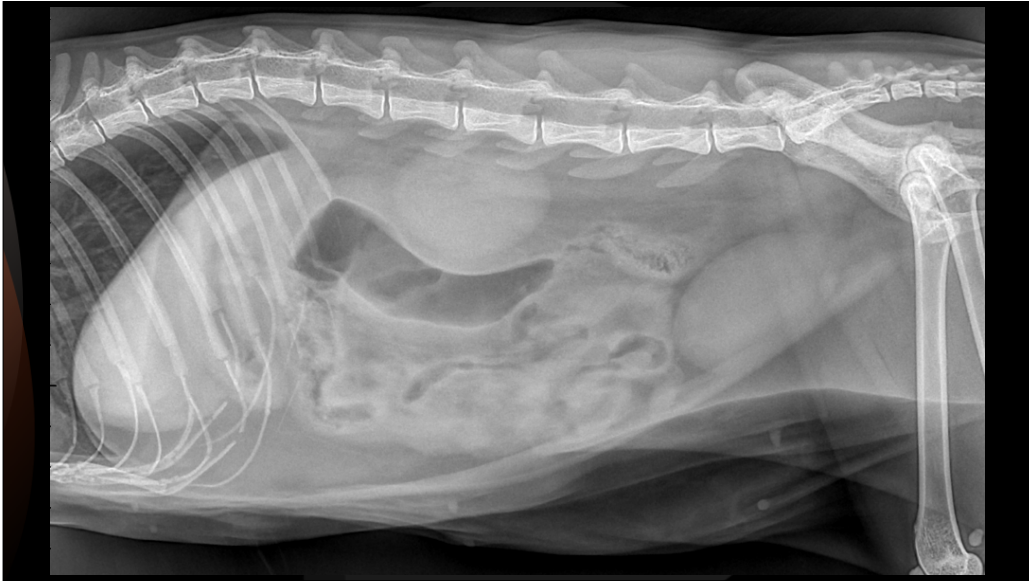
- Stuck in the electric gate two days ago
- Now reluctant to move
- Anorexic



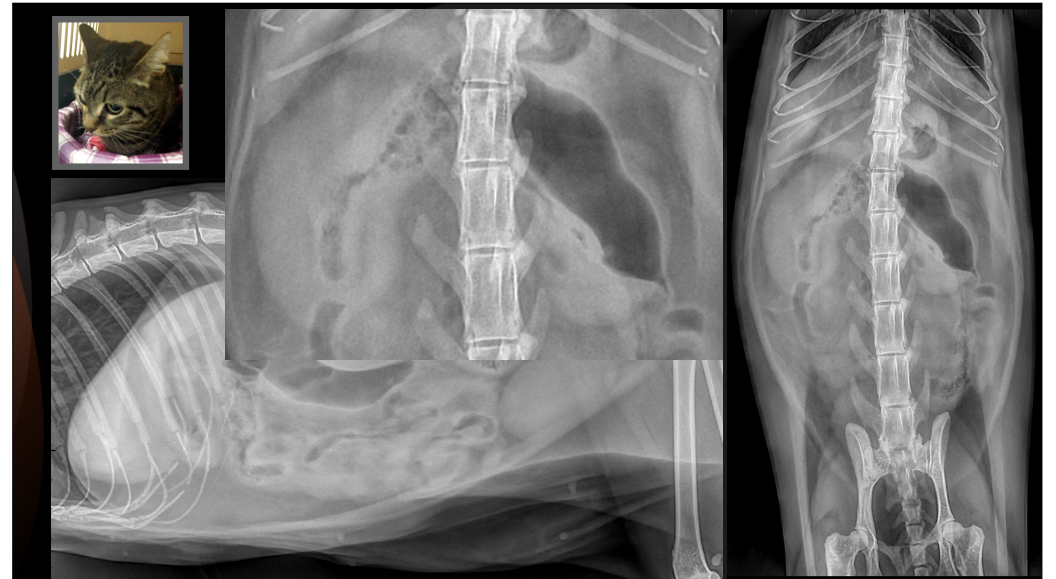
## Mimi, DSH, FS, 4 years

- Abdominal pain
- Bun 69 (20-65), Crea 2,0 (0,7-1,6)
- The rest of the blood works unremarkable
- A-Fast not possible due to temper



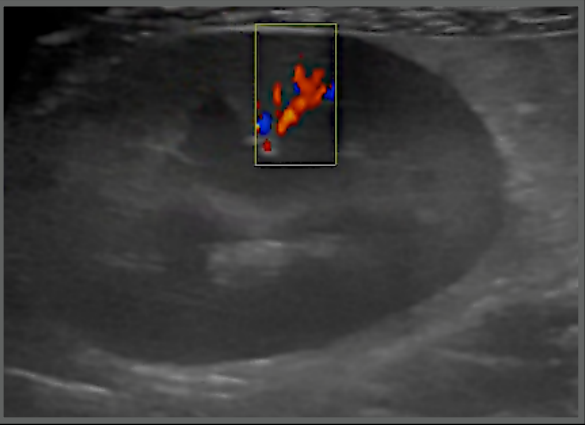
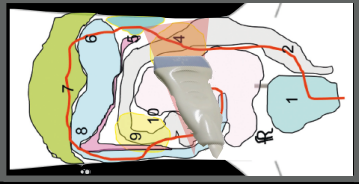



Your evaluation?



Mimi, FS, 4 years


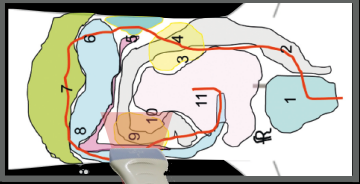
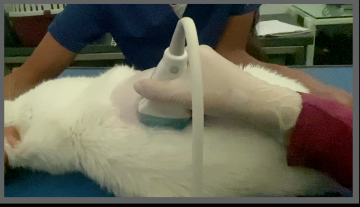
Another patient, to show the position of the probe

4

Mimi, FS, 4 years

Another patient, to show the position of the probe

9

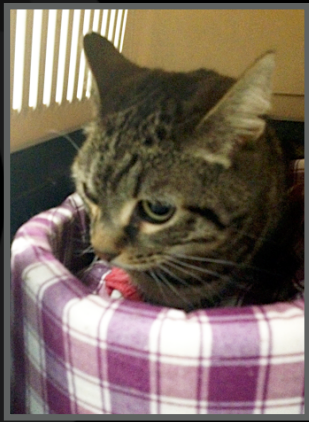
Mimi, DSH, FS, 4 years

Ultrasonographic diagnoses:

- Altered shape of the cranial pole of the right kidney
- Scattering artifact surrounding the right kidney
- Mild peri-renal effusion of the right kidney

Conclusions:

- Suspected right renal partial rupture



Mimi, DSH, FS, 4 years

Two days later

- Bun 25 (20-65), Crea 1,0 (0,7-1,6)
- Reduced abdominal pain (under treatment)
- Persistent anorexia





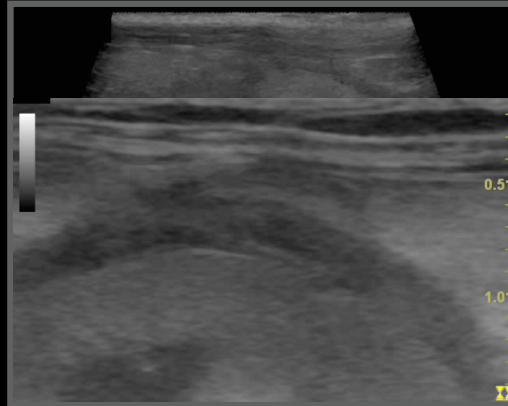
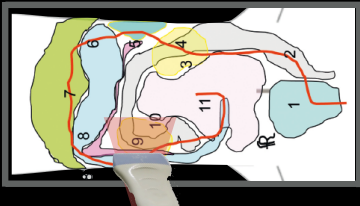
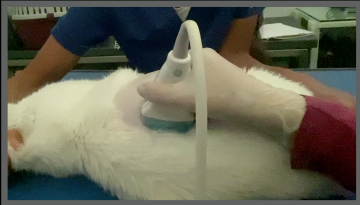
### Mimi, FS, 4 years

