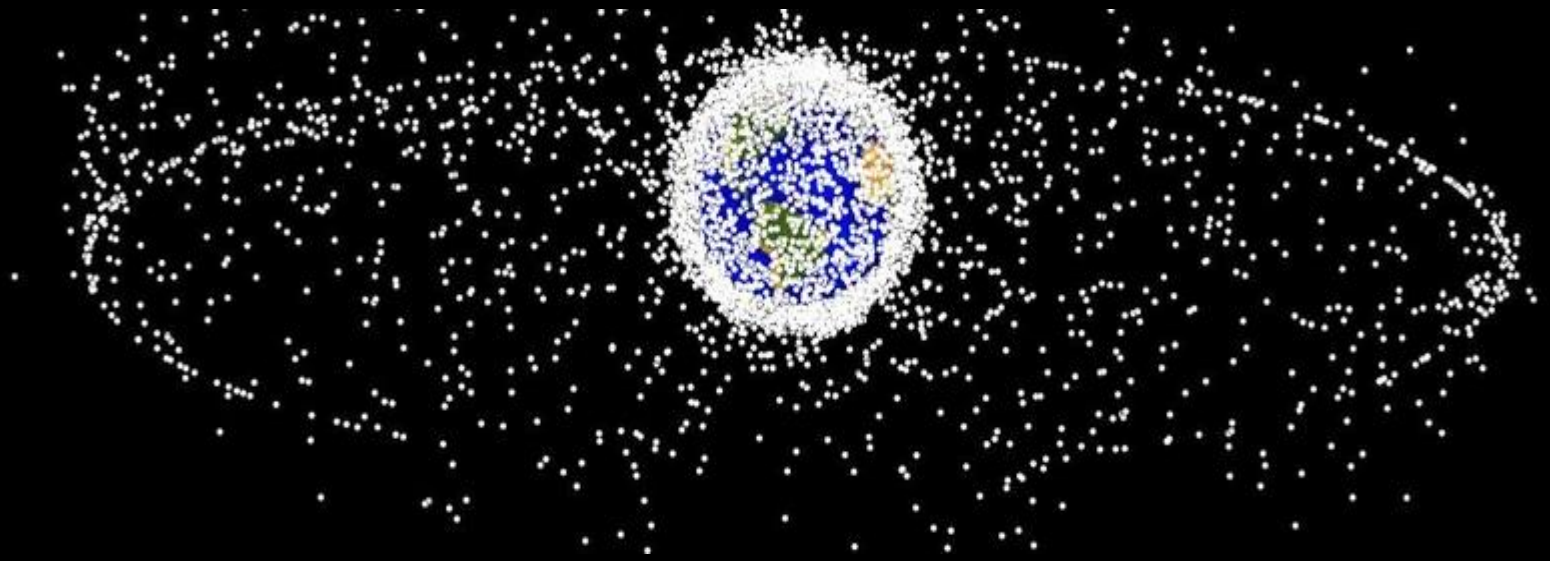


# Radiographic Examination Of Urinary System Diseases

Urinary system has

*metabolic

*humoral

*exretoric function

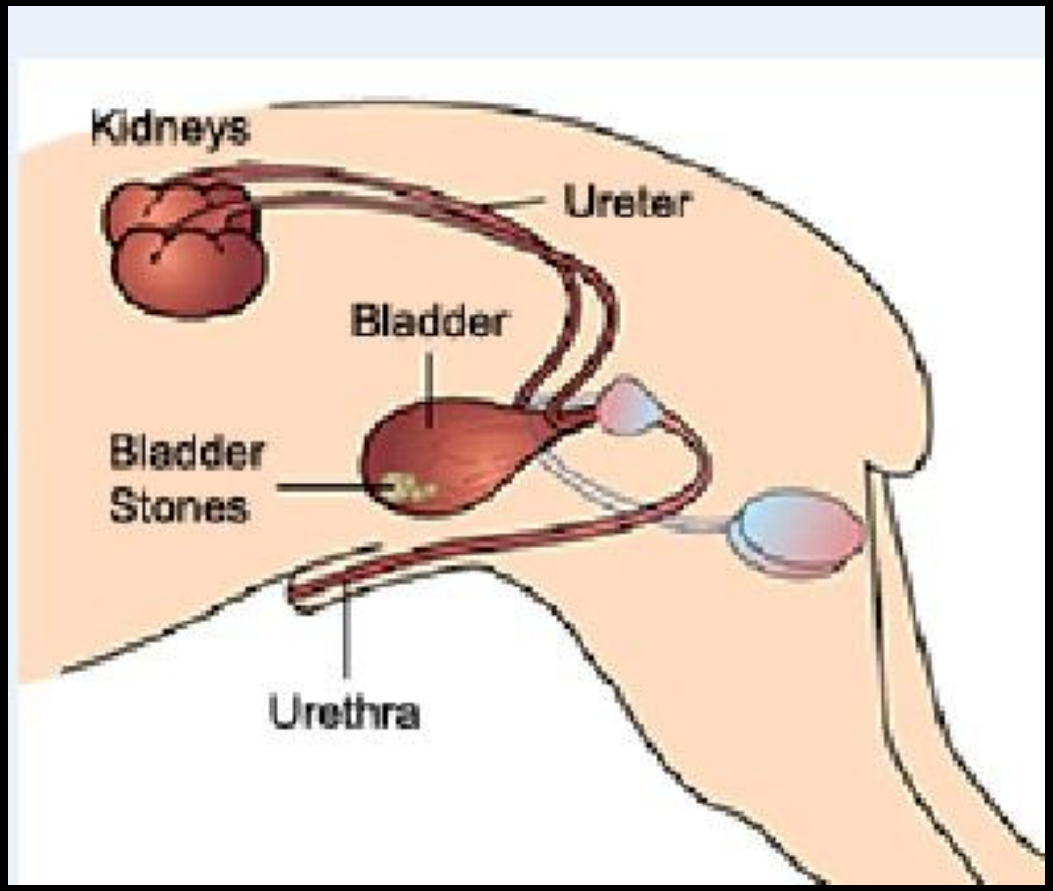
# Urinary system

kidneys

ureters

bladder

Urethra



When evaluating kidney diseases;

- *history
- *Physical examination
- *Urine analysis
- *Serum biochemical profile
- *Radiographic examination
- *Ultrasonography
- *Biopsy if necessary (definitive diagnosis)