Two days later



9

Another patient, to show the position of the probe



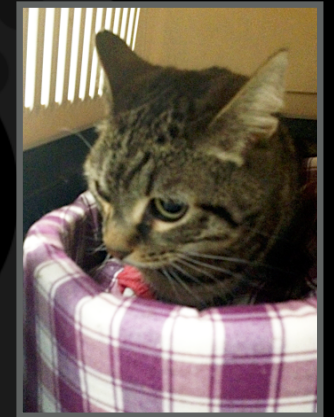
### Mimi, DSH, FS, 4 years

#### Ultrasonographic diagnoses:

- Worsening altered shape of the cranial pole of the right kidney
- Worsening scattering artifact surrounding the right kidney
- Mild peri-renal effusion of the right kidney
- Decreased vascularisation

#### Conclusions:

- Suspected right renal necrosis

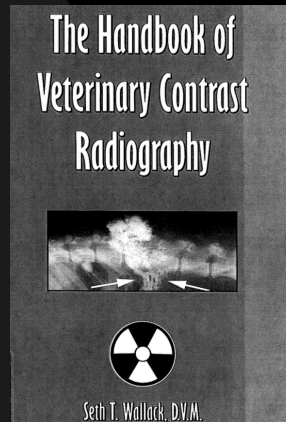


### Intra-venous pyelography

Iohexolo 200 / 300 / 370 mgI/ml

Iopamiro 200 / 300 / 370 mgI/ml

- 880 mgI/kg given as a **rapid bolus**
- Put one or two **large** IV catheters
- **Warm** the contrast medium



### Intra-venous pyelography

- Fasten the patient for 24 hours
- Consider enema if colon is full
- Native, at least two projections



## Intra-venous pyelography

- Anesthesia - Analgesia
- Collect sterile urine before contrast
- Catheterise the UB and inject negative contrast for ectopic ureters



## Intra-venous pyelography 1

- VD 5" after injection to check renal arteries
- RLR 5" to check the aorta



## Intra-venous pyelography 1



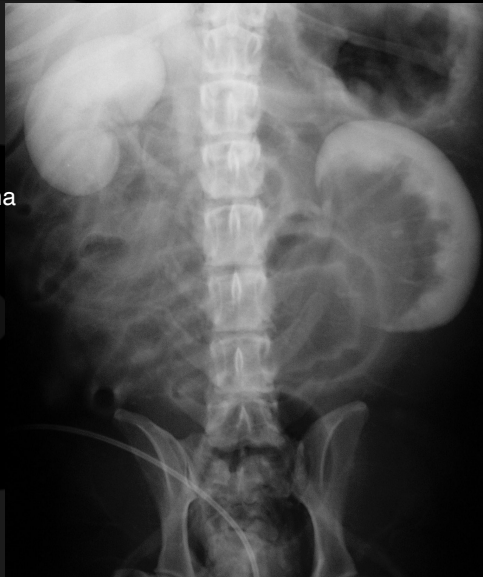
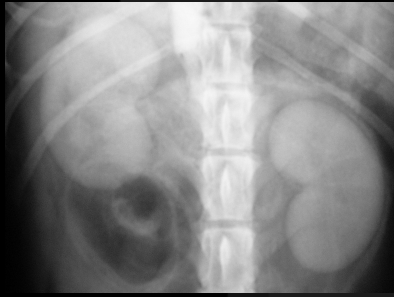
## What happened?



## Intra-venous pyelography

2

- VD 20" after injection to check renal parenchyma



## Intra-venous pyelography

3

- VD 1,5-3' after injection to check renal pelvis and ureters
- RLR 1,5-3' after injection to check renal pelvis and ureters



## Intra-venous pyelography

4

- RLR 1,5-3' after injection to check renal pelvis and ureters



## Intra-venous pyelography

5

- VD, obliques, and RLR 10 minutes after contrast to check ureters and UB

6



## Intra-venous pyelography

- VD, obliques, and RLR 10 minutes after contrast to check ureters and UB

7



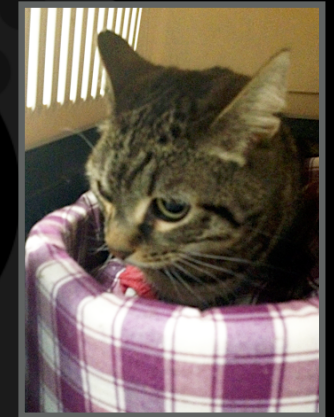
## Mimi, DSH, FS, 4 years

### Ultrasonographic diagnoses:

- Worsening altered shape of the cranial pole of the right kidney
- Worsening scattering artifact surrounding the right kidney
- Mild peri-renal effusion of the right kidney
- Decreased vascularisation

### Conclusions:

- Suspected right renal necrosis



1

Mimi, FS, 4 years

VD 5'



2

VD 20'



3

Mimi, FS, 4 years

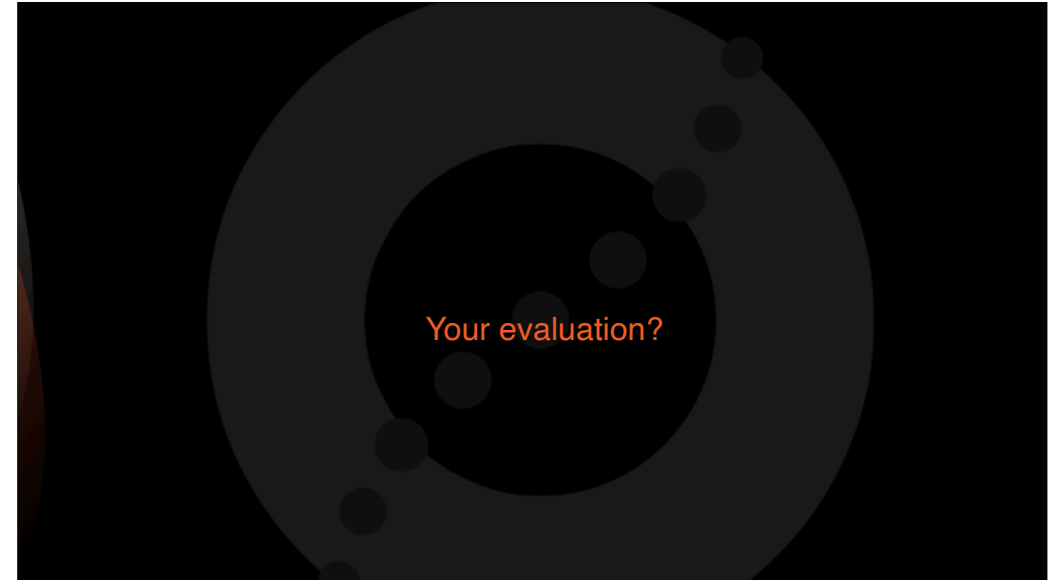
VD 5'



5

VD 10'





Mimi, DSH, FS, 4 years

Radiographic diagnoses:

- Suspected necrosis of the right kidney
- Absent vascularisation and function

Conclusions:

- Right nephrectomy performed
- Discharged two days later
- Doing fine with one kidney

Olivia, Persian, FS, 8 years

- Brought to vaccination: "Because she is not eating well lately"
- A large abdominal mass palpated
- Agreed to lab works and abdominal US

**Olivia, FS, 8 year**

Blood works



RBC (milioni /μL):	4.59	6.35	9.50	Acantociti:	+	Elipociti:	
HGB (g/dL):	8.50	9.6	14.3	Anisocitosi:	+	Ipcromia:	
HCT (%):	21	28.0	42.5	Agglutinazione:		Macroцитi:	
MCV (fL):	43.4	38.0	49.5	Codociti:		Microцитi:	
MCH (pg):	15.2	12.6	16.0	Cheratociti:		Parassiti eritrocitari:	
MCHC (g/dL):	35.1	31.0	35.0	Cnizociti:		Policromasia:	
CH (pg):		12.0	15.5	Corpi di Heinz:		Punteggiature basofille:	
CHDW (pg):		1.70	2.70	Corpi di Howell-Jolly:		Roureaux:	
RDW (%):	16.6	14.2	17.4	Cristalli di Hb:		Schistociti:	
HDW (g/dL):		1.60	2.50	Drepanociti:		Selenociti:	
NRBC/100 WBC:	0	0	0	Eccentricociti:		Stomatociti:	
				Echinociti:		Torociti:	
<b>Varie RBC:</b>							
WBC (x 1000 /μL):	15.2	5.0	11.0	Linfociti attivati:			
Conta corr. WBC (x 1000 /μL):		5.0	11.0	Linfociti atipici:			
Mielociti (μL):	0	0	0	Neutrofili tossici:			
Metamielociti (μL):	0	0	0	Corpi di Doehle:			
Neutrofili banda (μL):	152	0	300	Schiumosità citopl.:			
Neutrofili segmentati (μL):	9120	2500	7000	Vacuolizzazione citopl.:			
Linfociti (μL):	4104	1300	5500	Basofilia citopl.:			
Monociti (μL):	1216	65	250	Granuli tossici:			
Eosinofili (μL):	152	70	800	Neutrofili giganti:			
Basofili (μL):	0	0	110	Macropoliciti:			
Danneggiate (μL):	0	0	0				
Indifferenziate (μL):	608	0	0				
Altre (μL):	0	0	0				
<b>Varie WBC:</b>							
PLT (1000 /μL):	176	130	430	Stima PLT:	ADEG: <input type="checkbox"/> INADEG: <input type="checkbox"/> AUMENT: <input checked="" type="checkbox"/>		
MPV (fL):	11.7	7.9	17.5	Varie:	Plastrine attivate: <input type="checkbox"/> Macroplastrine: <input type="checkbox"/>		
PCT (%):	0.206	0.20	0.50		Plastrine allungate: <input type="checkbox"/> Inclusi plastrinici: <input type="checkbox"/>		
PDW (%):	15.3	55.0	70.0	Note:			
MPC (g/dL):		17.0	28.0				

**Olivia, FS, 8 year**

Blood works

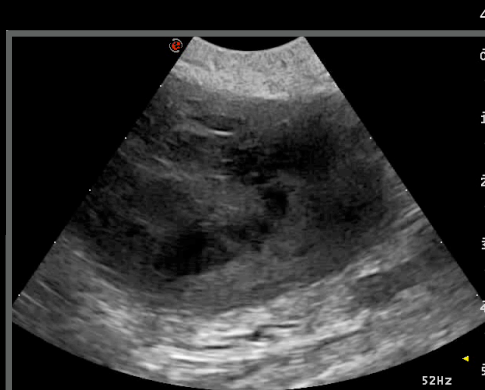
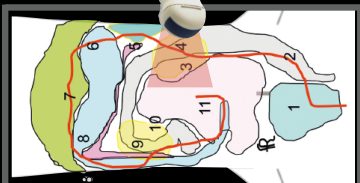
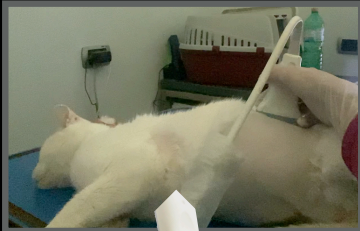


CPK (IU/L):	327	40-150
AST (IU/L):	55	20-60
ALT (IU/L):	302	15-50
ALP (IU/L):	2632	10-70
GGT (IU/L):	6.9	1.5-12
Colinesterasi (IU/L):		1955-3950
Bilirubina Totale (mg/dL):	1.52	0.1-0.5
Proteine Totali (g/dL):	8.1	5.8-8
Albumine (g/dL):	3.7	2.5-4.0
Globuline (g/dL):	4.4	2.8-5.5
Rapporto A/G:	0.84	0.4-1.3
Colesterolo (mg/dL):	277	70-200
Trigliceridi (mg/dL):	80	30-100
AMILASI (IU/L):	1105	350-1800
Urea (mg/dL):	425	20-65
Creatinina (mg/dL):	8.23	0.7-1.6
Glucosio (mg/dL):	98	80-145
Calcio (mg/dL):	9.9	8.0-11.2
Fosforo (mg/dL):	9.5	2.6-5.0
Magnesio (mg/dL):		0.81-1.05
Sodio (mEq/L):	150	141-155
Potassio (mEq/L):	4.5	3.0-5.5
Rapporto Na/K:	33.3	31-43
Cloro (mEq/L):	114	110-130
Cloro corretto (mEq/L):	118.6	112-119
HCO-3 (mmol/L):		12.0-22.5
Divario Anionico:		-
Osmol. sier. calc. (mOsm):	308	285-296
Ferro totale (μg/dL):	96	110-170

Haemolysis (?)  
Hepatopathy (?)  
Nephropathy

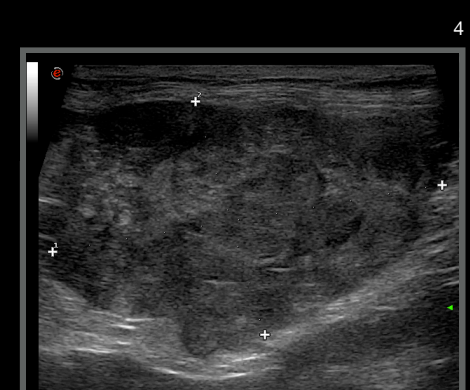
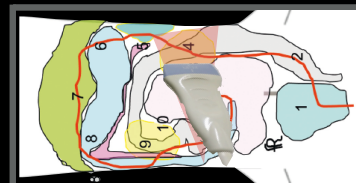
**Olivia, FS, 8 years**

Another patient, to show the position of the probe



**Olivia, FS, 8 years**

Another patient, to show the position of the probe



Olivia, Persian, FS, 8 years

Ultrasonographic diagnoses:

- Enlarged, severely altered left kidney
- Relatively unremarkable right kidney

Conclusions:

- Strongly suspected left renal neoplasia

What next?



Olivia, Persian, FS, 8 years

- Two days of intensive care
- Clinically improved and She is eating
- BUN 397 (425)
- Crea 8,50 (8,23)



What next?

Olivia, FS, 8 years



Olivia, FS, 8 years



Your evaluation?