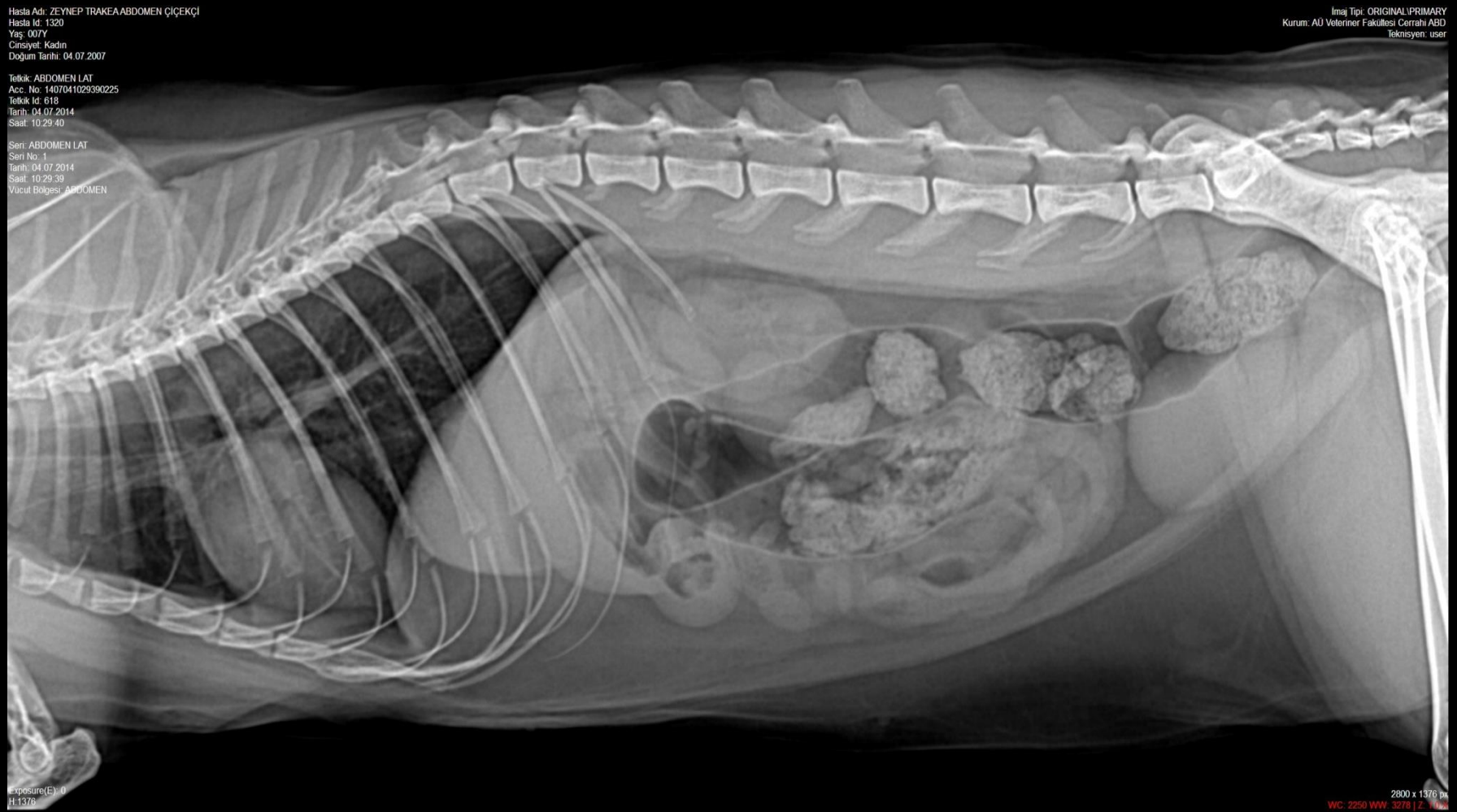
# Normal Radiographic Anatomy of the Kidneys

Kidneys are located in the dorsal space of the retroperitoneal cavity
Right kidney is more cranial than the left kidney

Right kidney
Dog; between T-13 and L-2
Cat; between L- 1 - L-4

Left kidney
Dog; between L-2 to L-4
Cat; between L-2 to L-5

Kidney size;
2.5 - 3.5 times the length of L2 vertebrae in the dog
2.4 - 3 times the length of L2 vertebra in cat



# Kidneys

Radiographic examination of the kidneys requires a prior preparation.

This provides an optimal image.

## 1. Preparation of Patient

The animals to be examined should be fasted 24 hours before the direct or contrast radiographic examination.

No water for 12 hours

Enema should be performed 2 hours before radiography

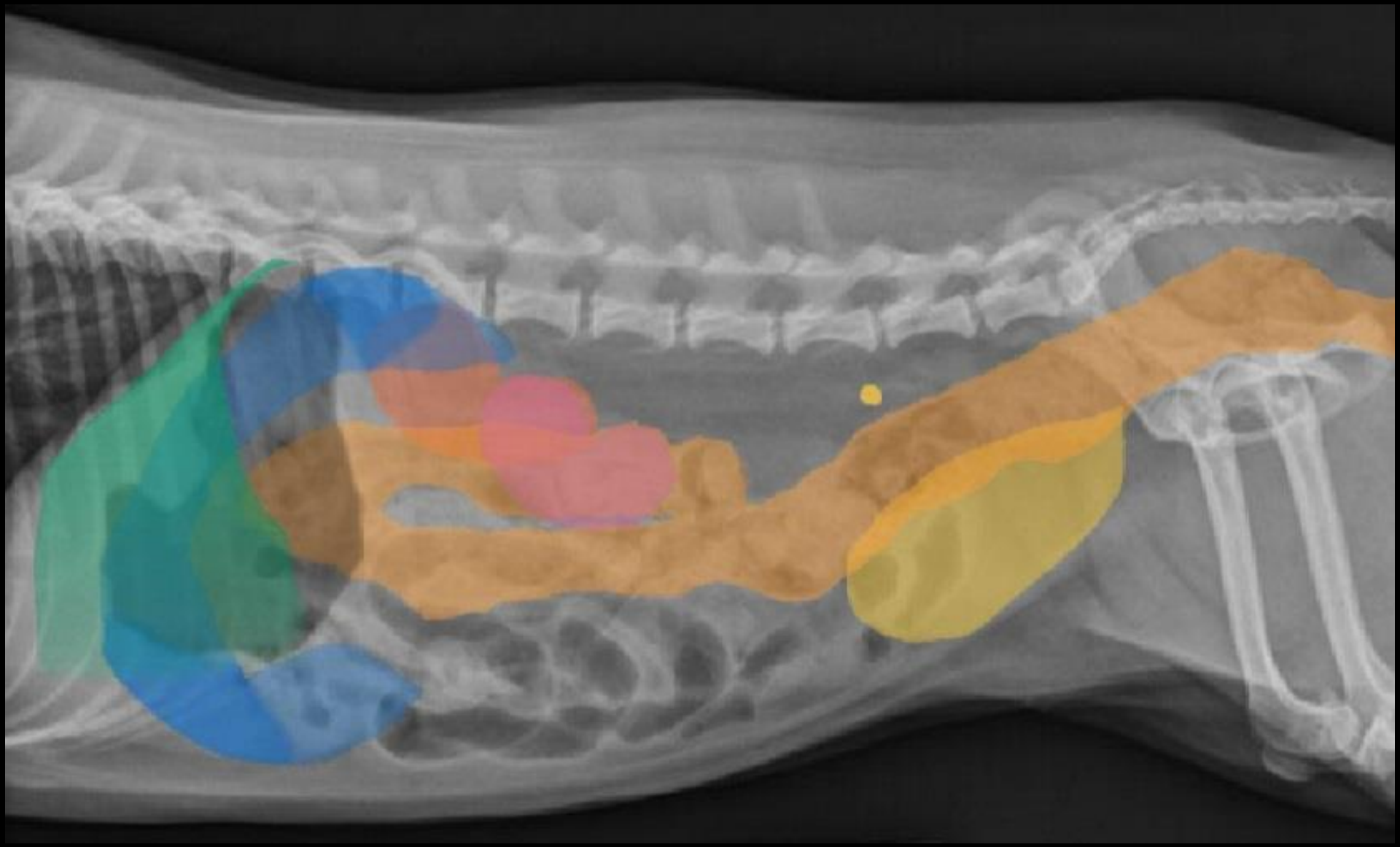
Empty bladder is useful

## 2. Radiation technique

Detail is very important in the obtained radiographs.
In order to ensure maximum contrast, the kV value is reduced and the mA value is increased to keep the shooting time as short as possible.
Must be grid cassettes or Bucy assembly
Radiography should be taken at the end of expiration time

## 3. The position of the animal

L / L (in the right lying position)
V / D
D / V



## Radiographic Examination of Urinary System

Radiographic diagnosis is made acording to radiographic changes caused by patological chances that happens due to diseases in urinary system

1. Direct radiography

2. Contrast radiography

Even thou ultrasound can be used for diagnosis of diseases radiography is still as important as before

1. Direct Radiography

   Performed without contrast agent

   On direct radiography; information about the size, shape, position, opacity and number of kidneys is obtained.