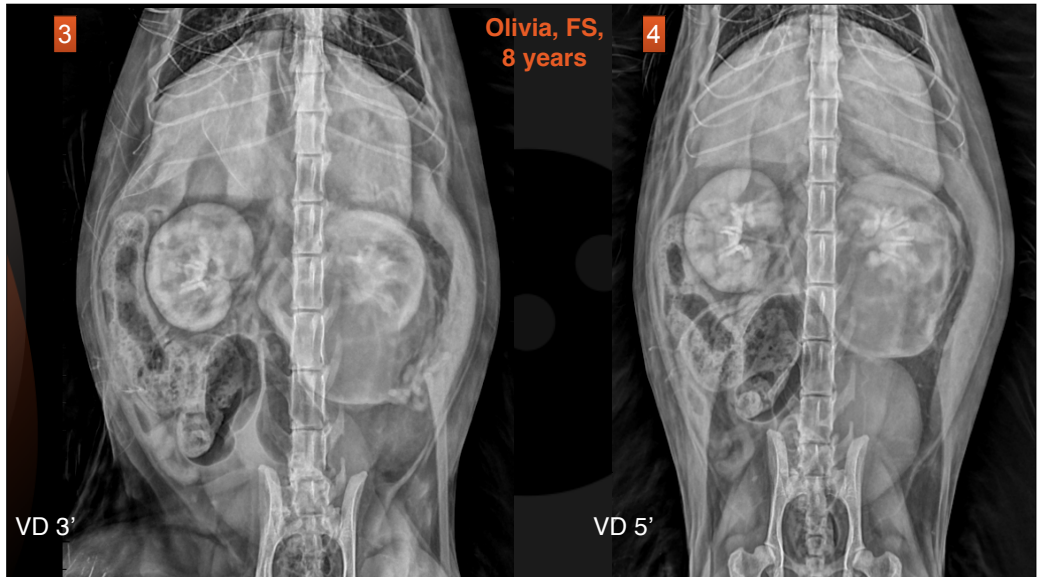
Would you perform an IVP in a hyper-azotemic patient?

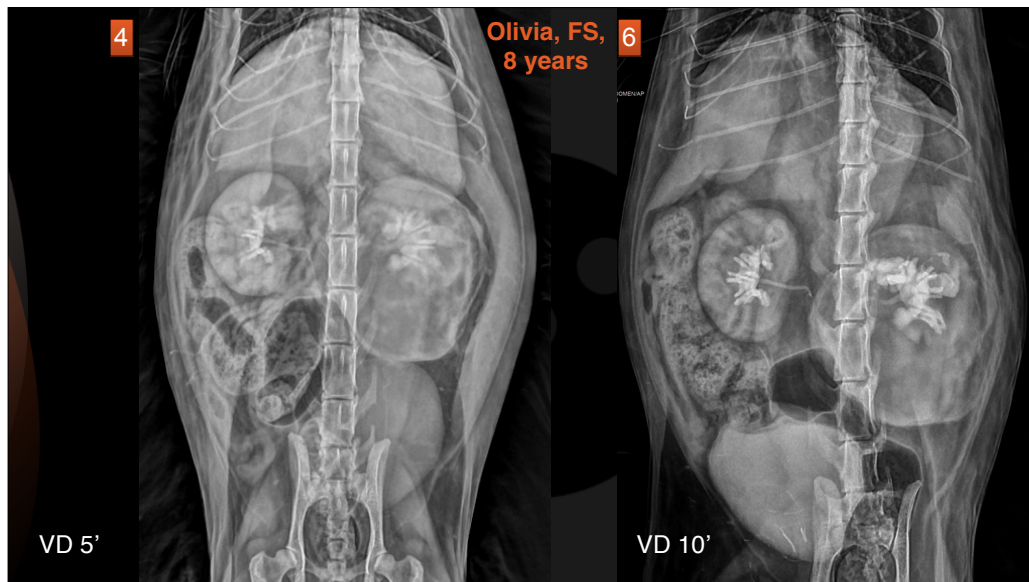
- 1) Yes
- 2) No
- 3) Yes, after hydration and check of the systemic pressure
- 4) Yes but I will inform the owner that the patient will die



When to perform an IVP?

- Suspected urinary apparatus rupture
- Suspected oliguric / anuric patients
- To check if the kidneys are functioning
- Ectopic ureters / urachus...





Olivia, Persian, FS, 8 years

Radiographic diagnoses:

- Enlarged, severely altered left kidney
- Functioning left kidney



What next?

Olivia, Persian, FS, 8 years

- Renal cytology results: adenocarcinoma
- Nephrectomy not performed
- Survived 22 months, died of severe chronic renal failure, no metastasis



Pepper, Labrador, FI, 1 year

- Smell of urine
- When on the back drop urine from the vagina
- Requested abdominal US, lab works pending

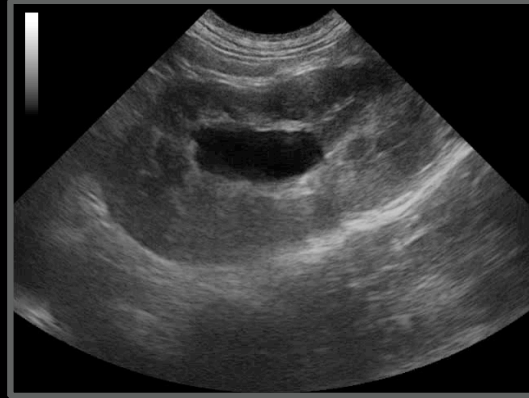
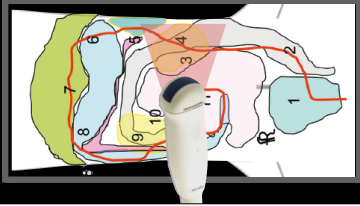


Pepper, FI, 1 year



4

Another patient, to show the position of the probe

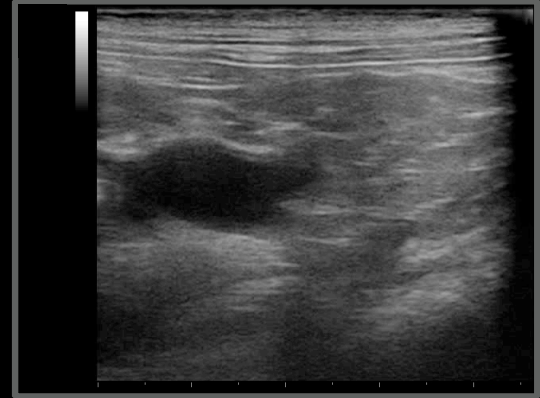
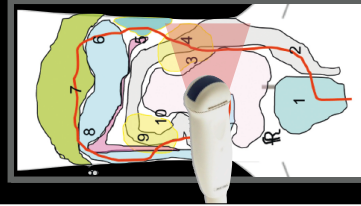


Pepper, FI, 1 year



4

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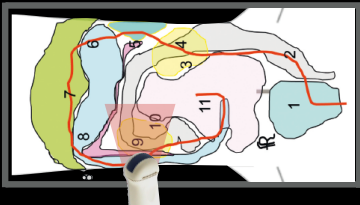


Pepper, FI, 1 year



9

Another patient, to show the position of the probe

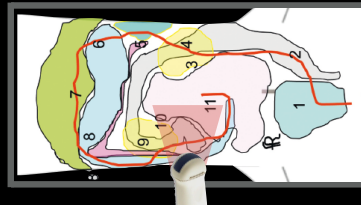


Pepper, FI, 1 year



9

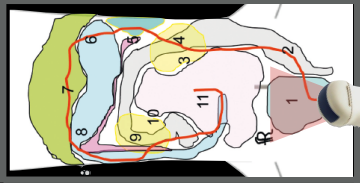
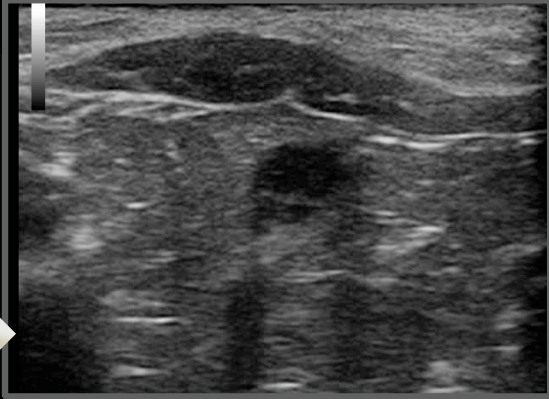
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Pepper, FI, 1 year