   Also radioopaque stones can be evaluated

Unilateral increase in kidney size

Compensatory hypertrophy
Subcapsular hematoma
neoplasia
Cyst
hydronephrosis

## Bilateral increase in kidney size

Acute Nephritis

Polycystic kidneys

Felin infectious peritonitis

Subcapsular hematoma

lymphosarcoma

Perirenal cyst

hydronephrosis

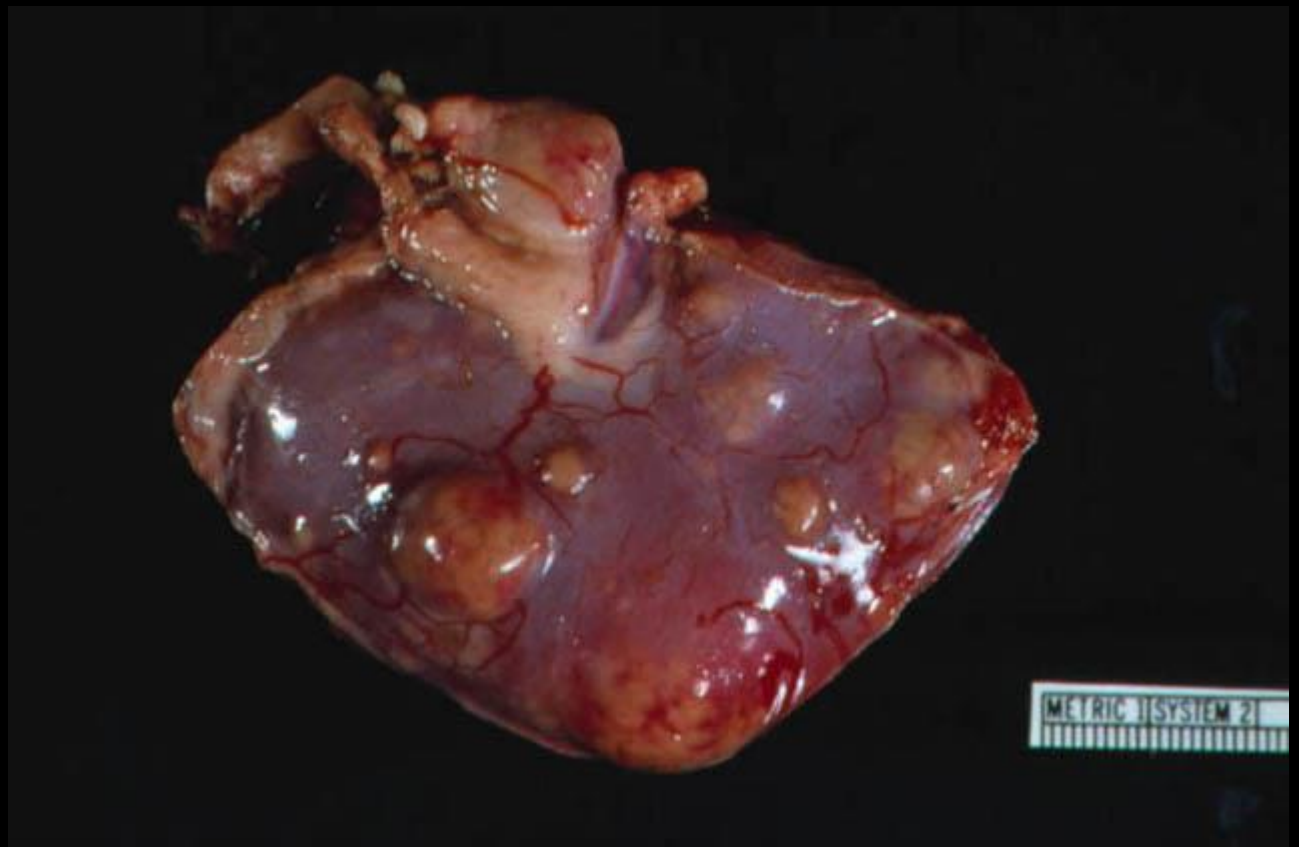
One or two kidney size focal or generalized irregularity;

*Cyst

*Tumor

*Hematoma

*Abscess



Reduction in kidney size;

*End stage of kidney disease

*Congenital hypoplasia of the kidney and dysplasia

## Increased kidney opacity

Local calcification in stone and kidney collecting system

Nephrocalcinosis (diffuse or local parenchymal calcification)

hyperparathyroidism

hypercalcemia

Ethylene glycol poisoning


4—

## 2. Contrast radiography

Intra-venous contrast agent is used to increase the visibility of the anatomical structures of the kidneys and the entire urinary system, facilitating the detection of pathology.

* Pneumoperitonography

*Excretory Urography (EU): Intravenous Urography (IU): Intravenous Pyelography (IVP)

## Pneumoperitonography

It is a technique that is not used very often.

It is used to ensure the visibility of the kidneys which are not defined in direct radiography.

Negative contrast agent (Carbon dioxide, nitrous oxide, air) are used

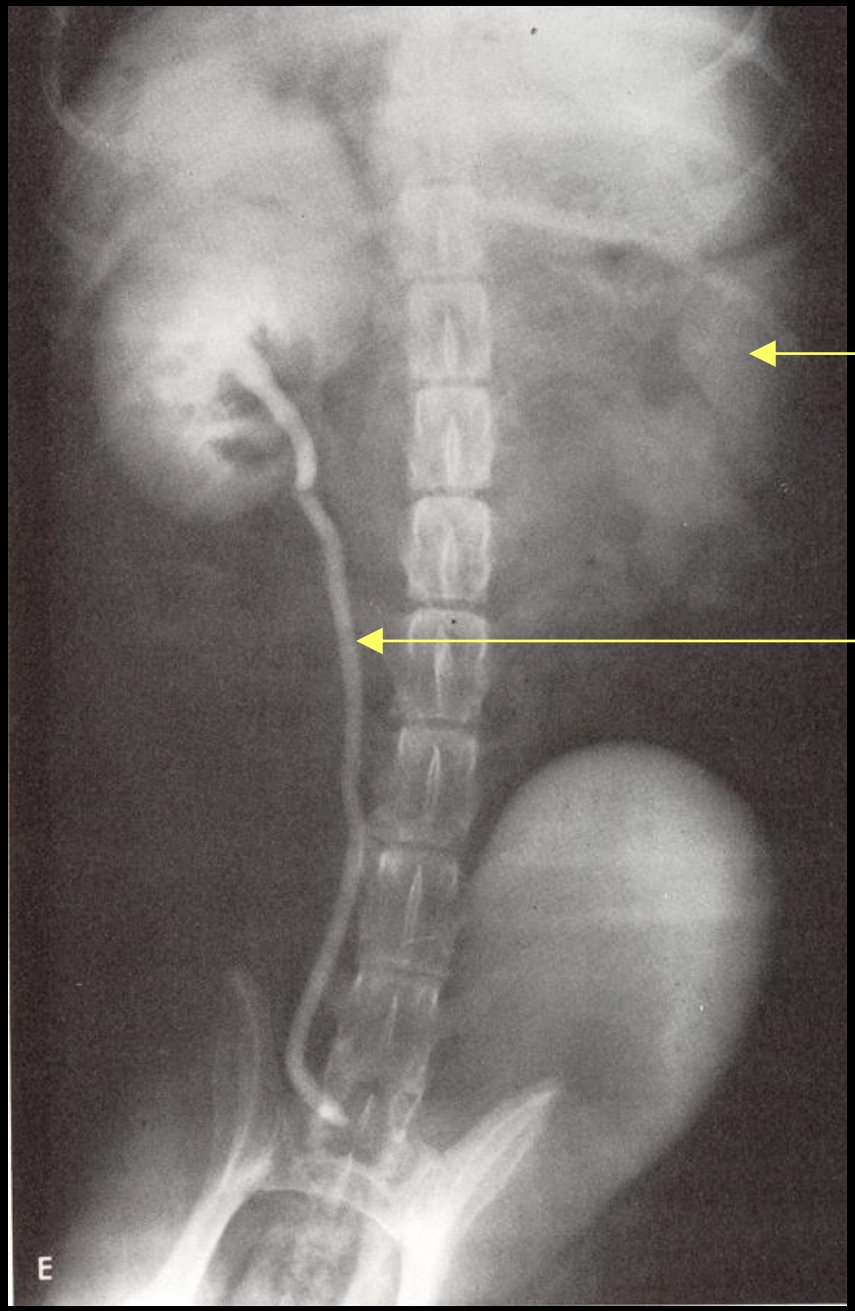
## Excretory Urography (EU): Intravenous Urography (IU): Intravenous Pyelography (IVP)

In this technique, water-soluble iodinated contrast agents are used intravenously.

These contrast agents let us evaluate the
- renal vascular system
- collection
- Concentration
- imaging of the kidneys in the stages of disposal

## Indications

* In cases of renal trauma, hematuria and renal pain
* The size, shape and localization of kidneys
* Qualitative evaluation of kidney function
* Evaluation of kidney diverticulum and pelvis
* Evaluation of ureters, urinary bladder and urethra


Nonfuctioning left kidney
Dialeted ureter
E

## EU Technique;

* The patient is prepared as previously mentioned and direct radiography is taken
* Ionic or Non-ionic contrast agents used
(Iohexol - Omnipaque, Iopamidol - Iopamiro, Iopromide - Ultravist - 300, Diatriosate - Urographine)

The contrast agent is administered iv
* Contrast dose dose 800 - 880 mg Iodine / kg
* V / D and right L / L radiography is taken as soon as the contrast agent is given
* If the BUN value is> 50% mg or Creatine value> 3%, the amount of dose to be given should be two times more

In intravenous urography, when the contrast agent progresses in the urinary tract, 4 phases are monitored physiologically.

* Arteriogram
* Nefrogram
* Pyelogram

* Cystogram

1. Arteriogram
   This phase is very short

2. Nefrogram
   Kidney parenchyma evaluated
   In two of the normal kidneys, opacification occurs immediately and the opacification should be homogeneous in both kidneys. This phase is very short
   In this phase, the position, shape and size of the kidneys are evaluated.

## 3. Pyelogram

It is the phase in which the opacification of kidney pelvis and diverticulum is formed.

During this period the pelvis should be small, thin in equal size, sharpness and opacity

The divertullaries should be seen in parallel with each other in the pelvis renalis

## EU Methods

* Unpressurized
* Pressurized
* Infusioned Pyelography

1. Unpressurized Urography

   The positive contrast agent is given in one single dose in 10-15 seconds.
   Then at 0 minutes V / D and L/L
   5th minute, V / D and L/L
   20 minutes, V / D and L/L
   40th minute, V / D and L/L radiographies are taken

## 2. Pressure Urography

Used to obtain a good nephrogram and pyelogram. For this purpose, pressure is exerted on the abdominal region to prevent the immediate discharge of the contrast agent from the kidneys.

1. Direct radiography is taken first
2. The contrast material is given as IV and the time of administration is checked. 5 minutes after contrast medium is given, pressure is applied to the abdominal region and then the first radiography is taken in the ventro dorsal and right lateral position.

3. The second radiography is taken at the same positions 10 minutes after the administration of the contrast agent and the applied pressure is removed.

4. At the 15th minute, the third radiography is taken (since the transition of the contrast medium to the bladder is late).

This technique should not be performed in patients with suspected renal calculi and patients with poor general condition.