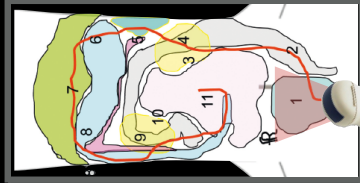
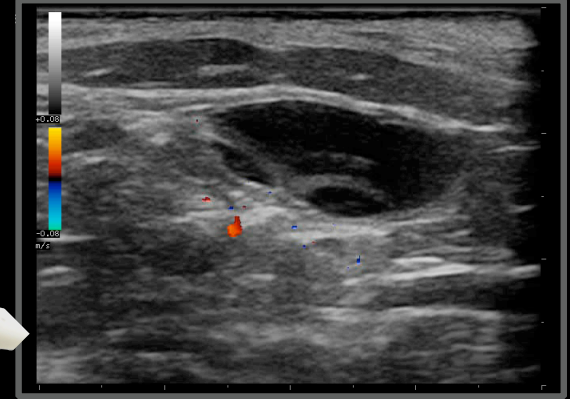
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Pepper, FI, 1 year



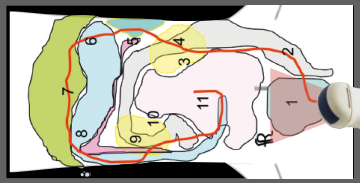
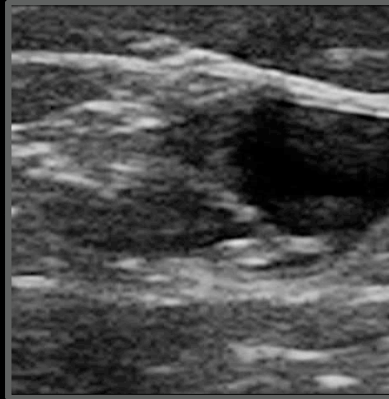
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Pepper, FI, 1 year



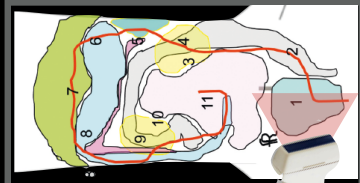
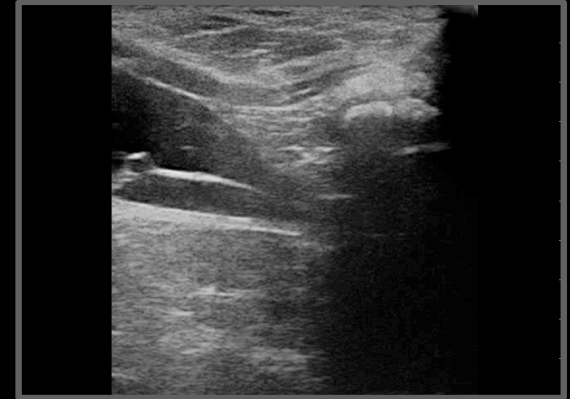
Another patient, to show the position of the probe



Pepper, FI, 1 year



Another patient, to show the position of the probe



Your evaluation?

### Ultrasonography as a sensitive and specific diagnostic modality for the detection of ectopic ureters in urinary incontinent dogs

*Vet Radiol Ultrasound*. 2022;63:328-336.

Oliver Taylor<sup>1</sup> | Rebekah Knight<sup>2</sup> | Marie-Aude Genain<sup>2</sup> | Laura Owen<sup>2</sup>

ities. Ultrasonographic findings were compared with those from cystoscopic examination to determine diagnostic accuracy. The relationship between the presence of at  $P \leq 0.05$ . Ultrasonography had a sensitivity of 93.5%, specificity of 100%, and diagnostic accuracy of 95% when identifying dogs with ureteral ectopia. When classifying individual ureters as ectopic or non-ectopic, sensitivity was 87.8% and specificity was 86.7%. Dogs with ureteral ectopia had significantly more concurrent urinary tract abnormalities on ultrasound than unaffected dogs ( $P = 0.004$ ). Ectopic ureters were associated with significantly more concurrent ipsilateral upper urinary tract ultrasonographic abnormalities than unaffected ureters ( $P < 0.001$ ). Ultrasonography performed by an experienced ultrasonographer is a sensitive and specific screening tool for canine ureteral ectopia, which eliminates the need for heavy sedation, general anesthesia, and advanced imaging, although it should not be relied upon as the sole diagnostic modality for the assessment of individual ureters.

### Ectopic ureters

CT

Endoscopy

Rad + contr



*J Vet Intern Med* 2009;18:271-281  
**Digital Fluoroscopic Excretory Urography, Digital Fluoroscopic Urethrography, Helical Computed Tomography, and Cystoscopy in 24 Dogs with Suspected Ureteral Ectopia**

Valerie F. Samii, Mary A. McLoughlin, John S. Mattson, Wm. Tod Drost, Dennis J. Chew, Stephen P. DiBartola, and Stacy Hoshaw-Woodard



Pepper, FI, 1 year

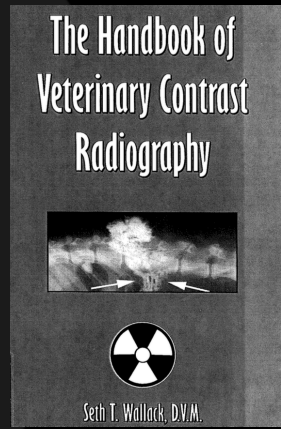


RLR 40'



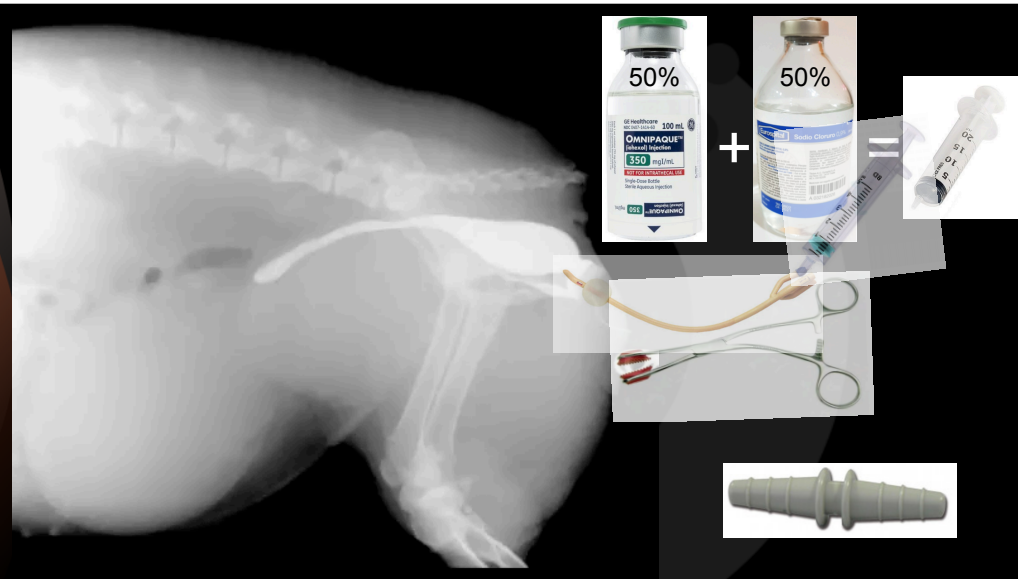
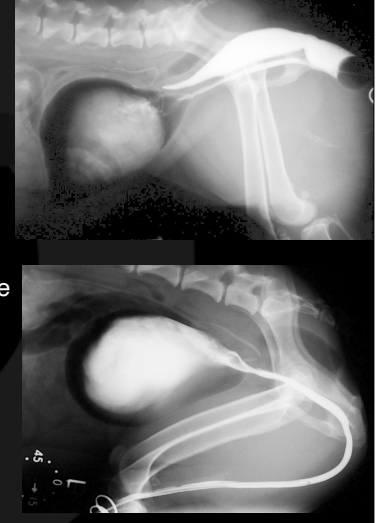
## Ascending urethrography