IVP

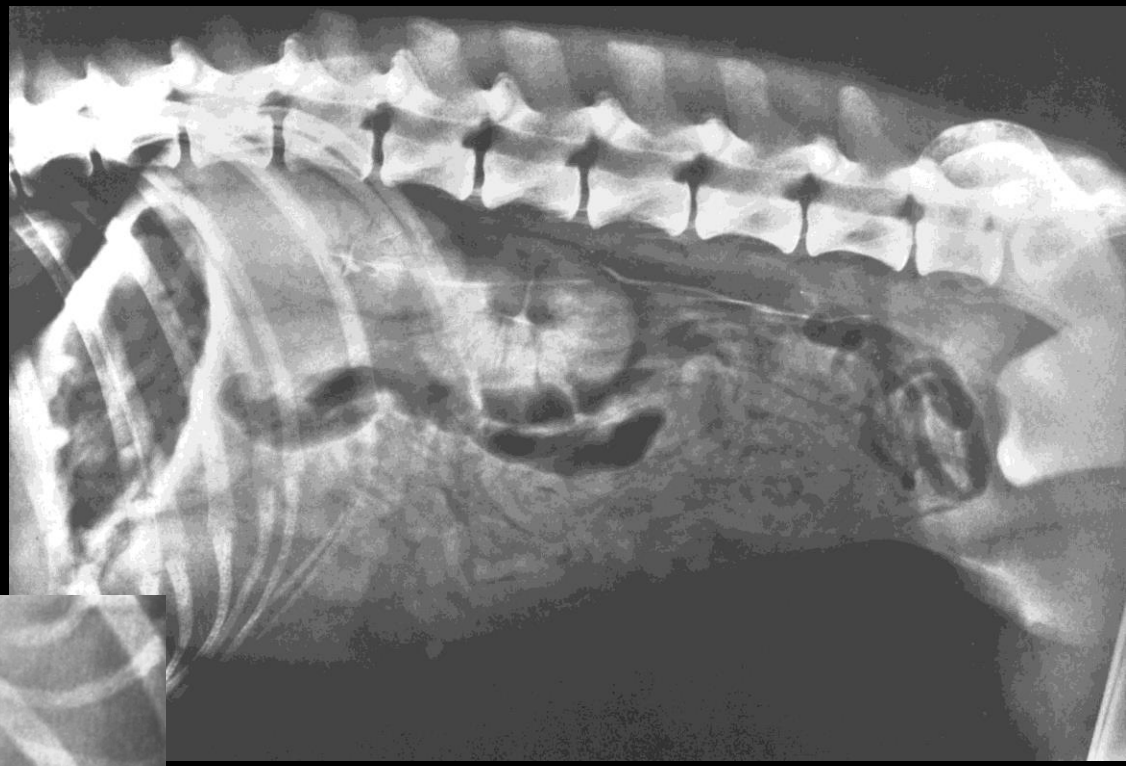
Pyelogram

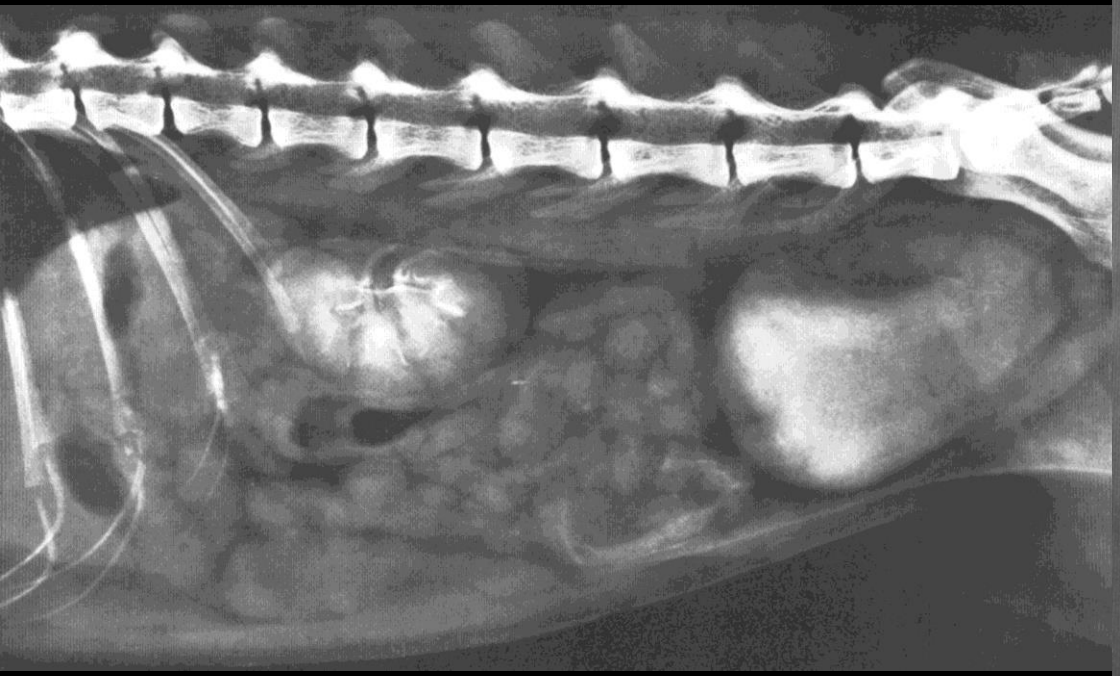
3. Infusion Pyelography

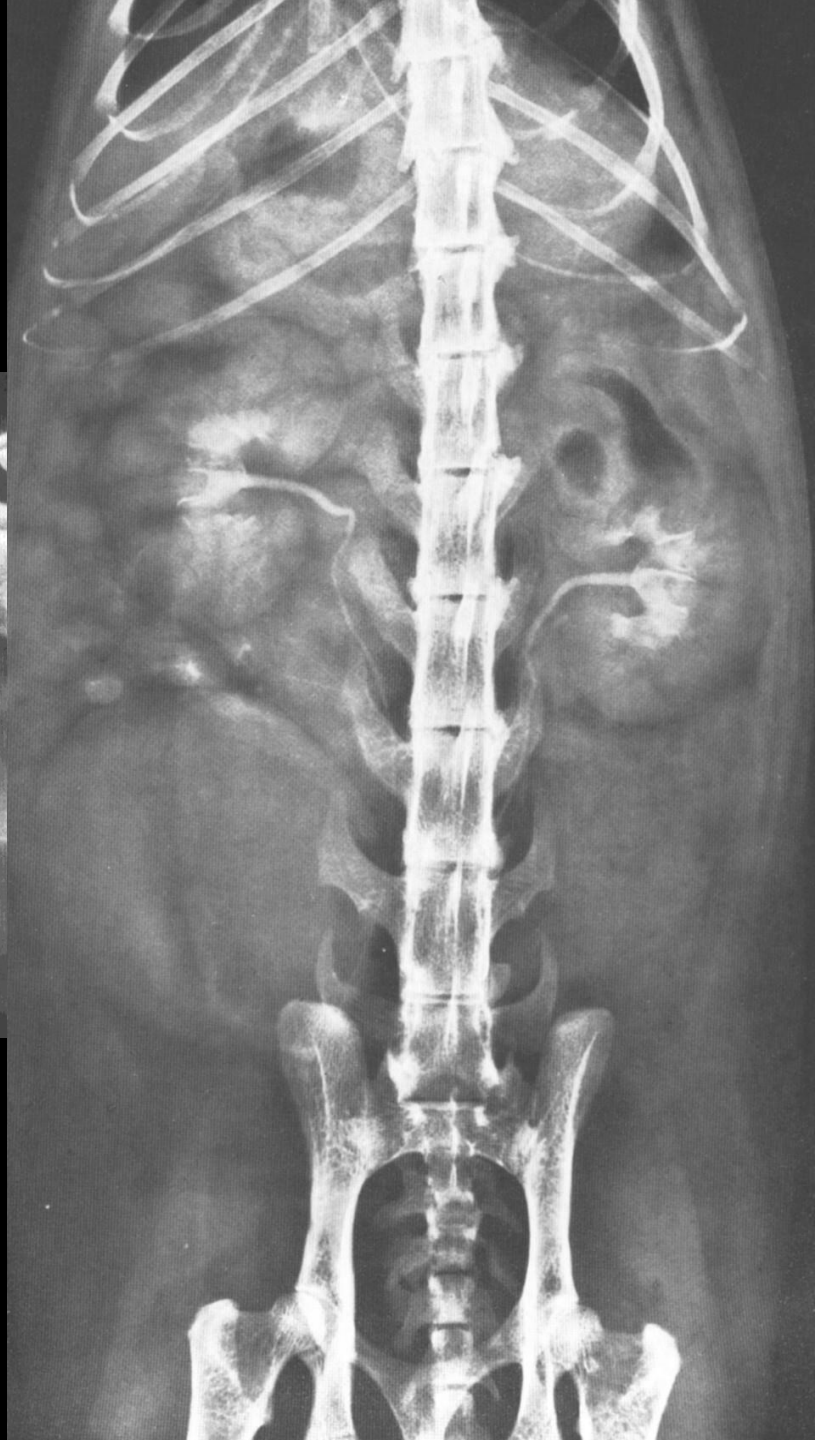
A less dense but larger amount of contrast agent solution is given here in the form of IV perfusion.
This gives a clear view of the entire urinary system.
The prepared contrast agent is diluted with 100 - 200 ml of saline and given as IV.

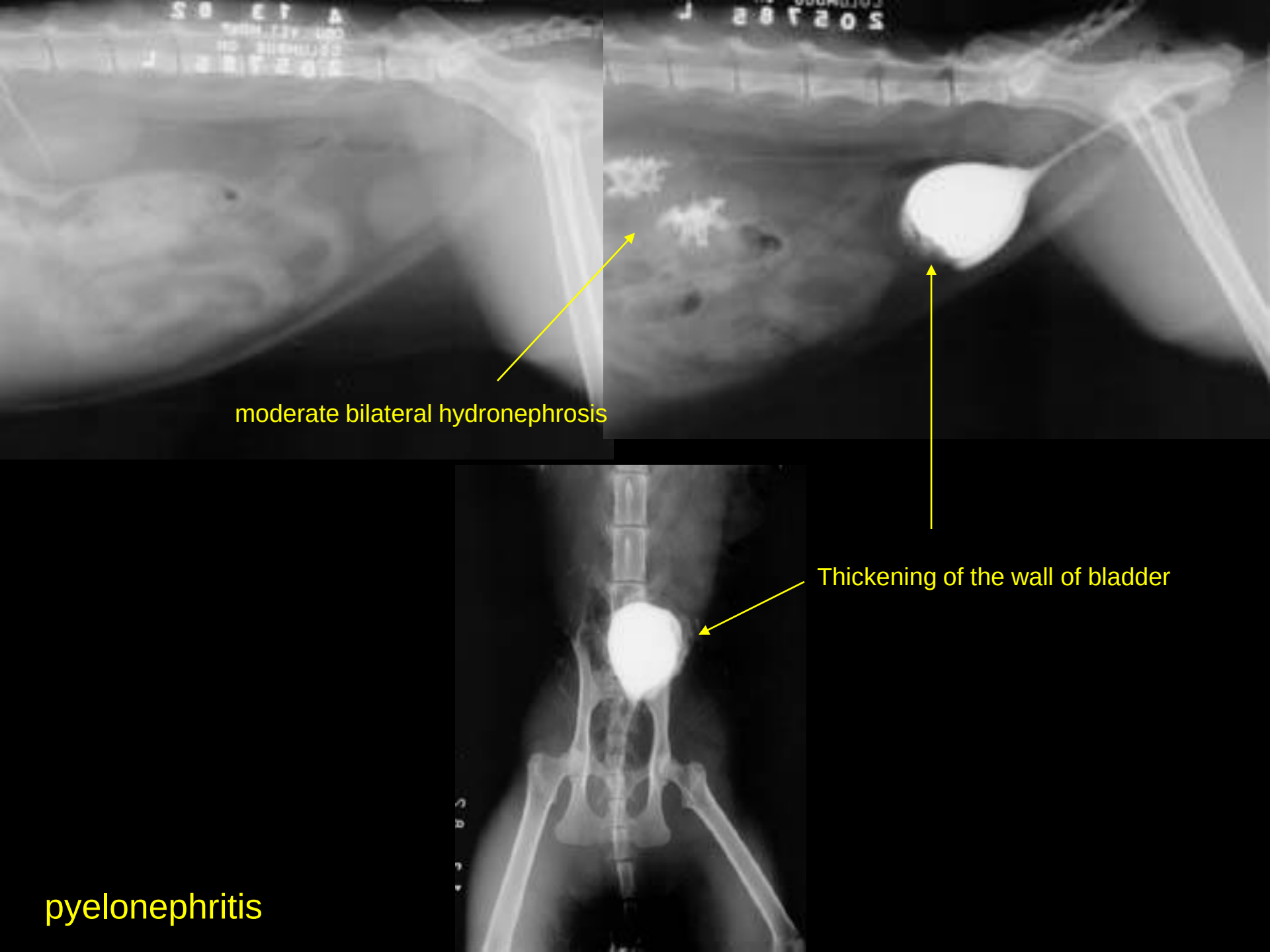
1. radiography is taken ventro dorsal and right lateral positions when the serum is half

2. radiography is taken in ventral dorsal and right lateral positions when serum is done
If there is no function in kidneys after 40 minutes, radiographs should be taken at 100th, 120th and 180th minutes. If there is no function again, it will be replayed at 6, 12 and 24 hours (Late radiogram)










pyelonephritis

# Disorders in Nephrogram Phase

- Acute or chronic primary or secondary disorder in kidneys
- Obstruction of renal arteries (thrombus)
- Renal artery avulsion
- Absence in the kidneys
- end period of kidney diseases
- Hydronephrosis
- Diffuse neoplasia (not common)