- Heavy sedation or anesthesia
- Obtain survey radiographs, two or more
- Dilute the contrast 30-50% with saline



## Ascending urethrography

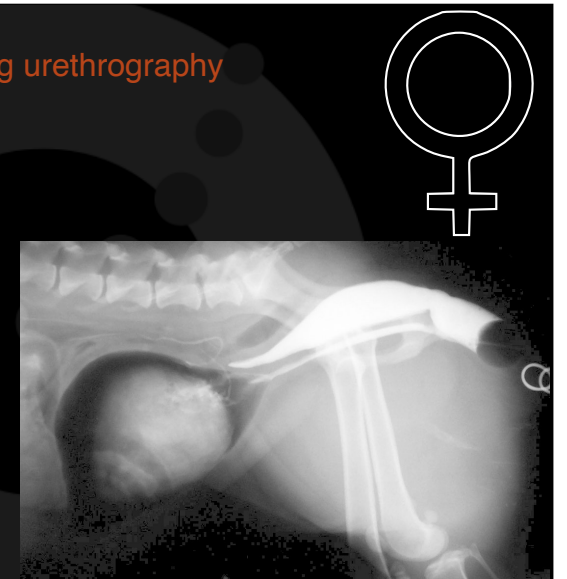
- Put a foley on the vaginal vestibule or distal urethra
- Close the vaginal labias / penis to avoid contrast leakage



## Ascending urethrography

- Cats 15 ml
- Small dog 30 ml
- Middle dog 45 ml
- Large dog 90 ml

Take images during last third portion of the injection

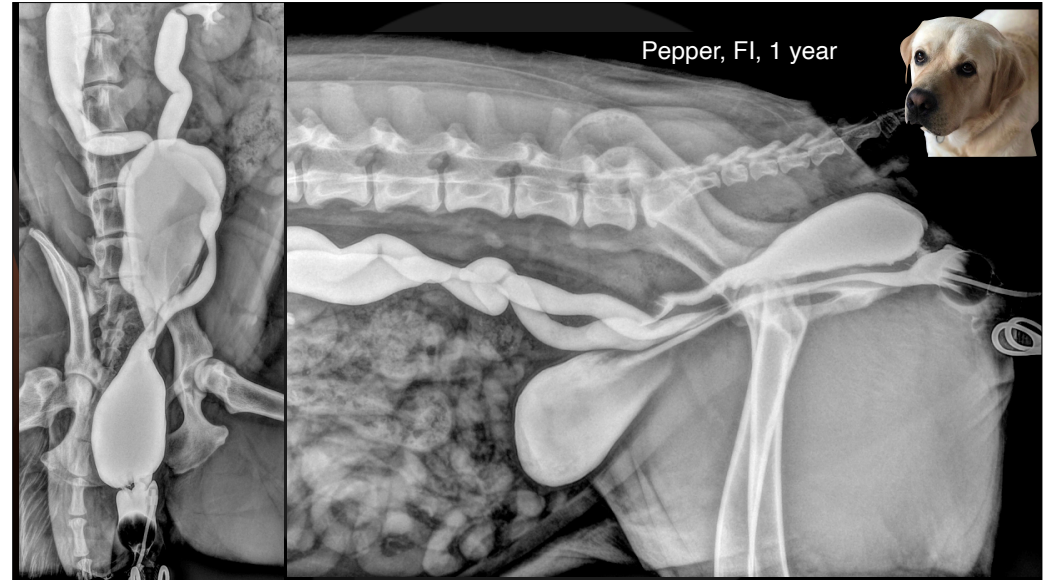
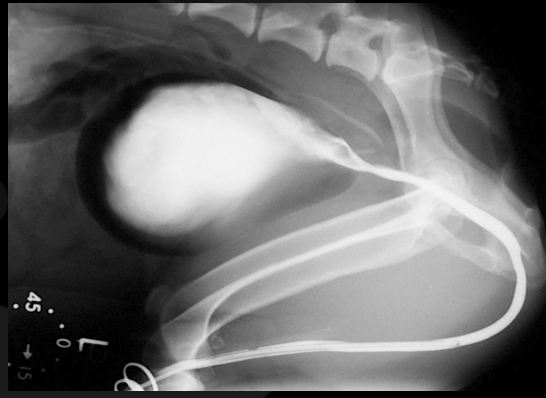


## Ascending urethrography



- Cats 5 ml
- Small dog 10 ml
- Middle dog 20 ml
- Large dog 30 ml

Take images during last third portion of the injection



Pepper, FI, 1 year



## Pepper, Labrador, FI, 1 year

- Bilateral ectopic ureters diagnosed
- Surgical intervention with ureters repositioned
- Continent patient
- Came back three years later for acute abdomen - gossypiboma
- Recovered well from FB removal



## Lady, Doberman, FS, 4 years

- HBC
- Send to Utrecht university for pelvic fracture
- Surgeon on duty decides for immediate surgery based on the single view provided by the referring veterinarian



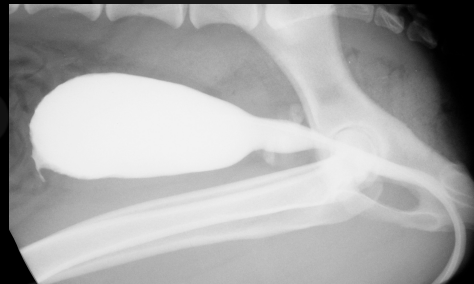
## Lady, Doberman, FS, 4 years

- The day after called in for an urgent positive cystography
- Suspected urine leakage from left thigh



## Positive cystography

- Heavy sedation or anesthesia
- Obtain survey radiographs, two or more
- Dilute the contrast 30-50% with saline
- Insert a sterile catheter in the UB



## Positive cystography

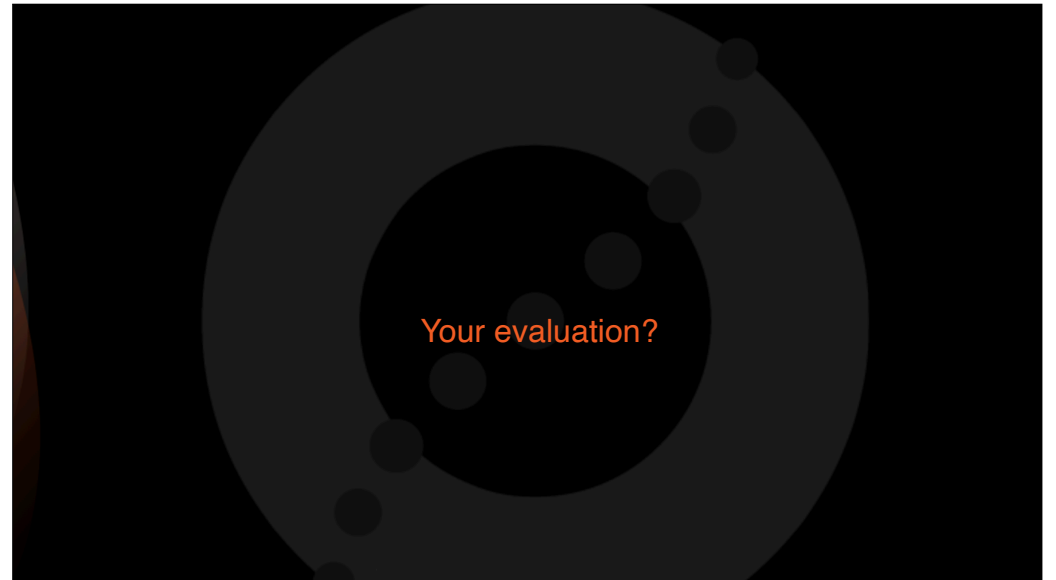
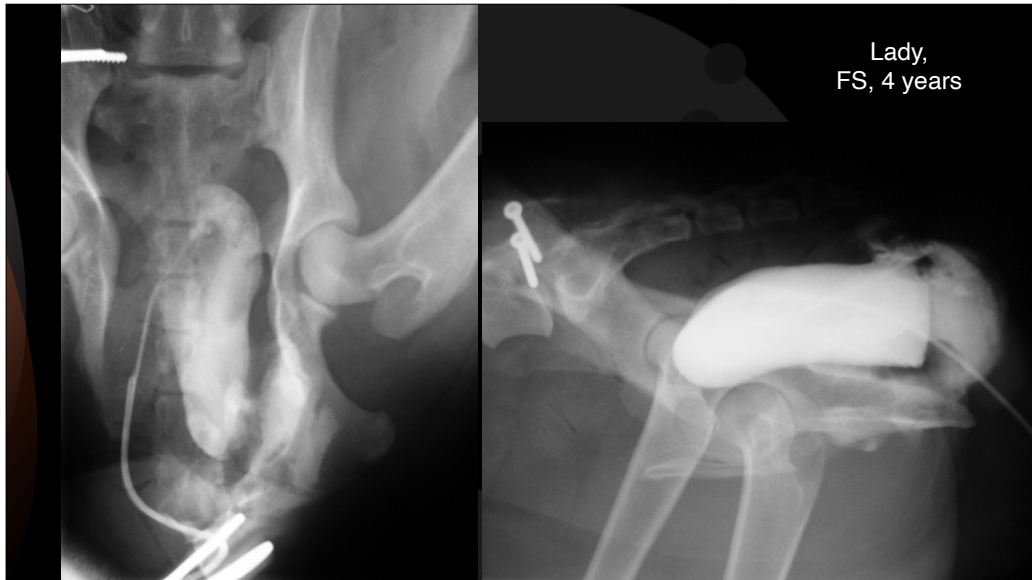
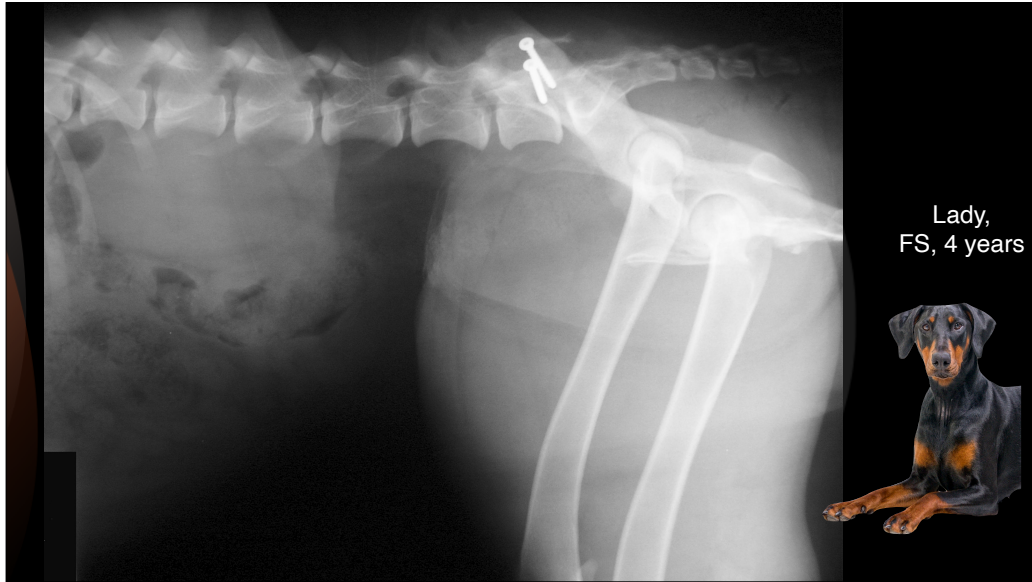
- Empty the UB
- Lidocaine 2% 3-5 ml to reduced discomfort
- 5 ml/kg of contrast (hold the UB to avoid overdistension)
- Cats 25 ml
- Take images during injection

## Negative

- 5 ml/kg of room air (hold the UB to avoid overdistension)

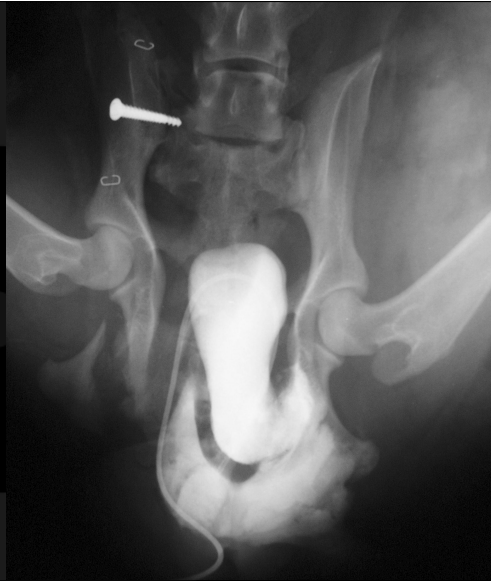
## Double cystography

- 5-10 ml of positive contrast and room air (hold the UB to avoid overdistension)



Lady, Doberman, FS, 4 years

- Herniated and ruptured UB in the pelvic canal
- At surgery, severe necrosis find
- Euthanised on the table



Romeo, DSH, MN, 9 years

- Difficult in urinating, severe swelling right hind limb
- Hematuria
- Lethargic and anorexic



Romeo, DSH, MN, 9 years

- Two years ago Hit By Car
- Pelvic fracture + ruptured urethra
- Urethrostomy performed at the time



Romeo, DSH, MN, 9 years

- Three months later caudal abdominal hernia with UB displacement - repaired
- Today, 18 months later, swelling of the right hind limb with suspicion of urine leakage