- Insufficiency of contrast agent dose

Extension of Nefrogram Phase

* Renal vein thrombosis

* Renal pelvis obstruction

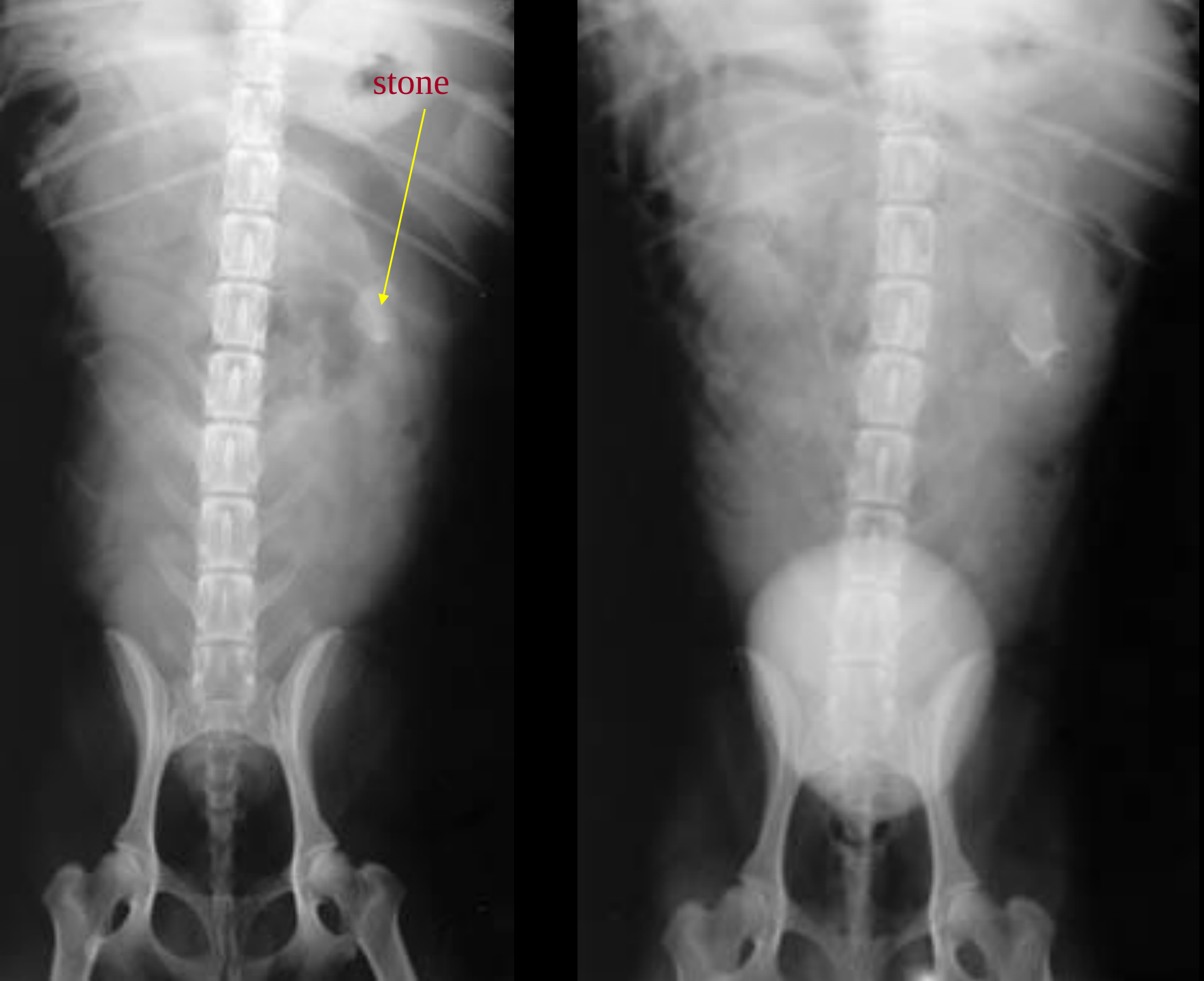
* Acute kidney disease

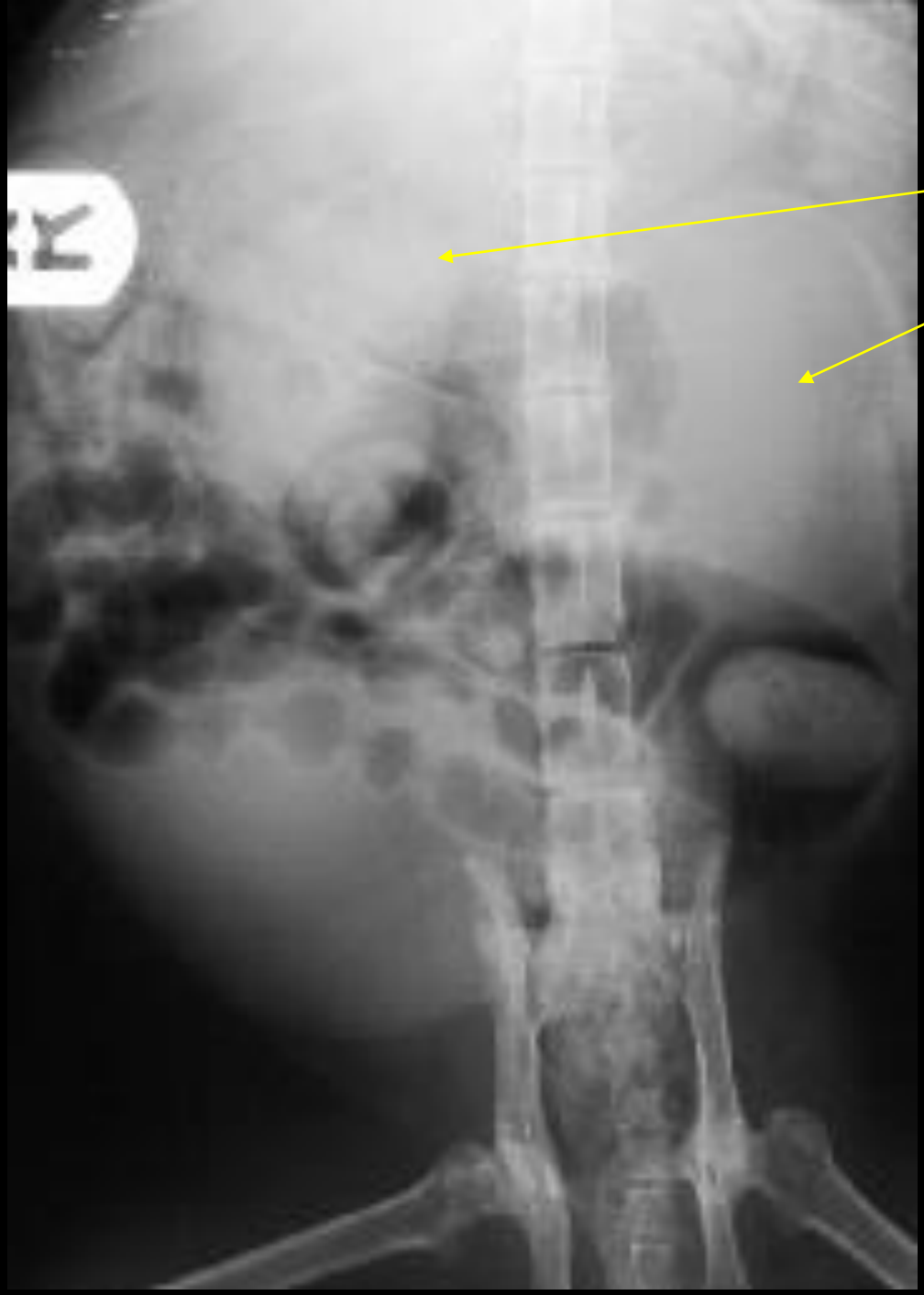
## Causes of Heterogeneous Nephrogram Phase

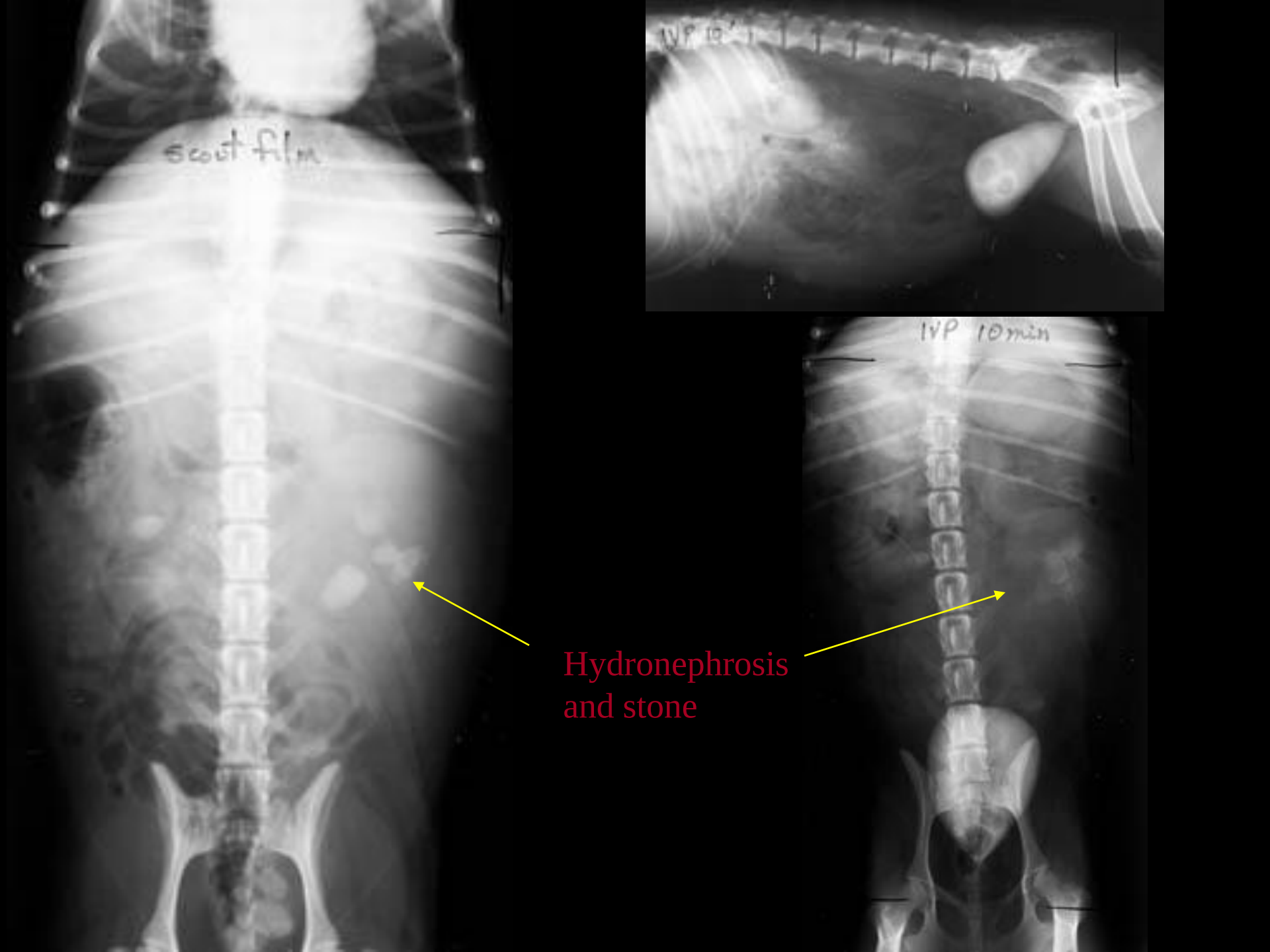
* Hydronephrosis
* Neoplasia
* Polycystic kidney disease
* Renal cyst and abscess

Distortion of the Kidney Pelvis and Diverticulum

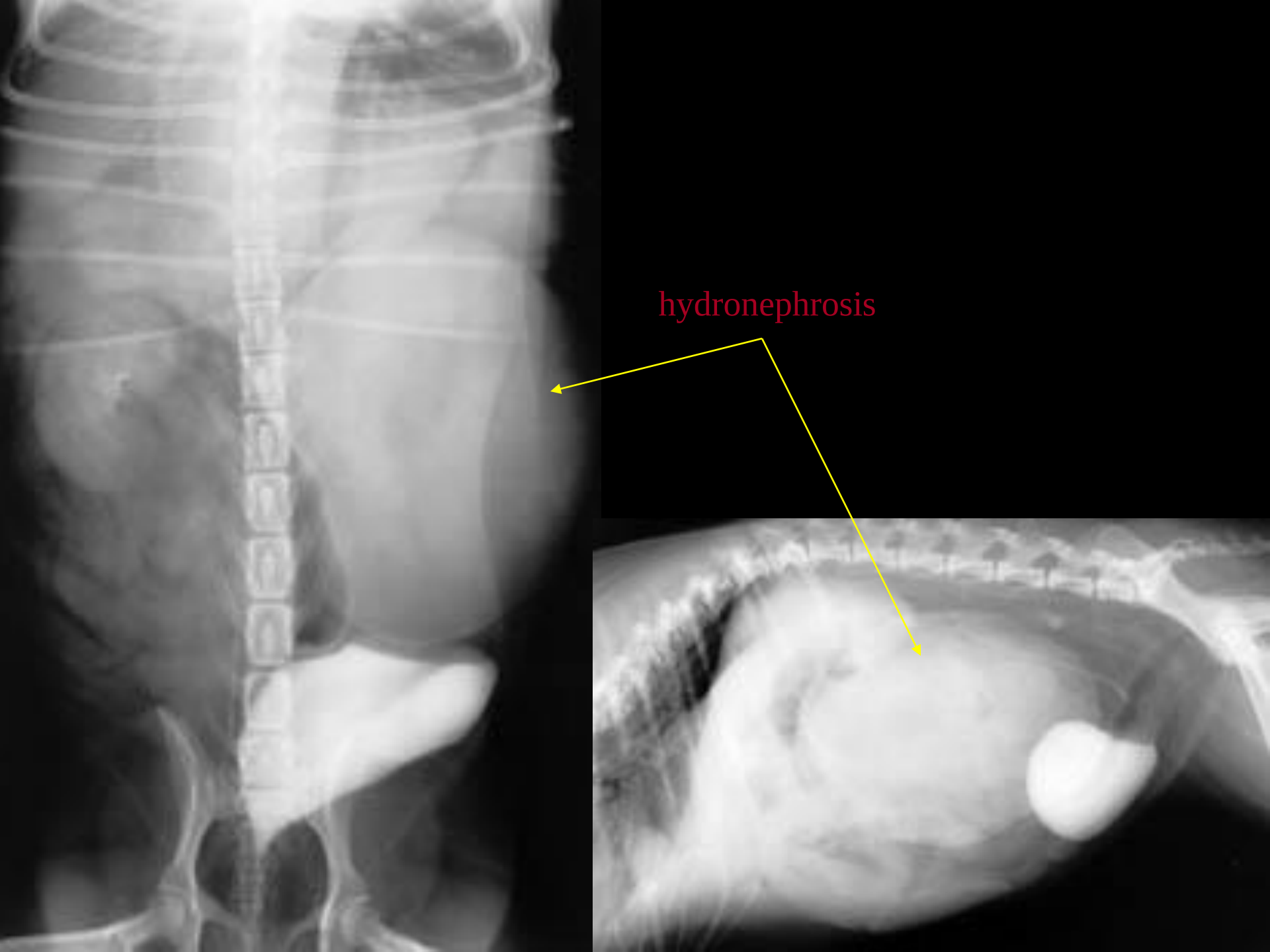
- Pyelonephritis
- Tumoral compression or tumor spread to the pelvis
- Moderate or severe hydronephrosis
- Stones


stone


hydronephrosis




Hydronephrosis
and stone


hydronephrosis

Rupture in kidney


Perirenal cyct

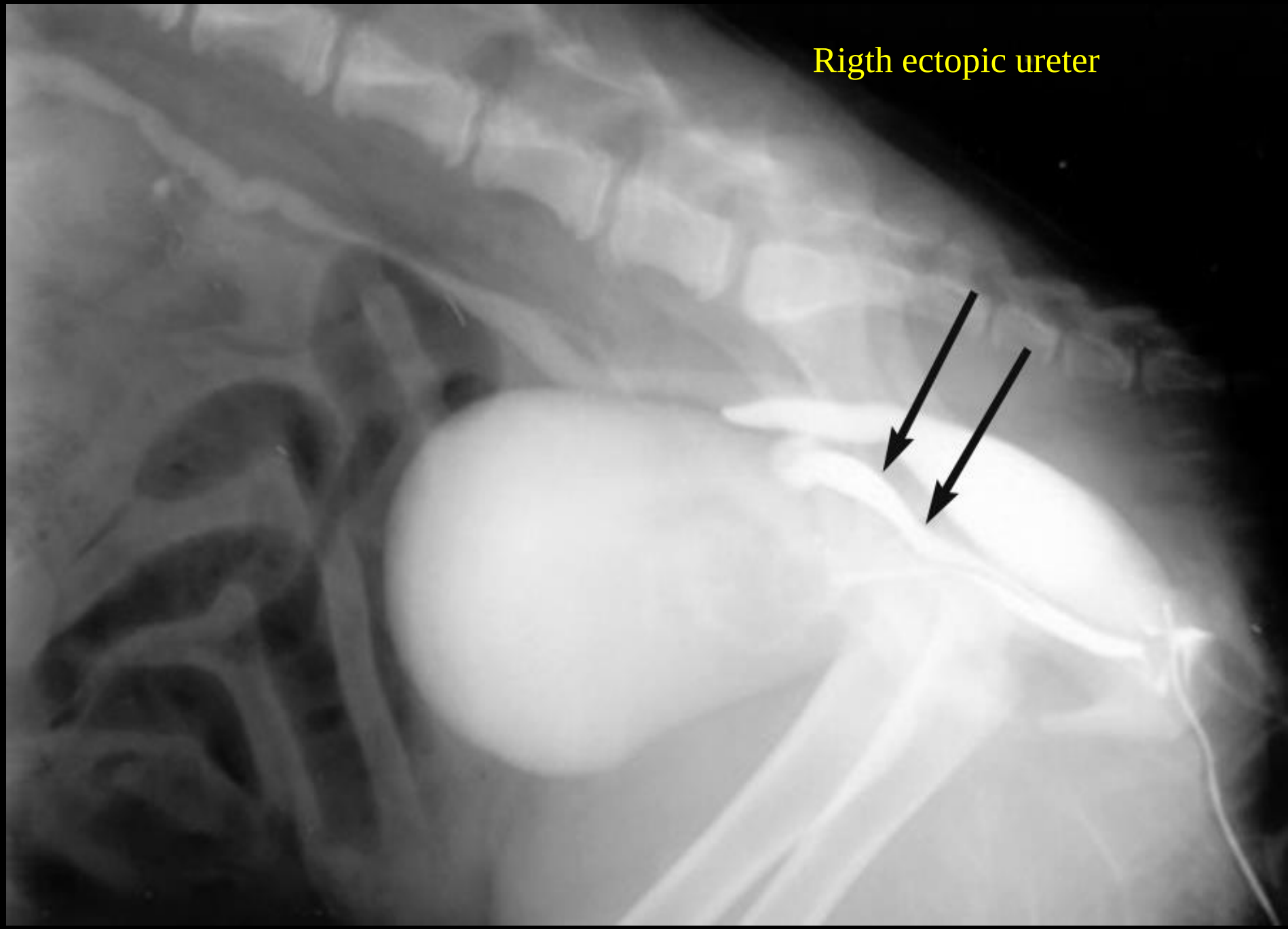
# URETERS

The ureters are retroperitoneal when they come out of the kidney, they are intraperitoneally when they come near the urinary bladder and they enter the urinary bladder from the dorsal of the bladder.

Urethers are not seen on direct radiography

During excretory urography, contrast media can be seen going to the bladder from the kidneys during infiltration.


✓
8 5
a 3


Rigth ectopic ureter


Ectopic ureter