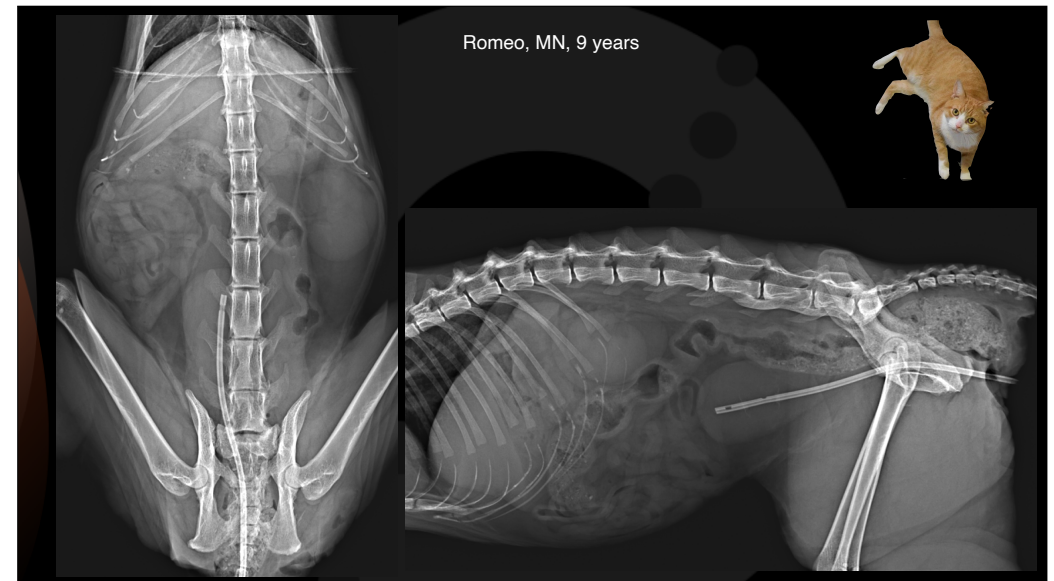
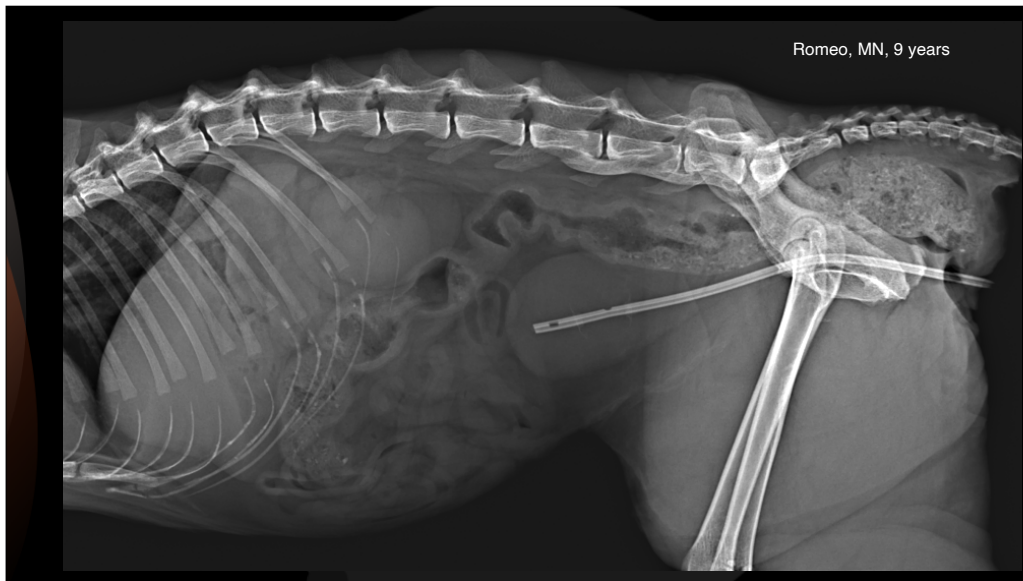
Stato del Sensorio:	<input checked="" type="checkbox"/> normale	<input type="checkbox"/> depresso	<input type="checkbox"/> stuporoso	<input type="checkbox"/> comatoso	<input type="checkbox"/> delirium
Peso (Kg):	5.65	B.C.S.:	NORMOPESO	TRC (sec):	2
Temp. (°C):	36.8	Polso (bpm):	132	Respiro (rpm):	28
Press. max.(mmHg):	160	Press. min.(mmHg):	90	Press. media (mmHg):	120

### Romeo, DSH, MN, 9 years

RBC (milioni / $\mu$ L) :	6.00	6.35	9.50	WBC (x 1000 / $\mu$ L) :	15.1	5.0	11.0
HGB (g/dL) :	8.5	9.6	14.3	Conta corr. WBC (x 1000 / $\mu$ L) :	0	5.0	11.0
HCT (%) :	24.4	28.0	42.5	Mielociti (/ $\mu$ L) :	0	0	0
MCV (fL) :	40.7	38.0	49.5	Metamielociti (/ $\mu$ L) :	0	0	0
MCH (pg) :	14.1	12.6	16.0	Neutrofili banda (/ $\mu$ L) :	453	0	300
MCHC (g/dL) :	34.6	31.0	35.0	Neutrofili segmentati (/ $\mu$ L) :	12986	2500	7000
CHCM (g/dL) :		30.0	33.5	Linfociti (/ $\mu$ L) :	1057	1300	5500
CH (pg) :		12.0	15.5	Monociti (/ $\mu$ L) :	453	65	250
CHDW (pg) :		1.70	2.70	Eosinofili (/ $\mu$ L) :	151	70	800
RDW (%) :	14.9	14.2	17.4	Basofili (/ $\mu$ L) :	10	0	110
HDW (g/dL) :		1.60	2.50	Danneggiate (/ $\mu$ L) :	0	0	0
NRBC/100 WBC:	0	0	0	Indifferenziate (/ $\mu$ L) :	0	0	0
				Altre (/ $\mu$ L) :	0	0	0
PLT (1000 / $\mu$ L) :	747	130	430				
MPV (fL) :	9.8	7.9	17.5				
PCT (%) :	0.735	0.20	0.50				
PDW (%) :	14.6	55.0	70.0				

### Romeo, DSH, MN, 9 years

CPK (IU/L) :	979	40-150			
AST (IU/L) :	27	20-60			
ALT (IU/L) :	29	15-50	Calcio (mg/dL) :	8.5	8.0-11.2
ALP (IU/L) :	11	10-70	Fosforo (mg/dL) :	9.4	2.6-5.0
GGT (IU/L) :	2.7	1.5-12	Magnesio (mg/dL) :		0.81-1.05
Colinesterasi (IU/L) :		1955-3950	Sodio (mEq/L) :	144	141-155
Bilirubina Totale (mg/dL) :	0.16	0.1-0.5	Potassio (mEq/L) :	5.4	3.0-5.5
Proteine Totali (g/dL) :	8.0	5.8-8	Rapporto Na/K :	27	31-43
Albumine (g/dL) :	3.7	2.5-4.0	Cloro (mEq/L) :	113	110-130
Globuline (g/dL) :	4.3	2.8-5.5	Cloro corretto (mEq/L) :	122	112-119
Rapporto A/G :	0.86	0.4-1.3	HCO-3 (mmol/L) :		12.0-22.5
Colesterolo (mg/dL) :	163	70-200	Divario Anionico :		-
Trigliceridi (mg/dL) :	121	30-100	Osmol. sier. calc. (mOsm) :	330	285-296
AMILASI (IU/L) :	612	350-1800	Ferro totale ( $\mu$ g/dL) :	15	110-170
Urea (mg/dL) :	322	20-65			
Creatinina (mg/dL) :	7.9	0.7-1.6			
Glucosio (mg/dL) :	148	80-145			



Romeo, MN, 9 years



Romeo, MN, 9 years



Romeo, MN, 9 years



Romeo, MN, 9 years





Romeo, DSH, MN, 9 years


Radiographic diagnoses:

- Ruptured distal portion of the urethra
- Surgical microrevision performed
- The patient recovered well, doing fine 11 months later



Conclusions

Contrast medium hold a very important role in the urinary system of small animals



STEVE MCCURRY

Thank you



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